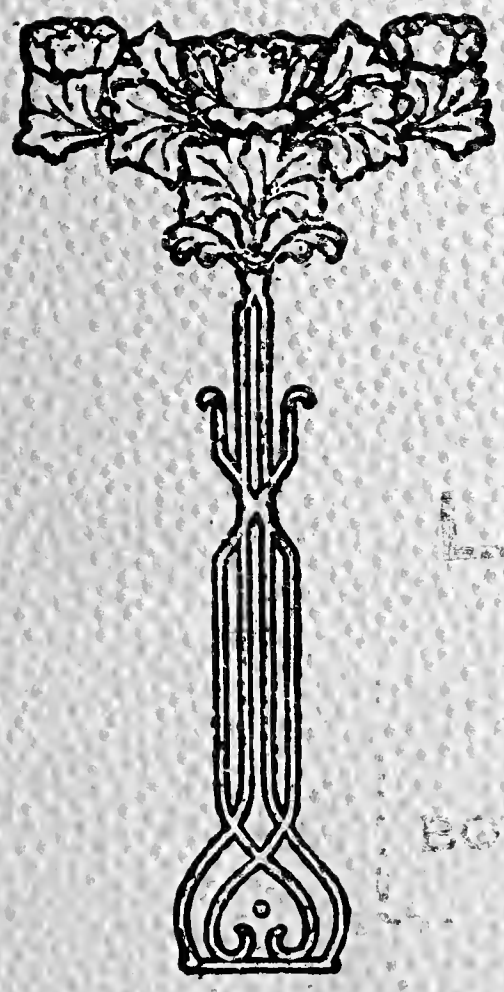
PROCEEDINGS OF THE FLORIDA STATE HORTICULTURAL SOCIETY *for* 1914



PUBLISHED BY THE SOCIETY

PROCEEDINGS

OF THE

TWENTY-SEVENTH ANNUAL MEETING

OF THE

FLORIDA STATE HORTICULTURAL SOCIETY

HELD AT

PALATKA, APRIL 28, 29, 30,
MAY 1, 1914

COMPILED BY THE SECRETARY
PUBLISHED BY THE SOCIETY

THE E. O. PAINTER PRINTING CO., DE LAND, FLA.

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-President, 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 1914:

PRESIDENT:

H. HAROLD HUME, Glen St. Mary.

VICE-PRESIDENTS:

L. B. SKINNER, Dunedin.

W. C. TEMPLE, Winter Park.

H. B. STEVENS, DeLand.

SECRETARY:

OKLE C. 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

Methods of Packing and Shipping Citrus Fruits.—David Scott, Arcadia, Fla.; J. C. Chase, Jacksonville, Fla.; Dr. O. W. Sadler, Mt. Dora, Fla.; S. C. Inman, Florence Villa, Fla.

Methods of Handling Citrus Groves.—J. W. Sample, Haines City, Fla.; S. H. Gaiteskill, McIntosh, Fla.; T. Ralph Robinson, Terra Ceia, Fla.; H. L. Borland, Citra, Fla.

Irrigation.—D. C. Gillett, Tampa, Fla.; Josiah Varn, Bradentown, Fla.; Geo. W. Peterkin, Lakeland, Fla.; F. W. Stanley, Washington, D. C.

Vegetables.—E. S. Hubbard, Federal Point, Fla.; C. K. McQuarrie, Gainesville, Fla.; J. P. Campbell, Jacksonville, Fla.; Joshua Gist, McIntosh, Fla.; R. A. Conklin, Fellsmere, Fla.

Peaches, Deciduous Fruits and Nuts.—Ira D. Soar, Dade City, Fla.; L. Latrobe Bateman, Tampa, Fla.; A. A. Lewis, Cathaline, Fla.; W. J. Ellsworth, Blanton, Fla.

Insects and Diseases.—S. F. Poole, Winter Haven, Fla.; F. M. O'Byrne, Jacksonville, Fla.; Dr. T. G. Julian, Clearwater, Fla.; F. D. Waite, Palmetto, Fla.; E. L. Pearce, Clearwater, Fla.

Fertilizers.—J. A. Stevens, DeLand, Fla.; Lem Wood, Tampa, Fla.; J. S. Carroll, Atlanta, Ga.; Harry Hassen, Jacksonville, Fla.; Mrs. N. M. G. Prange, Jacksonville, Fla.

Tropical Fruits.—Mrs. P. H. Rolfs, Gainesville, Fla.; H. C. Henricksen, New York City, N. Y.; W. H. F. Gomme, Brooksville, Fla.

Pineapples.—R. L. Goodwin, Ft. Pierce, Fla.; B. K. McCarty, Eldred, Fla.; W. R. Hardee, Jensen, Fla.

Ornamentals.—Mrs. Marian A. McAdow, Punta Gorda, Fla.; Miss Edith Hubbard, Arlington, N. Y.; Mrs. E. W. Berger, Gainesville, Fla.; Carl Holtenhoff, Gotha, Fla.

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Necrology.—E. S. Hubbard, Federal Point, Fla.; Edgar A. Wright, Tampa, Fla.

Legislation.—M. E. Gillett, Tampa, Fla.; A. H. Brown, Monavista, Fla.; G. L. Taber, Glen St. Mary, Fla.; I. A. Stewart, DeLand, Fla.; O. W. Conner, Tangerine, Fla.; Lloyd S. Tenny, Orlando, Fla.

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Hentz, W. B., City Point, Fla.
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Freeman, W. D., Palm Beach, Fla.
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Griffing, W. D., Port Arthur, Texas.
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Gurney, L. H., Merritt, Fla.

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Wilber, John E., Winter Haven, Fla.
Wilder, H. A., Fellsmere, Fla.
Wilmshurst, H. G., DeLand, Fla.
Wilson, C. H., Clermont, Fla.
Wilson, Mrs. C. H., Clermont, Fla.
Wilson, F. H., Palatka, Fla.
Wilson, F. Page Eden, Fla.
Wilson, Frank T., Tallahassee, Fla.
Wilson, Miss Mabel, Palatka, Fla.
Wilson, M. C., Weirsdale, Fla.
Wilson, S. S., Ozona, Fla.
Willard, A. S., Palatka, Fla.
Williams, Geo. R., Box 378, Jacksonville, Fla.
Williams, S. F., 403 West Bldg., Jacksonville, Fla.
Willoughby, C. L., College of Agri., Gainesville, Fla.
Winberg, C. F. E., Silverhill, Ala.
Windham, R. W., Fellsmere, Fla.
Winterbotham, R. W., Sutherland, Fla.
Wirt, R. D., Crooked Lake, Fla.
Wolfe, R. L., Glen St. Mary, Fla.
Wolfenden, J. L., Evinston, Fla.
Wolfenden, Mrs. J. L., Evinston, Fla.
Worden, L. P., Winter Haven, Fla.
Woodrow, David S., Ocala, Fla.
Woodruff, Hamilton, Care J. R. Tysen, Jacksonville, Fla.
Woods, L. R., Tampa, Fla.
Wright, Edgar A., Tampa, Fla.
Wright, S. H., Eldred, Fla.
Wyman, A. F., Bradentown, Fla.
Wyman, Mrs. A. F., Bradentown, Fla.

Yelvington, J. H., Palatka, Fla.
Yothers, W. W., Orlando, Fla.
Young, Albert B., 1032 Niagara St., Buffalo, N. Y.
Young, A. M., Palatka, Fla.
Young, G. F., McKinley, Isle of Pines.
Young, Lewis, Orange City, Fla.

Zachar, Jerome, R. F. D. No. 1, Racine, Wis.

Proceedings of the Twenty-Seventh Annual Meeting of the Florida State Horticultural Society

The Twenty-Seventh Annual Meeting of the Florida State Horticultural Society convened at Palatka on April 28th. The attendance was unusually large, the largest in fact that we have had for several previous years. The good people of Palatka welcomed the members with open arms and extended to them the freedom of the beautiful and progressive little city, and the many courtesies and attentions shown the members of the society during their stay in Palatka did much to increase their pleasure and satisfaction.

The opening session of the society was held in the parlors and lobby of the Putnam House, and at its close the members of the Palatka Woman's Club held an informal reception. This "social hour" was enjoyed by the visiting members, as it gave them an opportunity to meet and become acquainted with the good people of Palatka, as well as to renew old acquaintances among themselves, and to meet and become acquainted with the more recently initiated members.

The regular sessions were held in the commodious opera house, which was tastefully decorated for the occasion by the energetic local committee in charge of arrangements.

Our programme this year was one of the best and most comprehensive we have ever had, as it covered a wide range of subjects of most vital importance and interest to our members. The papers read showed most careful preparation and close study of the subjects treated, and the interest shown was emphasized by the discussion following the reading of the papers. These discussions as usual brought out many new points and valuable ideas.

The problem of marketing citrus fruits, is of course ever with us, and the valuable paper and report submitted by Mr. Tenny claimed the attention of the society for nearly one entire session That Mr. Tenny was talking to a deeply interested and appreciative audience was evidenced by its close attention and the many questions propounded to him.

Another interesting number on the programme was an illustrated lecture by Mr. J. Horace McFarland, of Harrisburg, Pa. The many beautiful colored views

presented during the course of the lecture added much to its interest. Mr. McFarland's address was an inspiration, and will no doubt do much to inspire in the hearts of his hearers a greater desire to beautify both the back and front yards of their homes. Recorded elsewhere is a short address by Mr. McFarland.

Among other attentions shown the members of the society by the good people of Palatka was a pleasant excursion on the beautiful St. John's river—the steamer City of Jacksonville having been chartered for that purpose by Palatka's enterprising Board of Trade. In addition to the steamer excursion there was an excursion by automobile through the great potato fields of Putnam county and to the immense camphor grove a few miles south of Palatka—the largest cultivated camphor grove in the world.

When the question of the next place of meeting was taken up, Arcadia, Gainesville, Ft. Myers and Tampa—each extended cordial invitations to meet with them the coming year. Gainesville gracefully withdrew and Ft. Myers was dropped after the first ballot. On the second ballot Tampa won by a good majority, and at that place the Society will meet next year.

Addresses of Welcome and Responses

ON BEHALF OF THE CITY OF PALATKA

Mayor S. J. Kennerly

Mr. President, Ladies and Gentlemen:

I deem it an honor and a pleasure to meet you here tonight, and in behalf of the citizens of Palatka, to extend to you a welcome; a welcome with the word written in large, golden letters. We have no walls or fences around our city; neither have we a key that I might present it to you, but our borders are all open and we come to you with open arms and say to you that all we have is yours; enjoy it, and when you return to your homes, we trust that your stay with us shall have been so pleasant that you can congratulate yourselves that you have been present at the twenty-seventh annual convention of this organization.

We are glad to have you with us tonight, tomorrow and the following day, and we would be glad to have you longer. We are proud of you; we are proud of you as an organization, one of Florida's products, with its membership extending throughout our State, and beyond. We are proud of you, for we feel that Palatka is the birthplace of this organization, for it was here thirty years ago that a few orange growers gathered together and formed themselves into what was known as the Florida Fruit Growers' Association.

Some of you present here tonight may have been members of that association. There are not many left of the number. Some of them who were dear friends of mine have crossed the river and are resting under the shade of the trees in the Great Beyond.

We are glad you are with us, and we hope you will continue to grow, that your organization may be known in every part of Florida and the United States.

In conclusion, permit me again to say to you, in behalf of the citizens of Palatka, that we welcome you to the Gem City of Florida.

RESPONSE

Lloyd S. Tenney, Orlando, Fla.

Mr. Mayor:

We are here; all of us, I think. I should hate to tell just why we have come, because I expect the excuses and reasons would be quite varied. Some of us have come because we have our new dresses to show. Some of us are here because we have our new Palm Beach suits. Some of us are here because Palatka has the reputation of giving us good things to eat. I heard one or two persons say they had come because they had not seen Palatka for twenty-three years, and they wanted to see if it had changed. The causes are numerous for our coming, but we are all here.

Seriously, though, Mr. Mayor, and officers of the Horticultural Society, a gathering like this is significant. Fifty or one hundred years ago, this would not have been possible. Agriculture was an entirely different type of business than it is today. Each individual farmer—and we are farmers, notwithstanding the fact we call ourselves horticulturists—has an entirely different problem to solve. Farming then was a different industry. Each little farm had its own life; it grew its own products which were essential to that life; it manufactured its cloth and other commodities used in the home. It was practically sufficient unto itself. This was as it should be, in those days, and the life at that time tended to foster the spirit which is, perhaps, the strongest characteristic of the American farmer; independence, self-reliance. Or, looking at it from another angle, it developed the characteristic which has made it so hard for the American farmer to co-operate with the other farmer, his neighbor.

But these days are past. With the development of the railroads, the refrigerator cars, the opening of distant and new markets is made possible, two thousand and three thousand miles away. No longer is the farmer able to supply his necessities and comforts from his own farm. The industry cannot be carried on, on the old individual lines. There are things in our common problems that the individual cannot solve; that two or three together cannot solve; and for these reasons it is necessary for us to come together to consider these problems. More and more the farmers are realizing this and great meetings are being held, from the Atlantic to the Pacific.

We are coming here representing just one State, just a few industries, but we have come with the hope that, in addition to having a little pleasure, we may gain a little strength, gather a little information, that is going to carry us through our trials and tribulations with a little more light than if we had not come.

And this is why we have come.

ON BEHALF OF THE BOARD OF TRADE

Mr. Howell A. Davis

Mr. President, Ladies and Gentlemen:

The program announces that the welcome from the Board of Trade was to come from Mr. Selden, our president, but as he is absent that pleasant duty has been placed upon me. I confess, however, that under hasty circumstances, having the day only to frame the words of welcome I am to speak, I come before you with some hesitation.

Naturally I am proud of Palatka, and you will not censure me if I tell those who may not be familiar with it, that it is a mighty good town; that it has more miles of brick street paving and concrete sidewalks than any other town in the state, if not in the South, as far as I know, of equal population; that it is at the head of deep water navigation on the St. Johns river, and accordingly gets lower freight rates than inland towns; that the only wagon bridge across Florida's greatest river is here; that we have six steamer lines and four different railroad systems; that it is in the chief artesian well district in the state, with pressure to carry water 25 feet above the surface; that in its territory is the leading winter grown Irish potato section of the state; that we grow corn and many other things; that the only cultivated camphor plantation in the United States is in our county, and it's a sight worth seeing, and it made 10,000 pounds of camphor last winter; that we have the largest cypress saw mill in the South, and ships from Atlantic Coast ports are here regularly; we have the largest door factory in the South; the only cedar pail and lard and tobacco bucket factory in the state; the only dynamite factory; a large fertilizer plant; the largest handlers of orange box material in the state, distributing over a million boxes last season, one-sixth of the entire number used in the state; and our county produces as fine oranges and grapefruit as any in the state, over 200,000 boxes last year; the largest exclusive paper and stationery house in the state; a wholesale drug house, besides several wholesale grocery houses; the largest mail order seed house in the state; we have three newspapers, none better in the state, and one of them a daily, with extras on the street when there's news worth telling; a successful business college; our fraternal spirit is seen in every form of lodge and society, and altogether we feel that we are entitled to a place on the map. And as more than an incident, I do not wish to overlook the fact that we have one of the most active Boards of Trade in the state, and visitors are most cordially invited to visit our rooms, and I hope the members of this society may take a look in while they are here.

Palatka is my home, I was born here, and I feel its welfare as sincerely as I do my own. I want you to feel at

home, and I want you when you go away to bear only good feelings for our city. Palatka this week is your home and we will be glad to believe that your stay with us may always be a cherished experience, and the wish is expressed that you may come often.

If my memory serves me, this society is the outgrowth of a meeting held here by orange growers twenty-eight years ago. In the years since then mighty changes for the better have taken place in Palatka, in Florida, and in the strength and fortunes of your society, one of the best, if not the best, among all similar organizations in the republic.

Your society has made a reputation for Florida, and I am proud of you, and our people are sincerely glad to have you here. The reports of your meetings are sought for and serve as text books in the homes of intelligent people on every continent. This is a fact of which all of us can be proud.

Your deliberations reflect the achievments of men and women whose minds are free and hands unbound, and who are wresting from the ground, the patient mother of us all, the bounties she freely yields to those who gently and intelligently and earnestly persevere.

No land is fairer than our Florida. The climate in Florida is nature's smile and goes with the land. Florida is a land of flowers, of plants in myriad variety and of trees. I was looking over a list of the merchantable trees of Florida, not long ago, and was surprised to find over two hundred, one-half more in number than in any other state. And yet the stranger hurrying through our state and forming his opinion from a car window survey, says "nothing will grow in Florida." He has eyes, yet he sees not. The more I study the possibilities of Florida the stronger my convictions of a greatness to come without comparison in any equal area on the continent. Florida is going to help solve the problem of how to keep down the high cost of living by growing plenty of things, and growing them at minimum cost. Florida has the soil, mark you I say soil, the water, the warmth, the light, the great markets are near and available by car or ship, the food demand is large and growing, and with more farmers and fruit men to join the pace set by the splendid men and women before me, to what heights of greatness can our state not attain?

I thank you. Come again.

RESPONSE

W. S. Hart

Mr. President, Ladies and Gentlemen:

When the mail brought me notice from our worthy president advising me that I had been appointed to reply to the address of welcome of the president of the Board of Trade of this city, and saying "Don't write 'No'—that will do no good. Copy has already gone to printer." I asked myself why he had done this thing, knowing nearly as well as I do, my entire lack of qualifications of an orator and most else that would fit me for the task, except an abiding love for this Society and a pretty thorough knowledge of its history. I came to the conclusion that it was through an error of judgment on his part, coupled with a desire, in the kindness of his heart, to give me a running start early in the game, fearing that, in my old age, I might not be able to hold out to the end, as in former years.

Following out this thought I am going to ask you to be indulgent and pardon me if I speak in part of matters with which the older members are familiar and for the frequent use of the first person, singular number. I have been privileged to share in the benefits of this association from the time of its first meeting after its organization, held at Ocala in February, 1889, where it entertained the American Pomological Society, the foremost pomological society of the world, and the Georgia State Horticultural Society, with that giant horticulturist, Prosper J. Berkmans, to call the great convention of three horticultural societies to order and preside over its deliberations. The meeting was held in the immense building of the Semi-tropical Exposition, where the finest display of citrus fruits, scientifically considered, ever gotten together on earth, was one of the chief attractions.

From that date to this, I have taken part in all but two conventions, and was absent from them only because it was not possible for me to attend. I have followed closely the history of the society, and in my humble way, tried to help in making it a worthy and a valuable one.

As secretary, for some years, I wrote its early records and was privileged to edit, with President Adam's assistance, and publish its first printed and bound report, as well as others that followed.

From the time I resigned the secretaryship that the work might be placed in more able and experienced hands, I have been entrusted with the funds of the society and have been on its executive committee for twenty-five years. I am proud of this because of the splendid record the society has made, and have inflicted that much of my connection with said record on you simply to show that I speak with authority when putting a high value upon it.

It could not have been other than

a glorious one with such men as Dudley W. Adams, Rev. Lyman Phelps, Jas. P. DePass, J. B. Anderson, Geo. L. Taber, Arthur Manville, Pliney W. Reasoner, O. P. Rooks and other strong men to give it birth, soon to be joined by E. O. Painter, E. S. Hubbard, Professors Rolfs, Swingle, Webber, Heime, by F. G. Sampson, C. F. A. Bealby, Dr. Richardson, C. T. McCarty, W. C. Temple, Mrs. Rolfs, Mrs. Prang, still later by Mrs. McAdow and scores of other earnest and able horticulturists. It has in its twenty-seven years of strenuous life, faced a multitude of grave problems with fortitude and seldom failed to solve them in a way to increase the sum of horticultural knowledge and benefit to its members, the state and others everywhere who are working along similar lines.

In these labors it has always had the very able and valuable assistance of the Scientists of the Agricultural Department at Washington, and of those of our own Agricultural College and Experiment Station, they appreciating the advantages to themselves as students, that a membership and close association with this society would give, and at the same time, its value as a medium through which they, as scientific workers and teachers, might make the results of their labors immediately effective and valuable to those who were eager to receive and benefit by them.

This society, outside of political and religious organizations, has been for much of this time, the strongest and most influential in the state. It has always had the highest respect of her people and done more than any other to increase her wealth and build up her industries. Except for it, Florida would have been far behind where she is today and many millions poorer. These are generally accepted facts, yet few realize anything like the full value of its work.

As an illustration of this, I have in mind the great disaster of the winter of 1894-95, now but a tradition to many of you, when, in one night, property was destroyed that was paying good interest on eighty millions in value. The state had but a small population (I think something like a half million, all told). Every interest in it suffered severe hardship, we had no insurance money coming in to help rebuild our groves, we had little credit, few had means with which to hire help; we sent out no appeals for assistance, or received any contributions. It would take years to get our trees back to a profit-bearing condition; but many went bravely to the task, got vigorous, but tender, sprouts started on the old roots, only to have them cut down by cold again in two years. Again we made the attempt and again, in 1899, came a cold spell that destroyed all our work and killed more citrus trees outright, than any previous cold spell. Some of our best men were heartbroken, could stand the strain no longer, and dropped wearily into their graves. Others, by the hundreds, abandoned their groves and either went into other lines of business or left for other parts. A few sturdy, unconquerable souls ac-

cepted conditions as they were, came together each season in convention of this society, talked matters over, compared notes, earnestly discussed plans for the rebuilding of our horticulture and its protection from injury by cold; told each other of their individual failures and successes and went home with their faith refreshed and their courage renewed to continue the fight. At the end of seven years of famine and heroic struggle, the horticultural interests of the state were on a safer basis than ever before, a few had gotten the fruit to growing again and to markets that were hungry for it and willing to pay prices that, with returns from truck grown among the trees, once more put the faithful on their feet and proved their faith well founded. Florida was soon restored to her proper place at the head of the citrus growing world and as the winter garden of the United States. This is but one of the many instances in which this society has done grand work for Florida, and yet, up to this date, she apparently has never, through her legislative body, become fully assured of her existence.

Other states make annual appropriations and many of them very liberal ones, to foster the work of their horticultural societies and deem it money well spent. The finances of this society have ever been run on lines of generous helpfulness to its members, never on those of prudence. It has given more than it could afford each year, rather than curtail its usefulness to those who needed its help, and those who loved her best and were able to do so, have each season met the deficit. This may have made the tie closer, but I, for one, am ashamed of this neglect on the part of my adopted state and I always shrink from asking for contribution from our members, as I know that some will respond who can ill afford to do so; yet I see no way of meeting the increasing expenses in the future, otherwise than as in the past, unless the state does give help, or some of the loyal ones continue to help, after they are gone from our midst, by endowing the society with funds, as did Marshall P. Wilder endow the American Pomological Society, when death took him; its first and only president up to that date. His legacy has done much to increase the usefulness of that body.

I have hardly yet reached the "three score and ten" mark, nor are any of us fully assured that we ever will.

I believe that Mr. Taber, Mr. Gaitskill, Mr. Hoyt and myself are the last of the "old guard," and I think I speak for them as well as myself when I say that it would add to our peace of mind before we step off the stage to know that the future of this society was assured through an ample income that would allow of the expansion of its work and usefulness.. I leave the thought for your consideration.

From what has been said, I believe it has been clearly shown that, in my estimation, any town that secures the presence of this society in annual convention must show good credentials and is highly honored by a winning vote. I am glad to note that the most

wide-awake and progressive towns of the state eagerly compete for this privilege. Palatka has entered the field repeatedly; the first time, if my memory serves me correctly, at Ormond, in 1892, Mr. W. H. Mann, of Manville, acting as her spokesman, and with a Palatka man as our first stenographer, but Pensacola won, so the next year we gathered in the extreme western part of the state.

When I was fourteen years of age, one cold winter morning in my native town in New Hampshire, I listened to a schoolmate reading in the South Florida Journal, a stray copy of which had in some way fluttered down in our midst, an account of Col. Hart's orange grove at Palatka, Fla., and the returns that his crop had that year brought him.

There and then I decided, and announced that I was going to Florida and raise oranges. Ten years later I arrived, having been in the state 39 years this month and have grown oranges.

All this time I have had a warm spot in my heart for this town, because of its association with that decision. I have always desired that our society should gather here because I wished to meet her people and be known by them, and have waited, rather impatiently, for the invitation to become sufficiently urgent to bring this about. I am told that she "did herself proud" at DeLand, so we are here, are receiving a warm, earnest and hearty welcome, which this society fully appreciates as coming from one of the oldest towns of the state, yet one which we have been assured here this evening, has renewed its youth and awakened to the new order of things.

By noting her late improvements we see that she has a spirit of up-to-dateness to rival that of her younger sisters and only awaited the coming of the State Horticultural Society convention to prove this to the world. When we return to our homes I hope, and believe, that most of us will have given Palatka new prominence on our mental maps as one of Florida's most beautiful and best located towns, one that has a future of great promise and a warm-hearted citizenship that we shall count it a privilege to have become more intimate with and in whose welfare we shall take a deeper personal interest.

Gentlemen and ladies of Palatka, you have known some of us personally for years, some only by name and others not at all. I think I express the sentiment of each member who has listened to your greeting tonight when I say it is our hope that from this meeting may grow up many warm and lasting friendships and that in the future the name "Florida State Horticultural Society," either seen or heard, may remind you of a season of happy and improving experiences that will cause you as well as ourselves to wish that its next convention to be held in your city may be at an early date and that, if possible, an even more earnest and cordial greeting may welcome its arrival.

President's Annual Address

H. Harold Hume.

Members of the Florida State Horticultural Society, Ladies and Gentlemen:

It used to be, if there was a bright boy in the farmer's family, he must needs forsake the farm to become a lawyer, or a doctor or some sort of a so-called professional man, but Jim or Jack or Bill, somewhat dull of mind and wit would do very well on the farm. On the surface it would seem that the farms lost and the professions gained. But it was not always so and more often the farmer lad who chose to remain on the farm outstripped his brighter brother. Yet because he dealt with things earthy his occupation and he himself likewise were looked down upon. As years went by, however, it became more and more apparent that to succeed in crop-producing required knowledge no less exacting in its requirements and covering a vastly wider range of subjects than the knowledge which brought success in other walks of life. For many, many years, however, it was true that our practice as applied to crop raising far outran our knowledge of the principles involved. While it is true that the cultivation of the soil and the handling of crops will never become an exact science, yet the knowledge which we now apply to the work in which we are interested and which Jim or Jack or Bill must have at his command has increased many fold within very recent years. And it is because of this gain in knowledge, both theoretical and practical that the attitude of every one toward the farmer and his occupation has changed. Today farming in its several more or less specialized branches of vegetable growing, fruit growing, cattle raising, poultry raising and field crop production is regarded as a worthy calling for the brightest and best minds in the land.

As already intimated, for many years our knowledge as applied to farming lagged behind our practice, but it is now equally true, speaking always in general terms, that our practice is not keeping pace with our knowledge. Now it is to this thought that I desire at this time to direct your attention by reference to the lines of work in which we are engaged and with which we are most intimately acquainted.

Cultivation of the soil began with the desire on the part of the cultivator to destroy weeds or plants not desired that were likely to crowd out and injure the ones in which he was interested. But we now know that the destruction of weeds is a matter of very secondary importance. We now cul-

tivate to conserve moisture and to promote chemical and biological activity. Our view point has changed greatly with increased knowledge, yet it is a fact that we do not do all we might in this direction. We do not stir the soil during rainless periods as frequently as we should, or we do not do it at the time we should and allow valuable moisture to escape. It must be borne in mind that it is often quite as important to do a thing at the right time as it is to do it at all.

Great stress has been rightly laid on the vegetable matter content of our soils. And so important is this material that in a large measure we take it as an index of the fertility of the soil. Under cultivation humus is worn out of the soil, but in spite of this, under proper management, the amount in a piece of cultivated land should actually increase. In many types of Florida soils, humus is woefully deficient, and it is furthermore true that soils are cultivated with the expectation of satisfactory returns that are little more than chemical pure sand. Are we doing all we should in this direction? Are we growing cover crops to help maintain the fertility of our soils? There are some crops which we may cultivate successfully on soils deficient in humus but the large number of crops we produce cannot be successfully and economically produced except on soils rich in humus. Many of us are not doing as well as we know.

Go with me to some of the richest horticultural regions in the world and let us examine the soils. We will be impressed at once by the fact that these lands are rich in lime. And how much lime is there in the average Florida soil? True, here and there the lime content is sufficient, but in the majority of Florida soils there is none at all, or only a trace. Have we not known in this society ever since its beginning that lime in plenty in the soil would help us to produce more and better crops? Yes, we have known this, for the value of lime runs like a well defined thread through the warp of every report we have issued. From our first report published in 1892, let me quote the words of a member who is here tonight and who has long been noted for the production of fine fruit: "The shells (referring to the material from shell mounds) when burned to lime make an excellent application to apply to groves when there is a good supply of humus in the ground." We know, too, that by the use of ground lime stone we may have all the good effects of lime without any of the ill effects that attend the use of some forms. Yet in spite of our knowledge of the benefits to be derived from its use, there are thousands of acres of cultivated soil in Florida, woefully deficient in lime, to which none has ever been applied. Here again our knowledge has outrun our practice.

The old practice in applying commercial fertilizer to our soils was to make one or two or perhaps three heavy applications each year. But it has been proven that by following this practice, fertilizer is wasted, because it leaches from the soil or gets out of reach of

the plant roots before they can get it. And we now know that more frequent applications of smaller quantities will enable the plants to get more of it, yet the general practice of making heavy applications still continues in spite of the fact that loss could be prevented by using the same amount in smaller doses. Again we know better than we do.

For many years it has been generally accepted that our citrus trees are better off with a minimum amount of pruning. This principle seems to be sound enough, but some of us are inclined to carry it too far. Our Experiment Station workers have pointed out the menace to the health and welfare of our citrus trees that lurks in the dead twigs and branches that are so often in great evidence in our tree tops. They are responsible for a long list of crimes against tree health. Wither-tip, anthracnose, melanose, stem-end rot and perhaps other diseases are carried over from one season to another in dead twigs and branches. Time and time again this fact has been held up before our gaze, and still the dead wood remains in thousands of trees throughout the state. And we wonder why our crops are light, and why our fruit does not carry well to market. The value of grove sanitation has been made plain to us, yet we have not done the things we know we should do.

For a number of years past the United States Department of Agriculture has carried on a series of experiments in the handling of fruits and vegetables in this state. From this work much valuable information has been gained and plainly set before us. Is it too much to say that the results of these investigations properly applied along the lines they have indicated would entirely revolutionize our fruit handling? Already a long step has been taken in this direction, but much yet remains to be done in applying the principles laid down. Every one knows how to pick, handle and pack fruit, or if he does not know, there is no excuse for his ignorance, but it is not done as it should be. Were it only the individual who suffered it would not perhaps be so grave, but outside and beyond the individual is the good name of Florida, which every good shipper of good fruit adds lustre to, and from which every bad handler of poor fruit detracts. The benefits which should have come to us from the lessons gained in fruit handling have fallen very far short of what they might be, simply because we have not used the knowledge at our disposal.

Our orchards and groves and fields and gardens are unfortunately troubled by more pests in the way of diseases and insects than we like to have. The returns from our labor and investment would be larger and our peace of mind would be better were there fewer of them. One very important thing has happened, however. The causes of these diseases and the life histories of these insects have been studied and their mysteries and secrets laid bare, thanks to the efforts of investigators entrusted with these problems. The unexplored

area in this field of investigation has grown wonderfully small compared with the area of ignorance of a decade or two ago. Contrast, if you will, the days of resin wash and kerosene, when the sprays applied did more damage than the insects they were used against, with the present, when miscible oil and soap sprays or water charged with the spores of friendly fungi are really effective without injury to the plants and we have some measure of what we have gained. But, alas, this really wonderful store of knowledge is not drawn on to the extent that it should be.

In Florida today there are numerous organizations, born of the hope that they may be more or less helpful to the people, and whereas there should be the fullest co-operation among these associations, there is too often instead, petty jealousies and dissensions. Is it not time that these were banded on a common basis of action for the public good? Is it not time that petty squabbles and jealousies were laid aside and the whole welded together for the upbuilding of Florida's greatest industry? Let us present a united front, not primarily for the individual, but for the good of Florida's products —knowing that when we have established their reputation we have then benefited ourselves. For nothing can benefit the people as a whole without each individual among the people being benefited as well. We know that in co-operation there is much to be gained for all concerned, yet we do not act on the knowledge.

Now, do not think that my arraignment is unduly severe for in a large way it is true and let us take this truth to ourselves: *"We do not do as well as we know how to do."* I voice the thought of every worker in the advancement of agricultural knowledge, when I say that it is not lack of knowledge, but the lack of application of the knowledge that we already have, that operates against the greater success that might come to us in our labors. In coming here for our meetings at this time—each one of us has had some object in view, perchance to meet our friends, perhaps to gain something of knowledge to assist us in our work, or maybe to accomplish something for the larger good, the advancement of the horticulture of the state. But whatever may be the object, let us go back home resolved to put to practical use some of the latent power that knowledge has given to us and by so doing Jim and Jack and Bill will come more abundantly into their own.

Handling the Citrus Grove

B. F. Floyd

Mr. President, Ladies and Gentlemen:

Handling the citrus grove from a physiological point of view means handling it from the point of view of the tree. It means a recognition that the citrus tree is a living organism; that it is as it is because of the hereditary characters within it, and because of the influence which the conditions that surround it have had upon it as a living organism; that these conditions are numerous and are complex in their action; that each individual condition exerts a particular influence and the tree which we obtain in the end is the result of the sum of all of these influences.

As has been said, these conditions are numerous, and are complex in their action. At a given time, some of them may be exerting a beneficial influence, while others are exerting a detrimental one. Again, the conditions differ as to the amount of influence which each exerts, so that the result of their influence is very much the same as if we were to add a column of plus and minus quantities. In other words, within certain limits, the character of growth which a tree makes is determined by a particular combination of conditions. When this combination or balance is disturbed, the growth is also disturbed. For example, suppose that your trees are growing along nicely in the fall and beginning to harden up properly, and you give them an application of fertilizer high in ammonia and low in potash that brings on a renewed growth. A little later a period of cold occurs that injures this growth. The application of fertilizer has thrown the conditions that were bringing on the normal fall growth out of balance, so that the tree is made to produce a type of growth that is not normal for the season.

The conditions that are essential for the maintenance of life in the citrus tree are not different from those required by most of the higher plants. They are *food, water, heat, light* and *freedom.* All of these conditions must be present for life to exist. If any one is entirely absent or below a certain minimum, the tree cannot live at all. And the tree makes its best growth when each of these conditions is contributing its best influence.

By *food,* we refer to those chemical elements contained in the raw food materials which the tree obtains from the soil and air. These chemical elements are *carbon, hydrogen, oxygen, nitrogen, potassium, phosphorus, calcium, magnesium, iron* and *sulphur.* These terms are doubtless more or less strange to you, but when I mention the terms, ammonia, potash, phosphoric acid and lime, you know at once to

what I refer. It is because nitrogen, potassium, phosphorus and calcium are not present in our soils in sufficient quantities for the requirements of the trees, so that we have to supply them in the form of different sources of ammonia, potash, phosphoric acid and lime. Of the other food elements, carbon, hydrogen and oxygen are obtained from air and water, and there is always a sufficient amount present for the proper development of the tree. The magnesium, iron and sulphur are obtained from the soil and are usually present in sufficient amounts in the soil, or they are contained in the different fertilizers we use, so we do not concern ourselves about these.

Next, as everyone knows, the tree must have *water,* by means of which the food materials are obtained from the soil and transferred from place to place within the plant body. Water is also the medium for chemical action and for the storage of substances within the cells. It is a part of the groundwork of all living things.

As a living organism, the tree requires a certain amount of *heat* for the proper action of the living processes that go within its body, whereby it may manufacture, use and store its food, and utilize its energy for growth and reproduction.

It also requires *light,* for this is its source of energy for doing its work. The light is absorbed by the green chlorophyll bodies, converted into chemical energy and stored in chemical compounds to be used in carrying on the work of the tree.

The tree must also have proper *freedom,* not only from diseases induced by insects and fungi, but also from razor-back hogs and tick-infested cattle.

These conditions—*food, water, heat, light* and *freedom*—are those which are absolutely necessary for the maintenance of life in the tree.

In addition, there are other conditions which we recognize as of importance. Although they are not of absolute importance to the mere maintenance of life, they are of importance for the development of trees on a commercial scale. There is the *soil* which is the medium for holding the tree in place, and from which the mineral food materials and water are obtained. In it profound chemical processes are constantly going on whereby certain plant foods become available for absorption by the tree, and others are stored in non-available form so that they are not lost through washing and leaching.

In the soil are also contained humus and other organic materials. These improve the physical condition of the soil and enable it to hold more moisture and plant food, and are themselves plant foods under certain conditions. In addition they serve to support a rich growth of fungi and bacteria, which are so important for making the plant foods available in the soil, especially the nitrogenous foods.

As was said in the beginning, each of these conditions contributes to the growth of the tree. Therefore from the standpoint of controlling these con-

ditions, it is necessary that we know something about the tree itself in order that we may know how they influence it. The tree as a living organism has a definite structure. This structure may in a way be compared to that of a brick wall. The unit of structure in the wall is the brick. The unit of structure in the tree is the plant cell. As the collection of bricks makes the wall, so the collection of cells makes the tree. The difference between the brick and the plant cell is that the brick is large and contains only dead mineral matter, whereas the plant cell is so small that it cannot be seen by the unaided eye and contains living matter.

The plant cell itself has a definite structure and the arrangement of its parts may be compared to those of an egg. The shell of the egg represents the wall of the plant cell; the white of the egg, the living matter in the plant cell which is known as protoplasm; and the yellow of the egg, an open space or open spaces within the living mass known as vacuoles and which are filled with a watery solution of chemical compounds.

All living plant cells have about this arrangement of their parts, but cells in different parts of the plant differ in their shape. For example, some of the cells that make up the wood are long, their walls are thick and in many cases the protoplasm has disappeared and the cells are dead. The cells of the bark vary in shape from those that are large round and have thin walls to those that are long and have more or less thickened walls; the protoplasm for the most part consists of a thin layer within the wall. The cells in the root tip are not so large, but are more or less rounded and are almost completely filled with the protoplasm. Back of the tip, the cells do not contain so much protoplasm and the spaces within the protoplasm known as vacuoles are larger.

The cells vary thus because of the different work they have to do. Those back of the root tip have to do with the absorption of the solutions from the soil that contain the raw food materials; the cells of the wood carry the water with the food materials in it upward for distribution to different parts of the tree; the cells of the bark carry the prepared plant foods downward for distribution to the different parts where it is used or stored.

For the maintenance of life, doing its work and reproducing itself, the tree like any other organism, has certain physiologic functions which it must perform. It breathes or *respires*. Oxygen is absorbed through the breathing pores, chemical compounds are broken down, energy is liberated and carbon dioxide is freed.

It *transpires* or evaporates water from its surface. In this process, water is absorbed through the roots, and evaporated from the breathing pores which are located at various places over the surface of the plant body, particularly the leaves. Large quantities of water are thus absorbed and given off, and in the movement of water through the tree, raw food materials are carried from the soil and distributed to the proper places in the

tree where the actual food is prepared. The actual foods are starches, sugars and proteins.

The tree *prepares* its own food. In the preparation of its food it uses the carbon and oxygen from the carbon dioxide of the air; hydrogen and oxygen from water; and phosphorus, nitrogen and sulphur from the soil. The carbon, hydrogen and oxygen are combined to form starches and sugars. The energy for doing this work is derived from sunlight, and the work is done by small green bodies known as chloroplasts that are held in the living matter of certain plant cells. The green color you see in your trees is due to the green pigment contained in these small bodies. Leaves are frenched or yellowed when this green pigment is lacking in these bodies.

The proteins are formed in various parts of the tree by the addition of phosphorus, nitrogen and sulphur to the starches and sugars. You may ask, "What does the tree do with the tons of potash which we apply to our soils?" The tree still has some secrets hidden from us. We know that potassium, calcium, magnesium and iron are indispensable food materials. They are helpers in the work of the preparation, movement, storage and assimilation of the foods and the disposal of the by-products, and are not constituents of the living matter. But the details of how they help are for the most part lacking.

After the foods are prepared, they are carried to different parts of the plant body where they are either used or stored for future use.

Next, the tree *grows*. In growth, the tree makes use of the energy and materials supplied by respiration, transpiration and nutrition.

The tree has the power of response to *irritation*. It responds to the influence of such external stimuli as light, gravity, contact, etc.

And finally, it has the power of *reproduction*. This function gives the fruit which is the aim of our work in the grove.

These functions of the tree—*respiration, transpiration, nutrition, growth, irritation* and *reproduction* are the ones that are influenced by the external conditions which we have discussed, namely *food, water, heat, light, freedom* and *soil*. It is by the close co-ordination of these functions and conditions that the tree lives, grows and produces fruit. For example, when we apply a normal fertilizer to the soil, the tree responds to feeding if there is sufficient moisture in the soil, if the temperature is not too low, and if tree is not badly injured from disease. The response of the tree to fertilizers therefore depends upon the other conditions contributing to growth being good. If any one of them is entirely off, results are not obtained from the fertilization.

The tree growing in the wild is subject to all of these conditions and it survives or perishes according as beneficial or detrimental conditions prevail. But in growing a tree under cultivation we endeavor to control the growth conditions by certain methods. The methods of control we use are those practices we carry out in the grove, which are: *fertilization, cultivation, irrigation, drainage, orchard heating, pruning, spraying, fumi-*

gation and the *encouragement* of the *natural enemies of pests.*

We *fertilize* the soil to supply it with those plant food materials which are either lacking or present in a non-available condition. We select those sources of the food materials and combine them in such proportions and apply them in such quantities and at such times as we believe will give best results. We add soil improvers, such as lime and humus, to improve chemical, physical and biological conditions in the soil.

We *cultivate* the soil to add air to them, and thus bring about chemical and physical changes favorable to the growth of the tree. We also cultivate to break the capillary movement of water to the surface and thus hold the moisture in the ground for the use of the tree, especially during periods of drought.

We grow *cover crops* in the summer season to protect the soil from excessive heat, to help remove excessive amounts of water from the soil and to add humus and organic nitrogen to the soil.

We practice *drainage* to rid our soils of an excess of water which would be injurious to the tree. We practice *irrigation* to supply water, the lack of which not only prevents the trees from maintaining the proper supply within their bodies, but also prevents them from obtaining the necessary food materials for developmental stages.

We make use of *orchard heaters* for protection from low temperatures which may prove injurious. We *prune* and remove trees when they become so crowded that they do not receive proper light or when the heads become so dense that the branches in the interior die from lack of light.

And we *prune, spray, fumigate* and *encourage natural enemies of pests* in order to give our trees proper freedom from diseases.

Of those life functions of the tree that were mentioned, namely, respiration, transpiration, nutrition, growth, irritation and reproduction, we are most interested in these functions, *growth* and *reproduction;* because it is these functions that we try directly to influence when we employ the control methods just reviewed. However, it should be kept strictly in mind that the methods of control influence the other functions just as directly.

In the use of these methods of control, the element *time* enters very largely. The citrus tree puts on and matures three successive flushes of vegetative growth during the year; the first in the spring; the second in the summer, and the third in the fall. The bloom comes out for the most part in the spring. The fruit that is set passes through successive stages of development until it matures in the fall, or winter. At certain seasons the roots are spreading in the soil and are increasing in size, and buds of different types are being developed.

The whole aim of the use of the methods of control is to overcome any adverse action of the growth conditions, and thus allow the tree to make a steady normal growth in all of its parts. In order to do this all of the methods must be timely. If they are not timely they may not only not be effective themselves, but also inhibit the good effect of other methods and conditions. A good example is that of

spraying for the control of the Rust Mite. If the spray is applied in time to kill this pest before it begins to damage the rind of the fruit, the spray is effective. If we wait until the surface of the fruit appears mealy from the presence of large numbers of them, we may be assured that the mite has begun to do damage, and that the spray will not be entirely preventive. Therefore, to be timely, there should be regular periods of inspection of the trees with the aid of the hand lens and when the mite is found on the leaves or has begun to move onto the fruit, then spray at once.

Now, not all citrus trees of the same stock and variety are alike. We have all noticed this individuality of the tree in the grove and in the nursery. It is due to certain inherent qualities within them. For example, two trees located side by side in the grove that are of the same age, size and appearance may differ as to the amount of fruit that they will bear or they may differ as to vitality. These inherent differences we endeavor to control by the proper selection of stocks and budwood in the nursery.

Again, there are certain inherent differences in different stocks whereby some will survive under conditions beyond our control and others will not. Therefore we have to select to obtain the proper stocks for a given locality.

The art of handling a citrus grove for the production of fruit consists entirely in the practice of the methods for the control of those conditions which have been referred to. In applying these methods, we judge our results by certain appearances of the tree, such as color of the leaves, types of growth, and by the quantity and quality of the fruit. For example, if we see a certain type of yellowing in the foliage of our trees, we recognize it as nitrogen hunger, a certain crinkly waxy appearance of the leaves indicates too much phosphoric acid; and certain malformations indicate the presence of certain diseases; etc.

From experience based on long practice, there are certain of these methods which for the most part we employ regularly without any particular reference to the tree, whereas in the case of others, we employ them only when appearances of the tree or conditions warrant their use. For example, we may have a regular method of cultivation which we follow each year without any particular variation; or we may have a regular time for the application of fertilizers which we follow more or less blindly. On the other hand we consult the tree as to what kind of fertilizer we will use, as to whether or not we will prune, spray or irrigate.

I have thus reviewed in a general way the growth conditions in the grove, the functions of the tree which these conditions affect and finally, the methods we use in the control of these conditions, or in other words the methods we use in grove practice. It goes without saying that our information on these subjects is by no means complete. Then what are some of our needs that we may handle our groves more intelligently and to better advantage? On thinking it over, we find that our needs are as broad as those of science itself. In other words in order that we may grow good trees and much good quality fruit with greater certainty

and with fewer failures, we must have more information of a fundamental nature from those sciences on which our practices are based.

In any grove to begin with, we must have good trees from the nursery—trees with plenty of vitality. In the future we will demand that these trees be "pedigreed."

The soils in our groves are more or less unknown quantities; and one of the big problems in connection with it is how to build up the humus content without inducing or favoring disease in the tree.

Only a few years ago, we classed all organic matter in the soil under the term humus. But thanks to the workers of the Bureau of Soils of the United States Department of Agriculture, and other workers over the country, we know more concerning the nature of the organic compounds in the soil. They have found that certain of them are beneficial to plant growth and others are not. It is probable that in the future we will be able to make use of this information in a practical way.

In the soil are contained myriads of fungi and bacteria. Our information concerning these is very meager. We should know more concerning the part these play in making plant foods available and their relationship to diseases in the tree. It has not been proven that Blight of the Citrus Tree is not due to the attack of some unknown soil organism.

Again, we put large quantities of fertilizers on our soils without very much knowledge of what becomes of them, the changes they undergo, and their immediate and ultimate effect on the soil and soil organisms. The Tank Experiments at the Experiment Station are giving us some surprising figures as to losses through washing and leaching. But this is only a step in the right direction.

There is more to be learned concerning fertilizers themselves. Although there are many sources at our command, others may be found that are better and cheaper than those we have. Again, we are in doubt as to which of those at hand are the better sources for the tree under given conditions. This information must be obtained from extended experiments conducted under controled conditions.

Again, there are the questions of cultivation and non-cultivation, and the advisability of allowing Bermuda grass to grow in the groves. Although we may have our opinions about them, we will have to admit that they are not settled questions. Irrigation, Drainage and Orchard Heating have problems peculiar to themselves.

In the way of methods for the systematic treatment and prevention of diseases, our needs are great. We know, for the most part, well enough how to control the individual diseases; but when our trees are attacked by a number of diseases at once, and the method of treatment for one is favorable to the development of the other, then we are puzzled. For example, you would hesitate to use Bordeaux mixture for the prevention of Melanose in your trees if they were already infested with the purple scale.

We need a pruning and spraying program for the year which will be economical and at the same time efficient for the prevention of our fungus and insect

troubles. It is probable that before such a program can be perfected, we will have to find some spraying solutions other than those we have at hand.

And finally, we should know more about the tree itself. The saying "Man, know thyself" should be changed to "Grower, know your tree." There is needed more information concerning the different stages of growth in the tree, the different types of growth, when and how the fruit buds are formed, the setting and development of the fruit, the development of size, color and quality in the fruit and the development of the root system.

The grower should know his tree so well that its appearances indicate to him its needs. He should be able to distinguish sharply between disease symptoms and appearances due to the effect of a lack or an excess of the different fertilizing elements in the soil or to the adverse effect of other growth conditions.

He should be able to tell from appearances how the trees should be fertilized, the amount, the formula, and the sources and quantities of each that go to make up the formula. If the grower is unable to thus read his tree, there should be trained and experienced advisors whom he could call to his help who would diagnose and prescribe on the same basis as does the doctor of medicine.

In conclusion, the index to all of the operations in the grove should be the tree. Its appearances and variations should be the guide to the grove practices. Regular and close inspection should be an important part of the work. Good results can not be obtained from haphazard methods.

Discussion.

Mr. Hume: Following our usual custom, this paper is now open for discussion. Any questions you would like to ask, or any comments on Mr. Floyd's full and detailed remarks: now is the opportunity for them.

Mr. Poole: I should like to ask him to describe more particularly the condition of the leaves produced by excess of phosphoric acid.

Mr. Floyd: That is a condition which is very hard to describe accurately. It consists of a crinkled condition of the margin of the leaf, accompanied by a waxy sheen of its surface. This sheen is somewhat comparable to that produced by a light coat of paraffin over a surface.

I know that this description is not so definite that you can identify the condition readily in the field except it is very pronounced. But this is an example from that class of appearances of the tree which should serve as an index to the factors that influence it, and of which we should know more. This index should be as usable to the grower as is the analytical key in the botany text to the botanist.

Mr. Poole: Does this appearance appear on the old leaves or only on the young leaves?

Mr. Floyd: Immature leaves are in a state of formation and while in that state are susceptible to affection. The old leaves would not show it anew. I suppose you refer to a rather old leaf; one that is well matured.

Mr. Poole. No. I mean a leaf that is six months old.

Mr. Floyd: A leaf of that age might not show it anew.

Mr. ——: Does it have to do with the size of the leaves?

Mr. Floyd: Not necessarily so, although affected leaves are likely to be undersized.

Another probable indication of an abundance of phosphoric acid is the development of large numbers of buds on a stem into branches. This development of the buds was quite marked on plants which were fed with large amounts of acid phosphate in the course of some experiments carried out at the Experiment Station. This bud development gives rise to a rather bushy growth.

Mr. ——: Where there is a multiplication of short terminal growth does that indicate it?

Mr. Floyd: Possibly so. Sometimes that short terminal growth is due to other adverse conditions. The appearance of the tree at any particular time is due to the combined influence of a number of growth factors. When a different combination of these factors occurs, a different appearance of the tree may result. Short, slender growth of a yellowish color indicates an imperfect combination of influencing factors.

I know the grove to which you refer, and do not believe that the particular type of growth shown there has been brought on by an over-abundance of phosphoric acid.

Mr. Temple: What is the evil effect of phosphoric acid?

Mr. Floyd: We have not been able to find any killing effect from the use of amounts of phosphoric acid comparable to those that have ever been used in grove practice. Of course, the roots would not grow in a soil consisting largely of a source of phosphoric acid, as for example, acid phosphate or steamed bone, but that is outside the question because such amounts are never used in grove practice.

Mr. Temple: I mean an over-application. Does it have any actual deleterious effect on the tree itself?

Mr. Floyd. Only to the extent that has been mentioned in this discussion.

Mr. ——: When you say "crinkly," do you mean frenching?

Mr. Floyd: No, I refer to the shape of the leaf. Frenching refers to the color of the leaf.

Mr. Sample: I would like to ask the latest discovery of the cause, prevention and cure of frenching. I know you have made some diligent search along that line.

Mr. Floyd: You have asked me a big question, and I cannot give you the answer which you would like. Frenching is a form of yellowing of the leaves. It is characterized by a lack of green color between the veins of the leaf. It is probably induced by some disturbance of the roots. This disturbance may be either of a physical or chemical nature.

Frenching in plants other than citrus is frequently induced by the roots being attacked by nematode worms. Investigators in California have found the roots of citrus trees showing frenching or Mottle Leaf to be attacked by a species of nematode worms, and they are inclined to believe that much of the frenching of the citrus trees in that State is induced by that cause. Although this worm has been reported to have been found on cit-

rus roots in Florida, I have not been able to find them on any of the trees showing frenching that I have examined. I am of the opinion that we must look for other causes for frenching as it occurs in Florida.

Mr. Sadler: Does it have any appearance of the scab?

Mr. Floyd: There is no similarity.

Mr. Sadler: What effect does phosphoric acid have on the fruit?

Mr. Floyd: I do not know. I have not worked along that particular line.

Dr. Julian: As to the amount of phosphoric acid in the soil. At a certain Experiment Station, a soil expert made an estimate of the amount of phosphoric acid contained in an acre of soil, nine feet down; that is, the first nine feet, the feeding area of the roots of plant life; and in one acre he made his calculation that there were 240-odd tons of phosphoric acid in that soil. That was considered pretty fair soil, too.

Mr. Temple: Don't look so accusingly at me; I couldn't help it. (Laughter.)

Dr. Julian: What I mean was that it would be very difficult to add an amount that might cause it to become excessive. Where there is an amount like that in the soil, a ton or two to the acre would have very little effect on the plants or trees.

Mr. Hunter: Will you detail what you mean as pedigreed nursery stock?

Mr. Floyd: That is looking into the future. When you buy a horse, if you want him for racing, you look into his ancestry, who they were and what reputation they had for speed. Why shouldn't you demand pedigree in your nursery stock? Your buds should have come from trees that bear well. But, as I have said, this is probably looking into the future.

Mr. Hollingsworth: I think Prof. Floyd is right. We must have our buds from bearing trees; something we know about. The same rules that apply in animal breeding should apply in plant breeding. I think the sooner this is understood, the better it will be.

Dr. Julian: I suppose you should know the record of every tree in your grove.

C. H. Thompson

Mr. President, Ladies and Gentlemen:

This is rather a large subject that has been handed out, and I took advantage of the opportunity of being chairman to get in touch with all the members of the Committee and was assured by two or three of them that they would prepare a paper on the subject, so I did not prepare any paper.

There are quite a number of things that may influence the care of a grove. We will take it for granted that you have the grove already planted. In the first place I would like to say just one word in connection with the preparation of the ground for planting. It is rather a sad sight, as you go through the State, to see people so eager to get their grove planted that they do not clear their ground first. They plant right in among the trees and expect later to clear the ground. The proper course is to absolutely clean the ground out. Grub it out and put it in thorough till; get in good shape for the permanent home of the orange tree.

There are a great many things that will influence the care of the trees. In the first place, all the experience I have had has been in the high pine ridges. I might say I believe such as we have around Winter Haven and Florence Villa. I have had no experience with flatwoods and hammock lands. The method of handling those lands will have to come from someone else.

The general plan in our section is to plow very shallow in the fall of the year. That plan, however, is not followed by all. That is largely a protection from fire in a grove. It is not absolutely necessary to plow. You can run an Acme harrow and keep the growth down so that it will not become a menace to the grove.

As the spring approaches, with its dry weather, we always try to keep the Acme harrow going to keep the ground from caking and to keep it from losing all the moisture through evaporation. At the beginning of the rainy season, after every good rain, it is a very important thing to do, that you may not lose the moisture. If you are not situated so that you can irrigate the grove, it is very important to keep the moisture in the soil.

When the rainy season comes, we just let the grass and weeds grow and take the grove. Underneath and around the trees we keep the grass down so that they will not rob the trees of too much of the fertilizing elements, but we let the middles grow up to any cover crop. Each one must decide for himself the conditions best for that.

There might be a number of things that would indicate different care of a grove. One is the stock, perhaps, on which the trees are grafted. Different stocks require different treatment that each one has to figure out for himself in his own particular community and his kind of soil.

There is a great inclination among many people to attend to things in their groves, always at some future time. The time to do a thing is right when it is needed. Take time by the forelock in the handling of a grove. If you know certain work should be done, do it immediately, and don't wait until tomorrow, or next week, or next month. Great damage may be done, and often is done, by not attending to your grove at the right time.

Mr. Skinner is here, and Mr. Griffing. I hope Mr. Peters of Tavares will be here this afternoon to give his paper.

L. B. Skinner

Mr. President, Ladies and Gentlemen:

I have no paper, but I have been thirty years in the orange business, and if I could not say something without a paper, I would think it was about time I was going out of the business.

Now, this subject, Methods of Handling Citrus Groves; I suppose you want to start with the young trees.

I am pained sometimes to see the way some people handle their groves. To start with, Mr. Thompson hit the nail on the head when he said they started too soon. They plant their trees too hastily. Down at Winter Haven and Florence Villa I believe it would pay to dig a large hole and fill it with soil before you plant the trees in the ground because the soil there is so thin. (Laughter.)

I have had a certain measure of success in growing groves, and to my mind the greatest success has been due to this: I plant my young trees and immediately start to plow them. I didn't say cultivate, mind you; I said *plow*. My experience was founded on the advice of different men who have been successful men in the raising of oranges, and I feel very grateful to them for the points they gave me. Some of those points were worth listening to.

You take a young tree. Prof. Hume said last year they first started to cultivate to keep down weeds and grass and they found now they cultivate for other reasons. In growing a tree, the first thing you want to do is to get a root development. The way to do that is to induce those roots to reach out; to go down. Plow that ground, and plow it and plow it. You will be surprised at the results. There are groves in my neighborhood that have been planted as long as mine, and the trees are not any bigger than some of the twigs in my grove. It is because I *plow*. It does not take any more fertilizer; it takes less.

To provide the necessary humus, plant in the middle of your rows, three rows of velvet beans. You have to work to keep them off your trees, but it is worth the trouble. Plow six feet around each tree, and let the velvet beans grow as much as they want to. If you will do that and let them die down, you will get a rich soil, even in the Winter Haven country. (Laughter.)

Those Winter Haven people know all about their soil; our country is just the same. We are in the same boat.

As the tree grows older, the depth of cultivation must be less. Don't plow so deep. My experience is that it costs a great deal more to care for a young grove than an old one, except the cultivation in the spring, and the fertilizer.

Now comes the question: shall we cultivate an old grove or shall we not? Some of the best I know do not cultivate their groves. I think Dudley Adams did very little of it on his old groves. If you can grow fruit without cultivation, you are going to get a better quality of fruit. The skin will be thinner and smoother the less cultivation you can get along with. But I think the stock the fruit is budded on may have a great deal of influence as to whether the grove will get along without cultivation. I have one that has not been cultivated for five years, and it has been bearing five heavy successive crops. It does not look so good, but it puts out the fruit.

I am not prepared to say you should let your groves grow without cultivation, nor am I prepared to say they should be cultivated.

In regard to your bearing grove, there are two things I have found very important. One is, never to plow a bearing grove unless the ground is moist. I repeat that; never plow a bearing grove unless the ground is moist. With a young grove, it does not matter.

The other is; never plow your grove when it is in bloom.

If you use plenty of fertilizer, and brains, you will have plenty of fruit.

C. M. Griffing

Mr. President, Ladies and Gentlemen:

On this Committee we had such an array of citrus fruit growing talent that I did not feel it worth while for me to prepare a report, but thought I might touch on a few points not covered.

One thought is the great diversity of soil and climatic conditions that we have to meet in Florida. One of those has already been referred to. In some localities other than around Winter Haven there is *real* soil, but I don't know that they are showing any better results in the grove, and possibly the bank account is no larger.

There are at least seven different soil conditions to consider, and we find good, profitable groves on each.

First: the high, sandy pine land so largely used in Polk and Lake counties, where, owing to altitude, air drainage, and lake protection, they are practically immune from frost risk. While the soil is light and practically all fertility has to be supplied, the grower has the advantage of being able to give the tree exactly the food it needs, resulting in the production of magnificent fruit both as to quality and appearance.

A short time past I was driving over the sand hills south and east from Bartow with a gentleman from Bartow, a notice of South Florida, who remarked that thirty or thirty-five years ago such lands were not considered of any value, while now they are selling at from $40.00 to $100.00 per acre, and are producing the goods to prove their value. If you doubt it, go to Winter Haven, Frost Proof, Avon Park and other sections where similar conditions exist and see for yourself.

On this class of land, cultivation is easy, soil is nice to work, can be tilled flat or level, grass and noxious weeds are easily controlled, so much so that as I see it, clean culture is carried to the extreme. Many times have I, in passing through some groves, felt a pity for the soil expected to carry the burden of a grove laden with fruit, the same feeling of pity that one feels for a poor, half-fed horse dragging a heavy load through a sandy street. You feel sorry for the animal. With proper food, well balanced with forage and grain, the old horse would get slick and fat, able and willing to bear its burdens, while with only a little grain and doped up feed stuffs it would not be possible. Likewise with the soil—it needed something besides chemical dope, called commercial fertilizer. Such groves need humus crops, velvet beans, iron peas, beggar weed or other leguminous crops. It takes some nerve to plant velvet beans in a grove and means some work keeping them out of the trees, but it pays in nitrogen gathered and stored in the land alone, to say nothing of the humus which acts like a sponge, holding moisture and plant food, in the fertilizer you apply, in suspense near the surface where the feed roots of the trees can reach it. I was interested and pleased with Mr. Skinner's remarks about the use of velvet beans in the grove. The testimony of one of his experience is valuable, and carries weight with is.

My observations lead me to believe that, for the young grove, shallow, thorough cultivation near the trees, with legumi-

nous crops in the wide space between the rows to shade and keep the ground moist and cool during hot summer and early fall months, to be plowed under during November and December, followed by a thorough harrowing, burying as nearly as possible all vegetable matter, with clean, shallow cultivation during spring and early summer, re-seeding with leguminous crops the latter part of May or June is, in my humble opinion, ideal cultural practice.

Second. The flat woods grove. In DeSoto County and, in fact, in portions of all counties in the orange belt we find the old seedling groves on the little elevations affording the necessary drainage, which were during their earlier development chiefly or wholly fertilized by cow penning, the soil and natural conditions being almost the reverse of the sandy hill pine land grove. Naturally the soil is more moist and is supplied with a vastly greater amount of humus. Here the trees must be planted high and mounded or ridged, preferably ridged, with water furrows between each row, running in the direction of the general slope of land to provide a quick run off for excessive rainfall. The general plan of culture need not vary much from that of the higher, lighter lands. The need of humus crops is not so imperative. No one need say that such land is not good grove land, as some of our finest and most profitable groves are flatwoods land. The high, sandy pine land and pine flatwoods constitute the greater portion of the area now used for orange and grapefruit groves.

Third. The hammock, a high, light soil covered with hardwood growth, land that when first cleared is far more fertile, containing a greater amount of nitrogenous matter, and well supplied with humus. Trees should be planted on the level and cultivated flat. While naturally full of humus, yet this will soon disappear leaving the land poor, thin and hard to rebuild to its former fertility unless means are provided to replenish the humus supply from year to year. The same general cultural practice, with the exception of keeping the leguminous crops cropped back or mowed once or twice during the season to prevent them from becoming too rank and heavy, and the use of purely mineral fertilizers and crushed lime rock, would apply. In the early days the high hammock was chiefly sought for grove planting, and today some of the state's best groves are on this land.

Fourth. The low, moist cabbage palmetto hammock. Probably the richest, strongest soil used for grove purposes in Florida. Here cultural practice is more complex. Weeds and grass make rank growth and unless the planter exercises eternal vigilance the trees are soon covered and hidden from view. The drainage must be carefully planned and trees planted high and mounded. Soil is apt to be acid, requiring thorough preparation and heavy application of ground lime rock before planting, with a free use of hydrated lime or hardwood ashes after planting and during cultivation. Humus crops are not so necessary, yet leguminous crops for the purpose of multiplying bacteria as an aid in reducing the plant food locked up in the decaying vegetable matter, may well be employed. The soil near

the trees should be frequently stirred and aerated, and during the winter months the grove should be kept as nearly as possible free from all vegetable matter.

Fifth. On the lower east coast from Ft. Lauderdale south, we find the rocky land of Dade County, a vast area that is rapidly being developed. That the soil is adapted to citrus fruits, especially grapefruit, is evidenced by the fine groves and superior fruit that is being produced, especially in the Redlands section. There they have the special advantage of immunity from frost and cold damage. In cultivation they have difficulties peculiarly their own. In most of the groves it is next to impossible to plow and cultivate as is done in other sections of the state. Mr. Skinner recommended to plow, and plow, and plow. Were he located in some of the rocky sections of Dade County, he would change it to grub, and grub, and grub.

By the use of leguminous crops, velvet beans, cow peas, pigeon peas and beggar weed to cover and shade the ground and keep the weeds and grass in check, and the disking, hoeing and grubbing the surface as well as they can during the winter and early spring, they are making magnificent groves and fruit, and from the character of the homes being built, I think they are keeping their pocket books fairly well filled.

Sixth. The recently drained or reclaimed land in Manatee, Southern DeSoto, northern part of Lee and along the East Coast, back of the edge bordering Indian River, is a vast area that is being opened and on which there will be many groves planted in the next year or two. There are no old groves on such land as I refer to, for until drainage was effected most of the land was either under water a portion of each year or too wet to admit of grove building. Here, as in the flat woods, the high planting of the trees, ridging of the land providing of quick run off, is imperative. Much of this land is naturally fertile, but requires the application of lime and is much improved by the use of leguminous crops, both before planting and during summer cultivation while the grove is coming on.

Seventh. The reclaimed muck lands of the Everglades. I do not know to what extent that land may be used for fruit culture. On some of the older improvements there are fine, promising young trees. Again we have before us the matter of quick and effective mounding or ridging up to the trees and drainage, and arranging for quick run off by the free use of lime and leguminous crops to aid in reducing the rich muck and peat to loam and get it in condition so the tree can get the benefit of the natural fertility of the soil. The future problem of grove care and culture on this class of land is yet to be worked out. We may have our theories, but no old groves as a guide.

In all classes of soil it is especially important to have your land well prepared before the planting. Mr. Skinner touched on that point. Too many people come here, get enthused in grapefruit and orange growing, buy a piece of land from a real estate agent along about the middle of January or the first of February, want a grove planted before they are ready to go north or in about six weeks. I have actually known just such cases.

If they have a piece of flatwoods land that is naturally acid from the nature of the growth on it, clear and plant without a chance to lime and sweeten the soil, what can you expect the first two or three years? The trees may live but will simply stand still barely holding their own; then the tree man, the fertilizer man or the country gets the blame and the disappointed grower will say the land is worthless for citrus fruits. On the other hand, had he prepared the soil thoroughly, limed it well and grown a crop of legumes on it to encourage the bacteria as an aid in breaking down the fertilizing material on the soil, and then planted his trees, at the end of the three or four years he would have had a far better grove than he could possibly have had by starting his trees at once.

Another serious proposition throughout the entire state is the matter of the absentee landlord. People come and start groves and put them into the hands, in very many cases, of incompetent people to care for them. Many of these groves are cared for at so much per acre. The owner knows little or nothing as to the cost or practice of properly caring for a grove. He depends upon hearsay in the neighborhood where he is located and makes a contract with some one who probably does not know, and often does not care. The caretaker has agreed to care for the grove at a certain price and he may pay a reasonable portion of the price into the care of the grove, and he may not. But, as many of you know, at the end of the year when the owner comes back to see the grove, he is disappointed and discouraged. Then, instead of giving the grove what it needs, he begins to tighten up on his purse strings, and the result is at the end of the second year, he has no grove and only condemnation for the state.

It is a very serious proposition and a drawback to the development of the state in many sections. It gives the industry a "black eye." It has a tendency to discourage many who come here to stay and build homes.

As to the best methods of handling bearing groves, I hope that will be thoroughly brought out in the discussion that will probably follow, as that is going to depend very largely upon the various soils and local conditions, such as I have mentioned. I would say, however, that I believe from the observation I have had in many sections of the state, that the less you cultivate and plow the old bearing groves, the better off you are, provided you keep some cover crop coming on in the grove, with as little cultivation as possible. There is the Kudzu Vine that I would like to see experimented with more generally, possibly some of the growers here have had experience with it. I believe it is going to be a great thing for bearing groves where you want to largely cease plowing and cultivation. It is a perennial legunimous plant and keeps a thorough cover crop on the ground. I think it will be a wonderful help in caring for old bearing groves.

Jack Peters

Mr. President, Ladies and Gentlemen:

The ultimate object in the planting and raising an orange grove is the net profit

to be obtained, but the primary object is to keep health, vigor and growth in the most economic way. Now, the point is, how can we procure these primary ends? But before undertaking the discussion, would say the subject assigned us is too broad to be covered with one paper, or even one phase of it, for the entire citrus fruit producing section of Florida. So I desire to limit my discussion to soil management in the grove, and further to that class of soils in Florida known as the uplands, such as are found in Lake, Orange and Polk counties. That this class of land is ideal citrus fruit land I am sure nobody would question, but they are lands that are usually wanting in organic matter, and often not well supplied with any kind of plant food. They are especially a class of soil that is wanting in the basic elements, and when made to grow crops will soon become more and more acid.

Being acquainted with these facts, then, when a man begins a grove in this class of land, it becomes necessary to start building the soil by growing the legumes of velvet beans, cow peas and beggar weeds, and the cutting and turning these back into the soil annually and progressively deeper. In addition to this it seems it would not be extravagant to state that during the formative period of a grove, one should persistently grow cover crops, rye, oats or rape, in the winter time, and turn them in shallow in early spring. It is evident that this course would soon make the soil intolerably sour, but by use of the basic materials of lime, etc., this condition is corrected, and so by the time the grove comes into bearing, a deep stratum of soil has been formed, filled with humus, capable of retaining much plant food and storing a great quantity of water to be used by the trees as they need it, and thus supplying regularly the moisture and the plant food as it is needed.

As it is true of stock, so is it true with a plant; if you are to keep it healthy and all its vital processes active, you must see that its food and water supply is regular, plentiful and in proper condition. The deep stratum of soil, the abundant supply of humus, with the chemical and mechanical changes wrought, the soil is prepared to give a regular supply, and with this regular supply, famishing and starving can be largely prevented. And indeed in Florida, a means of prevention is necessary, because the spring drouth is a characteristic of our climate, and unless some means have been employed to store up the fall and winter rains, the moisture supply will get low and the tree must suffer; likewise is the rainy season a characteristic of our climate, and if the soil is not prepared to absorb and retain the nitrogen and other fertilizing properties, they will soon be leached out, and though much fertilizer has been applied, the trees suffer because the food supply is abnormally low. With the food supply abundant at one time, and wanting at another, and with the moisture excessive at one time, and the earth extremely dry at another, it is but natural to suppose, and absolutely natural in effect, that the tree is at one time all vigorous, gorging itself with food, only to have a reaction, and become vitally low when the moisture and food supply are wasted.

These conditions retard the maturity of

the tree or prevent full and regular bearing, cause dropping and undersize of the fruit; and invite many of the troubles, such as dieback, withertip and other citrus diseases; hence the necessity of a soil well filled with humus, made alive with nitrifying bacteria and capable of admitting the air to a goodly depth.

Now, as to whether my theory is good in actual practice, I wish to say I have seen some demonstrations, proving my point. Where the legumes are grown and progressively deep plowing is practiced, and where proper cultivation is kept up, there is a considerably less demand by the trees for commercial fertilizers, and in the end the grove has been produced more rapidly, and at less cost. The only restriction I would suggest is not to run this process of soil building on into the grove after it comes into bearing, but the plowing to a depth of 15 or 18 inches with disc or turning plow and subsoiler should recede from the trees as the roots take possession of the land, until, by bearing, the process will have been eliminated.

Another point that possibly may need a little notice in passing is the fact that too much organic ammonia will cause dieback, but we are loath to believe that the above treatment of soil with a sufficiency of the basic elements applied would even produce unsanitary conditions, and without unsanitary conditions of soils physiological troubles need not be feared.

Relative to the cultivation of these soils, we should say it is good practice to keep the hoe and harrow going about the young trees in order to keep the soil active and productive, and to keep down weeds during the growing period of the trees; indeed, heavy growing weeds, like beggar, that would rise up and shade the trees, should be kept back to a goodly distance from the trees all times of the year. When the grove comes to bearing we have seen that it is advisable to keep up the rapid shallow cultivation during winter and spring, connecting the cultivation with the rainy season, whether it be early or late.

As to what implements should be employed in doing this work would depend largely on the condition of the soil as to whether clean or littered. Ordinarily the work can be begun with a disc and continued with the Acme harrow. That this method is obviously better than non-cultivation is proven by the fact that these soils are free and open, readily yielding up their fertility and moisture; and, if the cover crop is on the ground during the growing and bearing period, the trees will be largely robbed of their food properties and both the tree and its fruit must suffer in consequence.

Then in summing up we should advise: Start the process of soil building when the grove is planted, use basic materials to keep the soils in healthful condition and the young trees protected from weeds.

In the bearing grove an occasional shallow plowing in the late fall, rapid, shallow cultivation during winter and spring, and permitting the cover crop in summer and fall, would be possibly our best and most economical means of handling the sandy uplands of south central Florida. And thus, so far as the soil is related to the health and growth of the trees, handling the citrus grove would be much improved.

Discussion.

Prof. Rolfs: It seems that this has been pretty well discussed, and a while ago I thought it was going to be "cussed."

It seems to me there are some phases of this work that might be emphasized a little more. One is, the question of planting flatwoods. If you are an experienced orange grower and have made successful groves, I have nothing to say to you about it. To the man who is beginning, I say "Don't." Let the man who knows how do the work.

It is the same with the drained muck lands. If you have made a grove and know just what you ought to do with it, all right; but that information does not work very well, second-hand. If you were in my place, you would know that over 90 per cent of the trouble that is referred to the "trouble man" comes from the flatwoods, or flatwoods conditions. Dynamiting is all right, but after all, when you want to make a nice grove without very much trouble, take the good, rolling, high pine land and you will come about as near having soil that is "fool proof" as any you can get hold of.

The hammock land, of course, is a very fine thing and is where the orange industry got its start; we have nothing to say about the hammock; if you can make a start on the hammock, do it. You will get a good grove, even if you do not know everything about citrus production.

I believe that is all I have to say. I am glad to have a chance to say something about trying to make a flatwoods grove.

Mr. Skinner: I would like to know if anybody here has had any special experience or observation with the cultivation of the grapefruit stock. The grapefruit stock in the Fort Myers country is the only stock that they will have, and for a very good reason; but I would like to know if anybody knows anything about the cultivation of grapefruit stock, as to plowing, light cultivation and cultivation on flatwoods soils, light, sandy soils and hammock soils.

Mr. Hollingsworth: My life has been made up of experience, and especially with this grapefruit root. In my groves I have several stocks. The grapefruit stock is not the proper stock for all soils. It is a superb grower. The grapefruit seedling becomes one of the most magnificent trees of the citrus family; but as a stock for dry, sandy soils, it does not give the satisfaction that other stocks do. The grapefruit stock is not what we would like to have it. It seems to be a grower in our neighborhood, and under favorable conditions, does well.

I will further say on the stock question: We prefer the lemon stock in our high section for various reasons.

While I am on the floor, I might mention the matter of shallow plowing. I do not see any sense in that whatever. Trees are different. I believe in plowing deeply, and very deeply.

Liming Soils

R. E. Skinner

Mr. President, Ladies and Gentlemen:

Lime, king of soil amendments, has long been used as a means of soil improvement, and the recognition of the agricultural value of certain forms of lime appears as far back as the writings of Pliny, which show that liming was practiced by the Romans and Saxons more than two thousand years ago. The effects of lime on the history of the human race are well described by that great student of the soil, Professor Hilgard, as follows: England, France, Belgium, and most of western Europe are rich countries largely owing to their abundant limestone formations, and it may be questioned whether had this been otherwise, Europe would so long have remained the center of civilization.

Its use and popularity in agriculture, however, has not always been so general and prominent, as the old adage would indicate: "Lime maketh a father rich but a poor son." The recent revival of interest in liming began about 1895, and since then much studying and experimenting, scientific and otherwise, has been done, giving rise to some theories, many practices, and much uncertainty in its use.

As a factor in plant growth, however, science has shown it to be a most important one. Prof. Fippin, of the Department of Soil Technology in Cornell University, places it in order of importance before fertilizers, tillage and organic matter, and second only to the factor of soil moisture.

Interest was drawn to the study of liming in this state about 1906, when the Agricultural Experiment Station published a bulletin (No. 87) on soil studies, followed two years later by another (No. 93) on acid soils. These, through the knowledge gained by soil analysis, led to the belief that Florida soils are more generally acid in character than had previously been suspected. This leads us to inquire as to just what is the meaning of this phrase, "acid soil," of recent years so prominent in agricultural literature, and yet perhaps there is no phase of the knowledge of soils so little understood, particularly by the layman. The phrase is a misnomer, used because no better term has yet been suggested. So-called soil acidity may be of two forms, active or negative acidity. The active acidity is induced by an actual acid in the soil. Such acid is invariably of the weaker or organic acids, as the stronger acids take to themselves the basic material at hand. But any free acid soon drains away, so it is only where poor drainage occurs that any significant amount of active acidity is found.

These tend in the processes of weather-

ing and chemical changes continually going on in the soil combine with and use up the bases of the soil, particularly calcium, the active element in lime, and thus form numerous neutral salts, most of which leach more or less rapidly out of the soil. There eventually arrives a time (depending upon the amount of lime originally in the soil, the rapidity of the formation of organic acids, and amounts of commercial fertilizers used), when all free or active bases are used up or washed out of the soil, and then there exists a non-basic, or to all intents and purposes, an acid soil.

But very few soils are actively acid as ordinary soil conditions do not long permit of the presence of an actively free acid. This being the case, we must find virtues in lime other than the mere neutralizing of active acids by which it makes our soils more fertile. And we must also determine if our soils in this state are rendered more fertile by the presence of lime. Natural evidence of this latter question is found in the fact that hammock growth—an abundance of hardwood trees of many varieties, accompanied by a luxuriant undergrowth—is no doubt the original growth on the calcareous soils, and this is later exchanged for the pines as the soil becomes acid through the loss of its lime carbonate, and concurrent with this loss, the pineland advances upon the hammock.

Practical evidence of the benefit of lime is well brought out by a letter I received last month from a prominent grower in the state, part of which reads as follows:

"You asked me to let you know what experience I had had with the use of lime and ashes on our orange groves, as well as results obtained. We have only used ground rock lime one season—the season of 1913—and as yet have not been able to determine results. We have been using hardwood ashes for a number of years with very beneficial results. We have had applied anywhere from 1,000 pounds to a ton per acre, and have thought that where we used a little application of hardwood ashes it assisted in the early maturing of the fruit. Some three years ago, through the mistake of our superintendent, he applied nearly forty tons of wood ashes on less than six acres of grapefruit trees. These trees for a number of years had been neglected before the property came into our possession, and when we got control of it we attempted to force the trees forward with ammoniated fertilizers, and in the course of three or four years we found that the roots were in a diseased condition, the feeding roots were sloughing off and turning black. This application of practically seven tons per acre corrected this root trouble within one season, put the trees in a healthy condition, and they produced one of the finest crops of grapefruit we have ever seen, so far as the texture of the skin is concerned. The writer pointed out this block of trees to you when you visited the grove a few days ago, and you can judge for yourself as to whether or not there is any evidence in the appearance of the trees as to an overdose of lime or ashes."

Let me assure you this block of trees was as fine as any man could ask for. The

soil was pine land soil, and what they needed was the forty per cent of carbonate of lime which the ashes contained.

All productive soils contain a fairly large amount of lime. Professor Fippin, of the New York Agricultural College, places the amount in a normal soil at 24,000 pounds per acre of soil one foot deep, or at .8 of one per cent. When the proportion of lime falls below a certain limit the crop yields begin to diminish. This limit is not constant, but varies according to crop and the texture of the soil. Red clover and alfalfa will do best when the soil contains at least 3 per cent of lime. Let us then see if our Florida soils show by analysis a deficiency of this element.

Florida soils are composed very largely of sand which has been derived from disintegrated rocks. Originally, minerals containing bases were associated with this sand, but because of their not being so resistant to the weathering action of air and water they were carried into the sea either in solution or as suspended particles of silt or mud.

In 114 samples of high pine land analyzed by the Florida Experiment Station (1908-B. 93), 67 were found to be distinctly acid, and the lime content ranged from .01 to .14 per cent. In other words, they only had one pound of lime where they needed at least a hundred.

Two samples of spruce pine soil contained only .0001 per cent of lime. In three samples of low pine land the lime content ranged from .01 to .1 per cent.

In nine samples of flat woods soils only one was found to be alkaline, and the lime content ranged from .03 per cent to .16 per cent. From these figures it is self-evident that one of the most important factors in Florida agriculture is and must always be the liming of soils. And it is interesting to note that we are not alone in this phase of agriculture, as the use in the United States of lime on the soil has steadily increased; in 1912 we used 604,000 tons, valued at $8,000,000, compared with 596,000 tons, valued at $7,000,000, in 1911.

We have so far endeavored to show that the liming of our Florida soils is of greatest importance and deserving a closer study of its effects on plant growth than is generally given to it by the average farmer. It is to bring to your attention the very numerous effects of lime on plant growth that this paper has been written.

The first effect to be noted is a physical one, spoken of as flocculation. In this phenomenon the fine particles of a clay soil are drawn together to form little crumbs of soil. The hydrated or rock limes are the most effective in this regard. This drawing together of the fine clay particles to form groups or crumbs of larger size permits of a more favorable soil moisture condition. When it rains the water more readily sinks into the soil, rather than flowing off, and in dry weather the subsoil water can move upward by capillary attraction much more readily. The circulation of air through the soil is better and deeper, thus increasing the root area of the soil, and the plant food in the soil is brought into available condition much more rapidly.

The physical effect of lime on sandy

soils is the reverse. The soil is made more compact and the particles are more or less loosely cemented together. This permits of the soil drawing subsoil water higher and faster in time of dry weather, and by checking somewhat the movement of air through the soil tends to a slower oxidation of humus. By always plowing to a certain depth a lime pan may be formed—a layer somewhat impervious to the downward movement of water, thus reducing or checking to some extent the loss of plant foods, chiefly nitrates, by leaching.

The first chemical effect of lime when applied to the soil is probably the neutralizing of free acids in the soil, forming inorganic or organic salts of lime as the case may be, thus producing a neutral or slightly alkaline condition of the soil water, according as lime is applied in sufficient amount or in excess of the requirement. Just what the different effects upon the crop in satisfying the soil as regards lime may be is a somewhat difficult proposition to answer specifically. We will speak of this phase in considering the biological effects. Suffice it to say that Blair and Macy conducted experiments which showed that 68 per cent of the soils showed by the lime water method an average requirement of about one and one-half tons of carbonate of lime to the acre nine inches of soil. Experiments with beggar weed showed a gain, with the use of lime, of 17 per cent green weight and 20 per cent dry weight, while on acid muck soil ground limestone increased the yield 120 per cent dry weight.

A second chemical effect of liming is the liberation of plant food by the chemical interchange of free lime with potash which is held in absorption by certain zeolitic materials and the humus in the soil. By this interchange the soluble lime becomes insoluble and the insoluble potash becomes soluble and available. By means of the absorptive power of soils the farmer, if he puts on potash as a fertilizer in excess of the immediate requirements of the crop, does not lose it, but is able by the aid of lime to reap the benefits steadily throughout the season. Otherwise, the best method of applying fertilizers would be a much more complicated one.

Applications of phosphoric acid in the form of super-phosphate is also beneficially affected by lime. Let us suppose we have incorporated in the soil a ton or two of lime, which by the action of rain and soil moisture together with carbonic acid has been thoroughly disseminated through the soil and coats more or less all of the soil grains with a thin layer of lime. Then we apply the super-phosphate, the rain dissolves the soluble or monocalcium phosphate and carries it in solution all through the soil, but does not wash it out because what is not taken up immediately by the plants comes in contact with this layer of lime surrounding the soil grains and is taken out of solution by a chemical process called reversion, so that it coats more or less all of the soil grains with dicalcium phosphate or reverted phosphate, which, though it cannot be leached out of the soil, is gradually available to the plant. This gives a more perfect dissemination of phosphoric acid than is possible with any form not water soluble. If, now, we had not applied lime and the

soil were deficient in this base, what would become of the phosphoric acid? It is not likely that much would leach out of the soil, but most of it would become combined with iron and aluminum compounds in the soil, and in this form would be quite insoluble and unavailable. It is seen, then, that lime prevents leaching of the phosphoric acid and by combining with it prevents the formation of insoluble compounds, thus increasing its final availability. Van Slyke, in this connection, writes: "We do not know of any experimental evidence showing that pure soluble or acid calcium phosphate tends by itself to make a soil acid. The acid portion of the compound is sooner or later removed from the soil by growing plants. Where acid phosphate is used in considerable amounts the complaint is often heard that it burns out or exhausts the soil, as is apparently evidenced by decreased crop yield. This may be due to one or both of two causes: (1) to soil acidity, or (2) to an insufficient amount of organic matter—conditions easily corrected not by discontinuing the use of acid phosphate, but by the application of calcium carbonate or organic matter, or both. It is well known that on distinctly acid soils the amount of available phosphoric acid is small, while the proportion of insoluble iron and aluminum phosphate is unusually high."

Prof. Cavanaugh, agricultural chemist of New York College, wrote me concerning the behavior of fertilizer on sandy soils as follows:

"I think you are entirely on the right track. I am convinced that the phosphate fertilizers will give far better results if the soil is first treated with applications of lime. I have seen some samples of the Florida soils and know something of their character. I suggest your recommending the application of hydrated lime, or if one must use ground limestone, to get it in a rather fine condition. When this has been thoroughly incorporated or worked into the soil, the acid phosphate will revert after it has been applied and moistened and will furnish probably a much better source for the growth of plants than the basic slag."

Also a letter from H. O. Buckman, soil expert of the Department of Soil Technology in New York State College of Agriculture, reads in part as follows:

"I think that you are right in considering that acid phosphate plus lime would give you better results that basic slag plus lime on a sandy soil poor in organic matter. The reasons which you give are the ones which I would consider to be the correct ones. The presence of an excess of lime, as you state, is to be sure that the reversion is to the form of the dicalcium phosphate."

Another chemical effect is the reaction which takes place betewen sulphate of ammonia and carbonate of lime to form carbonate of ammonia and sulphate of lime. The latter is leached out of the soil, while the carbonate of ammonia combines with humus, forming compounds which do not leach, and is gradually converted by bacteria in the soil to nitric acid which, combining with more lime in the soil, becomes nitrate of lime—a readily available plant food.

It also assists chemically in the trans-

formation of vegetable matter into humus, assists in the retention of humus against the oxidizing effects of hot climates, and prevents the loss of humic acids by precipitating them into beneficial lime humates. Also, lime corrects the toxic effect of many compounds that accumulate in an acid soil—as proto-sulphate of iron and certain other poisonous compounds.

As to the biological effects of liming soils, there are the direct and indirect benefits. Calcium, the active basic element in lime, is a direct plant food, and all plants require a certain small amount to build up their tissues. It enters largely into the formation of the cell walls in the growing tissues of the plant and aids in the formation of feeding roots. Citrus trees require it, and remove a small amount from the soil each year. Every carload of three hundred boxes of oranges carries away one hundred pounds of lime, and the ash of the citrus tree contains about 6 per cent of lime.

There is also the factor of the lime-magnesium ratio which at the present time is a bit uncertainly established. It is sufficient to say that the lime content of the soil should exceed twice the magnesium content.

It has also been observed by a number of growers throughout the state that lime tends to give a smoother skin and brighter color to the oranges, grapefruit and tangerines.

Certain plants are benefited by lime, as: Lettuce, beets, okra, celery, onions, cauliflower, cucumbers, cow peas, eggplants, cabbage, cantaloupe, pepper, peanut, turnip, common pea, pumpkin and squash, sorghum, alfalfa, clover, velvet bean, wheat, orange, grapefruit. In experiments with these crops not only were the yields greater in many cases, but they were ready to be marketed much earlier where the soil had been limed. Among the plants which have shown a slight injury from liming under certain conditions and may under other circumstances be helped by it are: Cotton, tomatoes, peach, apple and pear.

The plants which have quite persistently shown marked injury are: Common sorrel, radish, blackberry, raspberry and cranberry. The influence of lime on some plant diseases is also important. Lime tends to favor the production of potato scab, provided the germs of the disease are already in the soil or are introduced into it on the seed tubers.

On the other hand, liming is capable of lessening materially the injury to turnips, cabbage, etc., caused by the disease known as finger-and-toe or club root.

Slaked lime was found to be effective in reducing soil rot of sweet potatoes, and quick lime in checking or preventing the root disease of alfalfa.

But one of the chief effects of lime is the favorable influence it has on the activities of soil micro-organisms and bacteria. "Many important changes are produced in the soil by organisms so small that they can only be observed by the aid of the most powerful microscopes, and these organisms are the life of the soil. Some of the changes of this character in which lime plays an important part are the following:

(1) The change of ammonia and of nitrogen in organic matter such as blood,

meat, bone, tankage, plants, cover crops, dead roots, etc., into nitrates, the form in which it is chiefly and most readily assimilated by most cultivated plants. This process of nitrification requires the presence of lime in the soils.

(2) In the process of decomposition of organic matter in muck and other soils the production of carbonic acid is much accelerated by the presence of lime. This carbonic acid then so acts upon the inert plant food of the soil as to make more potash and phosphoric acid available than would otherwise be possible.

(3) The association of certain bacteria with the roots of legumes is aided by the presence of lime and a slightly alkaline soil solution, by which the fixation of atmospheric nitrogen and consequent enrichment of the soil is facilitated.

Lime, however, with all its benefits and desirable features, is not to be considered as a fertilizer. Continued success with lime can only be assured by the use of other essential manurial substances in connection with it to furnish needed nitrogen, phosphoric acid and potash, and by the adoption of a method of cultivation which shall maintain a goodly supply of humus in the soil.

There has been much debate as to the kind of lime to use. The farmer should inquire into: (1) the amount of actual free or basic lime in the material; (2) the fineness of the material; and (3) the presence of injurious compounds.

The forms available are, quick lime, hydrated lime, ground limestone, ashes and basic slag.

Results of Rhode Island experiments show, especially in cases where lime is greatly needed, that slaked lime insured a more complete and vigorous stand of plants at the outset. But at Sanford the experience seems to be that ashes give better results on virgin land cropped for the first time than does either ground limestone or air slaked lime.

On light sandy soils inclined to be dry, carbonate of lime is the least likely to cause immediate injury to the crop. On most of our Florida soil it is advisable to use ground limestone or ashes, and the item of expense throws the balance of the favor to the limestone, as the ashes carry only about 35 per cent carbonate of lime, while the limestone carries 95 per cent and costs about one-fifth as much. Basic slag is even less economical than ashes in price and contains only a small amount of free basic lime and would require the use of supplementary applications of lime. The matter, therefore, resolves itself into the question of the form in which the largest amount of lime in the finest state of division can be gotten on the soil for the least money.

But to summarize the usual claims for the two materials: I. Raw ground limestone as against, II. Burnt or caustic limes.

(1) Lime carbonate, including ground limestone and ashes, is the natural form of lime, and therefore best for the soil.

(2) It is easy to handle, having no offensive properties.

(3) It may be stored.

(4) It does not burn out the organic matter.

(5) It simply needs to be used in chemical equivalents to caustic limes.

(6) It does not at any time injure the productive power of the soil.

On the other hand, the dealer in caustic lime holds up the facts:

(1) That caustic lime has been used repeatedly with good effects.

(2) It is quicker and stronger in its neutralizing power.

(3) It is more concentrated, so cheaper to handle.

(4) It is more effective on clay soils.

(5) In the form of hydrate it may be stored indefinitely.

(6) Its efficiency is higher than the chemical equivalent in ground limestone, owing to greater degree of fineness.

As to the amounts to use, it has been found that small applications requently repeated are far better than the same amounts at long intervals of time. The heavier the soil the more lime will be required. Generally on sandy lands 500 to 1,000 pounds hydrated lime or 2,000 pounds of ashes, or 3,000 pounds of ground limestone repeated every four or five years gives the best results. On clay soils 1,500 pounds of hydrated lime or two to three tons of limestone every three or four years will be found effective.

Method of Application—The aim should be to get the lime thoroughly incorporated with the soil. Fineness here becomes a factor and determines not only the solubility of the lime, but the thoroughness with which the material can be incorporated with the soil. Veitch conducted extensive experiments to determine in a practical way the speed with which applied lime neutralizes the acids of the soil. From this mass of evidence the assertion seems warranted that for practical farm purposes the neutralizing effect of applied lime is not exerted below the depth to which it is incorporated with the soil during the various processes of preparation and cultivation. Consequently, the more thorough and deeper those operations are the better the distribution and the more effective the action of the lime.

Lime should be incorporated to a depth of three or four inches to be effective on acid soils. The results indicate that alkaline soils are more fertile than acid soils and produce crops more economically than acid soils do, and the soil should be finally made alkaline to the full plowed depth. (Fla. Bul. No. 93).

Let me emphasize, in closing, the great importance of the necessity of maintaining the content of organic matter in the soil in connection with liming. Lime alone may lead the way to a so-called dead soil; drainage, irrigation and fertilizers are frequently inadequate, but the combination of proper moisture supply, organic matter, dry cover crops, legumes, with good tillage at the right time and in right manner, together with the proper mineral fertilizer combined with a suitable liming practice, is the acme of good soil management and modern conservation of soil fertility.

Discussion.

Mr. Sample: I would like to ask Mr. Skinner, could we obtain bad results to the ammonias by putting on lime?

Mr. Skinner: Not if the lime is incorporated with the soil and the materials are put on two or three weeks apart, with a

couple of good, heavy rains coming between the applications.

Mr. Sample: You mean the lime rock, or hydrated?

Mr. Skinner: Either one.

Mr. Shepard: Mr. Skinner mentioned quick lime, ground lime, slaked lime, etc. It seems to me he neglected one of the important resources in this state; that is, marl.

Mr. Skinner: Marl is very good, and has the advantage in this respect, that on very sandy soils it contains a certain amount of clay, and that adds fine particles to our sandy soils and makes them more of the nature of sandy loams. The more of that we can produce in that direction, the better off we are; that is, the clay in the marl will assist in improving the physical condition of the soil.

Mr. Shepard: One of the problems is that it is hard to get it fine enough. I would like to know what experience anyone here has had to get it in shape to put on the land.

Mr. Skinner: I don't know of any particular case, but where you can get marl cheap and apply it, it is my suggestion to go ahead and use it. You could not wish for a much better material.

Mr. ——: I would like to know whether or not lime which has been used to soften artesian water would be beneficial. In softening our water, hydrated lime is put in and the water deposits it after the process of softening is finished. We have a large amount of this by-product and I am a committee of one appointed to give away this by-product in order to put it out of our way. If anyone would like to experiment with it, so that they could use a carload at a time, they may have a carload just by paying the freight. It is simply hydrated lime that has passed through the process of softening artesian water.

Mr. Skinner: I have had no experience, and have had no information with reference to it.

Mr. Hume: I think it would be practically useless so far as obtaining the results desired, because the process of washing the lime would take out the active part that is the agent in the fresh lime that is used. It would be worth a trial, however.

Mr. Lewis: What conditions would be noticed in a grove needing lime?

Mr. Skinner: The frenched condition that I described in the paper, with sloughing off of the roots. Sometimes it causes a marked frenching condition of the leaves, and very often I think it induces dieback where it otherwise would not exist; that is, forcing the trees with ammonia where an acid condition of the soil exists, is more likely to produce dieback and diseased condition than forcing them in a wholesome soil; one that is alkaline.

Mr. L. B. Skinner: Isn't it a fact that all our groves need lime?

Mr. R. E. Skinner: Down in the limestone country they have a soil under the limestone that is very alkaline. Then there is hammock soil that has a large amount of lime that really would not require lime.

I would not be willing to take a litmus test of soil as an indication as to whether or not it required lime. I would rather

take a chance and put two or three tons of lime on it. It cannot do any harm, and there are ten chances to one in Florida that it will do a whole lot of good.

Mr. Ley: Is there any particular season when lime should be applied on the groves?

Mr. Skinner: As soon as you can get to it.

Mr. Hume: This is a very interesting and valuable paper we have just had, and I believe it would be of much value to the good of agriculture in Florida if it is taken to heart and acted upon. I have no lime for sale and so can advise you disinterestedly to buy some.

Fertilizers

G. M. Wakelin

Mr. President, Ladies and Gentlemen:

It would be a difficult matter to present to the members of this society a paper on fertilizers, giving them anything particularly new or original. The great majority of the members of some years' standing are well informed on the subject, and it would be presumptuous on my part to suppose that I could add to their store of knowledge. However, we have not all thrashed and rethrashed this subject, so it may be that a little *review* of one of three important elements of plant food will prove interesting.

THE SUBJECT IS PHOSPHORUS

This is from the Greek word Phosphor, the Latin equivalent is Lucifer, both meaning "light bearing," and were the names given the morning star, usually Venus, when it precedes the sun. The element phosphorus was then so named because it glowed.

It is one of the simple elements, chemical symbol P., not a compound, and in a pure state is a non-metallic soft solid. Phosphorus cannot be kept in this form except under oil, for on exposure to the air at ordinary temperature it undergoes a slow glowing combustion, and oxidizes to the compound called phosphorus pentoxide P_2O_5. This again will take on water and become phosphoric acid $H_3P_2O_4$. Phosphorus is not found in nature except as the salt of phosphoric acid and some basic element such as calcium. This is its most abundant form, known to all as natural phosphate, soft rock and pebble; and again found the world over as the mineral apatite, and again in marl. This is a combination of phosphate of calcium and fluorin or chlorin. By some this is supposed to be the one original source of all the phos. found in nature. Phosphate of calcium again comprises the greatest part of all bones of fish, birds and animals, and the element P. itself in combination with other elements constitutes the substances called proteins, found in the cell structure of every living thing and its product.

By common usage the P. in fertilizers is called phosphoric acid, but figured as phosphorus pentoxide. Forty-four per cent (App.) of "Phos Acid" (P_2O_5), so called, is phosphorus, though of course we understand that this P. exists as Phosphate of Ca. It would probably be better usage and more instructive to figure on fertilizer elements as N. instead of Am., potassium instead of potash, and phosphorus instead of phos acid. Roughly speaking—

N is 82 per cent of ammonia (NH_3)

K is 83 per cent of potash (K_2O)

P is 44 per cent of "Phos Acid" (P_2O_5)

And P. is 20 per cent tricalcium phos-

phate, sometimes called bone phosphate or bone phosphate of lime.

Availability and Solubility. There is often some confusion about the terms solubility and availability. Soluble phosphoric acid means of course P. A., soluble in water. In addition that amount of P. is further considered available which is soluble in the neutral solution, ammonium citrate. So the water soluble and the citrate soluble together constitute the available phos acid. The question of a test for availability will be considered later.

The Different Compounds of Phosphoric Acid and Calcium. These have many different names, but are best designated by the number of atoms of calcium found in each compound, thus 1 part momocalcium phosphate, $CaH6(P2O4)2$, a manufactured product soluble in water; 2 parts dicalcium phosphate, $Ca2H4(P2O4)2$, partially water soluble. This has taken on one more atom of Ca. and is said to have reverted toward the original substance from which it was made, viz: 3 parts tricalcium phosphate, $Ca3H2(P2O4)2$; natural phosphate insoluble in water under ordinary conditions; 4 parts tetracalcium phosphate—partially water soluble—a problematical compound found in basic slag.

The more important organic sources of P. as used for plant food are as follows (and perhaps this is a good place to state that organic sources as contrasted with the inorganic of P. do not appear to have the possible deleterious effects of organic ammonia as contrasted with inorganic): 1 part bone in two forms, raw and steamed—a possible third form is acidulated bone, but this has largely gone out of use since there is little to be gained by treatment with sulfuric acid, as all the bone becomes available sooner or later. Acidulated bone contains no N but 12 to 14 per cent available P. A.; 2 parts tankage; 3 parts phosphatic guanos.

In comparing raw and steamed bone we find that raw bone has a little less P. than the steamed bone, but more nitrogen. It is not to be recommended above the other, however, for steaming removes the fat. This is not only of no use to plants, but reduces the availability of the tricalcium phosphate in the bone since it prevents fine grinding and forms an oily coat on the particles in the soil. "Other things being equal, the availability of any fertilizing element is proportional to the fineness of its division."

2. *Tankage*—The composition varies greatly according to source—the per cent of tricalcium phosphate 13-39, phosphoric acid 2-8, the term tankage is now understood to include not only slaughter-house refuse, but even hotel refuse and general garbage. The nitrogen content may run as high as 10 per cent. The phosphoric acid is supposed to be about as available as in steamed bone.

3. *Phosphatic Guanos*—These are the deposits of sea birds mixed with considerable quantity of fish bones. The range of phosphorus content is wide, and considerable N is present—availability about equal to bone tankage. All of these sources are rather slow and it is therefore desirable to use them in connection with a more quickly available source. All organic sources contain phosphorus, as tricalcium phos-

phate—scarcely any of it water soluble, but all of it available in time, more readily so where favorable climatic conditions and the presence of lime in the soil hasten the decomposition of the organic matter in the structure of the material.

Steamed bone is by many considered the preferable source of P. for citrus groves. The organic sources in general seem particularly congenial to the citrus family, perhaps because they contain N in connection with P. It is never really necessary to treat them with sulphuric acid. As further sources of P. we also have cotton seed meal, castor pomace, tobacco waste, etc., all valuable and useful as absorbents in fertilizer mixtures, but more conspicuous for their N content than for P.

1. *The Inorganic Sources. Floats.* This is the natural phosphate, tricalcium ground as fine as flour. The name was originally given to the dust which floated from the grinding mills.

It averages —— tricalcium phosphate associated with a slight amount of iron, aluminum and carbonate of calcium. Where soil is naturally rich in phosphorus this is the form present. I consider this fact very significant.

2. *Acid Phosphate* $CaH6\ (P2O4)2$. One hundred pounds of acid phosphate made from pure tricalcium phosphate contains forty-six pounds of monocalcium phosphate and fifty-four pounds of gypsum or land plaster—sulfate of calcium. If the rock phosphate contains, as it usually does, also carbonate of Ca. there will be less soluble acid phosphate and more gypsum in the completed product. Acid phosphate may also contain some iron and aluminum, but raw rock which has a considerable content of these two minerals is unsuited for the manufacture of acid phosphate. Usually there is also present some undissolved tricalcium phosphate with which the monocalcium will react by taking on one more atom of Ca. and becoming dicalcium phosphate—the reverted form.

3. *Dissolved Bone Black.* This is made by treating the bone charcoal discarded by sugar refineries with sulfuric acid. The name "bone" has charms, but B. B. has no advantage over acid phosphate, containing, as it does, about the same amount of soluble phosphoric acid. It may have less gypsum and less of the soluble Ca. may revert. There is, however, no superiority worth the difference in cost. A little lamp black mixed with acid phosphate will make very good bone black.

4. *Slag.* Total phosphoric acid 18 per cent. The value of slag lies in its phosphoric acid content and not in any particular name—called basic slag, slag meal, Thomas slag, etc. It is the finely ground refuse from the smelting of iron ores containing phosphorus—an excess of limestone being used in the process. The stone used, called dolomite, contains also considerable carbonate of magnesia, which accounts for the Mg. content of the product. Of the P. A. only about 5 per cent is available, i. e., soluble in ammonium citrate solution.

This brings up the whole question of availability. The test as provided by law in Florida, and nearly all other states, is solubility in the neutral ammonium citrate

solution. In other words, that amount of P. A. is supposed to be available which dissolves in this solution. The solution is supposed to approximate the soil solution, but of course it is a purely arbitrary standard, as indeed any test must be. For soil conditions are so variable and so many different factors enter into consideration that no accurate measure of availability can be provided. Soil chemists do not maintain that the available P. A. is accurately measured by this test. It is said that they are now working to perfect the better standard. As a matter of fact, much more P. A. is available to healthy, growing trees under the best soil conditions and management than would be shown available by any chemical test. Living organisms have selective and solvent powers of their own. It is asserted that the available P. A. content of slag should be determined by its solubility in a 2 per cent citric acid solution—the Wagner test—since its alkalinity reduces the solvent action of the legal solution. This Wagner test gives slag 16 per cent available P. A., while the Florida test will show not more than 5 per cent.

Slag and Acid Phosphate. Availability of slag is said to be due to the disintegrating effect of the slaking of the CaO associated with the tetracalcium phosphate. The slaking might be completed between the times of manufacture and application. This calcium oxide is variously estimated at from 2 to 5 per cent—a very slight amount compared to the needs of Florida soils. The carbonate, says Van Slyke, is insignificant. No other forms of calcium except CaO, CaHO, $CaCO_2$ are of any value in correcting existent acidity and cannot properly be called lime. The burden of evidence is that slag does not contain at the outside more than 5 per cent of genuine lime. Certainly it is of value as furnishing an alkaline source of P. However, as a dependent source of lime, it is both expensive and insignificant. If the total P. A. be worth $1.00 a unit the lime, iron and magnesia may be considered extras. The claims now being made for slag seem extravagant. Take this matter of 14 per cent iron content. While iron is found in connection with chlorophyl in most plants, it is in such infinitesimal quantities and the amount in the soil is so proportionately great that there is no need of applying any. Certainly the presence of unusual amounts of iron will tend to lock up soluble P. A. as the insoluble phosphate of iron.

A. P. ranks first in availability. Fresh A. P. is easily soluble in soil waters, and is thus widely diffused before reversion. A considerable quantity of the monocalcium will revert in the presence of calcium to the less soluble dicalcium (1-18) as soluble. The reversion may even continue to tricalcium phosphate, which is ordinarily not considered available. However, the solubility of Di and Tricalcium is much increased by the carbon dioxide universally present and some common forms of fertilizer as nitrate of soda, sulfate of ammonia and sulfate of potash. Unfortunately, it is retarded by iron compounds and gypsum. When we consider that A. P. contains more gypsum than anything else, we cannot help but consider so large a quantity rather objectionable.

The consensus of opinion is that A. P. is likely to increase soil acidity, but the authorities do not agree as to just why it should. Popular opinion fastens on the use of sulfuric acid in manufacture, but A. P. does not contain any free acid unless very carelessly made. That is the point guarded against—less than actually needed to dissolve the tricalcium being used since an excess is expensive to the manufacturer and injurious to the product. Van Slyke lays the possible acidity to the interaction of the gypsum with other compounds present, thus leaving the sulfuric radical in the soil. At any rate this possible acidity is not a serious objection if the soil be well supplied with lime. Gypsum is partially soluble, but is not in any sense a fertilizer or a soil corrective. Then if we use large quantities of lime we are likely to cause a more speedy reversion of the soluble P. A., perhaps there may finally be present more tricalcium phosphate (floats) than either other form of P. A.

Possibly A. P., along with other fertilizer sources, has been made to suffer for the sins of its users. It is not unreasonable to presume a possible corrosive action from a large quantity—twenty to thirty pounds per tree—of fertilizer largely water soluble—applied at one time. Many growers believe that little but often means better results for the same or less money. We know that less phosphoric acid is lost in the soil drainage than either N. or K., but it may readily be carried below the reach of the roots. The use of more soluble sources in winter and less soluble in summer is advised by some who fertilize twice or three times a year, but we cannot depend on having a wet summer or a dry winter. It is matter of record that January may be wetter than July or August (1912), or December than June (1913).

The facts are that we have not any complete data on the use of different forms of P. under Florida conditions and in citrus groves. The usual recommendation of some grower is seldom of weight because, in the first place, the tests have not been carried through a number of years, and secondly, they have not embraced several different sources, nor have they been checked by black plots. Neither have records of temperature and rainfall been kept.

Prof. Hopkins, of the Illinois Experiment Station, has made an excellent case for floats, and farmers in Illinois by following his advice get good results at little expense for P. The satisfactory use of floats is conditional upon thorough incorporation in the soil with large amounts of decaying vegetable matter and plenty of lime. We may say in passing that advantageous fertilizing necessitates lime either in the fertilizer or applied separately. And it takes limestone to fill the bill. Present indications are that floats cannot be used to advantage in a bearing grove, but I do believe that a new grove can be easily and cheaply made by plowing under on land previously well dressed with floats and limestone. The grower would really need to buy little fertilizer in addition, except potassium, which if used as low grade sulfate would also supply Mg.

Most sources of the fertilizing elements have some possible objection, sometimes more theoretical than practical. All the

organic sources of P. produce acidity. Floats and slags are the only neutral sources I recall. This question of acidity, we are told, has never been thoroughly studied out—there is much work to be done before accurate data can be assembled. I believe most of the argument for slag holds good for floats. If, as stated, there is enough acid in Florida soils by its action on slag to make available all the phosphoric acid needed, and this in spite of the alkalinity of slag, why is not the same true of floats?

Steamed bone comes nearest being the ideal source of P., but it is expensive and will probably continue to advance in price. Acid phosphate is the cheapest source and should be cheaper. At present floats cost entirely too much. It is furnished by the manufacturer of acid phosphate, who is not interested in its use, but it should be placed on the market by the mining companies themselves. It is the cheapest source of P. that is, floats furnishes more phosphorus for less money than any other material. Certainly it is the slowest source in point of available P., but I do believe it can be used to great advantage in farming operations, and it is quite possible that we may yet find it profitable in orange groves.

There is yet a great deal to be learned about the most profitable use of the fertilizer elements. Some prominent and successful growers who know how to use them separately, do so at a considerable saving. Others are even rash enough to mix their own fertilizer and succeed in raising a No. 1 fruit at less cost than when they use mixed goods. Of course, neither one of these methods of procedure should be undertaken by the novice. But I do believe we are paying more than necessary for our mixed goods and for the raw material as well. It is hardly possible for an association of growers to make much saving by buying mixed goods in quantity. Let us, in collaboration with those skilled gentlemen who are paid to help us, use some systematic study and work along these lines, and not be quite so ready to swallow all the information put out by interested parties.

Mr. L. T. Dade, Orange City

Mr. President, Ladies and Gentlemen:

In speaking on fertilizers, I fear I can give you but little information that you have not already known or tried. However, I will try and we can at least exchange a few ideas.

As the word implies, we are seeking or trying for that with which to improve our soil, and give to our trees and plants that which nature intended them to have, in order to make a strong, vigorous tree or plant, and our aim, it seems to me, should be to follow nature as closely as possible, and try as far as possible to restore to our depleted soils the fertility of which we have in a measure robbed them, and to build up and give fertility to those soils which lack the necessary elements for producing good crops.

As we all know, we have a great many acres of such land in our fair state, but I believe from my own observations and that of others, that with proper care and judgment, our poor soil can be made to bear and bring forth crops and that the wasted fertility can be restored to our depleted soils, but in order to do this we must go about it in a systematic way, and

to begin with I would suggest the planting of cover crops such as velvet beans, cow peas and beggar weed. Of the three named, I prefer the velvet bean, not only from the fact that being one of the legumes, it gathers nitrogen from the air, and stores it up in the soil, but it also gives a greater amount of humus, the great essential in our light, sandy soil, and having a tremendous vine growth it shades and prevents the leaching of the soil. My method of handling it as a cover crop is to begin, say in October or November, by running a heavy disk harrow over the vines going two ways the first time, but few of the vines are cut, but they are mashed down so that the sun can get at them. I then let it lie for a few days when I go over it again in the same way. This time more of the vines are cut and broken. This is kept up at intervals of two or three days until the vines are well cut up. As a general thing, after going over the vines the second time, if they have been planted in a grove, the fertilizer can be applied and subsequent harrowing will help not only to cut up the vines more thoroughly, but will thoroughly mix the fertilizer with the soil. I find that all cover crops handled in this way become available as plant food much sooner than when they are turned under with the plow.

I have been following this method for several years and find it much cheaper and more satisfactory than plowing under. For doing this work, we use a four-gang cutaway harrow, the two forward gangs throwing the earth one way and the rear splitting the forward furrows, and turning in opposite directions, thus pulverizing the soil perfectly.

Aside from the cover crops, there is much waste material which, if returned to the land, would greatly add fertility and help build up our soils. Many tons of good fertilizing material are being wasted on the farm and in our groves through carelessness and lack of forethought each year. A case was brought to my notice only last spring. In gathering up the drops and decayed oranges from the groves, for fear of the spread of Melanose and Stem-End Rot, we instructed the men to haul them out and spread on land where we intended planting cow peas for making hay. The leaves and small twigs were also hauled out and disposed of in the same manner. When cutting time came the effect on the crop was plainly discernible, especially where the oranges were put. The result was a rank heavy growth of vine where the oranges were used, while the land on which no oranges or trash was used was light and thin.

I do not think it wise to bury the oranges in the grove as I think there is danger of inoculating the ground with the fungus germs. I may be wrong in this idea, but I find we had less Stem-End Rot and Melanose this season than for several years past, and we have been following this method for the past two years. It takes but a short time to gather up the oranges—a man can take four rows at one time, placing the oranges in piles in the middle of the rows, so that the team in hauling them out does not have to cover so much ground.

If the fruit is falling badly, this should

be done every week, but as a general thing every two weeks is sufficient. Broad trenches can be plowed where they are to be hauled, and the oranges covered at once; leaves and twigs are scattered broad cast, and plowed under. The land on which I first tried this was poor white sand on lake shore, nothing more than beach sand. After cutting the peas, I got a second cutting of crab grass hay, the only fertilizer used being the oranges and trash from grove. The decayed and refuse oranges from packing house can also be utilized in this way. I also have all leaves and grass when mowing lawn hauled into the groves and spread around the trees where it is worked in with good results. Of course when it comes to general fertilizing, we have to fall back on our chemical fertilizers, and I will say here that I fully agree with our friend, Mr. Wm. M. Atwater, in his idea of frequent application in small doses, beginning in January with fertilizer analyzing say 4 to 6 Ammonia, 6 Phosphoric Acid and 8 to 10 Potash; three months later another application of about the same analysis; three months later with a decrease in ammonia and increasing phosphoric acid and potash. The last application should be applied the latter part of October to the middle of November, should show high phosphoric acid and potash with low ammonia. This would aid in maturing the fruit and hardening up the wood and thus placing trees in a strong healthy condition to carry them through the winter.

This method I think, tends to keep the trees in a good thrifty condition with less danger of over-stimulating, thus avoiding the danger of Die-Back and other troubles caused by over-stimulation. I am also a strong advocate of the use of lime in the groves, especially the ground rock lime. We all know and must admit that the finest oranges and some of the best groves in the state are grown on our shell hammocks. If enough of the rock lime becomes incorporated with our high pine soil, why should we not get the same fine thin-smoothed-skin fruit?

You may say there is danger of getting too much lime in the soil. My reply is, then why is it we found the largest and best wild groves growing and thriving on shell mounds along our coast, and on the St. Johns River. I have seen some of the largest and best crops of oranges grown on these shell mounds where there was but little soil, and the trees were in a fine healthy condition, the fruit being of the finest quality. Some growers prefer hydrate of lime, but I am inclined to think that there is considerable danger in its use on account of its caustic qualities, and if applied near fertilizing time either before or after an application, it is, I think, liable to loosen up and dry out the soil, thus releasing too much of the available ammonia. On the other hand, I have seen good results come from its use. In cases where we had Die-Back in an aggravated form, I have cured it by a good application of caustic lime. A case in particular which first suggested to my mind the need of lime in our groves and which came under my observation some ten or twelve years ago, we had some trees badly affected with die-back, and I concluded to try an experiment on them. Knowing that the two chief causes of

Die-Back were either an excess of ammonia or too much acid in the soil, I came to the conclusion that if there was an excess of ammonia the lime would release it; on the other hand, if too much acid the lime would correct it, and sweeten the soil. I began by cutting a trench at the outer extremities of the branches all around the tree, and twelve or eighteen inches deep. I then put in about a peck of unslacked rock lime. In a short time the trees thus treated put on a thrifty growth and we have had no Die-Back in them since. There was also a most luxuriant growth of grass came up about these trees, much heavier than the trees around, although these trees were treated just the same as the rest of the grove with the exception of lime. I find since we have been using lime in our groves, we get a much heavier growth of grass. For applying our fertilizers, we use a Stevens broad-cast machine, which does fine work and is very simple in construction.

Grove Heating

Rolland E. Stevens

Mr. President, Ladies and Gentlemen:

The object of grove heating, or smudging, as it is popularly termed, is to keep the temperature in the grove above the danger point. This point is not an absolutely fixed one, by any means. There are times and conditions when fruit will freeze at 30 degrees Fahrenheit, and other times it will not freeze with the thermometer at 28. Some growers claim that an orange will stand 26 degrees for three hours; as to this I am not prepared to say. If it is a possible thing, I don't ever expect to let the temperature get to 26 degrees when there is either fruit or bloom on the trees. A dormant orange tree will stand remarkably low temperatures. Personally I think that in December or the early part of January, if the trees are in a dormant condition, they could stand 15 or possibly 10 degrees above zero with little or no damage; the fruit, however, will not stand any such temperatures as these. The danger mark must be decided by each man for himself, and when he has done so he must use whatever means he has for protection accordingly. It is better to be safe than sorry, and while it is not advisable to burn up a large quantity of oil needlesssly, still it is better to burn the oil and save the fruit or trees, than to save a few gallons of oil per acre and lose a car of fruit per acre or several years' growth off the trees. It must also be kept in mind that it is much easier to hold the temperature at any given point than it is to raise it to that point after it has gone below.

There are two distinct methods of protecting a grove from frost. I shall divide these as follows: First, overhead protection, which includes sprinkling systems of all kinds, with which many of you are familiar,—the so-called "overhead irrigation systems." These will keep off a frost and will raise the temperature a little, in all probability, as the water here in Florida will be some warmer than the air. It will also help the fruit that has been frozen on the trees to turn on an overhead system and thoroughly soak out the fruit and foliage. The damage will be much less than if the sun came out on the fruit and trees when they were covered with frost. Another overhead system which has been used in a few isolated instances, is the use of sheds. I shall not dwell on this as the cost of installation and up-keep is practically out of the question.

Second, protection by fires: There are three classes of fuel available for fires—wood, coal and oil. Wood, while perhaps cheaper than the other two, has several disadvantages. It takes too long to build a large number of fires; it is impossible to regulate the fires very close; and is

wasteful of fuel in that they cannot be readily extinguished. The fire will be either too high or too low, as a general thing. It has been found by experience that a large number of small fires, well distributed through the grove, is more efficient than the same amount of heat generated by fewer large fires; but this is hard to manage when wood is used for fuel. The fire is apt to be too high when first built, and gradually burns down and will allow the temperature to get too low for safety.

Secondly, coal: This is practically out of the question here on account of the cost. In some of the coal-producing sections, coal is burned with fairly good results.

Thirdly, oil: There are a great many different grades of oil, ranging from Mexican crude, which has a high percentage of asphaltum, down through the lighter oils to distillate and kerosene. In the use of oil it is necessary to have a can of some type to hold it. There are at present on the market a great variety of cans, or as they are popularly called—smudge pots or heaters. They range all the way from the small, round lard pail type, holding about a gallon, to the large reservoir heaters with drafts and chimneys, having a capacity of 11 1-2 gallons and costing from 20c to $1.55 each. In choosing a type of heater, the first consideration should be the grade of oil available. Kerosene may be burned in an open pail with a very little ill effect from soot, but the heavier oils, if burned in this type of heater, give off a dense sooty smoke, which, if much firing is done, will greatly damage the fruit.

There was considerable loss in California from sooting fruit a year ago last winter. It does not really hurt the fruit, but it is a greasy, black smut that is very hard to wash off and hurts the sale of the fruit very much.

There are, however, several different types of smudge pots which generate gas from the oil, and by the use of drafts, burn this gas practically clean, even from the heaviest oils. There will be some little smoke even from some of the so-called smokeless heaters, but if it is of a bluish or hazy nature, no ill effect on fruit or trees will be felt from it. There are heaters now which generate gas by a draft of air down onto the surface of the oil through the cover of the pot; also by running the oil through a coil of pipe which is heated from the flame itself; and one heater which I know generates gas by allowing the oil to drip through a receptacle containing coke. This last heater can be fed direct by pipe lines from tanks or reservoirs located in the grove, and operated by valves so that they can be turned out very quickly if the temperature rises above the danger point. This, I consider an important factor for, at the present price of oil, every gallon that can be saved is an item to be considered. With this system also there would be no loss of oil from spilling when taking up the heaters in the spring or putting them out in the fall. In one grove this year a grower reported the loss of 8,000 gallons of oil in filling and emptying heaters. The originator of this heater is a member of our society and has used these in a small patch of grove twice this last winter, and he told me they worked remarkably well. I have seen them burn and think they are fully as efficient as any.

I shall give a few of the requirements of an efficient heater as I see them from the experience I have had and the investigating I have done along this line. First, a large capacity heater is best. A heater should always hold enough oil to burn full capacity at least all night. In the past it has rarely been necessary to fire a grove during the day, but a heater should hold enough oil so that refilling at night would never be necessary under any circumstances. It will always be necessary to have men out at night to fire them, but the refilling should be done in the day time.

Second, a gas-generating heater is best in my estimation. It is more economical in that you get more heat units out of the same amount of oil than you get from a heater which gives off a dense smoke. You burn the carbon instead of throwing it off in the air. There are probably many who will say that the smoke is worth as much as the fire. I do not agree with that. Smoke will keep off a frost; it will not keep off a freeze. A frost will not injure your trees nor fruit, and a freeze will. Smoke may save a vegetable patch or any plants that a frost will kill, but smoke will not raise the temperature. A gas-generating heater will throw off less soot and will discolor the fruit much less than one which makes smoke. This will be found to be a large item when it comes to cleaning up the fruit at shipping time.

A practical heater should be as cheap as possible, consistent with the use of good materials. It should have few parts and few adjustments, because if it has too many parts it will be hard to put together, the parts will get lost, and will get out of place, and be generally inefficient. Too many adjustments will complicate it beyond the ability of the labor available to operate it. Drafts or dampers are an absolute necessity. There are times when it will be necessary to fire up early in the night with the thermometers just at the danger point. It may stay there until morning, or it may go either way—up or down. If it goes down suddenly, as it frequently does, it will be necessary to open the heaters up and open them quick. They should be so arranged that the drafts can be quickly and accurately set by our ordinary labor. It is not economical to burn fuel enough to raise the temperature 10 degrees when five is all that is needed, as oil is too expensive here to raise and keep the temperature at 35 when 30 is high enough.

The weather bureau can give you information as to where to obtain wet and dry bulb thermometers, and how to use them to determine the dew-point, which will help you to determine how low you dare let the temperature go. A heater should be made of good material in order to withstand the damp climate here as much as possible. Light guage steel will rust out in one year even after being dipped in crude oil. The heavier guage a steel is the better, even though it increases the cost of the heater.

I shall now try to give you an idea of the practical application of heaters as we have used them, and then a table of costs. Some four years ago we put in 2,500 three-gallon heaters with twenty-six 600-gallon tanks through the grove for reserve supply of oil; also a concrete cistern, holding 25,000 gallons. We have

burned these heaters but twice, but those two times were sufficient to demonstrate to us that, even though the cost is high and the depreciation both of pots and oil is large, the insurance afforded is remarkably cheap. One night the weather bureau predicted a frost; the wind was in the northwest and the conditions seemed to warrant the report. We fired up when the thermometer went to 28, and by the time the men in one 5-acre grove had the pots all lit and got back to look at their thermometer, it had gone to 38. Half of the pots were extinguished entirely. It went to 36; the other half were shut down very low. The thermometer went to 33 where it was held until morning. The thermometer outside of the grove showed a minimum of 26 degrees. The makers recommended 50 of these pots to the acre. We use 75, and have them double thick for two rows on the north and west sides of the grove. We have since then bought one thousand heaters of another make and expect this summer to put in more, as we firmly believe they will do the work.

As to the equipment necessary to protect a grove against a freeze I can recommend the following: I do not feel that in a paper of this kind I am justified in rceommending any make of heater, but whatever heater you decide on use more per acre than the makers recommend. Get a heater that will not require refilling during the night. If it is a large heater that makes a good, big fire, 50 or 75 to the acre may be enough.

As to oil, have enough oil on hand to burn until you can get another supply. If it will take five days to get another supply of oil have enough on hand to burn at least five nights. You will need tanks to hold your surplus oil and tank wagons to distribute the oil. These may be had from various makers here in the State. We have a concrete reservoir for our main supply, but I understand some people who have used concrete have had trouble with the oil leaking out, though we have not ourselves.

You will need two or three *good* thermometers; this is an item on which you are going to hang your crop of fruit, so don't economize on it. Get a thermometer that has been government-tested, or that has been compared with an absolutely accurate thermometer. In order to be safe it should not vary more than one degree. Get a wet and dry bulb thermometer, and write the weather bureau for directions how to use it. This latter may save you many a sleepless night. You will want two torches and two gasoline cans for each ten acres of grove, as we find that one man can handle about five acres.

The cost of this equipment will depend so much on locality and the make of smudge pot, that I shall merely give you the figures that were printed in the *Florida Grower* of March 21, 1914, in an article by Mr. James D. Culbertson of the Limoncira Company of Santa Paula, Calif. I have had some correspondence with Mr. Culbertson and feel that his article is the best on the subject of frost protection I have ever seen, and can heartily recommend it to anyone for careful study.

The cost in California will be perhaps a little less than here, as he figures his oil at 2½c per gallon, while with us even the Mexican Crude will cost in the neighborhood of 3c. The following figures are based on the cost of one hundred heaters per acre:

100 heaters	$100.00
Storage space for 1240 gal. oil	15.77
Pipe line	12.75
1 tank wagon to 14 acres, per acre	8.63
Pails, 1 to 3½ acres, per acre	.60
Torches, 1 to 2½ acres, per acre	.40
Thermometers, 1 to 10 acres, per acre	.30
Telephone	1.50
Oil in heaters—700 gal. at 2½c	17.50
Oil in storage, 1000 gal. at 2½c	25.00
Total	$182.45

This applies as first cost. The interest, depreciation, deterioration, handling and filling he estimates as $33.34 per acre per year, which is really the price of the insurance. Of course if the heaters are burned the labor of lighting and of refilling would be additional to this; but these figures will serve to show you to some extent whether you could afford to carry crop and tree insurance of this kind or not.

Personally I feel that we cannot afford to be without it. In my mind there is no question but what there will be more efficient heaters developed in the next few years, but in the meantime we are not going to sit idly by and see our investment lost, waiting for someone to invent a better heater.

Discussion.

Mr. Darby: I would like to ask if he has ever experimented with coke.

Mr. Stevens: No; I have never used it.

Mr. Darby: We have used coke with excellent results. However, we have had no very severe frosts. We used forty heaters to the acre and about 20 or 25 pounds of coke. We find 25 pounds of coke will burn ten hours. Our coke comes from Birmingham, Ala., and costs us there about $3.50 per ton, and the freight is about the same. That will make about 28c per heater; forty to the acre will be $11.20.

Mr. Stevens: Is your receptacle for burning expensive?

Mr. Darby: No, sir; about a dollar. Of course, on a few the freight would be excessive, but we went in together and bought a car-load, which greatly reduced the rate.

They are very easy to light; there is an opening in them at the bottom which is filled with light wood, and then touch a match to it and that is about all that is necessary. The way to extinguish them is to tip them over.

Mr. Stevens: Is there any way to regulate them?

Mr. Darby: No; you just have to let them go. We can raise the temperature ten degrees without any trouble.

Mr. Stevens: Then you are raising the temperature to 38 degrees when you need only 30 degrees.

Mr. Darby: We have forty heaters to the acre. One advantage to the coke is that it does not depreciate. It is of as

much value two or three years after you get it as it is at first.

Mr. Cullen: In filling and emptying the crude oil, there must be a good deal of it spilt on the ground, and I would like to know the effect of this crude oil on the trees or the roots.

Mr. Stevens: I asked Mr. Hamilton when he was here last December. He said it had no bad effect. We have had in our groves little low places where oil had been spilt and after a heavy rain these low places would fill up and the floating oil would spread all around where the water ran over this low place. So long as the oil does not get on your foliage, it does not seem to do any harm whatever.

Mr. Wakelin: I have not noticed that it does much harm, but if it is spilt against the trunk of the tree, especially if the sun strikes it, it will make a very bad burn.

Mr. Skinner: I would like to know whether pruning a tree high or low from the ground has any effect on the manner in which a grove is heated.

Mr. Stevens: If the limbs in a grove reach over and close over in the middle of the rows, it would be much better to have small fires and more of them. It would be the same as a fire in your grove and might cause some damage in spots.

Mr. Skinner: I referred to having the trees pruned high or low from the ground whether or not the difference in air circulation or air drainage caused by this difference in pruning, had anything to do with the heating.

Mr. Stevens: I think the less air there is stirring around, the better it is. I don't think I would prune a grove with that end in view, however.

Mr. Stewart: What effect has a stiff west wind on heat.

Mr. Stevens: We put our heaters double thick on the west side. It would be harder to heat the west than the east side. The heated air will blow from the west to the east. It is simply a matter of more fuel.

Mr. Stewart: How about that '99 freeze that caught the blaze and carried it right out of the grove. The wind came from everywhere.

Mr. Stevens: I don't know; I was not firing at that time.

W. J. Ellsworth

Mr. President, Ladies and Gentlemen:

The subject of orchard heating has been of deep interest to me for many years past, and I have followed as closely as possible the work done along this line, from the so-called shed with various arrangements for securing overhead light and at the same time enabling the grower to speedily close the openings to exclude cold, the v-shaped individual windbreaks, tents of various designs, open wood fires, and now the up-to-date oil pot.

Our first venture in the field of orchard heating was an investment in 300 of the Painter tents, ranging in size from three to nine feet across and six to nine feet high. These were a great success from the standpoint of security, easily operated, afforded an abundance of light, and, provided with double burner brass lamps, secured absolute protection for the trees inclosed. Owing to the rapid growth of

trees this line of protection was not followed further.

As the Weather Man seemed to have acquired the "Florida habit" we decided to undertake orchard heating by means of open wood fires, and in the fall of 1902 provided a supply of heart pine wood for a five acre section of our grove. We selected the best timber possible to be gotten in our then pine-clad hills with a view to its lasting qualities in the event it was not promptly used. This wood cost us about $1.50 per cord laid down in the grove. It was piled in the tree rows, on a basis of one half cord per tree, trees 30 feet apart. The fire piles were arranged in the center of the checks, and a large handful of "turpentine scrape" placed under the upper sticks for quick lighting when ready to start the fires. This supply of wood lasted three years, since it was not until January, 1905, that such a temperature was experienced as to require fires. The work of firing was an entire success, and the fruit, foliage, etc., was thoroughly protected through a temperature of 17.

During this and later periods of cold we found we could readily maintain a difference of 15 to 20 degrees between the temperature in the fired area and outside.

Though entirely successful with this method of protection it is not without its drawbacks. In our locality we found it difficult to get sufficient teams to enable us promptly to renew the wood supply in the event it was burned early in the winter, so that there was always a period during which we could not have afforded protection, owing to the lack of fuel, no matter how badly it might have been needed. Contrary to the practice of many growers we did not haul the wood out of the grove in spring, considering this entirely too expensive in comparison with the advantage secured of having the space between the trees clear, hence our wood piles were always an impediment to grove work from one year's end to another, affording a harbor to undesirable growth, and owing to rapid decay adding much trash to the soil.

These and other considerations led us to investigate the claims made for the use of crude or fuel oil for orchard heating. During the years 1909-10 we secured samples of each of the various smudge pots then on the market and tested out with a view to determining their comparative merits. In no case did we find a pot that fulfilled the claims made for it by the manufacturers in the matter of oil consumption, or heat produced. Invariably we found that to secure a reasonable volume of flame a greater consumption of oil than claimed was necessary, also that a greater number of pots per acre was required. In 1910 we placed in one of our groves 1700 of the Hamilton heaters. These were arranged in pairs 15 feet apart, rows 30 feet apart, 200 to the acre, the plan being to light alternate heaters, the others being held in reserve for an all-night battle if needed. Up to this time we have had no occasion to use them in the groves so can give no results. We have, however, used the heaters in a fruit shed, walls 16 feet high on three sides, open on the front side, 55 heaters to one half acre. With the covers of the heaters pulled out to afford

a burning surface of 48 square inches, using approximately one and one-half quarts of oil per hour, we held the temperature in this inclosure ten degrees higher than outside.

I have given a great deal of thought and hard study to the question of oil heaters and consider there is room for vast improvement over the types now on the market. Some makes are faulty in that they admit rain, particularly is this the case with one of the heaters much advertised in Florida the past season. Another fault common to most of the surface-burning heaters is that there is a large amount of coke or asphalt left in the bottom of the heater as a result of imperfect combustion of oil. All the heaters rust badly, lasting only a few years. Some manufacturers offer galvanized heaters, but as this coating burns off quickly I cannot see that it is any advantage.

The most satisfactory heater in its burning qualities I have tested is the Richardson Heater. This has a six gallon reservoir, near the bottom of which is attached a quarter-inch pipe 12 or 15 inches in length. To the end of this pipe is attached the burner, a vessel about the size and shape of a 4-pound lard pail with the sides perforated, and into which the oil flows from the reservoir, the flow being controlled by an ordinary gas cock placed in the pipe. This heater more nearly consumes the oil than any other I have tried, there being only a slight residuum left in the burner.

Since no oil is burned in the reservoir of this heater the extra expense of galvanizing should prove a good investment, as it could then be left in the grove indefinitely, saving the expense of removing the oil in spring and storing the heater. It is to be noted that at temperatures requiring heat in the grove this crude or fuel oil in small bodies thickens to such an extent that its flow is extremely slow. Under such conditions it is necessary to warm the reservoir of the Richardson heater in order to get the oil to flow through the small pipe to the burner. This may be accomplished by starting fire in the burner a few minutes in advance. In the case of the Hamilton heater this thickening of the oil is extremely troublesome as it causes the cover to stick badly, rendering the work of opening the covers for lighting up very slow and laborious.

Starting the fires is rapidly done with a can of gasoline and a torch; one man thus equipped can light 500 heaters an hour.

A feature of the surface burning heaters worth knowing is that after burning, even though for only a short while, it is necessary to have fresh oil on top before they can be relighted. This may be accomplished by refilling, or, if there is enough oil in the heaters for the purpose, by stirring it up.

Every prospective smudger will find it greatly to his advantage to have everything ready to start the fires the moment their need is indicated. Nothing should be left to do after it is found the cold is coming that can be done in advance. Heaters should be placed where they are to burn and be filled with oil; gasoline cans should be filled and ready and torch-

es in good condition for use, and finally be sure you have a good strong battery in your thermostat circuit if you depend on a bell to call you to the fray.

An exhaustive report of the smudging operation of the Limoneira Orchard Co., of California, as appeared in a recent issue of the Florida Grower, will be found interesting reading.

Packing and Shipping Citrus Fruits

S. F. Poole

Mr. President, Ladies and Gentlemen:

I do not know why our President landed on me for this paper, not being a packing house man, unless he wanted a filler for the program. I can assure all of you that you will not be detained very long. Anything of interest or new to the subject will be left to my colleagues on this committee.

I debated for a long time what to say on this subject and finally decided to present some of the aims and problems of the packing house in the Winter Haven district.

One factor that has undoubtedly contributed to the successful carriage of our fruit to market is our light thin soil. Such a soil produces a firm juicy fruit with a naturally tough rind. Yet in spite of our natural advantages, at all stages in the packing of the fruit the greatest care is exercised to prevent injury. At no time does the bare hand touch the fruit. All sharp corners on boxes, receptacles or carriers, are rounded off or padded to prevent injuries to the rind. The houses are kept clean. No trash or spoiled fruit is allowed to accumulate for the fewer are the chances to breed decay spores, the less will be the danger of infection. Extreme care and vigilance all along the line have been taken by the two best equipped houses, the Winter Haven and Florence Villa, to demonstrate to the fruit buying world that our brands can be placed on the market and sold with practically no decay. The average decay being only a small fraction of one per cent. The pickers are provided with sacks into which the fruit is carefully placed. When filled, the sack is lowered into the field boxes before bottom of sack is unhooked. Every orange must be clipped close and square across; the clipper used is the Tuttle clipper. The pickers are subjected to a triple inspection. First, a constant one by the foreman, second, a frequent one by an inspector, and third by the owner or manager. The picker is furnished with number tags. As fast as a picker fills the box, he sticks a tag showing his number, under the metal of the strap. Whenever a box of fruit is inspected in the field, it is then possible to find out what picker may need attention. Too much stress cannot be laid upon good picking for we all know poor clipping will spoil the first-class packing. All fruit is picked by the box. The boxes are of the usual type with straight partition and hold about two thirds of a packed crate. These crates are easier to handle and are consequently not so apt to be slammed around. The filled crates are loaded on to wagons furnished with bolster springs. These springs are tested to three thousand pounds capacity. Two

types of loading wagons are employed. One requires 36 boxes and the other 45 boxes to the load. In the former fruit is stacked in one row four high in a line back from the driver. One long rope ties on the load. The other type of loading has three rows of 15 boxes each. These wagons are supplied with side racks. Ropes are placed from side to side to prevent the slipping of load. All wagons must be furnished with five inch tires. These teams deliver the fruit to the packing house at a side entrance where it is trucked to its proper place in the receiving room of the packing house.

ARRANGEMENT OF HOUSE

The fruit is stacked up north and south of the washer which is located on the east side of the center of the house. The drier and sizers occupy about two thirds of the length of the house in the center of the full space. The packed boxes are stacked up next the wall on the west side. This is the side next to the railroad track. The north end of the building is used as storage of the crate material and for the box-making machine. The office is outside and detached from the main house. Each grower has a number and at all times is known only by his number. These field crates are trucked to the soaking-tank of the washing machine into which they are emptied. Here the fruit is allowed to remain some few minutes. More fruit is put into the soaking tank as fast as the fruit is carried up on to the brushing machines. The type of washer employed is the Lemoneira. Here the fruit goes through a narrow passage supplied with a fine spray where it is brushed and polished. The fruit is constantly turned over so that every particle of dust is removed from it. From here the fruit passes on to the drip rack. At the very first stage of entering the drier, the fan blows air upon the fruit driving off most of the adhering water. The passage through the drier occupies about five minutes. Two ways of heating this air are employed. In one house the air is warmed by the exhaust of the gasoline engine, and in the other house the air is heated by a blast furnace, burning crude oil. The temperature to which this air is heated varies according to weather conditions from 100 to 180 degrees Fahrenheit. At the end of this passage through the drier, the fruit comes out upon the grading belts. Here the graders are seated. They are furnished with gloves on both hands, and they take the fruit and place each grade of the house upon separate belts. If there is any doubt in the mind of the grader where the fruit belongs, it goes into the next lower grade. Every orange doubtful as to its keeping quality, is a cull. Each house makes three grades based largely on the color of the skins. These belts carry the fruit down to the sizers. The type of sizer used is the Maull. The bins of the sizers are so arranged that the drop of the fruit is very slight, falling on a thoroughly padded surface thus avoiding injury to the rind. The packers at this point take the fruit, wrap it and put it into the boxes. This pack is about one to two inches high, the fairly tight bulged pack being used, so that the fruit may arrive in the market showing no slackness. A hookless type

of box is employed as the fruit is shipped in carload lots. The boxes are placed in the car and held in place by strips. As an additional precaution the Winter Haven house is using a metal hook to hold the lid in the center. Very few cars are iced. Towards the end of the season for the mid-season fruit some cars of overripe fruit are either half or fully iced.

The two houses in this section handle all their fruit through the Florida Citrus Exchange whose methods of operation do not need to be described at this time. Fruit must be tightly packed and placed on the market with practically no decay. This decay must not appear before the dealer has had a reasonable time to sell the fruit. I wish to emphasize once more that fruit carefully and attractively packed will ship sound.

Dr. O. W. Sadler, Mt. Dora

Mr. President, Ladies and Gentlemen:

Having been appointed one of a committee on Packing and Shipping, I reviewed the reports on all the usual steps of the operation from trees to packing house, and through packing house to market, and found every point so fully dealt with, and the results so thoroughly demonstrated by numerous experiments extending over seven years, by the Bureau of Plant Industry, represented here by Mr. H. J. Ramsey, that there is very little to be said, further than to emphasize with all the force the English language can express that it *pays* and pays big, to use the *utmost* care in handling citrus fruits. Every grower should obtain a copy of the latest bulletin on the subject, No. 63, by the U. S. Dept. of Agriculture.

At last year's meeting of this society in DeLand, I made some remarks on one process in the packing of fruit which for the past three years has impressed me as being of the utmost importance, and capable of vast improvement—I refer to the Perfect Drying of Fruit after washing.

With the advent of whitefly and sooty mould, washing has become imperative, where they exist. On page 26 of bulletin 63, we find that *carefully* handled fruit *not* washed showed 1 per cent decay after 2 weeks, while the washed showed 4.1 per cent.

In the commercially handled fruit, *not* washed showed 3.6 per cent, while the washed showed 10.2 per cent.

From this test it is shown that up to the time of these experiments, *washing* was the cause of 3.1 per cent decay in the carefully handled fruit, and 6.6 per cent of that commercially handled.

All the shipping experiments have demonstrated that *Blue Mold* is the chief form of decay.

Laboratory experiments have shown that blue mold is a fungus, of the Genus Penicillium, and that these fungi require *heat and moisture* for their development.

From this *last* fact we get a *hint* as to the *cause* of *increased decay following washing of fruit—moisture.*

Let it be understood that my subsequent arguments are based on the supposition that the utmost care from tree to packing house, and through all steps in the packing house to car, including washing, have had the best management as to personal and mechanical *handling;*

and that fruit with a perfectly *sound rind* is not innoculable by blue mold,—yet, in spite of this utmost care, *undiscernable injuries* will pass the graders.

Prevention from decay from these *undiscoverable*—and accidentally overlooked injuries—has been the theme of my studies. We have seen that *"Heat and Moisture"* are *necessary* conditions for the development of "blue mold." To control these, then, is our task. *Weather* changes of "Heat & Moisture" we *cannot* control. The first element—heat—of the combination, has impressed itself upon everyone, as the most fatal and important element of our dual foe—"Heat & Moisture." *Vast* sums of money have been spent to artificially deprive heat of its venom; by icing and precooling,—unwittingly adding *more* moisture—the second element in the combination that causes our ruin.

The unphilosophical idea of overcoming *decay* by artificial *cold,* will be seen on a little "cool" reflection. Cold induces precipitation of *moisture* in a warmer atmosphere than the cold produced; hence in trying to control our arch enemy—"Heat & Moisture," while we may have lessened to some extent the effects of heat, by cold, we have added more *moisture,* which we believe to be the most dangerous factor, as we *know* that decay, with moisture present, will go on, up to, and slowly, after the *freezing* point, and *frozen* oranges are not marketable.

In bulletin 63, page 48, we find: "The investigations of the Bureau of Plant Industry have demonstrated, that Florida oranges may be transported to market under ventilation, with a minimum of loss from decay, even during periods of warm and humid weather, if sufficient care is taken to preserve the *skin unbroken.*" And on page 50: "Precooling may not safely be depended upon to offset decay following mechanical injuries."

Precooling *plus* icing, are the last attempts at control of heat and decay. But in the presence of mechanical injuries—"cannot be depended upon"—are a failure, and *expensive* to the tune of 15c and more per box. Now I ask you to follow me in a *philosophial* study of the *possibility* and *probability* of preventing decay—"blue mold"—by turning our attention to the *other* element—moisture—number 2 of our arch dual enemy "Heat & Moisture." I say philosophical study, for there have not been millions of dollars spent in experiment on this half of the combination, as applied to shipment of citrus fruits. We may find it easier and *cheaper* to prevent *moisture,* than heat. If we can banish moisture, the heat necessarily encountered in the transit of fruit to market will become perfectly harmless.

Receiving encouragement from L. B. Skinner and other growers, as to the correctness of theory of drying fruit for shipment, I began correspondence to find the means for applying heat in the most controllable and cheapest way possible—steam radiation.

Although there were numerous manufacturers of steam heat radiating applicances for house-heating, etc., I found none who were prepared, or cared to adopt appliances to packing house plants.

Being a member of the "Lake Region

Packing Association" at Tavares, I formulated my ideas of a system of applying pipes in a manner to utilize the old "hot air" drying box and drop rack, to the President, Mr. Wakelin, and Manager, Mr. Booth, of the association.

After carefully digesting the conditions, an expert contractor was called in, and the requirements laid before him. He approved of the plan, and fulfilled a contract to put in operation the necessary piping including a boiler "*Guaranteed* to give satisfaction," at a cost considerably less than $400. This drying plant consists of a set of wooden rollers turning on their own axes, 38 feet in length by 3 feet wide, discharging the fruit onto another set of rollers 6 feet wide and 36 feet long. Both are enclosed in a box made of tongued and grooved flooring. Close under the rolls is a system of one-inch iron pipes—the first 12 and the other 24 pipes running lengthwise—each with an expansion joint, and connected to a large cross head pipe. The steam is supplied by a 10 H. P. upright boiler, set in a convenient out of the way location, and stop cocks so placed that the steam can be turned onto one or both systems of piping. A *thermostat* should be placed inside the drying box against the middle of the length of the side wall, also a thermometer. A fan is run in the chimney flue by a 3 H. P. motor at the far end from grading belt to draw off the air that has become saturated with moisture. By these means the desired temperature can be maintained steadily.

The capacity of both drying boxes is 30 boxes, and the fruit is 8 minutes passing through each, giving 4 cars in 10 hours, and the fuel cost has been $197 for the season—using coal. This cost would be lessened by nearly one-half, had all the coal been bought by the car-load.

The results have been very satisfactory and controllable. So much so that the manager, Mr. J. B. Booth, does not believe there is a better drying plant in the state.

This house has to pack under very unfavorable conditions. Being a central house, considerable of the fruit is picked by inexperienced pickers, has to be transported across a lake on barge, reloaded on car, in some cases hauled 50 miles, often being 3 to 5 days after picking before it is packed. Another disadvantage is that they have so much early and mid-season fruit they have to continue packing through the decay weather periods.

The past season the dry box has been kept at 98 to 100 degrees. It is my belief that the box should be kept at 120 to 135 degrees to secure a *drying over* of all injuries that have passed observation. There seems to be a general fear that the fruit might be cooked. It is yet left to experiment how much heat fruit will stand without injury. The greater the degree of heat, the shorter time it need be exposed, quick drying of the peel with little heating of inside being desired.

A comparison of results of last and this season shows a vast improvement. Season of 1912-13, shipped 177,954 boxes; season of 1913-14, to April 24, 183,175 boxes. Last season's decay,

2.6 per cent, or 26 boxes per 1,000 boxes. This season, .0046 per cent. Or last season, 26 boxes per 1,000, or one-sixth as much Dk. The greatest part of this difference can safely be attributed to the more perfect drying. Last season hot air in place of steam heat radiation was used.

With the laws of natural physics as a guide, and the few experiments made, we think it reasonable to conclude that heat by steam radiation is the most controllable, most efficient and cheapest method of drying fruit.

That the removal of, and prevention of moisture in transit, will be the easiest, cheapest and most effectual method of preventing decay by "blue mold."

We believe it very desirable that the Bureau of Plant Industry make as thorough test of preventing decay by blue mold by controlling moisture conditions, as have been made by precooling and icing to control blue mold.

Discussion.

Mr. Hollingsworth: What percentage of seedling fruit was in these shipments as compared with the budded stock?

Dr. Sadler: I cannot give you the percentage of seedlings.

Mr. Hollingsworth: Is it a fact that seedling fruit ships as well as budded stock?

Dr. Sadler: I believe seedling stock is more tender than the budded.

Mr. Bennett: I think one point that should be discussed is drying the fruit by electricity. As compared with any other method of heating the air, it is superior. The equipment is very easy to put together, too. The expense is not great; I have dried perhaps 1,200 boxes of oranges per day at an expense for electricity of not to exceed 50c. Where you have the electric current the expense is about 1½c a killowatt hour.

Mr. Hollingsworth: I would also like to ask if it is advisable to wash fruit where whitefly has not spoiled the fruit; where it is naturally bright and clean.

Mr. Hart: Florida fruit is not perfectly bright and clean. When the sooty mold is absent, the fungus is there . All of the markets now are used to bright, clean, handsome washed fruit, and if you put your fruit into that shape, it will pay you well with the little difference in the cost. I do not believe that fruit *properly* washed is any more subject to decay than that which is not washed. I know that a great deal of the fruit that goes into the market is weaker because it is washed. I do not think that is necessary, however; I think it can be done without weakening the fruit. To get the top price on the market, I think it should be washed.

Dr. Sadler: Our house was fitted up first for drying with electricity and it used up so much money that we could not stand it. It would not be very advisable in almost all the points in Florida I know of. ——— .

David Scott, Arcadia, Fla.

Mr. President, Ladies and Gentlemen:

In the packing of citrus fruit, two objects should be kept in view.

First: To secure the greatest possible

keeping quality. This is the work of a scientist.

Second: To produce the most pleasing impression on the customer, which calls for the genius of an artist.

To secure keeping quality, mechanical injury to the tender cells of the rind should be avoided. The less handling and the shorter time from tree to box the better. Work here begins with gathering from the trees. In this process frequently the greatest injury is done to the fruit. A good foreman, who can secure largest amount of careful work from pickers is of prime importance. Much also depends on equipment as well as careful workmen. All clippers should have rounded points, curving slightly from the fruit. This reduces danger of clipper cuts or long stems. One long stem will injure every orange with which it comes in contact. Hence may do ten times more damage than a clipper cut.

Sacks opening at bottom are preferable for picking low budded trees. But in case of tall seedling trees where long ladders are necessary, baskets are better, as the fruit is not so easily bruised. Each fruit should be held in one hand while the stem is clipped, then *placed, not dropped,* or *thrown* in the basket or bag.

If roads are rough, fruit should be hauled to the packing house in spring wagons, and in all cases protected from sun, dust or rain by canvas covers.

After fruit reaches the packing house, if smutty or dusty it should be washed and dried by artificial blast of warm air, after which it should be graded from grading belts, into at least four grades, five would be better. Bright, Fancy Bright, Russet, Golden Russet and seconds. In some crops it is not advisable to make more than one grade of russets. There are a number of good systems of packing house equipment. That which handles the fruit with least friction or dropping is to be desired.

A word as to packages. The trade almost universally demand bulge pack. The fruit should be placed in the boxes to fit close, slightly higher in middle than at ends, so that no severe pressure shall be necessary in order to nail down ends of cover.

There seems to be a tendency with some Florida packers to imitate foreign packages. The writer has found it pays to stick to the old standard *Florida* box with birch hoops. They may look somewhat rustic, but when neatly made, with an attractive brand, the birch hoop, Florida box, like its contents, is in a class alone, and is immediately recognized as the Florida product. The best in the world.

F. D. Waite

Mr. President, Ladies and Gentlemen:

I have been placed on a committee to report on packing and shipping fruit. Before attempting this report I find that the ground has been most thoroughly covered in the past six or seven years by several government experts. In a meeting in 1907 Mr. Tenney gave his experiences in handling citrus fruits from the tree to the car, and the results of his experiments have been found practical and effectual in every detail.

For the benefit of new members I will state a few points that I think worth remembering:

In picking fruit we try to carry out Mr. Tenney's instructions especially to avoid rough handling, and by using the Tuttle clipper which we think superior to all others (as with it it is almost impossible to clipper-cut the fruit) and when a picker has confidence in the clipper he is using he will hold it nearer the fruit, thereby avoiding the cutting of long stems, which is so injurious to other fruit when passing through the different machines. We never use anything but the canvas-lined willow baskets, which I think are now recognized as the safest to use.

A great many have felt that in washing fruit they were starting it on the road to decay. We have been washing fruit by machinery for thirteen years, and only in exceptionally bad weather have we been troubled with decay; and I think it has been an acknowledged fact that when we have foggy, rainy, hot weather it is better to shut down the packing house and wait for cooler and dryer weather—or, if the crop must be moved, it should be shipped under ice. We find that half tank cars of ice are sufficient.

When equipping our packing house two years ago we tried to eliminate all chance of fruit being bruised by falling onto other fruit or into the packing bins. In putting in equipment the best is the cheapest, and I think it should be constructed so that the fruit can be automatically dumped on the roller conveyer and travel on a level through the washing machine, drip rack, dry boxes, roller grader and sizing machines to the packing bins.

There is such a diversified opinion in grading fruit that I am loth to say very much on the subject. I have been in packing houses where they used color to represent different grades, and those grades were made irrespective of whether fruit was bright, golden or russet, being graded more as to texture of peel than to color of fruit. I think this is a mistake—the fruit should be graded bright, golden and russet, and we have one other brand which we use for the scarred or ill-shaped fruit.

We believe in a good, swell pack, each layer packed firmly and the sooner the fruit is packed and shipped after it is picked the better the condition will be on arrival. We use refrigerator cars with vents open, which gives the best circulation of air.

I don't know that I have said anything in this report that has not already been explained to the Society, but there may be new members here today who have not had the advantage of attending former meetings, or an opportunity of reading the reports of the meetings.

W. Walton O'Hara

Mr. President, Ladies and Gentlemen:

If I speak in a loud tone of voice, louder than seems necessary to those in the front, it is because I discovered when sitting in the rear that it was impossible to distinguish a word that was said by the speakers this morning.

This privilege accorded me here on this floor I deeply appreciate, and thank this

organization for the opportunity granted by its officials.

It would be absolutely impossible for me to give you the physical conditions of the Panama-Pacific Exposition in the time allotted to me, and therefore, before reading a telegram which I asked your president the privilege of having read, I will take a few moments of your time in telling you of my efforts since I arrived in Florida a few weeks ago.

All of those present know what this Exposition is to celebrate; the opening of the Panama Canal, and if you think back you will remember that it is an international affair and not a local or state fair; therefore your state, my state, has just as much interest in the Panama-Pacific Exposition as California, and it belongs as much to you and to me as representatives of our States as it does to California.

The President of the United States has issued a proclamation inviting all the people in the world to attend this Exposition which opens February 20th and closes December 4, 1915. After doing that he appointed San Francisco as the place for the meeting and when San Francisco, or the State of California was made the trustee, she raised the sum of $17,500,000.00 with which to conduct this Exposition.

When I arrived in Florida a few weeks ago I went to the east coast and after explaining to them the physical conditions of the Fair I was encouraged and told I could have their co-operation and this State would be properly represented in 1915 at the Panama-Pacific Exposition. Encouraged at the way they received me, I then went to Tampa. (I came pretty near saying Tammany Hall). There I discovered a condition that had not entered into the matter before. The President of the Board of Trade told me, after extending the privilege of a talk there that evening, that unless I could secure the endorsement of the Florida Citrus Fruit Exchange they would not join with the Board of Trade of Jacksonville or in St. Augustine, and he then asked me to interview the General Manage of the Citrus Exchange before we went any further with the matter.

In my interview with Mr. Jones I discovered that California had some years ago passed a quarantine law which prohibited the importation of Florida fruit into that State, and having learned the conditions named in that law, I began telegraphing out to San Francisco to know what could be done about it.

This telegram I am about to read would not be worth a cent as information if you do not follow me right straight through.

After telegraphing them, I received a telegram saying that special provision had been made by which Florida could exhibit fruit at the Exposition in 1915, but we did not know on the strength of that telegram what those special provisions were. They stated in that telegram that a copy of the law prohibiting the fruit, and the information as to provisions had been mailed.

In discussing it with Mr. Jones and the President of the Board of Trade at Tampa, we did not want to wait seven or eight days, so I wired again asking them to embody in a night letter these new provisions which would admit Florida as an exhibitor of her fruit. The answer

came back that Florida could exhibit her fruit by having Florida inspect the fruit, it was to be inspected by California, and it was to be put into a booth which was to be erected on the grounds and fumigated, and it was to be destroyed after being exhibited.

I read that over several times before I had the courage to go over and show it to Mr. Jones. I knew he would not submit to anything of the kind, nor would anyone else, with any degree of reason.

After conferring with him in the matter and getting from him in black and white just how the matter must be handled so that the Fruit Exchange would endorse having the exhibit at the Panama Exposition, then I put that in a telegram and followed it up by saying that the Board of Trade of Tampa concurs in this and unless the horticultural department of their state so modified their law as to admit Florida fruit without all that red tape, they would please let me go home and attend to my business, because I would not ask Florida to exhibit under any other conditions than those mentioned in my telegram.

Then I received several other telegrams, all showing improvement, and finally this telegram was received last evening:

"Mr. Dennison, Chief of our Department of Horticulture, today presented for consideration the modification of the quarantine now obtaining in this State against citrus fruits grown in Florida. He submitted the changes suggested by the Florida Citrus Exchange as you wired them to us and reports that the outlook for their adoption is exceedingly promising. No definite statement, however, can be made until about a week from this time. From what Mr. Dennison says to us we think we are warranted in taking a very hopeful view of the matter."

Now, ladies and gentlemen, the gentleman who sent this telegram to me is not only a personal friend of mine, but he is also identified with me in business in New York City, and I know him so well that I am prepared to tell you that this embargo is practically raised, and all I ask in return is that I may have the endorsement of this organization that I have the privilege to tell your Governor when I see him tomorrow, that the Horticultural Society of the State endorsed the proposition of having an exhibit. That will be, of course, with the understanding that you receive the official notification that the requirements made by the Citrus Exchange are complied with.

There is more to it than merely exhibiting fruit in 1915. It affords Florida one of the finest opportunities to exhibit her fruit to the world, and also to open up relationship with California so that there will be no jealousy whatsoever. We have heard from your platform today the advantages that arise from co-operation, and we have heard each man praising up his section of the state. Of course he is proud of his own section of the state, but there is no jealousy about it, and it would be much better all around if just such a feeling could prevail between the states.

If, because of exhibiting our fruit in 1915, the laws of California are made less stringent, so far as Florida fruit is concerned, it may be the beginning of a

new relationship that will lead to better understanding.

Discussion.

Mr. Hume: What action do you care to take on the suggestion made by Mr. O'Hara.

Mr. Sader: What are the conditions that are made by which we can exhibit in California?

Mr. Hume: I do not know, but I have no doubt the conditions set down by the Citrus Exchange are those that the growers of the State could well comply with. The details have not been laid before us.

Mr. O'Hara. Simply that fruit leaving Florida shall have Florida inspection here and California inspection in California, and that it is taken directly from the car to the exhibit building and not put through any fumigating process, and there shall be no rule that a shed shall be built especially for Florida fruit, thus placing a stigma on it right away. Briefly, that is what the conditions are.

I came to your State a few weeks ago and I am very much interested in it. I got the Florida sand in my shoe, and I sent a big bunch of Florida moss back to New York for my wife's studio, and what with the sand in my shoe and a bunch of moss in my wife's studio, I was moved to buy a few acres for myself and I want Florida to be represented, and to be represented in a manner worthy of her. (Applause.)

Mr. Gaitskill: It seems to me that we should show our products wherever we can. I think there is no state in the union can compare with us when we are given a fair chance. I think we can safely say we sanction what the Florida Citrus Exchange demands, and I move we give Mr. O'Hara what he asks for to go to California with.

Mr. Hume: Please tell us just exactly what it is you want, Mr. O'Hara, and I am sure there will be a second to that motion.

Mr. O'Hara: I merely want to be able to tell Governor Trammell that together with the endorsement of several other bodies, the Horticultural Society also is favorable to having an exhibit in 1915 in California, provided the conditions are complied with as enumerated by the Citrus Exchange.

Mr. Hume: I think that puts the matter briefly before us. (Motion seconded). Those in favor please say "aye"; opposed "no." The motion is carried.

Mr. O'Hara: I have just been told that there is a telegram at the hotel for me, and that may mean that perhaps the embargo has been raised.

The Florida Growers' and Shippers' League

L. B. Skinner

Mr. President, Ladies and Gentlemen:

President of the Florida Growers' and Shippers' League is a title I have held for only about two hours, and I do not expect to hold it for more than three or four hours more. I will lead up to that point.

At a meeting a year ago last January at Tampa, which I trust most of you attended, an executive or organization committee was appointed to take up the organization of a growers' and shippers' league similar to that in existence in California; a league that had done wonders for the State of California and which that meeting believed would do wonders for the State of Florida.

We called the first real meeting of that committee at the Horticultural meeting at DeLand about a year ago. The representation of the committee at that meeting was very small. The enthusiasm felt by those present was not very great; in fact, I think Mr. Wright, of the *Florida Grower,* became rather weak-kneed,—but he got better later. When we organized that committee I was elected chairman. The obvious thing to do was to get everybody we could together and come to some action as to a man to head the league. It seemed to us a great thing.

Some time after that, the thought came to me that possibly, just possibly, we might get a man who would assuredly fill the bill; we might get a man well known all over the State of Florida, and who was favorably known by all of the growers of Florida and admired and loved by most of them, if not all of them. I corresponded with each member of that committee, and without exception they all said, "If you can possibly get that man, he is the man for the place." I corresponded with prominent growers not members of the committee, and their feeling was just the same. And then I corresponded with the man himself. You can imagine my pleasure and surprise when I found there was a grain of hope.

I talked with Mr. Powell, of California, who was for many years the head of the California league, and Mr. Powell said, "If you can get him, you will do well; but I do not believe you can get him."

It has been my habit through life never to be convinced a thing can't be done until I have used every effort to accomplish it; and that I can't get a man until I go right to the man himself.

After some weeks I arranged a meeting with Mr. Tenny—you all know who I am talking about; after what I have said it is not necessary to mention names (applause)—in New York. It was finally arranged by a meeting of the executive

committee that he should come down to take charge. In the meantime, at the meeting at DeLand, one of the new comers to the State, a man of great energy, a man of a great deal of ability and a man who believes in this league, agreed to take hold of it and get a large membership for the league, and while we did not think he could realize his hopes, we hoped against hope that he might do so. I am speaking now of Mr. Hamner. He did wonderful work for the league and we are all due Mr. Hamner a great deal of gratitude for the energy, brains and work he put into it.

Since the first of January Mr. Tenny has been absolutely in charge of the work of the league, and I believe I voice the sentiment of the executive committee appointed by you a year ago, when I state we have passed the experimental point. I think the establishment of the League is assured. The only question, gentlemen, the *only* question, is the support. There is no question about the amount of work to be done by this league. It crops up in a new place every day. We have to have it, and we must support it. In union there is strength. By attempting to fight your battles alone, you can never accomplish anything; by fighting together, there is nothing reasonable that you cannot demand and attain.

The assessment placed by the committee this past year was only one-sixth of a cent a box. Just think how small it is! Yet many people have held back and not sent in their one-sixth of a cent a box. I had hoped that in all Florida there would be no one who would refuse to give such a small pittance for what they will get back.

Concerning the work, I think since the first of January Mr. Tenny is much better posted to tell it to you than I can.

Lloyd S. Tenny

Mr. President, Ladies and Gentlemen:

The various questions we must present for consideration in connection with the work of the Florida Growers' and Shippers' League are so numerous, and of such great importance that there scarcely seems time for remarks of a general nature. Permit me to say, however, in beginning this, my first annual report of the league, that I am glad for the circumstances that have brought me again to Florida—this time though, not as an outsider to impart knowledge to you, but as one of you, to work out with you the problems that come to us.

The foundations of the league have been well established. I have read with the greatest interest the minutes of all of the early meetings that were held last year, leading to the establishment of this League. The earnestness of purpose manifested there, the calibre of the men conferring, the absolute lack of friction, and the perfect harmony appeal to me as something almost unique in the annals of agriculture in this country.

It is a fortunate day for any industry when the members engaged in it realize that there are some problems that affect them all, and, realizing this, become willing to join forces in solving these common problems. That day has come to the

Florida Horticulturists, and this league represents in a concrete and definite form the evolution of this idea.

It is well that we have the purpose of the League clearly in mind. Perhaps I can do no better, indeed, I am very sure that I cannot, than quote from the report of the committee on organization, made at the Tampa meeting of April 17, 1913. The purposes as outlined by this committee have been the standards toward which we have been working during the few months the League has been fully established. The following paragraphs very clearly outline these standards.

"The purpose of the organization is to secure equitable rates of transportation to all markets, on all Florida fruits and vegetables, and on materials and supplies pertaining thereto, and to otherwise protect the interests of the fruit and vegetable growers and shippers of the State of Florida, including such legislation as may be necessary, and endeavor by every proper means to procure the enactment of laws both national and state for the proper protection of the fruit and vegetable industries of Florida, and to take from time to time such action to further extend and inprove the fruit and vegetable industries as may be deemed advisable; and to do any and all other things that will advance the fruit and vegetable interests of the state.

Your committee suggests that the League should be organized for the purpose of attending to the various matters that are of vital importance to the fruit and vegetable growing interests of the State—that it should be entirely separate and apart from any marketing organization of any kind, and under direct control of the delegates appointed by the growers themselves from the various fruit and vegetable districts of the state, and should have in charge all matters relating to the tariff, reciprocity treatise, legislation as to railroad rates, private car lines, routing, icing, etc.—the protection of growers by the passage of proper laws such as are in force in other states to prevent the introduction of insects and diseases, and all other kindred matters in which fruit and vegetable growers are alike interested."

The history of the League during 1913 is well known to the most of you. Mr. Hamner carried on his vigorous campaign of organization, holding meetings at many points in the state, and emphasizing with great force the need of such an organization. Mr. Hamner was especially well qualified for this type of work, and it is due to his untiring efforts that a membership list of 1,002 was handed over to your new secretary on the first of January. During the organization work the headquarters of the league were located in Tampa. When it came to establishing permanent headquarters every one felt that we should make no mistake. The matter was gone into carefully, and many different places were considered. Members of the league from different parts of the state were consulted, and there was practically a unanimous choice in favor of Orlando. Suitable office facilities could be obtained there. There were good railroad connections to nearly all parts of the state, and what

was still more important, Orlando was to an unusual degree a neutral point within the state. It belongs neither to the Jacksonville territory nor to the Tampa district. It favors neither the East Coast nor the West Coast. The executive committee of the league, at a meeting held in Jacksonville on January 15, 1914, definitely decided to establish permanent headquarters in Orlando. Two well located office rooms were therefore rented, on the second floor of the building owned by the People's National Bank of Orlando. What office furniture the league possessed, together with all the records belonging to the league, was therefore moved to Orlando early in February.

ORGANIZATION.

Up to the present time the league has been an unincorporated body, held together simply by the mutual consent of its members. We have felt from the first that this was too loose an organization, and that we needed an incorporated body which could act in a business capacity, could sue or be sued. A notice of intent to incorporate was therefore issued, and has been properly published, and presented to the governor of the state, and we expect that the Letters Patent has been issued today. The Florida Growers' and Shippers' League, as such, shall consist of one central state organization. The machinery of this league should be simple. The following plan is suggested for your consideration.

There shall be an Executive Committee of nine members. This committee will be the controlling body of the league, subject, of course, to instructions from the league itself in annual session. This Executive Committee should be elected in such a way that the entire state will be represented. The committee should be elected by the members themselves, and should be selected because of the special fitness of the individual to serve in such a position. This committee should have permanency; there should not be periods of administration. The work will continue from one year to another, and many problems that are begun one year cannot be completed until the following season. We would suggest, therefore, that the state be divided into three districts as follows: A northern district which shall consist of all the counties north of Citrus, Sumpter, Lake, Seminole and Brevard counties; a southern district which shall include all counties south of Hillsboro, Polk, Osceola and Brevard counties; a middle district, which shall include all the territory lying between the northern and southern districts. Each district shall be represented upon the Executive Committee by three members. The term of office on the committee, in my opinion, should be three years. This will mean that after our first election three members of the Executive Committee, one from each district, shall be elected annually. This plan will give us the permanency we so need. It will also make it possible to select with care those whom we elect each year. I have considered carefully many different plans of organizing the league, and I am frank to tell you that this plan seems to cover the field better, and gives us simple, yet effective machinery for carrying on our work. The Executive Committee will have authority immediately after each

annual meeting to organize by electing its own president, two vice-presidents, and it shall also have the power to appoint some bank as treasurer of the league. and to employ a general manager, and to prescribe his powers and duties. The machinery described above refers to the Central, State-wide Organization.

LOCAL ASSOCIATIONS.

The question of having local associations of the league in various places over the state is left for you to decide, and your manager refers the matter to you without recommendations. If it were possible to have fifty active local associations of the league in fifty places in the state, this would without doubt strengthen the league greatly, but my observation of Farmer's Organizations in different parts of the country leads me to the conclusion that in order to keep such associations together, and in fact to have anything more than a mere name of an association, it is necessary to have some very strong bond of common need among the farmers. I have ventured to express the idea several times that it would require the undivided attention of one good organizer to keep fifty local associations alive in the state, when the problems were as distant as most of those on which the league is engaged. My idea has been to organize these local associations whenever and wherever the interest seems to be sufficient to warrant such action. One great advantage of the local league is that it offers a means of collecting assessments for our work. I am convinced that the major portion of our finances must come, like the income tax, from the source of the revenue, or in other words, from the agency which markets the products of the individual. While the major portion will come from these larger marketing associations, yet it is true that there are many individuals, especially so in the vegetable business, who handle the sales end of their business either direct or through some regular commission house. The assessments for our league from these shippers must come to us in some other way than through the marketing agency. These sums must come either direct from the individual himself to the league, or the collections must be made by some neutral, disinterested person in the community, or through some local organization. In a few places I think it will be possible to establish real active local associations. In other places I believe it will be better for us to work through some organization which is already in existence, and which will continue in existence because it is organized for some special local purposes. We have in the State of Florida, in many towns and cities, active Boards of Trade, and I am finding in a good many instances that these Boards of Trade are interested in our work, and are willing to co-operate with us. We even have some Boards of Trade that have taken the initiative in obtaining members for our league, and in making the collections from these members, and remitting to us these collections made. I cannot pass over this point without speaking a word of commendation for the work that has been done at Lawtey by the Board of Trade through the efficient work of its secretary, Mr. Hill. We are receiving constantly members from this source, and each month

Mr. Hill makes the collections on the cars of produce shipped by the members, and remits the same to us. I am impressed with the efficiency of this kind of co-operation, and I cannot see why other places in the state cannot co-operate with us in the same way. Only recently the Board of Trade of Crescent City arranged a meeting for the league, and we are co-operating with them in a somewhat similar way. It appeals to me that, for our needs, we can get local support through the Boards of Trade better than we can got it by attempting to organize some new association in the community which perhaps has too many organizations already.

THE MANAGER'S ADVISORY COMMITTEE.

From the very first I have felt the need of having some person at each shipping center, whom I knew personally, and on whom I feel free to call for advice or information in regard to conditions in his locality. At times it may be necessary to secure petitions to present to the Interstate Commerce Commission, or to other bodies. Such a person could secure these lists. Often we will want to know the condition of crops or the amount of produce left to ship, acreage planted, etc. Such information can be secured better by the league if it has a personal representative in the different localities over the state. It will be impossible for the manager of the league to be personally acquainted with each member or to correspond often with each member to secure any such information, and I therefore feel that there should be some person at each point who stands for the work of the league in a particular way. These people I shall call the Manager's Advisory Committee. In some places I think it will be possible for the members of this committee to make the collections for the league, and to remit them to the central office.

To summarize then on the question of organization, each member shall be a member of the central league itself. These members in annual session shall elect an executive committee which shall be the controlling body of the league. Local associations may be established whenever there is sufficient interest to warrant such action. In other places the local work of the league may be carried on through such organizations already in existence, as the boards of trade. There shall be appointed from time to time by the manager an informal committee known as the Manager's Advisory Committee, which shall assist the manager in whatever way assistance may be needed.

SUMMARY OF WORK ACCOMPLISHED.

Briefly I would like to outline some of the problems the league has under consideration. The work completed has not been great, for of necessity the first weeks have been largely used in getting the league established, and in becoming acquainted with the problems before us. To outline some of the matters already undertaken will give you perhaps, however, a better idea of the scope of our work than could be gotten in any other way.

THE S. & E. BRANCH ADJUSTMENTS.

The new headquarters of the league had not been opened in Orlando before a call came from the vegetable growers at

Sanford to assist them in connection with matters of rates and service, on a small branch of the Coast Line. This branch had been built several years previously by interests in and around Sanford, and had been controlled by these local interests until last fall when the road was purchased by the Coast Line. Under private ownership a local freight charge was made for hauling produce along the line into Sanford, where the delivery was made to the Coast Line road. Under the old management there had been two placings of the cars each day, and the loaded cars were likewise pulled out twice a day. With the change of ownership, and with the branch road coming under the switching district of Sanford, the road was not entitled to these local charges into Sanford inasmuch as the billing of the cars was made from Sanford, notwithstanding these facts the additional charges had been continued, and in addition the railroad was giving but a single service each day. This made it necessary for practically the entire output to be held over until the second day, and cars of celery, which were loaded by three o'clock, had to remain on the siding until half past two the following afternoon. Local people had taken the matter up with the railroads, and without doubt would have secured the adjustments to which they were entitled. The manager of the league, however, had an opportunity of looking the conditions over, and of going in person with local representatives, to the railroad authorities. The result of our conference was that on the day following our visit, the service on the branch was doubled. In a very short time thereafter an adjustment was made whereby the local rates into Sanford were cancelled. These more favorable rates, and the better service were not accomplished primarily through the efforts of the league, and we would not lay claim to accomplishing these results. The kind of help the league gave, however, represents the kind of assistance I hope we can give in many instances. We want each community and each individual to handle their own problems just as far as possible, but the league stands ready to add its influence at the time and place when a little additional influence is needed to accomplish the ends sought after. These reduced rates and better service on the S. & E. branch have meant the saving of several thousand dollars in freight charges alone, besides an additional indefinite sum from the better service given the growers.

PRECOOLING RATES.

Considerable attention has been given to the question of the possibility of precooling fruits and vegetables in Florida. For several years California has been using this method of preparing its shipments to insure the arrival of the products upon the market in a sound condition. The system of cooling fruits before shipping has been so carefully worked out by our competitors in California that precooling is accepted there as the one method which will insure the arrival of sound fruit upon the market during periods of great heat or high humidity at the time of harvesting. We would not minimize the importance of careful hand-

ling in its relation to good carrying quality, yet the commercial grower recognizes that there are times and conditions when it is practically impossible to handle our fruit with sufficient care to expect it to arrive sound. Under these conditions the shippers have resorted to shipping their fruit in refrigerator cars under ice. Experiments made by the Department of Agriculture have shown that the difficulty with this method of shipping produce lies in the slowness of cooling the fruit under ice. They have demonstrated that if the produce can be cooled quickly after harvesting that the chances of its arrival in a sound condition are far greater. The California shippers, through the Citrus Protective League of California have obtained from the Interstate Commerce Commission a very satisfactory rate for shipping precooled fruit. It has been necessary for them to spend a great deal of money in railroad hearings, and carrying the case through the courts, even to the Supreme Court of the United States. The outcome of these local proceedings has been that the courts have decided that precooling, and the initial icing of cars are not a part of transportation, and therefore the shippers themselves are entitled to perform these services. For the use of the car in precooling, in case the shipper desire to use the car for that purpose, and for the wear and tear on the car in initially icing it, and for hauling the ice over the country, which ice the shipper has purchased and put into the bunkers of the car at his own expense; for all of these services the railroads were entitled to a charge of $7.50 per car. With the enforcement of this rate there went into effect however, the right on the part of the railroads to increase the minimum load of the car.

Soon after taking up the work as manager of this league, I addressed a letter to the Interstate Commerce Commission at Washington, asking if the rate of $7.50 would apply equally to Florida. I was informed that this rate would not so apply, or at least not until there had been a hearing upon the conditions that exist here to determine whether these conditions were similar to those in California on which this rate was based. The matter was then taken up with different railroad officials to determine what the attitude of these officials would be toward giving us the right to precool our fruit and to ship it out without paying the full icing charges which had been demanded by the railroads here on precooled fruit that left the state with ice in the bunkers. A conference was finally held in Norfolk on the 6th of April, which was attended by representatives from the Coast Line railroad, the Seaboard railroad, the Armour Car lines, and the Florida Growers' and Shippers' League. At this conference the league asked for a rate which would cover a refrigerator car initially iced, the icing being done by the carrier or the private car line. Basing their decision upon the rulings of the courts, the railroads did not see their way clear to granting such a request, but they were willing to give us for all practical purposes the California rate in its entirety. The basis of this new rate will be as follows: The shipper may precool his fruit and load it into the cars with as much or as little ice in the bunkers as he de-

sires to put in there at his own expense. If the shipper so desires he may connect the refrigerator car with his precooling establishment, and precool his fruits in the car. The rate for the use of such a car will be $7.50; the minimum load, however, for precooled fruit going under this rate will be 360 boxes. According to our present rule the shipper is not entitled to put into the bunkers of the car additional ice after the car is delivered to the carrier. If additional ice is needed, and the railroad places such ice there, then the full icing charge must be paid by the shipper. This is a matter which no doubt will need further consideration on the part of the railroads and the league. I do not think there will be any doubt but that we can secure the co-operation of the California shippers in adjusting this matter. There are some other minor points which we will need to take up further with the railroads, but which I think can be adjusted satisfactorily. The fact remains that any shipper now of citrus fruits who wishes to build a precooling establishment in connection with the packing house may do so with the absolute knowledge that he can ship his precooled fruit without paying to the railroads the full icing charge. While the rule already made applies only to citrus fruits, I have the assurance from the railroads that the rate will be extended to include vegetables just as soon as the matter of increased minimums can be worked out. I feel safe in saying that any vegetable shipper who desires to equip a precooling plant for next season's business can be reasonably sure of having the rate adjusted by that time.

The importance of this matter can scarcely be determined this early, but without question the coming years will see a great development of this method of shipping perishable produce from Florida. The proposed rate on the whole is very satisfactory. It is the rate California has obtained only after a most difficult struggle, and while I think there are some things which will need changing, yet in the main, we can congratulate ourselves on obtaining this satisfactory adjustment, and especially so without having to go through the long process of an Interstate Commerce hearing.

FREIGHT RATES TO NORTHWEST POINTS.

Every shipper of Florida produce knows that the freight rates to northwest points are unreasonably high. Notwithstanding the fact that fruit jobbers in the cities of the northwest have to handle large quantities of Florida products they have practically been prohibited from doing this because of the unjust rates. Action was finally brought by these fruit jobbers to secure an Interstate Commerce hearing on the unreasonableness of these rates, and the Interstate Commerce Commission granted such a hearing at Helena, Montana, on the 16th of this present month. The Florida Growers' and Shippers' League united with the large marketing associations in Florida to request the State Railway Commission to send a representative to this hearing, so that the Florida interests which were especially at stake might be properly represented. Hon. R. C. Dunn, one of our Railroad Commission, was delegated to attend the hearing, and to represent Florida interests.

In this connection I desire to say that the question of my attending this conference was referred to the Executive Committee of the league, and it was decided that I should attend the Helena hearing, providing it seemed necessary. Inasmuch as we were able to secure the Railroad Commission to send one of its own members we felt that it was unnecessary for the manager of this league also to attend. While it is too early yet to tell what the decision of the Commission will be, we trust that Florida may secure some relief from the excessive freight rates to that part of the United States.

A NEW YORK LAW AFFECTING FLORIDA SHIPPERS.

New York state recently passed a law which has gone into effect, which requires that all lemons and other citrus fruits be sold by the count. The law further requires that all boxes and crates containing citrus fruits shall be marked (1st) with the number of fruit contained, and (2nd) the dimensions of the box or crate shall be clearly stenciled thereon. The meaning of the law is plain and it requires that every box of citrus fruit sold within the State of New York shall have stamped thereon the dimensions of the box. Until this law is changed, a shipper who does not want to run the risk of arrest must so stencil all of his boxes going to New York. Inasmuch as it is impossible to tell the destination of a car when loaded, this will mean, for all practical purposes, that all our boxes must be so labeled. Efforts are being made, and the matter will be pressed vigorously, to get this law repealed. We do not object to having to stamp the number of fruit in the box, but we claim that this should satisfy the New York authorities. There is no standard size for the citrus box in New York, and nothing whatever can be gained to any one by having the dimensions stenciled upon the box.

NEW GRAPEFRUIT DISEASE.

Early in February my attention was called to the fact that there had been found last summer in two or three places in the state of Florida, in connection with nursery stock, a new and apparently a very disastrous disease on grapefruit buds. The nature of this disease, and much of the details of what is known about it, will be told you by other speakers at this meeting. The league immediately upon gaining this information began to find out the sentiment of the prominent growers in the state as to what action should be taken to eradicate the trouble. We are probably all familiar with the strenuous actions the California citrus growers took to eradicate the Whitefly after it had once gotten established in their state. There was a unanimous opinion among the growers of Florida that every possible means should be used to completely eradicate this new pest. The matter was presented to Dr. Berger with emphasis, and the matter was taken up by the Board of Control of the State, and Dr. Berger was instructed to make a trip through the Gulf States where we felt sure this disease had originated in this country, in order to have complete data upon the extent of the disease to assist us in our control measures. Dr. Berger is here to tell us of this

trip. The manager of your league feels that every effort should be made to eradicate by digging up and burning every tree that shows a trace of this disease in the state. It would have been far better if this action had been taken a year ago when the disease was first discovered, and I feel confident that if this league had been in active existence at that time, such measures would have been taken. Unfortunately during the winter months it has been impossible to locate much of this disease, and we are only now able to begin an active campaign of cleaning up the state. Unfortunately our state legislature has given to the nursery inspection work but a very small appropriation, and it is very doubtful whether this work can be carried out under state direction, providing we cannot secure additional funds from some source. The details of this eradication work I am going to leave for Dr. Berger to describe. I am glad to say, however, that the Board of Control of the State has taken steps to keep out of Florida all nursery stock, including bud-wood, coming from all of the Gulf States where this disease is known to exist. Unfortunately, however, we are again confronted with the lack of funds to properly see that this law is enforced. One of the things that the league is planning to do, and do vigorously, is to present the needs to our state legislature in its next session, for a considerably larger appropriation for nursery inspection work. The league also favors, and will attempt to have passed a much more definite law, giving the Board of Control sufficient authority to shut out from this state not only nursery stock, but if it sees fit, all sorts and kinds of fruits, seeds or anything else upon which new diseases or pests are liable to be brought into the state.

CO-OPERATION WITH THE FEDERAL HORTICULTURAL BOARD.

In recent years the Federal Department of Agriculture has received the authority to place a very strict quarantine against nursery stock or fruits or seeds coming from foreign countries, or moving from one state or territory to another state or territory, providing these plants or fruits or seeds are liable to scatter any new or not generally-distributed disease. The administration of this new law is through the Federal Horticultural Board. Quarantines have been placed against fruits coming from countries affected with the Mediterranean fruit fly and many other pests. The one which affects Florida most, in my opinion, is the Mexican fruit worm. This is especialy disastrous to citrus fruits, and I can assure you that if Florida citrus growers had this pest to fight it would be a serious question as to whether the industry could survive. The power of this Horticultural Board is tremendous, and if Florida once secured this Mexican fruit worm it is more than probable that the Federal Horticultural Board would place an embargo upon citrus fruits leaving the State of Florida. The workings of the Horticultural Board in this connection are illustrated in the new potato disease which has been found in Maine, and if it had not been possible to discover a method of inspecting seed potatoes leaving Maine, an absolute embargo would have been placed upon all Maine

potatoes. I do not want to cause you over anxiety in this matter of the Mexican fruit worm, or in fact the Mediterranean fruit fly, but I do know the attitude of a majority of the Federal Board, and I am very free to say that if we get either of these pests introduced into this state, the chances are more than good that we shall have an embargo placed against us. We already have sufficient authority to keep out these pests. What we do need, however, is a more rigid inspection at our ports. The Federal Board promulgates the quarantine, but it leaves the inspection work in seeing that these quarantines are enforced, to the state authorities. This league is now engaged in the study of condidtions that exist at the different ports in Florida, attempting to find out how great the danger of getting these pests is, through the importation of fruits either for commercial purposes or by passengers. The Federal Board is willing to co-operate with us and if it seems advisable, they will restrict the ports of entry in Florida. One thing we must do, we must establish competent, thorough inspection at all of our ports where vessels are permitted to unload any and all kinds of fruits. The very fact that these importations are small makes the problem still more difficult.

There are in addition to these questions several others upon which the league has done some little work. We attended the meeting at Ocala, in connection with the express rates out of Florida. The changes in express rates have been so radical, and the shippers had been so thoroughly misinformed as to the new rates that greatest good accomplished through this meeting was its educational effect.

Mr. H. S. Kealhofer of the Traffic Department of the Jacksonville Board of Trade has compiled extensive data relating to these new rates, and is about to give this out to the press. It is an admirable piece of work, and should be the means of settling definitely the question of the effects of the changes in express rates on the Florida industries. The getting together of this data has been the first step in connection with this express matter.

I have spent considerable time in discussing the few things that have been undertaken already. I want now to present for your consideration several matters of greater importance upon which you will need to take action before the close of these meetings. This league belongs to you growers and shippers. Your manager stands willing to follow your instructions and to develop just the kind of an organization you want to have in the state. Perhaps with the present finances, or at least by increasing the assessment slightly we can carry on the league as it is now organized. From many sources, however, we are being urged to extend our activities in other directions. I want to mention two, both of them important.

A TRAFFIC AND CLAIM DEPARTMENT.

In the early organization work of last year, emphasis was laid on the fact that the league would have a traffic and claim department. Without doubt many individuals who were not connected with the larger marketing organization in the

state, which already had its claim departments, were attracted to the league by the promise of such a service. Up to the present time, however, this type of work has not been undertaken, largely because of the fact that personally I have not had the proper experience in this kind of work to justify my undertaking it. We have made one underlying rule, namely that whatever the league undertakes, it is going to accomplish in the very best possible way. We do not feel that with the present work of organization over the state and carrying on the various lines of investigations, it is best to undertake the collection of claims. If it is best for us to establish a claim department and there seems to be a sufficient demand to maintain such a department, then we will need a man who is equipped to handle that type of work. This will mean additional responsibility and additional finances. It is a question that I feel you should decide and I refer this question to you without recommendations. I am frank to confess, however, that the right kind of a man who is familiar with rate-making and comparative rates from different points in the United States would be of immense value to the league. The system of rate-making in this country has become so very complex that only an expert can handle that part of the work. I do not see how you can afford to maintain a league of this kind where one of the main objects is the reduction of our freight charges without employing an expert to handle these matters for you. It is possible that such a department might be made self-supporting by collecting claims on a percentage basis. I would like to have a free discussion of this subject by those interested and I am confident that the executive committee will be very glad to abide by your decision.

ADVERTISING THROUGH THE LEAGUE.

Another question of even greater importance has to do with the possibility of making use of the league for the purpose of advertising Florida fruits and vegetables. The question of the advisability of advertising perishable products has been settled in the affirmative. I need spend no time in arguing this question with you. Florida must advertise if she keeps abreast of the times with the great increased production she has coming on. The only question for us to decide is whether it is good business to use the league for any of this advertising. We advertise for the purpose of increasing consumption. Can the league increase consumption through any advertisements it might put out? The apple growers and shippers of the north have decided this great question as far as they are concerned, and they are now engaged in a great plan of increasing consumption through a general publicity scheme similar to what we would undertake. We would not have you get the impression that if we undertook an advertising campaign, that the different marketing agencies would discontinue their advertisements. These would be continued, and we hope increased, but the league would make an effort to put before the public, and keep before them, the advantages of Florida products. We would give them new receipts to try. We would describe

the conditions under which the fruits and vegetables were grown, and we would constantly keep before them facts which would stimulate their interest in these products and cause them to purchase more of them. Whether this kind of publicity would pay, I do not know. You have as good a right to your opinion as I to mine, and even better, for advertising costs money and you must pay the bill.

There are two ways in which an advertising scheme might be financed. We could have a special assessment which each member would pay, and with this money carry on the publicity campaign. One large marketing agency has suggested that each member of the league have the privilege of using a special mark or brand such as a red circle on the printed wrap, the individual brand being printed within this red circle. If this were practicable it might be made use of.

The second plan is that one made use of by the apple growers, namely the stamp idea. An attractive design is worked up in the form of a stamp somewhat larger than a postage stamp. These are published in books, and are gummed ready to be attached. These stamps are sold for one cent each, or whatever price is determined upon, and the revenue is used for the advertising campaign. The stamps themselves are attached to the packages of fruit and thus identify the fruit with the publicity plan. There are many things about this last plan that appeal to one. It is simple, and the advertisements could refer to the stamp upon the box. Purely from the standpoint of finances, the assessment plan probably is more sure and easier. It might be possible to use the stamp idea in connection with the assessment plan if you so wished.

I have briefly outlined this idea of using the league as an advertising agency. Two general plans of obtaining the necessary funds for carrying this out have been suggested. There may be other and better ways of doing this. Many of the growers in the state are anxious that something of this sort be undertaken. Nearly all the larger marketing agencies have been consulted and favor the plan decidedly. The final decision, however, rests with you. If you instruct us to go ahead with it, we will work the details of the plan out and attempt to get the greatest benefit possible from the money spent.

I have kept you too long already. I was greatly impressed with the possibilities of the league when I accepted the position of general manager. This impression has been increased many times since I came to the state and began the work. Florida has great possibilities; in the main we are making use of these possibilities in a splendid way. In the past too much energy has been wasted in fighting among ourselves. But a new day has dawned for us. We realize that in the large majority of things that affect us we stand together. This league would not have been possible ten years ago. To-day it is organized complete without a trace of friction or discord within it. I doubt if there is a person here who will prophesy of our future if this same spirit it continues.

The remainder of the session was devoted to the work of the Florida Grow

ers' and Shippers' League. Mr. L. B. Skinner, President, was in the chair. Mr. Tenny explained the Charter, which had been granted the League, and read the names of the original Directors, as prescribed in the Charter. These were as follows: L. B. Skinner, Dr. J. H. Ross, J. C. Chase, H. C. Schrader, B. L. Hamner, H. E. Heitman, T. V. Moore, W. C. Temple, H. J. Drane, J. R. Davis and John Taylor.

According to the requirements of the Charter, it was necessary to elect a new Executive Committee, and the President appointed the following committee as a nominating committee: Mr. L. S. Tenny, Mr. L. D. Jones and Mr. B. F. Tillinghast. While this committee was conferring, the members of the League took up the question of the adoption of by-laws, and the following by-laws were adopted:

By-Laws of the Florida Growers' & Shippers' League.

Article I. *Membership.* Any person interested in the fruit or vegetable business of Florida, may become a member of this League by paying the annual membership fee of $1.00, and agreeing to pay the assessments of the League.

Article II. *Assessments.* The assessments for the support of the League shall be determined at the annual meeting, and these assessments shall not be changed during that year, unless by a majority vote of the members attending a special meeting called for that purpose.

Article III. *Special Meetings.* Special meetings of the League may be called upon a majority vote of the Executive Committee, or upon a petition signed by one-tenth of the members. Notice of such special meeting shall be sent each member, stating the purpose of such special meeting.

Article IV. *Special Contribution.* Nothing in these by-laws shall be construed as meaning that special contributions may not be made by the members for any special purpose. The voluntary contributions, however, shall be kept separate from the regular assessment fund.

Article V. These by-laws may be amended by a two-thirds vote of the members attending any annual or special meeting.

Article VI. *Quorum.* Twenty-five members present at any regular or special meeting of the League shall constitute a quorum.

The question of the term of membership was then taken up, and Mr. Tenny announced that thereafter a membership certificate would be issued to each member. This certificate would be dated, and the membership will continue for one year from this date.

Report of the Nominating Committee for Members of the Executive Committee for the Ensuing Year.

Northern District:

Z. C. Chambliss, Ocala, Fla., to serve one year.

J. C. Chase, Jacksonville, Fla., to serve two years.

H. C. Schrader, Jacksonville, Fla., to serve three years.

Central District:

J. H. Ross, Winter Haven, Fla., to serve one year.

J. R. Davis, Winter Haven, Fla., to serve two years.

L. B. Skinner, Dunedin, to serve three years.

Southern District:

T. V. Moore, Miami, Fla., to serve one year.

A. F. Wyman, Bradentown, Fla., to serve two years.

H. E. Heitman, Ft. Myers, Fla., to serve three years.

A motion was made, seconded and carried that the committee's report be accepted.

It was moved, seconded and carried that the Secretary be instructed to cast the ballot of the league for these men to serve as committeemen for the coming terms for which they are nominated.

The Secretary of the league cast the ballot, and the President announced the election of these men to serve as committeemen for the terms for which they were nominated.

Mr Hamner was then appointed a committee to collect memberships in the League at the meeting. A total of seventy members were enrolled at this time.

A question was asked Mr. Tenny regarding the payment of the assessments by members of the Florida Citrus Exchange, and he explained that all assessments from members of the Exchange were paid through the Tampa office of the Exchange, and that in the few cases where members had paid direct to the League, their checks had been returned with a notice that their assessments had already been paid.

Mr. Tenny was called upon to outline the financial needs of the League, and he stated that $10,000 would be needed for the first year's work. In his opinion, the present assessments would yield approximately $8,000 this first season. Finally a motion was made and seconded that the assessments for the coming year remain as at the present, which is one-sixth of a cent per box on citrus fruits and pineapples, and fifty cents a car on vegetables. This motion was carried.

Mr. D. C. Gillett announced that in behalf of the Florida Nurserymen's Association, he desired to contribute $100.00 to the work of the League. A motion was made, seconded and carried that the meeting adjourn.

Notice of Application for Letters Patent and Charter of Florida Growers' & Shippers' League.

Notice is hereby given that on the 28th day of April, 1914, the undersigned whose names are subscribed, will make application to the Honorable Park M. Trammell, Governor of the State of Florida, at his office in Tallahassee, Fla., for Letters Patent, for an incorporation, not for profit, organized under Chapter 5958 of the laws of the State of Florida, upon the articles of incorporation hereinafter set forth.

J. H. Ross,
B. L. Hamner,
L. B. Skinner.

ARTICLE 1.

The name of this corporation shall be the *Florida Growers' and Shippers' League.*

ARTICLE 2.

The purpose for which said corporation is formed, shall be the mutual co-operation of its members, for the purpose of advancing and protecting their interests as growers, shippers and marketers of Florida agricultural products of all kinds.

ARTICLE 3.

The place where its principal business shall be transacted, shall be in the City of Orlando, Orange County, Florida.

ARTICLE 4.

The term for which said corporation shall exist shall be fifty years from the date of the issuance of its Letters Patent.

ARTICLE 5.

The number of directors of said corporation shall be nine, but the Board of Directors by a two-thirds vote of the members present at any regular or special meeting, may increase or decrease the number of said directors, provided that the number of such Directors shall never be less than three. The Board of Directors shall be elected at the annual meeting of the members of this corporation to be held on the first Wednesday of May of each year, but the Board of Directors may change the date of any annual meeting, so as make it contemporaneous with the annual meeting of the Florida State Horticultural Society, by giving ten days notice thereof to all of the members.

The Board of Directors, at its first meeting shall divide the State of Florida into three districts and no more than three Directors shall be elected from any one of said Districts. The Board of Directors at its first meeting, and at its first meeting after each annual election, shall select from among themselves a President and two Vice-Presidents, and the Board shall also have the power to appoint a secretary, and to designate a bank as Treasurer of said corporation, and it shall also have the power to employ a general manager and prescribe his powers and duties. At the first annual meeting, three directors shall be elected for one year, three directors shall be elected for two years and three directors shall be elected for three years, and thereafter at the annual election directors shall be elected to fill the offices of those three directors whose terms have expired.

The names and residences of the directors of said corporation selected for the first year, and until their successors shall be elected, and have accepted said office, shall be:

L. B. Skinner, Dunedin, Fla.
J. H. Ross, Winter Haven, Fla.
J. C. Chase, Jacksonville, Fla.
H. C. Schrader, Jacksonville, Fla.
H. E. Heitman, Fort Myers, Fla.
B. L. Hamner, Tampa, Fla.
H. J. Drane, Lakeland, Fla.
W. C. Temple, Winter Park, Fla.
J. R. Davis, Bartow, Fla.

IN WITNESS WHEREOF the subscribers have hereunto set their hands and seals on this the 30th day of March, 1914.

J. H. ROSS	(SEAL)
B. L. HAMNER	(SEAL)
L. B. SKINNER	(SEAL)
J. C. CHASE	(SEAL)
H. C. SCHRADER	(SEAL)
H. J. DRANE	(SEAL)
J. R. DAVIS	(SEAL)
H. E. HEETMAN	(SEAL)
W. C. TEMPLE	(SEAL)

STATE OF FLORIDA,
HILLSBOROUGH COUNTY:

Before me, the undersigned authority, personally appeared W. C. Temple, to me known to be one of the persons described in and who executed the foregoing articles of incorporation, and who duly acknowledged the execution thereof to be his free act and deed.

WITNESS my hand and official seal this 30th day of March, 1914.

Insects

J. R. Watson, Gainesville

Mr. President, Ladies and Gentlemen:

It is my purpose this morning to briefly present to you the present status of three recently introduced and rapidly spreading pests of citrus trees. The first is

THE WOOLLY WHITEFLY.

This was introduced into Florida, presumably from Cuba, about 1908 or 1909. At least it was first discovered in Tampa (by Dr. Back) in November, 1909.

It has spread with phenomenal rapidity and is now found pretty generally distributed over the area inclosed in the black line. MAP.

Because of the evil record of its relative, the common citrus whitefly, we have been watching this species rather closely for the past two years.

APPEARANCE

I need not describe its appearance as the specimens I have will do that better than I can. No other species in Florida has this woolly coat. Its development in colonies or groups is characteristic.

The third insect is the

MANGO SCALE.

The mango scale was introduced a few years ago into the Miami region. It is now found also about Fort Myers, and has recently appeared about Winter Haven. It is said to be the worst pest they have on citrus in southeast Asia. As to what it is destined to do in Florida we can only guess at present. I mention it this morning chiefly to call your attention to the specimens I have that you may become familiar with it.

It is important to be able to distinguish between it and the pyriform scale so common on avocados, ficus and other plants. It can, however, be told by the shape, which is that of a shield, instead of pear-shaped, and by the bright green larvae.

The mango scale, as its name indicates, attacks, beside citrus, mangoes, guavas, figs, loquats, roseapple, and a number of ornamental plants. It is especially bad on mangoes.

When first discovered in Miami there was very little of this scale. If we had had at that time a crop pest law, and even a little money with which to enforce it, this pest could probably have been stamped out.

In addition I have here some specimens of the fruit fly, the new and apparently very efficient parasite of the Florida red scale. Also some Mediterranean Fruit Fly.

Damage.. The amount of harm that this insect has done to the groves it has infested has been very variable. In the vast majority of cases the owner has scarcely been aware of its presence. A dozen or so leaves per tree showed col-

onies for a few weeks, after which the whitefly died out, so that it was difficult or impossible to find live material, although the old colonies, dried out and matted down, were visible on the trees for several months or even a year. These old colonies are rendered more conspicuous by becoming heavily infested with purple scale, causing the leaf to turn yellow at that spot.

In other instances the infestation has been more persistent, the white flies becoming more or less permanent residents of the trees where they may do nearly as much damage as does A. Citri. This has been the case with certain dooryard trees in West Tampa for the past three years.

In two groves, both in Lakeland and about a mile apart, the woolly whitefly during the spring and early summer of 1913, inflicted much more damage than A. Citri ever did in the same length of time.

CONTROL.

Our spraying experiments show pretty conclusively that the woolly whitefly will yield to the same spraying solutions that have been found to be most efficient against the other citrus whiteflies, viz., the miscible oils, but the spray should be applied while the insect is in the early larva stages. The pupa is so well protected by the growth of wool matted up with honeydew and various molds that it is difficult to reach it with a spray solution. Experience has been that this insect is eventually brought under control by its enemies and especially the wasp-like parasite Eretmocerus haldemani. But in the case of even a moderate infestation it is not wise to depend solely upon the parasites to control it, on account of the rise of the purple scale, but to spray with one of the miscible oils. These oils will doubtless kill some of the parasites, but few at the time recommended, as there are comparatively fewer about at that time than when the adult whiteflies are emerging.

NUMBER OF BROODS

We have not been able to rear this insect in the insectary and carry it through a year, as we should like to do. During the past year we have made the following observations in the field:

December, 1912—Adults and pupae.

May 15, 1913—Mostly in the second (some in the third) larval stage.

May 15, 1913—Adults emerging in large numbers.

June 11, 1913—Mostly in the second (some in the third) larval stage.

July 11, 1913—Mostly pupae, but some adults.

August 15, 1913—First stage larvae, eggs and some adults.

October 10, 1913—Adults and eggs.

October 28, 1913—First and second larval stages and some eggs.

December 4, 1913—Good sized larvae and pupae.

February 1, 1914—Adults and eggs.

February 27, 1914—First and second larval stages.

From field observations and from the examination of much material sent in by correspondents, we can approximately reconstruct the seasonal history of the insect.

There are four generations per year with the maximum number of adults fly-

ing during December and January, about May 15, July 20, October 10.

The winter brood of adults is very variable in the date of its appearance, and much prolonged. The writer found adults abundant in December, 1912, in Tampa, as did Mr. S. S. Crossman in 1909. Back found them flying in January, 1910. This year the maximum number of adults apparently appeared about February 1 in Tampa. It should not be inferred, however, that the adults are flying during the whole of these two months. Much depends upon the weather. During a cool spell they do not emerge.

It is to be noticed that during the summer there is a brood about every ten or eleven weeks. This period is one or two weeks shorter than that for A. citri. For those adults of the winter brood that issue in mid-December the time of development is about the same, but if emergence is delayed until February 1, the time is lengthened to sixteen weeks. The time between February 1 and May 15 is again about fifteen weeks, while for the eggs laid earlier than February 1 the time is prolonged. This shortening of the time necessary to mature a generation, as compared with A. citri, together with the ability to develop and emerge during the winter months, enables A. howardi to produce one more generation than is the rule with A. citri, and always the case with A. nubifera. The October brood is nearly coincident with the fall brood of A. nubifera, otherwise the broods do not coincide with those of either A. citri or A. nubifera.

Damage. As in the case of the other whiteflies, the damage that this species inflicts upon its host plant is of a three-fold nature: (1), the withdrawal of sap from the tree; (2), the excretion of honeydew and the consequent growth of the sooty mold which interferes with the proper functioning of the leaves and necessitates vigorous washing of the fruit; (3), increase in the numbers of the purple scale.

2. It seems to be a less favorable medium for the growth of the ordinary sooty mold (Meliola camelliae) than is that of A. citri. There are, however, a number of other fungi which develop in it. One is a Meliola with much larger fruiting bodies than those of the common sooty mold. Another is of a dirty green color, suggesting the common green mold Penicillium. These and other fungi mat up an old colony of howardi and give it a particularly dirty appearance.

3. The third aspect of the infestation, the rise of the purple scale, is usually the most serious feature in the case of A. howardi. This phenomenon has been frequently noted in the case of the other citrus whiteflies, and has received a variety of explanations. For instance, in the Year Book of U. S. Department of Agriculture for 1908, it is said to be "a secondary result of the weakening of the citrus trees by the whitefly A. citri," the idea of the author of that statement being perhaps that the trees that have been weakened by the whitefly, although, perhaps, having no more scales per unit of surface than strong trees, are less able to carry the drain on their vitality; or, perhaps, that scales breed more rapidly on or seek out injured trees. But some investigations by the author show that leaves covered with loose-fitting sooty mold have, on the average, twice as many scales per

unit of surface as leaves free of sooty mold.

The explanation of this increase is as follows: The young crawlers react phototactic to the average degree of illumination met with in a citrus tree; i. e., they avoid such light. This leads them to crawl into any shaded corner as between two fruit trees that are in contact, under the calices of fruit where they are always relatively abundant, or under loose-fitting sooty mold, and especially under colonies of the woolly whitefly. This leads to the concentration of crawlers in such situations. Here they are partially protected from their enemies, such as chrysopa larvae, lace-winged flies, the lady-beetles, etc., and perhaps also from their fungous enemies, the spores of the red-headed, the gray-headed and the black scale-fungi.

So marked is this tendency of the scales to congregate under an old colony of howardi, that it is possible to tell just where on the lower surface of a leaf, there is a colony of howardi by noting the yellow areas on the upper surface. The writer has in several instances counted over a thousand purple scales per square inch in these old colonies, not including crawlers. Five hundred adult scales, i. e., those that have reached the egg-laying stage, have frequently been counted per square inch. These old colonies of howardi, if sufficiently numerous, become the centers from which the trees become heavily infested with scale.

Habits. The adults are markedly more sluggish than those of A. citri. A jar of the limb that would cause citri to take to wing has little effect on howardi. So sluggish are they indeed that the adults frequently lay their eggs on the same leaf on which they grew and emerged. There is not the marked tendency to seek out the new and tender growth that is so characteristic in A. citri and especially in A. nubifera. They seem indeed to prefer leaves that have recently completed their growth and turned a dark green to either the very young or the very old leaves. This sluggishness greatly retards their spread through a grove. In one of the severest infestations that have come under the writer's notice, they were confined to one-half of a ten-acre grove. None whatever were seen at the other side.

On the other hand, this sluggishness is a distinct aid to their transportation to a distance on the clothes of travelers and vehicles. The writer saw adults clinging to the clothes of the owner of one of the above-mentioned groves after he had driven in a buggy three miles. In Arcadia, in December, 1912, the writer found howardi only in some trees in front of the hotel and in a small door-yard grove across the street, plainly suggesting that the insect had been brought to town on the clothes or luggage of travelers. A year later the insect was found by Dr. E. W. Berger to be generally distributed in the groves about town and as far out as five miles.

The crawlers of this species are also very sluggish and settle down very near to the place where the eggs were deposited. This results in most of the larvae and pupae being collected in colonies instead of being scattered more or less uniformly over the surface of the leaf, as with the other species. These groups or colonies average a score or more of individuals and are a striking feature of howardi.

The eggs of this species are laid in cir-

cles which will often contain three or four tiers of eggs, if the female is not disturbed. The female inserts her beak into the tissue of the leaf, doubtless for feeding purposes, and, using that as a pivot, rotates slowly about, thus making the circles.

Food Plants. The preferences of this species for different varieties of citrus are almost the reverse of those of A. citri. Grapefruit seems to be its first choice; oranges a close second, while tangerines are distinctly less relished. The author has found howardi on lemon trees. Other than citrus, Prof. W. L. Tower has reported them on guava in Porto Rico, and Dr. Back on mangoes at Tampa, but states the infestation to be more or less accidental. The writer has received from Wulfurt what, as far as could be told from the limited material, is apparently this same species from sea-grape (Coccoloba). A large colony on a grapefruit leaf will make it curl like a young leaf heavily infested by aphids.

NATURAL ENEMIES

Fungi. Both the red fungus (Aschersonia aleuro) and the brown (Aegeritia webberi), which are such efficient enemies of A. citri and A. nubifera, have been found on howardi, but sparsely. So scarce are they indeed that they amount to very little in the control of the insect.

The red Aschersonia has been found parasitizing this species for some time, but until this year the brown fungus had not been found on this species. However, in February the writer found it parasitizing howardi at Sarasota.

The most efficient check to their multiplication is undoubtedly a small wasp-like parasite, Eretmocerus haldemani by name. This minute insect has a body which is less than 1 mm. (1-25 in.) in length, and of a clear yellow color. The compound eyes are dark brown and especially conspicuous under a lens, as are three small simple eyes between the large compound ones. The four wings of the living insect shine with an iridescent gleam in the light. The female pierces the tough covering of the pupa of a howardi and lays an egg in the interior. This egg hatches out into a minute legless maggot-like larva which devours the contents of the whitefly pupa, grows to full size and itself pupates in the now empty case of the host. When ready to emerge it cuts a round hole in the dorsal surface of its host towards the anterior end through which the adult parasite emerges. This round hole is very different in shape from the T-shaped rupture which the adult whitefly makes in emerging, so it is not difficult to pick out those pupa-cases from which the parasite has emerged. These parasitized pupa-cases usually turn jet black, which further helps to distinguish them. This is not always the case, however.

According to Dr. L. O. Howard, who described the insect, the parasite has before been found only in California and Mississippi, in both cases parasitizing aleurodids. It would seem, then, that the species is a widespread one, and is doubtless native to Florida, where it has been parasitizing our native whiteflies. When howardi was introduced it quickly discovered it and commenced to breed on it. It probably occurs in Cuba as well, where it helps to keep howardi in check.

It is a fortunate thing for the orange

growers of Florida that there was a native insect ready to infest howardi upon its arrival here. Otherwise it would have been an exceedingly dangerous foe, because of its ability to spread rapidly, its exceedingly sticky and copious honeydew, and its comparative immunity to the attacks of the fungi which parasitize the other whiteflies.

The other insect is the

COTTONY CUSHION SCALE

About the only new thing we have to report concerning this insect is its distribution in the state.

It was introduced into the Pinellas subpeninsula over twenty years ago, but until the writer found it in Tampa in 1911 it had not been reported from the mainland of Florida. During the past two years it has been spreading rapidly. Its present distribution is shown by the map.

This insect can be controlled by spraying in connection with its native enemies, chief among which is the common thice-stabbed lady-beetle, but *the* way to control it is by the introduction of the Australian lady-beetle. This insect (exhibit) is also getting pretty well distributed over the infected area. I am endeavoring to keep track of the colonies of the latter and am usually in a position to advise the owners of infested groves as to where they can procure the beetles. At the present time a party in Leesburg is attemping to raise the beetles in confinement so as to constantly have a supply on hand.

Discussion.

Mr. Thompson: The red scale spoken of there; is that what is sometimes called the Cuban scale?

Mr. Watson: No; it is the common red scale; the Florida red scale. The pink fungus is for that only.

Mr. ———: I would like to know if any fungus has yet been discovered that attacks the mango scale.

Mr. Watson: So far as I know, we have found no fungus. It seems to be a parasite.

Mr. Prouty: I would like to ask about the fungus growth down at Arcadia.

Mr. Watson: I was speaking of the whitefly; not the fungus. You never have had a severe infestation at Arcadia—just a few. The only severe infestations are at Tampa and Lakeland.

Mr. Baker: I would like to ask what he knows about the infestation of the woolly whitefly at Lake Okeechobee.

Mr. Watson: Nothing, except some specimens from Ritter.

Dr. Berger: I would like to say a whole lot of things I could say about that. It has no business there at all. I want to apply to you as a body, gentlemen, to report all violations of the nursery inspection law. Report them to me. I know well enough on the Caloosahatchee river there are contraband nurseries shipping stuff up and down that river, regardless of any law. There are a few nurserymen down there abiding by the law who have been inspected.

Now, what business has the woolly whitefly got on Lake Okeechobee? Some man ignored or maliciously defied the law and simply carted some dirty stuff up there.

You can do more than I can. You are right with these people, some of you, all the time. When you see those violations you can simply tell those who are defying

the law that they have got to quit it, and report it to me.

I can't reach the whole state. I know there are some of those men down there, but I can't get everywhere. I have made one hundred inspections myself since July. We have a few deputies who made another thirty-eight. We have no deputy at Fort Myers. I am not always able to get desirable men to take charge of that work.

There are those contraband nurserymen, and if you will simply get after them and let them know they have to abide by the law, you can do more in generating respect for the law and keeping the people from spreading insects than I can, though I am trying to do all I can with the modest means provided for this work.

There are boat lines at Fort Myers that are snapping their fingers at the law, and carting stuff up and down that river as they please. I did have one reported to me, advertising seedling stuff in the Fort Myers papers. I have written to them, and have no answer. It is one of the boat lines leading out of Fort Myers. Get after them, gentlemen, as well as expect me to get after them. (Applause).

Mr. Hume: I suppose this discussion might be prolonged at this point, but perhaps it is better to bring up some of the topics Dr. Berger is touching upon when we come to his paper.

I shall now call on Mr. Yothers for his discussion on the rust mite and its control.

THE RUST MITE AND ITS CONTROL

W. W. Yothers, Bureau of Entomology, Orlando, Fla.

Mr. President, Ladies and Gentlemen:

This pest was originally described by Ashmead in The Florida Agriculturist, September 1879.

The literature on this mite is very meager. The only account of any consequence is given by H. G. Hubbard in his "Insects Affecting the Orange," on pages 105-120 inclusive. The other references in literature to this pest are largely taken from this account.

This species is widely distributed, being found in California, where it is known as the Silver Mite, in Hawaii, Mexico, Jamaica, Cuba, Australia, and of course in Florida. It has been recorded from Philadelphia and New York, where no doubt it infested citrus trees growing in greenhouses. Up to 1887 it had not been found in Italy, but no records are available showing its occurrence since that date. It is not definitely known if it occurs in India. I have recently talked with several entomologists who have traveled in the Orient and they are of the opinion that it is either not present, or if so is extremely uncommon.

This mite is very tiny, being scarcely visible without the aid of a magnifying glass. When extremely abundant on either the leaves or fruit it resembles a

yellowish dust. It would take approximately 200 mites placed end to end to cover an inch. The adult is lemon colored, triangular in shape and three times as long as broad. It possesses four legs on the front end of the body and two bristled hairs near the caudal extremity. It can crawl quite rapidly from place to place. It has also been observed to bring its rear end toward the front end in a little heap and then straighten out suddenly. The result would change the location of the mite sometimes as much as an inch. No doubt this is one way it goes from one leaf to another. The adult mite deposits eggs which are spherical and transparent. At the expiration of about five days these eggs hatch. The little mite is also yellow in color, but of a lighter shade than the adult mite. Within a week or ten days it undergoes a molt, when it is full grown. The life history of a rust mite, therefore, may be considered about two weeks, that is, it takes two weeks for the species to go through its life cycle. It is interesting to know that even in winter Hubbard has found as many as 75,000 mites on a single leaf, and there is no doubt that in summer time this number is much greater.

FOOD PLANTS

Citrus fruits and trees are given in the literature as the only food plants. I have found a mite on roses which resembles the rust mite of the orange, but further examination will be necessary before any positive statement can be made in regard to the matter.

DAMAGE

This pest may be found on the leaves of citrus trees throughout the entire year. It is more frequently found on the upper surfaces of the leaves than on the under surfaces. In fact perhaps 99 per cent of the mites and eggs will be found on the upper surfaces of the leaves. The attacks of this pest on the leaves are not followed by rust. The surfaces of the leaves become finely corrugated and lose their gloss. While it is certain they suck the juices from the leaves there is no definite knowledge of how much damage they do by this habit. It stands to reason, however, that an orange leaf which is covered with rust mites must lose much of its juices and therefore cannot perform its functions as well as one which is free. This aspect of the pest is not usually given sufficient consideration.

It is generally believed among the orange growers that a rust orange contains a larger percentage of sugar than a bright orange. In several instances I found by tasting russet and bright fruit from the same trees that this was not the case. There are no analyses which will either substantiate or contradict this belief, but I am of the opinion that it is a Florida myth.

The chief damage which this pest causes results from the russeting of the fruit. This russeting is a discoloration due to the effect of the juices which ooze out from the punctures made by these mites in the rind. The action of these juices prohibits the growth and expansion of the rind and thus prevents the fruit from getting to be as large as it would have

been if the mites had not been present. This reduction in size is the cause of a large part of the monetary loss which the industry sustains from this pest.

The opinion is held by many growers that the rust mite does not reduce the size, but this is certainly erroneous. Chase & Company have found out by actual tests many years ago that the increased size that the fruit attains by spraying for the control of this pest more than paid for the cost of spraying and the additional price which sprayed or bright fruit obtained in an early market was clear gain. Mr. F. D. Waite is of the opinion that the rust mite reduces the crop in Florida on an average of from 1 to 2 sizes. I have recently figured out the reduction in size caused by this mite in many carloads of fruit and a few cars will be given as an illustration. This reduction is figured as follows: the total number of fruits and the average number per box of each grade was obtained, and the number of fruits of the russet grade was divided by the average number of fruits per box of the bright grades. This would give the number of boxes of fruit there should have been if the russet fruit had been as large as the bright fruit. From data obtained in this way from 40 cars of fruit in every instance the grade in which the largest number of bright fruits were included averaged a smaller number per box than the other grades and the grade in which was included the fruit known as "golden" was larger than the fruit in the grade which was largely russet, this percentage ranging from 2 to 14.

Not only does it require more fruits for a box of golden or a box of russet than it does a box of brights, but the percentage of the desirable sizes is much greater in the brights than in the other grades. In every instance in these 40 cars the percentage of the 150, 176 and 200 sizes was considerably greater in the bright grade than in either the golden or the russet grades. The small sizes are in most instances in the golden or russet grades.

In addition to the reduction in size which the rust mites cause it should also be carefully noted that this pest reduces the fruit one grade. If no rust mite were present, or if it were controlled by the sulphur sprays 85 to 90 per cent of the fruit would be known as brights or placed in the first grade. As it is, really very little fruit shipped goes under the first or fancy grade brands.

It should be stated that these figures do not show as great a reduction in size as actually exists because little or none of the commercial grading has been done strictly according to brights and russets. All the large, coarse, fruit, as well as more or less fruit that is inferior, is placed in the russet grade regardless of whether they are russet or bright.

In one packing house an orange which did not show more than 50 per cent discoloration was placed in the second grade, or which might be known as "golden." As a general proposition over 10 per cent discoloration places the fruit in the golden grade. It must also be borne in mind that little or none of this fruit is entirely free from rust mite injury which of

course makes all the fruit somewhat smaller than it would otherwise be.

There is some experimental evidence existent to show that the injury is much greater than these figures would indicate. In 1911 the fruit from a row of trees sprayed with oil emulsion in May was 50 per cent larger than the fruit from adjoining rows which were left unsprayed. By actual measurement 66 of the sprayed fruit made the same bulk as 99 of the unsprayed; owing to the fact that the spraying was done too late to produce entirely bright fruit the sprayed fruit was graded by an orange buyer as a high grade of golden russet. No doubt if the spraying had been done earlier or done with lime and sulphur solution instead of the oil emulsion the difference would have been greater than it actually was.

This will, no doubt, to a large extent account for the small number of boxes of fruit shipped from this State in 1911, since it is a fact that from 85 to 90 per cent of the fruit were russets. In fact much of the fruit was sold as black russets. It is safe to say that this reduction in size is close to 25 per cent of the total crop. In other words there would be approximately 25 per cent more oranges shipped from this state if no rust mite was present.

In addition to the loss occasioned by the reduction in size of the fruit, there is a difference in the market price when these different kinds of fruit are sold. I am informed by some expert orange salesman that it is very nearly impossible to sell russet fruit before the holidays, in fact the difference in price between russet and bright fruit before the holidays is very great, oftentimes reaching 50 cents a box. There seems to be an opinion among a great many people that after the holidays there is very little difference between the price of russet and bright fruit. While my data on this subject is not exhaustive I have a great many instances where russet fruit did not sell for the same price as bright fruit—these differences range from 10 cents to 70 cents per box.

REMEDIES

It has been known for thirty years that the sulphur sprays were very satisfactory to control this pest. While the sulphur sprays kill the mites and their eggs if used at sufficient strength it is not entirely known if this is sufficient to cause bright fruit. It is further known that the oil sprays will kill the rust mites and have produced fairly good results, but they don't seem to be so satisfactory in preventing rust as the sulphur sprays. It would appear that these sulphur sprays unite chemically with the juices that have oozed out from the punctures of the mites and prevent their injurious action on the rind.

The ordinary soda sulphur solution has been used in this State for many years by some of the most progressive growers, but I have found that the reason most growers do not get better results from spraying and the reason that it seems necessary to use it so frequently is because it has not been used strong enough. Most growers, I find, use it at 1 to 60 or 1 to 66 and some even weaker.

This dilution will kill the mites, but it will not kill the eggs. To kill the eggs this solution should be used at 1 to 40. This spray can be made as follows:

SULPHUR-SODA SOLUTION

Sulphur ----------30 pounds
Caustic (Soda (98 per cent) 20 pounds
Water ----------20 gallons

The sulphur should be very carefully sifted and all the small lumps broken up to the finest powder. Wet the sulphur with 3 gallons of water until it becomes a thin paste. Care must be taken to have every particle of sulphur wet to prevent burning. Slowly add the caustic soda and mix well with the sulphur paste, using a stick for stirring. If the paste has a tendency to burn, a little water may be added. When mixed about 16 gallons more of water should be added to make 20 gallons of stock solution.

Use one gallon of the above stock solution to 40 gallons of water.

LIME AND SULPHUR SOLUTION

Until the present writer investigated the matter it was usual to recommend lime and sulphur solution at approximately 1 to 200. This solution will kill the adult mites but will not kill their eggs. I have found out lime and sulphur solution testing 32 Baume should be used 1 to 75. It will do no hurt to the fruit or trees if used at 1 to 50, and when used at this strength it may kill out more scale than when used at 1 to 75. This solution can be purchased in the open market from the various dealers in insecticides or can be made according to directions which will be furnished on application to the Bureau of Entomology or to this office.

It is advisable from a financial standpoint that the orange growers make this solution themselves since the saving is about two thirds. The cost to make this material will be less than $3.25 per barrel of 50 gallons, while the cost when purchased from dealers is about $10.00 per barrel.

Owing to the fact that lime and sulphur solution has stable qualities which makes it remain a long time on the trees I certainly recommend this solution above all others for this pest. There is nothing which an orange grower can use on his trees which seems to do them so much good as this solution. Some experiments already conducted would indicate that an excessive use of this solution makes the fruit mature from two weeks to a month earlier than on adjoining rows which are either left unsprayed or sprayed with oil emulsion. There is some question, however, if the solution used at 1 to 75 will produce the effect of hastening the maturity of the fruit.

DUSTING

Several people in this state have had satisfactory results by the application of a mixture of hydrated lime and flowers of sulphur. This mixture consists of 1 lb. of flowers of sulphur and 2 lbs. of hydrated lime, and in some instances the pure sulphur is applied. This mixture must be applied very frequently since the eggs of the rust mite are uninjured by the dust. It is applied by means of a dusting machine.

CITRUS CANKER IN THE GULF COAST COUNTRY, WITH NOTES ON THE EXTENT OF CITRUS CULTURE IN THE LOCALITIES VISITED

E. W. Berger

Mr. President, Ladies and Gentlemen:

When no longer any reasonable doubt remained but that a new citrus disease had made its appearance in Florida, that at least one infection had been sent to us from Texas, and specimens were received from Alabama, it seemed pertinent, this spring, that some one should make a visit to the Gulf Coast country for the purpose of getting some idea of the distribution and seriousness of this new disease. Efforts to elicit definite information by correspondence had failed, as no one seemed to know anything definite about it. When the writer broached the desirability of such a visit before the State Board of Control at their meeting in March, it became at once a foregone conclusion that he would be sent to make the investigation.

To better bring the situation before you, this brief recapitulation is inserted here: The new disease, now known as *citrus canker,* had been discovered in two far separated localities in Florida. Near Monticello in West Florida, the writer had found it in about 20,000 small nursery trees consisting of some satsuma and pomelo on C. T. (citrus trifoliata) roots and some C. T. stock. Near Silver Palm, south Dade County, Mr. E. V. Blackman, Deputy Inspector in that county, had discovered it in about 20,000 pomelo and some oranges, all on sour roots, with approximately another 80,000 trees more or less exposed to the infection. This was all nursery stock. Suffice it to state here that certificates, permitting any of this stock to be sold, were promptly withheld, and treatment recommended, thus practically placing the infected stock in quarantine. In each instance the information then available was to the effect that the seedlings used for roots had come from Texas. This proved true, however, only for the sour seedlings used at Silver Palm, which came from Port Arthur, Texas. A recent letter from J. H. Giradeau, Jr., formerly a nurseryman at Monticello, states that he imported the C. T. seedlings, used at Monticello, directly from Japan, about February, 1910.

Leaving Gainesville, Florida, on the morning of March 14th, the afternoon was spent at Monticello to again look over the situation there. The places visited in other states were Auburn, Mobile and Grand Bay, Alabama; Biloxi, Gulfport and Wiggins, Mississippi; New Orleans and Happy Jack, Louisiana; Port Arthur, Noma, Alvin, Brownsville, McAllen and San Benito, Texas; and Matamoras, Mexico.

ALABAMA

At the Board of Trade rooms in Mobile, the writer was informed that one and one-half million trees had been planted

during this season on something over 13,000 acres, in the vicinity of Mobile, Grand Bay and other places.

Along the L. & N. Ry., toward Grand Bay, one sees creditable plantings here and there, ranging from a few acres to perhaps 20 or 30. At Grand Bay the acreage must be estimated by the hundred. These trees are all on C. T. roots and consist primarily of satsuma, with some pomelo and sweet orange. The oldest plantings appear to be 4 or 5 years old.

The fact that two nursery companies from Florida, the Griffing Brothers Company, and Miller and Gossard, have each established nurseries in Alabama, presages something of what the extent of citrus planting may become. A large part of the supply of trees now comes from Florida, Mississippi and Texas.

Seedling trees, whether sweet or sour orange, the largest probably 10 to 15 years old, were visible here and there in house yards. Some hardy hybrids were the only citrus trees seen at Auburn.

In Alabama, the writer first stopped at Auburn, in order to consult with the Nursery Inspector and Plant Pathologist of the College and Experiment Station. Dr. Wolf, Plant Pathologist, had just returned from the Mobile section with definite information as to the extent and localities infected. He reported the disease at Mobile, Grand Bay, Axis and Fairhope.

At Mobile and Grand Bay, everything that Dr. Wolf had reported was verified. At the shipping grounds of the Saibara Nurseries in Mobile, carloads of nursery stock, satsuma, pomelo and oranges were found. This stock was brought to Mobile from Alabama, Mississippi and Texas, to be sold and reshipped. Traces of citrus canker were noted in this stock, especially on pomelo and satsuma.

At Grand Bay, citrus canker was in evidence in every place visited, in the nurseries as well as in the groves. The most serious infection occurs in a small grove of 1000 grapefruit and satsuma trees, known as the Juvenal Grove. The oldest trees were planted about two years ago. The pomelo in this grove is most infected and badly crusted with canker on the younger growth. It appears that these trees are being retarded and forced to put out an excessive number of small branches which become diseased. Some treatment with Bordeaux mixture and defoliation had been made, but apparently without much success. No fruit was on the trees (March 17th). It should be noted here that the illustration of diseased pomelo (grapefruit) in Bulletin 122, Florida Experiment Station, came from this grove.

MISSISSIPPI

Judged by the number of small nurseries listed for Mississippi that offer citrus stock for sale, the extent of planting citrus in that state must be considerable. These are mainly along the line of the L. & N. Ry., at such places as Orange Grove, Pascagoula, Ocean Springs, Biloxi and Gulfport. An occasional planting may be visible from the railroad. At Biloxi, plantings to the extent of perhaps 60 acres were visited, with presumably hun-

dreds of acres lying farther out. The largest planting visited was at Wiggins, 30 miles north of Gulfport, where thousands of acres of cut-over pine land are being put on the market; there is already a new planting of something like 60 acres and a nursery here. The plantings in Mississippi are on C. T. roots and consist mainly of satsuma, with some pomelo and sweet orange. A 40-acre grove near Biloxi had many satsuma trees over 10 years old. The oldest trees at Wiggins were planted three years ago.

The writer searched for citrus canker only at Biloxi and Wiggins and found it only at the latter place. The disease is well established there and only the most drastic measures will ever succeed in eradicating it. The degree of infection of different varieties at Wiggins is as follows:

Pomelo—leaves, twigs, fruit;
C. T.—Twigs, no leaves or fruit present;
Navel—leaves, twigs, no fruit noted;
Med. Sweet—noted on leaves only;
Parson Brown—leaves, fruit, twigs;
Satsuma—leaves, rarely on wood.

When fruit is mentioned in the previous list information was furnished by the manager and foreman. The manager further informed me that he first noticed the disease in 1911 on C. T. seedlings from Japan.

LOUISIANA

Near New Orleans, on the south shore of Lake Pontchartrain, about 7,000 acres of land have been reclaimed by diking. Two large pumping stations have been erected to pump off the surplus water. The Lake Shore Land Company, through Symmes, Means, and Chandler, agricultural engineers, is carrying on these operations, and plans to set out a large acreage of citrus on trifoliata roots. Thirty thousand budded trees had just been planted, besides a nursery of 250,000 trifoliata seedlings, obtained from Arcadia, Texas. It is planned to sell this land and plantings in small tracts to settlers.

Below New Orleans, on the Mississippi River, considerable citrus has been planted. Trees 1 to 14 or 15 years old were seen at Happy Jack. At this point the Louisiana Orange Groves Company, of which Mr. Geo. H. Penn is President, has a splendid grove of about 70 acres, consisting of sweet oranges, navels, mandarins, and pomelo. Trees on sour orange roots appear to be doing better than trees on trifoliata roots, although some splendid trees on the latter roots, on better drained land, were in evidence. Between Happy Jack and New Orleans, a particularly fine citrus grove belonging to Mr. R. S. Moore, was noted at Naomi. Beyond Happy Jack, farther down the river, more extensive plantings of citrus were reported.

Citrus canker was not found at Happy Jack. On Lake Pontchartrain it is more than likely that it will soon be in evidence. At the latter place extensive shipments of stock have been received from Texas, where citrus canker is common, particularly the 250,000 trifoliata seedlings previously noted. The writer found citrus canker on a budded tree from Texas, but could not prolong his search

sufficiently to identify it on the 250,000 trifoliata seedlings.

TEXAS

At Port Arthur and at Nona, 40 miles north of Port Arthur, there is an extensive nursery business consisting largely of citrus. Satsumas appear to be the principal variety of citrus planted and these do well here. The writer had the privilege of sampling some satsuma fruit that had hung on the trees all winter and found it excellent. This was on March 24th.

At Alvin and vicinity there are extensive plantings of satsumas, but some oranges, pomelos and lemons, all on trifoliata roots, have also been planted. An extensive nursery business, principally citrus, is also carried on. On account of a heavy rain setting in, only about one-half day could be spent here in looking about.

Brownsville, McAllen and San Benito, in Southern Texas, were next visited. Citrus trifoliata roots fail in this part of Texas and sour orange roots are mainly employed. Many young citrus trees are being planted and the nurseries at McAllen and San Benito are prospering. All this, notwithstanding the fact that citrus in Texas was seriously injured by cold in 1911. Sour, bitter-sweet, and other citrus seedlings appear to thrive well in Brownsville, and while commercial plantings in this part of Texas are generally irrigated, seedling trees in house yards at Brownsville thrive without it. In general, it is apparent that Texas intends to continue in citrus culture.

At Port Arthur, citrus canker was present in the principal nursery there. Pomelo, trifoliata, sweet orange, satsuma, mandarin, tangerine, all except kumquat, were found infected. Four or five oranges, on a sweet orange tree capable of bearing several boxes of fruit, were found infected with canker. One of these oranges had at least a dozen cankers on the rind, while the others had only two or three.

No citrus canker was found at Nona, although trifoliata seedlings from infected territory at Port Arthur had recently been planted there.

At Alvin the disease was found on:

Duncan pomelo—leaves and twigs;

Citrus trifoliata—twigs;

Dugat orange—leaves only;

Villa Franca lemon—leaves and twigs (small trees exposed to disease among C. T.);

Ponderosa lemon—leaves (small trees exposed to diseases among C. T.);

Kumquats—not found infected.

To what extent citrus canker is generally distributed in the Alvin section was not determined, since, as previously stated, excessive rains interfered with the writer's getting about.

None of the citrus canker was found in south Texas. A full day was spent inspecting trees at Brownsville, but only a few hours each, between trains, at McAllen and San Benito. Not finding any of this disease in south Texas, nor at Matamoras, Mexico, disposes of the surmise that it might have been introduced from Mexico.

MATAMORAS, MEXICO

Several hours were also spent at Matamoras, acrosse the Rio Grande River from Brownsville. Several dozen orange trees, apparently all sour seedlings, were examined about the town, but no citrus canker was found.

VARIETIES INFECTED AND INJURIOUSNESS

Citrus canker has now been observed on the following varieties and species of citrus. The order adopted is according to the degree of infection observed. Pomelo, or grapefruit, is most seriously infected and heads the list. When fruit or twigs are not mentioned that simply indicates that no observations have been made:

Pomelo—leaves, twigs, fruit;
C. T.—leaves, twigs;
Key Lime, or Wild Lime—leaves, twigs;
Navel—fruit, leaves, twigs;
Sweet orange—leaves, twigs, fruit;
Satsuma—leaves, twigs;
Tangerine—leaves;
Mandarin—leaves;
King orange—leaves;
Lemon—leaves, twigs;
Kumquats—appear to be immune.

The greatest danger from this disease, for Florida, lies in the fact that it is principally a pomelo disease. As already stated, it attacks the twigs of these trees viruently, resulting in a putting out of more twigs, thus overloading the trees with small branches. It is also virulent in the manner in which it affects the leaves, spotting them, causing them to turn yellow and dropping prematurely. The worst of it, however, is the manner in which it affects the fruit. Judging by the few fruits that have come under observation, it appears safe to estimate that at the very least one-half of a grapefruit crop would be made unmarketable or reduced to culls, although probably not ruined for eating, as the cankers are only skin deep. It requires no extensive mathematical knowledge to discern that this disease may cause losses aggregating millions of dollars, if not eradicated.

It must be admitted, on the other hand, that, after all, we may know but little about the effects of this disease. There has been no opportunity to observe it in larger trees bearing considerable quantities of fruit. The fruit available was sent in by correspondents, and the writer himself found only one small specimen of grapefruit in the nursery at Monticello, but all of these had dozens of cankers on the skin. The pomelo trees at Grand Bay, Wiggins, and Alvin had no fruit on them at the time of examination.

While it is quite apparent that oranges are far less susceptible, it is also apparent that a large percent would become spotted and have to be sold as culls. The few fruits on a sweet orange tree at Port Arthur, Texas, previously referred to, indicate this.

ORIGIN OF CITRUS CANKER.

The evidence at present indicates definitely that it was imported from Japan on C. T. seedlings, and probably on other citrus. K. Saibara, of the Saibara Nurseries, Mobile, Alabama, stated that he saw the disease first, in 1911, on trees imported from Japan and planted in Tex-

as, but had never seen it in Japan. W. C. Griffing, of Grand Bay, Alabama, first saw it on C. T. seedlings from Japan, in Texas. Mr. J. Klumb, Manager of the Mississippi Farms Company, of Wiggins, Mississippi, first saw it in 1911 on C. T. seedlings imported from Japan. That all of this disease in Florida has not been sent to us directly from Texas is made clear in a letter just recently received from J. H. Giradeau, Jr., who imported the C. T. Seedlings for two of the infected plantings at Monticello. He writes: "I remember the blocks of trifoliata stock you mention, and these were imported stock, directly from Japan."

To what extent citrus canker is prevalent in Japan is not known. That it is there, was recently demonstrated beyond doubt by the receipt of specimens of this disease on leaf and rind of navel orange, directly from Japan. Professor B. F. Floyd, of the Florida Experiment Station, received these specimens during the middle of May, from a Japanese Plant Pathologist at the Kyu-shu Laboratory, Imperial Agricultural Experiment Station, Kumamoto, Japan. They were labeled "scab," indicating that citrus canker has hitherto been mistaken for citrus scab by the Japanese. That is exactly what happened in this country—the first specimens of canker sent in were diagnosed as "scab;" and it was only when an abundance of material became available that the writer successfully prevailed in his belief that the disease was not citrus scab (*Cladosporium citri*).

CAUSE OF CITRUS CANKER

This has been recently determined by Professor H. E. Stevens, of the Florida Experiment Station, to be a fungus.

THE SITUATION IN FLORIDA

All the infected stock at Monticello, except a small isolated block, has been dug and piled ready to be burnt. The small isolated block just referred to has been cut back to stumps and sprayed with Bordeaux mixture under the writer's supervision, and the owners will spray it several times more.

The infection at Silver Palm has been repeatedly treated with Bordeaux mixture, but some of the disease can still be found. Arrangements are being perfected to cut back all this stock to single stems or stumps and paint it with 2-2-2 Bordeaux, or 50 per cent. carbolinium.

The Florida Growers and Shipper's League, of which Mr. Lloyd S. Tenny is Secretary-Manager, are raising 2,000 dollars to assist in discovering new infections and to advise with the owners as to the proper methods to be employed for eradicating them. It is planned to place a regular deputy, under the direction of this office, but paid by the League, in the field for this purpose. He will begin to make this inspection in south Dade County, and later in other parts of the State where infections are suspected.

Shipment of citrus stock into Florida, from infected localities in the other Gulf States, have been made, and it is planned to look these up as soon as possible. At least two nurserymen in Alabama have furnished the writer with a list of their

shipments into Florida during the past year or two.

Discussion.

Prof. Rolfs: I would like to ask whether Dr. Berger has with him that somewhat acrimonious telegram from Texas to read to us, to see what the people say about his Rule 43.

Dr. Berger: As soon as I returned from Texas and the Gulf Coast States and made my report to the State Board of Control, they immediately passed Rule 43 which, I presume, will go down in history of Florida horticulture, perhaps as a land mark, absolutely prohibiting the importation of all citrus fruits from those states; not only from those states, but generally. Some provision, however, is made that small quantities of rare varieties may be imported, through special permit. That special permit is myself and the Board, and we may prescribe the restrictions under which they may be brought in. We may require them to be grown for a year or two in quarantine before the tree is given the freedom of the state.

I, of course, took pains to let these people know just what I was there for. I did not want them to feel that I was spying on them. I wanted them to know that I was looking up this disease. I let the Chief Inspector of the State of Texas know, and on the morning the Board was about to go into session at Tallahassee to adopt Rule 43, I received this telegram from Mr. Dickson. I saw Mr. Dickson while in Texas and he said, "What disease is it that you are looking for anyhow?" I tried to explain to him what it was. They are still laboring under the deception over there that it is nothing but sour scab. But Mr. Dickson's attitude is not exactly what it should be. Perhaps he has cooled down in the meantime. I will read his telegram to you:

"Houston, Texas, April 12th, 1914.

"E. W. Berger,
"Horticultural Board of Control,
"Tallahassee, Fla.

"Barring Texas Citrus stock from Florida account new disease regarded unfriendly believing new disease no more dangerous than your citrus scab and other Florida citrus diseases will force us to revise present regulations which in all probability will bar Florida citrus nursery stock from Texas. The conditions in Florida have always justified such action. If Florida should forget her obligations and bar Texas citrus stocks, Florida nurseries will feel the effect of our new rules keenly, as Texas is their most profitable field of operations." I believe in regulation but not in destruction.

"Sam H. Dickson, *Chief Inspector.*"

I do not think that it is necessary for me to make many more remarks after that. I do not think our Florida nurserymen are depending for their livelihood on Texas, just now. Florida's first obligations are towards herself; towards her biggest industry, the orange and grapefruit industry. We are within our rights, and Mr. Dickson shoots far from the mark when he speaks of retaliation. It is not a question of retaliation; it is a question whether we have a good reason why we

take this step. The Board of Control and myself saw that we had a good reason. We were backed up by the Growers' League and others whose influence meant much, and they told us they regarded our intended action as the thing to do, and it was done.

Mr. ——: I would like to ask if there is any similarity between the citrus scab spores and the spores of the canker, when examined under the microscope.

Dr. Berger: Can you tell us, Prof. Rolfs?

Prof. Rolfs: We are working to find out what the fungus is beyond all doubt, before we say anything definite about it.

Dr. Berger: Prof. Stevens is working on that, but his experiments are not completed, so that he is ready to go out and say "so" is "so."

The Construction of an Efficient Irrigation Plant

F. W. Stanley

Mr. President, Ladies and Gentlemen:

A study of the rainfall records for the last 22 years at Orlando, indicate that irrigation would be beneficial 17 years out of the 22, or that your groves should have been watered 38 times to get the best results. 7 years have been very dry. Namely 1892-3, 93-4, 96-7, 97-8, 1906-7, '08-9, '10-11, or one year in three has been dry enough to make the most sceptical wish that he had some way of watering his trees. The years 1897-8, and 1906-7, are still talked of as the years when even pine trees died from lack of water. The loss from these two years alone would pay for an efficient irrigation plant.

We are carrying on a series of experiments in conjunction with portable pump and engine and complete soil moisture apparatus, at Orlando and hope to be able to give you some actual figures on benefit of scientific irrigation, within the next year or two.

I will attempt to take up the construction of the irrigation plant in the order in which one would be constructed. We will assume first that the water supply is at hand, either in form of lake, stream, or good well.

The horizontal centrifugal pump, operated by either a gasoline or steam engine is admirably suited for most of the conditions found in Florida. The centrifugal pumps are cheap and very efficient for heads up to 150. They are very simple to care for and wear well. A pump with capacity of 1000 gal. per minute should be bought for $125.00 which is only a small fraction of the cost of the complicated triplex plunger pumps that seem to be quite popular.

The method to determine size of pump is very simple, and at the same time the least understood. Our experiments in studying soil moisture show that your grove should be covered with 2 inches of water, or to supply enough water to be the equivalent of two inches of rainfall. Next you should figure on covering your grove in about one week. The rest is simply a matter of arithmetic. You have the quantity and the time. For example suppose you have a ten acre grove. You will need to cover an acre and one half two inches deep in one day if you thoroughly irrigate your grove in one week. One acre two inches deep is about 54,000 gallons an acre and one-half would be approximately 70,000 gallons. This 70,000 gallons should be pumped in ten hours, which is equivalent to about 120 gallons per minute. A No. 2 pump would be about right for this case. If you own a 100-acre grove multiply the above by ten,

which means you will need about 1,200 gallons per minute, or a No. 7 pump.

I will not go into methods of figuring horse power of your engine as the process is a little tiresome to any but a mechanic. But if you know the quantity of water needed, the elevation of your grove, and the length of pipe line needed, the process is fairly simple. Your pump or engine man will give you the sizes needed from his tables.

We now come to the main item of the plant, namely the distributing system. I am going to keep on the same track that I have been on for the last two of your meetings, "The use of terra cotta or ordinary sewer pipe as distributers of your water." The reasons for using t. c. pipe is because of its cheapness and its durability. Probably the average price per foot of t. c. pipe is about one fifth of the ordinary iron pipes used, having the same capacity.

There are two things that are very important when t. c. pipe is used. First, lay pipe so that you will not have more than 10 to 12 ft. head on it, on account of danger of bursting the pipe. Second, get good pipe and lay it well. The secret of laying it well is to use a good rich cement plaster and tamp the plaster in the joints with a caulking tool, first putting in a layer of oakum. A good many of you have watched the laying of cast iron pipe. Well the process is very similar, using cement instead of lead.

To keep the pressure under the requirement needs a little care in laying out the lines. First of all use a steel or iron pipe till you get near the top of the grove. At the upper end of this iron pipe you will need to erect an open box or stand pipe, and from this lay the t. c. pipe. By this method you have a faithful safety valve as water will flow over the top of the standpipe before it can hurt your low pressure pipe. This standpipe is also used as a distributing center for the t. c. pipe.

The distributing pipes should be laid on the highest ridges of the grove so that water will flow by gravity to the trees. If the land has an uniform slope the lines should be laid from 400 to 600 feet apart in parallel lines, the slope being such that water will flow from the top line to the next below. The pipe should be buried deep enough to be beyond danger of a plow point.

There are two main forms of valves used on these pipes. The one used in California is composed of a vertical concrete pipe of large diameter cemented over main line. The water is let into this upright pipe by means of a horizontal screw valve or gate, and then water let onto ground through a number of little holes in the concrete pipe. The amount is regulated by little galvanized sheet iron lift gates. This form does not seem to be well adapted to our loose, porous sands in Florida, as the heads' supply are too small which results in considerable trouble and waste.

The cast iron gate or valve that works on same principle as an ordinary hydrant that is used to water your lawn with, is a good form to use. These valves are made with six-inch outlets and made to cement onto terra cotta risers or short pipes that in turn are connected to the main line that is buried out of sight.

These valves should ordinarily be placed in every other tree row so not to be struck by plow or harrow.

We have found by a series of experiments that water can be run over the sandiest of Florida soils if there is some grade and you have large heads of water. If the soil is the ordinary soil you will be able to distribute the water in four or five furrows running parallel about two to three feet apart in each middle. If the soil is very sandy you will need to make one furrow with a turn plow, in or near the center of each middle and rush a big head of water to the end, then flooding each tree beginning at the bottom. It is a good idea to plow a couple of cross furrows perpendicular to the water furrow, thus helping you flood your trees.

If the soil is too sandy or as is the case around Miami too rocky to use the furrow method, or as is the case in some parts of the West Coast too flat and bumpy, we can still use this same system by the utilization of the "Slip Joint method." This method of distributing water is used extensively in the west to irrigate alfalfa, where the ground is not leveled or the heads are too small to flood.

This slip joint pipe, is simply a portable galvanized sheet iron pipe of lightweight, usually made in ten foot lengths and slipped together like stove pipe. One man can handle a ten foot joint of ten-inch pipe with ease. Six-inch pipe will be large enough to handle 300 to 400 gallons per minute, and can be handled much easier than hose.

I will not go into much detail concerning methods of handling and making such pipe, as methods are almost self evident. The pipe fits onto the valve described above and water is flooded around one tree at a time by beginning at the top and putting on a couple of joints when you wish to water another tree. In other words this pipe takes the place of water furrow. It is more trouble than handling the water furrow, but it is adaptable to all conditions and does not permit any waste. I wouldn't use it if conditions would permit of the furrow or flooding method.

In conclusion I wish to emphasize that the methods described above are advocated because they are cheap and efficient, and can be adapted to nearly, if not all of our Florida conditions. The cost of such a plant on the average grove, should be from $20 to $40 per acre, for the distributing system alone. The pump and engine, a steel line needed, should average somewhere between $40 and $50, making the total from $50 to $80, per acre. The lower figure favoring the large plant. Understand that this is for average conditions, and would not fit cases where the grove was a long distance from water supply and lifts were excessive.

Compare this with the cost of installing some of the present plants, costing from $250 to $500 per acre. And remember that interest on first cost and depreciation goes on for ever, whether you are irrigating or not. For instance if a plant costs $500 to install, you should allow 20 per cent for interest and depreciation or $100 a year, or you must make $100 more per acre on the irrigated grove than on the non-irrigated. If the first cost was $50 this would amount to only $10.

I will not take time to go into details

of when and how to apply water. I will simply say don't be afraid to put water on your grove. Don't sprinkle the dirt to a depth of one half inch and go to the house and say you have irrigated your grove, because you haven't. Don't be so particular how you get water on your land, but be more particular how much.

If there is any thing I can do to help any of you that wish a little engineering assistance, address either Department of Agriculture, Washington, D. C., or Orlando, Fla.

Vegetables

THE CAUSES OF FAILURE IN TRUCKING AND VEGETABLE GROWING IN FLORIDA

C. H. Kennerly

Mr. President, Ladies and Gentlemen:

There are some failures in vegetable growing in Florida, that cannot be foreseen and guarded against. The failures I refer to are those due to climatic conditions, and I will, therefore, try to deal with the failures that can be avoided if proper precautions are taken.

First, I may mention the numerous failures made by new settlers, who come to Florida expecting to make their fortunes in a few months. One of the reasons that so many of these people do not make a success is because of the extravagant promises that some of our Florida Colony Companies make them. They tell these people, who know nothing of the conditions in Florida, that they can come here with a few dollars, sow some seed and make from $500.00 to $1,000 per acre with very little work and without a chance of failure. When the new settler arrives, he finds it entirely different. He must build a fence around his land, then clear it, put down a well and get his soil in good condition. Besides this, he has to fertilize his land, buy implements and seed, and give the crop careful work and attention if he makes a success. After the crop is made he finds that he cannot dispose of it for a profit, because he has not enough vegetables to load a car, and is located away from a trucking section, with few, if any, neighbors to help him out. He has to haul his produce to some distant express office and consign it to a commission man whom he does not know, and the chances are, no matter how good his produce is, or how well packed, he will not make any profit out of it. If the new settler who comes to Florida would locate in a trucking section, where the growers are making a specialty of the crops he wishes to plant, and where he can watch his neighbors cultivate these crops, and last, but not least, be able to sell his produce at the station after it is grown, he stands a good chance of succeeding.

Now that we have looked into some of the causes of failure of the new settlers, let us take a look at the experienced trucker, for he, too, makes a failure some times. When I think of this, it brings to my mind a lage truck farm that I visited in central Florida several years ago. This farm was well located, and the soil was excellent. It was in a large trucking sec-

tion where the owner could sell his produce at the station. He had his entire tract irrigated with the Skinner system, which I should judge, cost him several thousand dollars. But one thing he did not have. He did not have his land properly cleared. He had spent thousands of dollars buying his land, fencing it, putting in an up-to-date irrigation system, and had taken out very few, if any, of the stumps and roots. Think of it, having everything up-to-date and plowing around stumps, which not only kept his land acid, but doubled his labor bill. These could have been removed with a few days' labor, a stump puller, or a case of dynamite. This man made a failure and he had no one to blame but himself.

Another cause of failure in trucking in our State comes from not having a complete irrigation and drainage system. This is one of the most important things in the vegetable business. You must have a system that will not only supply your crops with water when they need it, but take off the surplus water when they are getting too much. It is the dry weather and the excessive wet weather that makes short crops in this country, and the grower who has a complete irrigation and drainage system, has an insurance against both of these. When crops are short, they are naturally high, and it is not an unusual thing to see a grower who has an up-to-date system of drainage and an irrigation system pay for same in one season. If you will show me a man in the vegetable business in Florida who has his land in good shape, well drained and irrigated, nine times out of ten, I will show you a man who is making not only a good living, but has a nice little bank account.

The improper use of fertilizer is another important cause of failure. Time and again I receive letters from growers who want to know what is the matter with their crops, and when I ask them a few questions, I find they applied their fertilizer and did not give it long enough in the ground before planting the seed. There is only one make of commercial fertilizer that I know of that can be sown and planted upon immediately; the others require from seven to ten days before the seed can be planted. Another point about fertilizing that a great many truckers do not watch is, that when they have planted on porous soil and get a heavy rain that washes the fertilizer out of reach of the roots or feeders, they do not apply more fertilizer at once. The fertilizer they had in the ground is gone and unless the plant receives something to feed upon, it is bound to go backward. I have always advocated applying only part of the fertilizer you wish to use, to a crop, at a time. You not only do away with the chance of the fertilizer being washed out of the soil, but you get better results from its use. Another point, sometimes overlooked, is that the analysis of the fertilizer should not only suit the crop, but the soil as well.

Many vegetable growers think it matters not where they buy their seed, so long as it is the right variety. They think it will make a good crop, but this is not the case. Take, for instance, sweet corn; if you use Western grown sweet corn in Florida, you will not get as good a crop

as you would from Connecticut grown seed. The same thing applies to Bermuda onions. The only Bermuda seed that will do anything in Florida comes from the Canary Islands. Some of the seedsmen in different parts of the country will sell California grown seed, but for planting in our State, this is worse than worthless, and will cause a failure every time. There are a number of good seed houses in Florida and Gerogia, who understand the conditions here, and if a grower will patronize them, he will not run the chance of getting seeds that are not suited to Florida.

Every vegetable crop grown in our State should be sprayed from the time it is large enough until it matures. The majority of them should be sprayed with both fungicides and insecticides, to keep off fungus diseases and insects. Some crops, like potatoes, do not require any spraying except with the fungicide. A great many growers contend there is no need of spraying a crop unless diseases or insects attack it, but if you watch these men for five or six years, you will find that they lose crops every once in a while from diseases and insects that they could not check before the crop was gone. If they had sprayed as a matter of policy, they could have prevented these attacks. Don't think that after the crop is made, you are through, and can put it up in any kind of manner. This is the biggest mistake that you can make. The most important thing is to put your produce up in the correct style crates and pack it in the neatest and best manner.

While I have not gone into all the causes that are likely to make a grower lose his crop, I have given some of the most important ones, and if a truck grower will watch these he stands an excellent chance of not only making a crop, but of making some money. There is no place in the world where, by giving the vegetable business the same careful attention you would give to any other business, that you can make money as easily and quickly as you can by growing vegetables in Florida. If a man will come to our State, buy a tract of good land, suited to the crop that he wishes to plant, situated in a section where they are making a specialty of raising the vegetables he wishes to grow, put up a good fence, clear his land, taking out every stump, root and stick, put in an up-to-date irrigation and drainage system, plant seed suited to Florida, give his crop careful attention and cultivation, watch the plants and give them what they need, from the time they come out of the ground until they are matured, he will make a success of his work in most cases.

As I have said above, the rules given do not apply to every case, but they will keep off many a failure, and help the inexperienced farmer to make money where he would otherwise make a failure.

HIGH-GRADE VEGETABLE RAISING IN FLORIDA

L. LaTrobe Bateman

Mr. President, Ladies and Gentlemen:

When a man finds he has a certain monopoly in some trade, it is certainly good business to expand that trade to the utmost extent. Not only should he use every endeavor to extend it but he should also, so long as he holds the monopoly, expand every branch directly pertinent to it.

Yet, what do we generally find? A monopoly becomes a hobby, and the hobby is ridden to death. As a rule there is no further expansion. The mind runs on the one thing and soon gets into a rut. It is good enough that the monopoly exists. What need therefore for extension or expansion or further development. How great the tendency and the temptation to "let well-enough alone."

Florida possesses a monopoly, and one that will serve for all time to bring her wealth. This is the monopoly of the trucking industry during the winter months and the ease and certainty with which she is able to supply the demand of the northern and eastern markets for fresh vegetables during a time of year when it is impossible to either grow or obtain them from elsewhere in the Union.

Fortunately up to now Florida has not gotten herself into the rut I suggested as so often the outcome of a monopoly, though there are sections within her boundaries where exist signs of a slight tendency towards that evil. Sections where lettuce, celery and tomatoes succeed each other every year with a regularity on a par to clock work, and with little or no modification or change in the varieties grown of each.

Now it must be remembered that in shipping vegetables, especially salads, during the winter months the trucker is catering to a very high class trade. It is not so very long ago that such a thing as a perfectly crisp fresh lettuce, in New York as an example, in the month of December or January was a pure luxury and could only be found on the rich man's table, certainly not in the general market.

Thanks in a measure to Florida and her climate, lettuce and celery can now be found in the markets during the winter months, but still it is high-class trade. High prices are maintained for this "out of season stuff," and the principal consumers are the extra well-to-do and the first class hotels and restaurants. If this were not so the humble grower in Florida would not get the prices he does for his products.

But are we catering to this trade as we should, or are we feeling so secure in our monopoly that we are contented to leave "well enough alone?" I sincerely trust not.

As an example of what the requirements of a first class hotel or restaurant are now during the winter months I will cite those of the Waldorf-Astoria in New York. It is typical of the rest. They are the results of special studies I made

some four years ago relative to Florida produce in the New York markets, and what I give below is the summary of a conversation, one of many, I had with the man at the head.

The season for these vegetables runs approximately from the first of December to the first of April, after that date produce commences to come in from nearby points. The quantities of each consumer are very large, and to those who do not know the inside workings of these large hotels the quantity would seem almost fabulous.

They require:

Peas, early green, practically all the time. A large quantity has to be imported.

Beans, stringless and green, also *lima* of which a very large quantity is used.

Lettuce, all the time, Head and Romaine, especially the latter, of which they do not get nearly enough supplied.

Chicoree, provided it is well bleached and the heads are large.

Egg plant, if of very fine quality and unblemished.

Cabbage, both Flat Dutch and Savoy, medium size but very firm.

Cauliflower, small, white and firm.

Cucumbers, special sort only, not as at present grown in Florida, should be 6 inches to 8 inches long with flesh of a greenish tinge.

Brussels Sprouts, small and firm and well closed.

Celery if firm in heart and *really* bleached.

Artichokes, (Globe), if fine and large, the smaller for garnishing only; the large are at present imported from France.

Analyzing this list, peas and beans are being shipped in increasing quantities. But do we commence to ship them early enough? We can have peas and beans by Christmas here, why not grow for that season's market up north as well as for the present market. I had on my table this winter on Dec. 4th, Henderson's Full Measure (Stringless) bush beans, exactly 53 days from date of sowing, and I had in 40 days from date of sowing (October 12) the first dish of green peas (First of All), and the supply of both was continuous through January into February. Then, mark you, I said *stringless* beans. Here is a rut we should get out of, the growing of string beans. Why grow string beans when we can grow them without strings. The first class trade demands the stringless variety, principally as labor saver.

Regarding lettuce there is with a certain trade an insessant and increasing demand for the Romaine variety. Is enough of this grown in Florida? Hardly. The tendency to keep to the rut of Boston Head is very strong. I sowed Trianon Cos on the 16th November last, the seed sprouted on the 20th, the plants were transplanted on December 21, and I had the first lettuce on February 14th, in just 90 days from seed. By earlier sowing, the Romaine being a special early variety, the northern markets could be supplied in late December. The demand is there and the prices capable of being realized would warrant shipping by express.

Chicoree or Endive is another salad plant in great demand. The only drawback to it is that it is not a very good shipper, decay setting in very soon after

the hearts have been blanched. Still with the facilities we now have for rapid transit this should not be a hindrance to getting this salad plant into the New York, Boston and Chicago markets where would be the greatest demand.

Relative to cucumbers observe the note "Not as at present grown in Florida." If they want them with flesh of a greenish tinge why should we not supply what they require. True, the Perfected White Spine meets the general requirements of the markets, but why keep entirely to that if we can expand another variety as well into other channels. Why miss that chance?

The last on the list which calls for special remark is the Globe Artichoke. New Orleans seems at present to have the monopoly of growing these to any extent for market, and even she does not fulfil the requirements demanded by the high-class trade, as the large heads and best varieties are still imported principally from France. Of the easiest culture, and a perennial besides, artichokes should be ranked in Florida amongst her staple vegetable crops, and artichoke growing should be as much a feature of her trucking industry as are lettuce, celery and tomatoes.

These are but a few thoughts and items on what I consider an important branch of trucking in Florida, namely that of catering specially to early and high-class trade and in addition to supplying the demands of the general markets. There is ample room for extension and expansion in both branches.

Discussion.

Prof. Rolfs: May I have a word to say in regard to this Committee. I do not know what kind of a charm there is about this matter of being on the Committee on Vegetables, but years ago when I had some experience in connection with the making of the program for the Horticultural Society, I had the same experience as Prof. Hume. If you want to keep a good horticulturist away from the meeting, put him on the program and you will accomplish it. It works like a charm on the Vegetable Committee. I don't think anything else would have kept Mr. Kennerly away. He will go several miles to attend a meeting of the Horticultural Society, but when the Society comes to him, he can't come to the meeting and read his paper.

In regard to the vegetables, ladies and gentlemen, in reviewing the literature as presented today, in addition to the information we are in position to possess, I am astonished at the development of the trucking industry in Florida. Do you know that the trucking interest of Florida in itself is running neck and neck with the citrus industry, and this year will probably surpass the citrus? Do you realize it? I don't believe the people generally have realized what our trucking interests in Florida really are, and I would not be surprised if in five years the money returns for the vegetable product will surpass the citrus returns.

There has been an increase of 900 per cent in the amount of truck grown, and there has been some general advancement

and improvement in the marketing methods, but not all that could be desired.

We need to give this matter more attention, and I am as anxious as the president of the Horticultural Society to discover some means whereby we can get the men on the program to come here and fight out these questions just as we do other questions. It is not because this matter is not given sufficient importance on our program, but because they take "French leave" of us when we get them on the program. I wish some one could discover some remedy. We need to be a society well rounded out, and we need to take in all the horticultural interests. I hold that the constitutional provisions are so broad that we can do almost anything that will build up the horticulture of the state. We need to look after this trucking industry just as much as we do after the citrus.

There were some things in that paper I would not agree with. Take, for example, the matter of growing Globe artichokes. If we fail, still we ought to try them again, because if at first you fail, don't give up. I have tried asparagus for over fifteen years and am still trying it; trying it in different ways. I do not encourage a man to plant eight or ten acres of asparagus in the hope of marketing asparagus, but I do want anyone with any degree of experience along asparagus lines to put in enough to try it out for himself. The man who has learned how to grow that crop in other states ought to take it up and study it in a small way—an experimental way.

Mr. Hume: I most heartily re-echo Prof. Rolfs' words in regard to this program matter. A member of the Society may come here year after year, but if you put him on the program, he will stay away. It certainly works like a charm.

Mr. Mills: I think Mr. Kennerly ought to be excused from that. He wanted to be here, but to entertain the Society there is a baseball game being given this afternoon and he had to be on the team. He really wanted to come, so I think he ought to be left out of that.

Mr. Hume: Well, it has been my experience and observation that baseball and horticulture won't go together. (Laughter.)

Mr. Hart: That last paper recommended the growth of artichokes. I know some who have failed. It is a most delicious vegetable and if we can grow it we ought to do so. A few years ago it was selling for $5.00 a pound. I would like to know if anyone in this audience has made a success of it.

Mr. Gaitskill: I have tried it, and I have failed.

In regard to the Romaine; it is a good form of lettuce and demanded by the market, but in limited quantities. A man with a carload of Romaine lettuce would wipe out the New York market. It is well to plant it, but only in very limited quantity.

Mr. Hume: That is true with many vegetables. The market will not stand a large amount.

Prof. Floyd: I would suggest another point. Mr. Kennerly's paper dealt with failure of the new comer. We have some master minds who are succeeding

in growing vegetables on a large scale and we parade those so much it encourages new comers to go into it on a large scale. I think sometimes we make mistakes along that line. Vegetable growing, as a general rule, is most successful when undertaken on a small scale with other things, such as general farming, stock raising, etc. A large venture should grow up gradually.

Peaches and Deciduous Fruits

Ira D. Soar

Mr. President, Ladies and Gentlemen:

Probably the most serious handicap to the production of peaches and other deciduous fruits in Florida lies in the wrong cultural methods which are usually accorded them. Every kind of plant or tree should receive that care which suits its special requirements. If a farmer or truck grower should plant corn, beans, cucumbers, cabbages, strawberries, etc., at the same time and care for them in the same way, he could expect but one result—failure, in most of his crops. Yet a large number of growers plant peaches and other deciduous fruits, give them the same care accorded citrus trees, and, because the results are not satisfactory, declare Florida is not a peach country. It is more often true that the grower is not a peach man. There are some deciduous fruits that do not thrive in Florida but peaches, pears and plums, when judiciously planted and properly cared for, should give as large, if not larger, returns than in any other part of the country. However, each kind of fruit should have proper attention as to varieties planted, character of soil, selected for the orchard and care accorded. Not only do deciduous trees differ from citrus in cultural requirements, but peaches differ from plums and plums from pears. The real difference in peach and citrus culture is not so much in cultivation and fertilizers as in pruning, spraying, etc. Peaches, as well as citrus trees, have diseases of their own, and some of them are very vital. In order to succeed, it is just as important to understand the nature of these troubles and how to treat them as in the case of citrus trees.

PEACHES

Although nearly all well-drained soil will produce good peaches, a clay loam usually gives best results. If trees are on peach roots plant only on virgin soil; when plum roots are used it is not necessary to have new land. The earliest varieties should always be set on the highest land so as to escape late frosts.

Plant only varieties of South China and Spanish strains, and preferably the former. The North China and Persian strains do not do well in Florida. The Elberta and many other varieties held in high esteem in other states are not suited to Florida conditions, and should not be planted here. The Jewel is our earliest market peach, and, owing to the fact that it goes in on an open market and has no competition for two or three weeks, is unquestionably the best commercial peach for South Florida.

Peach trees on peach roots should be fertilized liberally the first year, receiving four to seven pounds of a formula

suited for young citrus trees. Trees on Pasco plum roots should receive only two to four pounds the first year, as the plum is a very gross feeder, and is inclined to force too rapid a growth when excessive quantities of ammonia are applied. It is best to divide the fertilizer into at least three applications, beginning soon after the trees begin to grow and continuing until the first of July. Larger amounts should be used the second year, containing at least eight to ten per cent of phosphoric acid and ten to twelve per cent of potash, as the trees come to the fruiting stage. This should be divided into at least two applications, one in January or February and the second from March to May, varying in time as to whether the variety is an early or late one. Kainit is a valuable source of potash and is beneficial in killing root-aphis and other insects in the soil.

Give clean cultivation the first year. When trees are on plum stock, cow peas, sweet potatoes and truck of all kinds may be grown between the rows. Never plant oats in a peach orchard except for a winter cover crop. The second year give clean cultivation until May or June and then seed to beggar weed or cow peas.

Few Florida growers realize the importance of proper pruning at the right time. The trees should be cut back almost to a straight stick when set. After the first year they should again be headed in closely before growth starts in the spring, and trained to take on an open vase shaped form. After the second year most of the pruning should be done in the summer after the fruit is off, and the trees always kept headed in so that no fruit ladder will be needed. Our long summer allows the early varieties to form a good fruiting top again before fall. This gives the growers of Florida a great advantage over those in other states. Fruit on properly pruned trees of a given variety ranges one-third to twice as large as that on trees that have been allowed to run wild, and many years are added to the life of the trees.

Root knot is caused by a microscopic nematode closely related to the parasite that produces hook-worm in the human family. It attacks cow peas, tomatoes, okra and many other plants, but is especially bad on peaches in South Florida. Planting on virgin soil will usually insure freedom from this disease for two or three years. However, the most satisfactory method of avoiding it is to plant trees propagated on plum stock. Several varieties have been tried out and so far the Pasco plum has given the best results. It does not stunt the trees as Marianna and some other stocks. Trees on this stock should be grafted four to five inches below the surface of the soil, as much more satisfactory results can be obtained than by budding in the usual way. Your committee does not recommend the plum stock as a panacea for every ailment of the peach. It solves the root knot problem and leaves the trees just as susceptible to other diseases as if they were on peach roots. However, by using this stock an orchard may be planted on old land, and, by replanting trees that die from time to time, may be kept indefinitely on the same land. The humus content can be kept up by growing cow peas and beggar weed in the summer.

Many trees in this state give evidence of having their roots attacked by aphis. The trees take on an unthrifty appearance, the leaves turn yellow, droop and curl somewhat, and if no treatment is given often succumb. Soft soap, the old time remedy, is applied by drawing the soil back from around the body and main roots of the tree, pouring in the material and replacing the soil. Ground tobacco stems and ashes are also beneficial when used in the same way. Kainit, used at the rate of about ten (10) pounds for a five or six-year old tree is about right, and this material should be distributed evenly over the ground as far out as the roots are likely to extend.

As San Jose scale is widely disseminated and can be found on nearly every farm in many communities of the state, it is likely sooner or later to find its way into the newly planted orchard. Spray in the winter with lime and sulphur, or one of the oil preparations diluted one part to fifteen or twenty parts of water, and with Whale Oil Soap or an oil preparation diluted one part to twenty-five or thirty parts of water in the summer. Where no fungicide is used some of the beneficial fungi can be introduced. They help materially in controlling the scale during the wet season.

Those who are at all familiar with peach culture have seen the "peach-borer." It is a Lepidopteran larva that lives between the bark and wood just below the surface of the ground and causes an exudation of gum and woody material. In Florida the eggs are deposited a number of times during the year and are placed a little above the surface of the soil. These eggs hatch and the larvae burrow between the bark and wood. They attain a size of three-fourths to one inch in length, then spin a cocoon of silk, chips and gum, and in a few days emerge into the adult stage, resembling a wasp somewhat. Many trees are destroyed by girdling if the larvae are not removed. This is usually done with a knife or wire and is called "worming." It is important to remove all borers, as those left not only continue to girdle the tree, but will soon emerge to raise another brood.

"Gumosis" is a fungus disease that usually attacks the trees among the limbs, but is sometimes found at their base. It is caused by the same fungus that produces "gumosis" of citrus trees. When at the surface of the ground it is sometimes mistaken for the "peach-borer" but can be distinguished by the fact that no woody material is present in the mass of gum exuded. The bark should be removed over the affected area and carbolenium applied, when the disease has attacked the body or large limbs. Where it is confined to the smaller branches they may be removed in pruning.

Did you ever see peach, pear and plum blooms wither and fall? This was the work of thrips. They also attack orange and grapefruit bloom, vegetables and flowers. It is not easy to estimate the amount of damage these insects do in Florida, but it must total many thousand dollars annually. They are small, usually less than one-twentieth of an inch in length, and very slender, The eggs hatch in three days into wingless yellow larvae, and in twelve days reach the adult stage. They run and fly readily and some of

them jump long distances. Several different sprays are recommended. Black leaf tobacco extract diluted one part to fifty or seventy parts of water is very effective, and one quart of commercial lime-sulphur added to each fifty gallons of spray improves its adhesive qualities. This should be applied directly into the blooms as it opens, and, if necessary, again before it falls.

Nearly all of us have seen worms in peaches. They are caused by the sting of the curculio beetle. The insects sting the fruit and lay their eggs, which soon hatch and develop with the peaches. Affected fruit often drop before sound fruit is fully matured. The larvae come out of the drops and bore into the ground, where the pupal stage is passed. The adult, emerging from the ground, completes the life cycle. It is very important to pick up all drops or turn hogs into the orchard to consume them as every larva that passes into the ground and completes its life cycle, emerges as a beetle to sting other fruit. Many can be killed in the soil by cultivating intensively and applying kainit. Jarring the trees early in the morning and catching the beetles in a sheet is practical only where the number of trees is very limited but where fruit is grown on a commercial scale it is necessary to spray. In some localities curculio is accompanied by brown rot. Where both are present spray with lime-sulphur or Bordeaux mixture to which has been added one and one-half to two pounds of arsenate of lead to fifty gallons of spray. If no brown rot is present, do not use the fungicide as it will kill the friendly fungus. The first application should be applied soon after the bloom falls and again in three weeks. A third spraying is sometimes necessary where the beetles are very numerous.

PEARS

The selection of proper soil for the pear orchard is very important. Pears are probably influenced by the soil conditions for success or failure more than any other kind of fruit. They thrive best on very thin sandy, well-drained soil, such as is not most suitable for corn and other crops. Trees on heavy gravel, hammock, muck land or any soil that is not well-drained, are usually attacked by blight more than on light, sandy land. The bacteria that cause blight enter through the bloom and tender growth, and as the growth of trees can be better controlled on sandy land, trees on it are less likely to be attacked. Affected trees should be cut back so as to remove all diseased parts. All fruit spurs must be removed from the larger limbs as blight can enter through the bloom, and where fruit spurs are left on large limbs the disease may enter directly into them. Where it enters the smaller limbs only, they can be cut away without sacrificing any considerable portion of the tree. As mentioned under peaches thrips attack pear bloom, and the common failure of the crop in Florida is due to this cause. Even the tender foliage is attacked to such an extent that the leaves are diminutive and present a withered, ragged appearance much as if they had been exposed to fire. Black leaf tobacco extract, as mentioned before in this report, holds the insects in check. While

San Jose scale sometimes attacks the Smith and Garber, it is seldom seen on other varieties in Florida. The Cincincis and Sand Pear do well in some sections of the state, but in Pasco county the LeConte, Keiffer and Smith are most popular.

PLUMS

There are several varieties of plums that can be highly recommended for planting in Florida. Among the most popular varieties are the Kelsey and Excelsior. They are splendid for home consumption and sell in the markets at remunerative figures. The idea advanced by some horticulturists that native wild plums planted close to the cultivated varieties will make the latter fruit more abundantly, is, in South Florida at least, not correct. This is readily understood when you consider that the wild plums usually bloom several weeks before the cultivated ones. The failure of plums to set in Florida can in almost every instance be explained in one word—thrips. The remedies recommended for thrips, San Jose scale and curculio under peaches applies alike to plums. Plums can be grown on very light soil, such as is recommended for pears. The Kelsey, especially, does well on thin land, and, although the fruit is smaller the quality is much better than when grown on a soil that is rich in organic ammonia.

Among other deciduous fruits there are a number of varieties of Japan persimmons that do well, and bring good prices. Figs do well in localities where they are not attacked by root-knot.

In closing this report, your committee recommends the more extensive planting of deciduous fruits, and especially peaches and plums, either in orchards by themselves, or between the rows of your citrus trees. By proper attention they can be made to pay the way of the citrus grove and a handsome profit besides. In one way deciduous and citrus fruits are much alike. They will pay ample returns for good care but nothing for neglect.

Discussion.

Mr. Hume: Personally, I feel very much indebted to Mr. Soar, because it is so difficult to get anyone on this committee to report. We have certainly had an unusually good report this morning.

Mr. Colby: Will that report be printed in the book?

Mr. Hume: Oh, yes, Mr. Colby; everything that has taken place at the meeting will be printed in the report.

Mr. Floyd: I would like to know whether the root knot does not affect the plums very seriously.

Mr. Soar: There are a great many plants I believe the root knot does attack, where it does not attack them to such an extent as to really injure them very much. I have never noticed that it injured plums to any great extent. Did you notice that it injured the growth of the trees very much;

Mr. Floyd: Not very much.

Mr. Hollingsworth: I understood the paper to read that you budded or grafted the peach some three or four inches below the surface of the soil. Do we understand

that the peach tree under the soil will not throw out its own root?

Mr. Soar: Not to any great extent. I have seen them throw out roots and, of course, where they do that the root knot will affect the peach root the same as in any other case. Roots are sometimes thrown out by the peach where worms have been removed. This is, however, very seldom.

Mr. Hollingsworth: I got my first planting on plum roots, planting them on virgin soil. I also planted the plum stock on virgin soil, thinking it would have the same effect. I understood you to say that it is practically immune from root knot, regardless of the soil on which it is planted.

Mr. Soar: We are growing fruit at home on land that has been cleared something over thirty years. Some of the land has not been cleared that long, but some of it has been.

I might make a statement here that I would like to emphasize. In planting peach trees on plum stock, you do not want to apply too much ammonia, while the trees are young. If you apply large quantities of ammonia and force the trees to too rapid a growth the first few years, the results will not be as satisfactory. They will make too much top and not enough root. It is very important to apply a small amount of ammonia; that is, only enough to produce a good, vigorous growth. Never force the top to make an excessive growth.

It is also important to keep the trees well pruned back. Some orchards will die out in a few years if not pruned.

Some of our orchards have a number of trees that range from fifteen to twenty years of age; one orchard will run something like fifteen to eighteen years old, where fully one-half of the trees originally planted are still living. The soil is sandy with a little clay and a very few pebbles.

Mr. Hollingsworth: The ordinary plum we bud on is not as healthy a grower as the peach, and therefore the peach outgrows the root.

Mr. Soar: You will find in some cases the peach will outgrow the plum, but if you will graft them underneath the ground, you will find that it reduces the difference in rapidity of growth to a minimum.

The budding or grafting of peach trees on peach roots is not to be recommended for South Florida.

Mr. Watson: The peach growers in California have great success in the use of Asphaltum for borers. It is heated and applied warm enough to run. It hardens and makes a perfect protection against the assaults of the borer. It is applied in the spring and kept there until after the dangerous season is over.

Mr. Soar: There must be at least two broods during the year, because in removing the borers from peach trees, I have seen large and small borers at the same time. Go into an orchard where the borers are not well removed from the trees and you can find them working in the trees at almost any period throughout the year. I have seen large borers and small borers working in the same tree at the same time.

Mr. Knibler: I would like to say a word about this, too. I do know that

we do have a brood about the first part of June. There is no question about it; that is, I am referring to the peach tree borers.

Mr. Patillo: I would like to add, in connection with the pruning of the trees; I don't know whether the paper stated that or not, but in pruning always make your cuts from good, strong, thrifty limbs, turning the cut toward the outside of the tree, and always have the center of the tree so that the air can get in there. That refers principally to peach trees. I think it is mostly used to enable the peaches to color.

Another thing, in thinning the peaches, I do not know whether that is done in Florida or not. I know it is done in the north and the peaches would not bring any price at all unless they were thinned. In thinning them, they are left about four inches apart, and this is done as soon as the peaches are set.

I would like to ask, too, what kind of cultivation is used in a peach orchard; how deep is the cultivation?

Mr. Soar: The peach orchard is cultivated up to about the beginning of the rainy season, at least to about the first of June. Of course, that will vary a little with the variety of peaches. It is not as necessary to cultivate the early ripening varieties as late as those ripening later in the season.

In regard to the depth, I think it is best to cultivate young trees deeper than the older ones. Of course, it is not a good idea to break too many of the roots of any kind of a tree, under usual circumstances.

In regard to the pruning, the statement just made was correct; the tree should be pruned to an open, vase-shaped form so that the limb will tend to grow out.

The thinning is also very important. We always believe in thinning the peaches so that they will not grow more than one peach every four or six inches. That is a very important point. A great many people in Florida do not thin their peaches, and consequently have small fruit when they could have fruit that would run twice as large.

I think this has a great deal to do in connection with increasing the size of the peaches, as well as pruning.

There is one point I overlooked mentioning in regard to pruning; that is, the fact that it is very important to prune the trees in the summer time after the fruit has been removed in the case of bearing trees, because if you prune them in the winter or spring, you will force a large growth of green material, that is, leaves, and where you have so many leaves you do not get your fruit so well colored up.

Mr. Hollingsworth: I do not catch the idea why you cut at an angle from the trees.

Mr. Soar: That is to make the tree take on a vase-shaped form. If you cut the other way, you will force the limbs back to the center of the tree. By cutting the limbs to grow outward, the light and sun come in contact with the fruit and make it much more highly colored.

It is very important to have the fruit highly colored. Fruit that is well colored will always bring a much better price in

the market than fruit which is green-looking and uncolored.

Mr. Hume: The idea is they are cut to outside buds.

Mr. Patillo: You might add to that a close cut and a smooth cut is preferable to a long cut, because in a long cut the limb is liable to die back quite a distance. Make a cut where there is a good, strong limb.

The Pecan Case-Bearer

John B. Gill, Bureau of Entomology, Monticello, Fla.

Mr. President, Ladies and Gentlemen:

The most injurious insect affecting pecan culture in Florida is the case-bearer known to science as *Acrobasis palliolella* Rag. It would be well to adopt the term—pecan case-bearer—for the common name of this species, and thus do away with much confusion. In many sections of the pecan belt I have found growers referring to this species as the bud-moth or bud-worm, and of course, the larvae do injury to the buds, but since we already have a common pecan insect known as the bud-moth, why not use the name—case-bearer—for this pest. This name is very appropriate for during its entire existence as larva and pupa, it lives within a case which does, however, assume various designs and is attached to the tree in different manners throughout the course of a year.

As stated before the case-bearer is the most serious pest attacking the pecan in this state. The larvae, as they emerge from their winter cases (hibernacula) which are snuggly packed around the buds, attack the buds often before they have a chance to unfold. When the infestation is severe, the larvae destroy nearly every bud on the tree and at a distance the entire tree takes on the appearance as if a fire had destroyed its unfolding buds. If the "worms" are numerous, the trees will have a hard struggle to put forth foliage as fast as it is destroyed. Pecan trees are sometimes kept defoliate for several weeks in the early spring on account of the ravages of this insect. Where the young leaves do get a start the larvae web them together by means of silken thread and construct their cases amid these leaves, which soon become badly eaten up and in many instances wilt and dry up. The injury is not wholly confined to the buds and younger leaves, for the older, well-developed leaves are often eaten full of irregular holes. As the larvae destroy both the blossom and leaf buds they often are accountable for a short nut crop in badly infested orchards.

DESCRIPTION

At this time of year the case-bearer is found as larvae securely protected in cases that are attached to the foliage. These cases are an aid to one in readily determining the species. These cases are made of particles of brownish excrement along with bits of disintegrated bark that are closely woven together with silken threads and lined inside with a smooth compact surface of grayish white silk. They vary in length from three-quarters of an inch to an inch and are slightly enlarged in the middle. The case when the larva is nearly matured is always attached by

means of a foot-stalk of grayish white silk to the petiole of the leaf. At first the case is somewhat curved, but before it reaches its full growth, it becomes quite straight and the unattached or free end is always larger than the attached one. The fully formed case, which is of a brownish gray color on the outside and silver gray within is so tough and compactly constructed that it cannot be torn apart without much effort. This house affords a good means of protection for the larva against its numerous enemies. Just before the larva pupates it closes up the distal end of the case with a rather flimsy layer of silken threads.

The full grown larva measures about three-fifths of an inch in length and is of a nearly cylindrical shape, tapering slightly at both ends (more posteriorly than anteriorly). The skin is quite wrinkled and the general color of the body is very dark green with the head shiny brownish black. The prothoracic shield or neck is lighter in color and the second thoracic segment has two well defined tubercles. There are five pairs of prolegs, which are provided with a circle of very small hooks, and by means of these minute hooks, the larva is able to cling tenaciously to its case.

The pupa is shiny, mahogany brown in color, measuring about two-fifths of an inch in length. It is without any conspicuous markings. Upon emergence of the moth the pupal skin is not extended from the case.

The adult or moth has a wing expanse of about five-eighths of an inch. The general color is gray marked with whitish, cinnamon brown and black. The region of the head between the eyes, the thorax and upper parts of the legs vary from silky white to a dirty gray. The color pattern of this moth varies considerably, some specimens being quite light while others are much darker.

LIFE HISTORY

It might be well to give a short account of the life history of this injurious *insect* so that it can be known in all its various stages. Let us start the life cycle at the time when the larvae are pupating. As stated before the larvae pupate within their cases and for the most part pupation takes place during the month of May. The average length of this stage is about three weeks, but it may vary from seventeen to twenty-three days or more. The greatest emergence of moths occurs during June and these moths at once mate and lay eggs from which hatch, within a few days after oviposition, tiny dark brown "worms." Upon hatching the larvae immediately begin to feed upon the leaves, and from its excrement it constructs a loosely woven case, which is quite tortuous. This case lays flat upon the leaf surface and is open at one end to permit the larva to feed upon the foliage. The open end of the case is several times larger than the closed end and as the larva develops, it enlarges its house accordingly. Before the leaves fall in the autumn the little larvae migrate to the buds and there construct very compact oval winter cases, which are about three times the size of an ordinary pin head. These winter cases are called hibernacula. Only upon close inspection can these hibernacula be detected as they are so small and of the same color as the buds around which they are

closely packed. These over-wintering larvae only measure about six-hundredths of an inch in length in spite of the fact that they feed for about three months on the foliage before going into hibernation quarters. With the coming of warm weather in spring the larvae become active and just as the buds are unfolding, they attack them and do their most serious damage to the trees. In the spring the larvae become voracious feeders upon the buds and tender foliage and by May are for the most part full grown and ready to enter the pupal stage. The above is a short account of the complete life cycle of the pecan case-bearer, and I might say that up to the present time the life history of this species has been confused with that of other insects, especially the bud-moth (*Proteopteryx bolliana* Sling.)

REMEDY

Now I would like to say a few words relating to the means of control to be followed in fighting this pest. The United States Bureau of Entomology has been maintaining a field station at Monticello, Florida for the purpose of studying the insects affecting pecan culture. Since this case-bearer is the most injurious insect in the State, we have naturally devoted considerable time on its study with a view of determining a practical and effective means of control. A great number of dipping and spraying experiments were conducted at different seasons of the year for the purpose of determining the best means of control. Spraying during the dormant season and early spring just as the buds were unfolding was not found to be a good time to fight this insect. By far the best means of control is spraying with arsenate of lead during the summer from about the middle of July to the middle of September. By making one thorough application of arsenate of lead at the rate of three pounds of arsenate of lead to fifty gallons of spray mixture, the pecan case-bearer can be effectively controlled.

At this time I want to urge all growers who have groves seriously troubled with this pest to follow this method of treatment, and I know by actual experience your trees will be greatly benefited by this kind of spraying.

In this same family with the case-bearer there are three other species, namely *Acrobasis nebulella* Riley, *Acrobasis rubrifasciella* Pack and *Acrobasis angusella* Grt., that do damage to pecan buds. They are not, however, so troublesome as *Acrobasis palliolella* Rag.

There is still another case-bearer, *Acrobasis hebescella* Hulst, but this species confines its attack to the young pecan nuts before they become hardened, and from all reports, during certain years, has done considerable damage to the nut crop. The larva eat their way directly into the tender green nuts and hollow them out, thus rendering them useless. Usually they will drop off during the summer. As this case-bearer prefers the nuts, it is an insect which, if it should become very abundant and generally distributed over the pecan belt, would very likely prove a most formidable enemy. We now have this insect in Florida. In some sections of Texas, there is a similar nut-eating case-bearer, *Acrobasis caryae* Grote, that has been reported doing much damage to the nuts of seedling pecans.

How Pineapples are Grown on the East Coast of Florida

R. L. Goodwin

Mr. President, Ladies and Gentlemen:

The varieties mostly grown are Red Spanish and Abbaka with a few Smooth Cayennes and Porto Rico and Queens.

The Red Spanish are the most popular variety on the market.

The Abbakas and Smooth Cayennes will grow on soils unsuited for Red Spanish.

The largest acreages of pines will be found at Oslo, Viking, St. Lucie, Fort Pierce, Eldred, Walton, Eden, Jensen, Ankona, Rio, Stuart, Delray, Boynton, Deerfield, Pompano, Little River and Miami, and at these points may be grown without frost protection though none of these fields have escaped frost damage at times.

A few fields are protected from frost damage by slatted sheds which cost about $350 or $400 per acre but it is generally considered more profitable to grow them in the open.

The pineapple plant delights in a well drained soil and abhors a wet soil, thus the high sand ridge along the Indian river is particularly adapted for growing this fruit.

The best land for pineapples in our section is covered with hickory scrub.

The next best is covered with scrub oak or spruce pine or both.

Uncleared land of this kind sells for about $100.00 per acre and very little available.

All of the above varieties may be grown on flatwoods soil which may be bought at $25.00 per acre but on these low lands care must be used in selecting a location that will be free from cold or moist conditions.

Rich hammocks may be selected for the fancy Abbaka or Smooth Cayenne varieties.

There are fields near Fort Pierce that have borne 21 crops without replanting, but the average life of a field is about 15 years when the old plants are removed and new ones planted.

To clear the land, cut off the small growth level with the ground with a brush ax or machette then grub the land to a depth of about 10 inches with a grub hoe, throwing the roots to the top of the ground where all trash that would interfere with cultivation may be raked up and burned.

To clear land and put in pineapple shape will cost from $7.00 to $150.00 per acre according to the heaviness of growth on it.

Flat woods pine land, or prairie may be cleared at much less expense.

After raking, mark off the land with

a marker that marks 4 or 5 rows at a time, 21x21 inches, which will take about 12,000 plants to an acre leaving two rows out between beds of 15 rows, for an alley to facilitate picking during harvest time.

The price of slips in July or August which mature during and after harvest is about $6.00 per thousand delivered to the station in sacks.

The slips should be at least 8 inches in length with a good stocky butt.

Trim the slips by cutting off one half inch from the hard butt and tear off three rows of the basil leaves.

Drop a plant at the intersection of each row, and plant two rows at a time, using a garden trowel to lift up the sand while the slip is inserted about two inches and left upright.

Drop in the heart of the plant about a heaping tablespoonful of fertilizer that will not burn, to prevent sand from entering the heart during a beating rain.

After 4 to 6 weeks when the young plants have rooted, hoe with a scuffle hoe to break any crust that has formed and to kill weeds. Frequent hoeing is of benefit but be careful to use only a scuffle hoe as the pineapple plant is shallow rooted.

Fertilize before cool weather starts, in September or October and hoe it in well, with about 1,000 pounds to the acre.

Fertilize again when the plants are about a year old with at least 1,000 lbs. to the acre and again with 2,000 pounds before cool weather. Figure on giving about two tons to the acre of a mixture analyzing 5 per cent ammonia, 6 per cent K2O and 2 per cent P. A. per acre a year, applying in two applications, or, as some growers advocate, smaller applications frequently.

In applying fertilizer it is a good plan to put on the heaviest application right after the crop is off, and later applications when rain is in sight.

As a source of ammonia use blood and bone, tankage, dried blood, castor pomace, cotton seed meal or tobacco dust; avoid sulphate of Ammonia, Nitrate of Soda, or use with the greatest care.

As a source of potash use sulphate of potash, preferably the low grade as it contains magnesia that is thought to help make the plants hardy and frost resistant. The high grade potash, however, gives splendid results.

Avoid muriate of potash and kainit.

Hard wood ashes gives good results but must not be added to any mixture containing ammoniate as it sets free the ammonia to escape as gas.

For phosphoric acid use steam bone or raw bone ground and avoid acid phosphate, or bone black.

In my experience I find that 2 per cent of P. A. is plenty and that I get in my castor pomace, blood and bone or tankage.

The standard pineapple fertilizers sold by the reliable fertilizer dealers may be relied upon as being well mixed and true to analysis and as cheap as one can mix them at home.

Many growers use a mixture high in ammonia right after the crop is off to make plant growth and high in potash in the fall to balance up to make the plant hardy and fruit to carry well.

Some years ago I reasoned that the plant would do better with a balanced

ration at all times and results with me have proven satisfactory in using a 5 per cent ammonia, 6 per cent potash 2 per cent phosphoric acid formula, from the budding of the young plants to old age. The fact that I have some fields that have borne consecutive crops for 21 years tends to prove that I am right.

The fruit is harvested in the latter part of May, June and July, the Abbaka and Smooth Cayenne varieties coming last as a late variety.

The Smooth Cayenne, Porto Rico and Queen have almost disappeared from the Indian River section as the fields are shorter lived than the Red Spanish.

Some fruit is harvested during every month, with a light crop in the fall during October and November.

The fruit is sold mostly through brokers and commission men, but is sold at the track from day to day at varying prices and some is sold as a crop by sizes as well as a flat price for the whole season's output for the field run.

At the present time there is no selling organization among the growers on the East Coast, but there is a strong probability of organizing in future as a branch of the Florida Citrus Exchange. Speed the day!

300 to 350 crates of 80 lbs. weight, containing 16, 18, 20, 24 Abbakas or 18, 24, 30, 36, 42 and 48 Red Spanish apples, to the acre is considered a good output for the first two years, after that an average of 250 crates per acre per year for a period of the next 12 or 14 years are considered good crops.

It costs about 85 cents per crate to grow the fruit, pack it and get on the cars ready to move.

In 1913 crops netted about $1.60 average, leaving net profit of about 75 cents per crate. Of course it may be guessed that some growers made more and some less.

This year the crop will be small owing to frost damage in all sections, together with the effect of a long drought and net returns for desirable fruit will be much larger than last year.

Large quantities of cull pines, baldheads, ill shaped and over ripes are thrown away every season and it may seem that a cannery would pay.

No doubt that if a grower had the facilities and time during a busy harvest season he could can or preserve some of this fruit to profitable advantage but we have a canning factory on the East Coast that I understand has never been a profitable pineapple proposition and though many professional canners have visited the section they apparently cannot see the profits ahead to make them invest.

In conclusion, I want to say that I am ready and willing at all times to give any information that I may possess regarding pineapples or my section of Florida and if in this paper I have failed to cover any point fully I expect that you will ask questions, either at this time, through the question box, or by mail.

Discussion.

Mr. Floyd: Cannot some person give us some experience of pineapple growing on the west coast? This paper dealt with pineapple growing on the east coast.

Mr. Hume: I can say this, that while there used to be a very considerable industry in other parts of the state besides the east coast of Florida, yet the greater part of the industry by far is now on the east coast. Formerly a good many were grown around St. Petersburg and Orlando, but so far as I am aware, these plantings have almost gone out.

Mr. Hollingsworth: It is a success around Punta Gorda under shedded conditions; that is, the smooth cayenne.

Mr. Hume: I suppose that Punta Gorda is the only point on the west coast where pineapples are being grown for commercial purposes.

The shipments of the Smooth Cayenne used to, years ago, have to go out largely by express, and the growers have told me the express companies really killed the industry. There have been other causes, but that was one of the reasons assigned for it.

Tropical Fruits

H. C. Henricksen

Mr. President, Ladies and Gentlemen:

I regret that I cannot be with you at your annual meeting for I am sure that I could be of help to those of you who are really interested in tropical fruit growing. I know from experience that a good practical discussion is worth more than yards of prepared speech but as you have accorded me the honor of appointing me on one of your standing committees I feel that the least I can do is to send you a few notes.

The subject is so large and it is possible to treat it in so many ways that it is a question what one ought to mention and what should be excluded. It seems to me that what you ought to be interested in is the development of the fruit industry in the American Tropics and I will treat the subject from that standpoint. In comparing Florida with Islands in the West Indies and countries in South America where the climate is strictly tropical I wish you to remember that I lived in Florida for a number of years and I wish to say that there has been no time in my life that I look back upon with greater pleasure than some of the years I spent in your beautiful state. I have since that lived in various places in the tropics proper and while my experience as a whole has been very pleasant I cannot say that I long to go back to any place but just Florida. I made very little money in Florida which was probably more my fault than the fault of the country, but Florida was home to me. I made a great deal more money in other places, but somehow I never felt at home. From this you will see that I have two standards of comparison, the sentimental and the business; and from what I have observed in Florida, and elsewhere, most fruit growers have these two standards, whether they are conscious of it or not The difficulty in using them is that they cannot be reduced to the same value. One of the standards cannot be measured in money and we have no right to judge the man or woman on a five acre orange grove or vegetable patch who may seem to work hard and make but little money. They may be happier than others who pile up millions.

With that thought in view we will be better able to do justice to the subject of tropical fruit growing. A casual investigator, looking at it from a business standpoint would undoubtedly conclude that it would not be good policy for him to grow tropical fruits in Florida. He would say: The soil is poor, the climate is uncertain, labor is expensive and possibly several other things. He might be right, but just because it would not look promising for him to plant a hundred acres, engage a good manager and hire labor, that

would be no reason why a five or 10-acre proposition might not fill another man's need. Supposing the capitalist should go farther south and investigate conditions in the West Indies. He might say: Oh! here is good soil, real tropical climate and cheap labor; here is a good place to engage in fruit culture on a large scale. But, does he do it? No. Very seldom; he finds that sugar cane is his crop. Of course there are some large citrus plantations in Cuba and Porto Rico, as there are in Florida but up to the present time fruit has remained the small planters' crop.

Now let us examine the conclusions of the man who thought the West Indies were more suitable for fruit growing than Florida. He thought the soil of Florida did not compare favorably with that of the Islands, but he was wrong. One of the reasons for the development of fruit growing in Florida is the character of the soil, and he would find that as a general rule the better fruit soils of the West Indies are similar to the soils of your state. As to the climate, our supposed investigator was undoubtedly right. It is risky to plant tropical fruits in Florida and I think we will have to admit that there is no other reason for doing so than just this: that the people who engage in it like it, and they are willing to take the risk. That some of you have made handsome profits does not minimize the fact that there is a risk and that the same amount of energy expended in a country with a more tropical climate might have produced as good results without the corresponding risk. The contention that the labor in Florida is expensive compared with that of the West Indies is entirely without foundation. Considered from the standpoint of training, which is absolutely necessary in fruit growing, you have cheaper labor in Florida than the West Indian fruit grower has.

With these facts before us, together with the incontestable fact that fruit growing is much better developed in Florida than in the West Indies and adjacent countries of South and Central America, one might conclude that Florida is much superior to those countries. That would be an erroneous conclusion, however. The supremacy of Florida's fruit industry is not due to soil, climate nor transportation facilities, but preeminently to yourselves. What you have done in Florida you could have done in some other place, with the same amount of capital and energy. In this you may not all agree with me and I cheerfully waive the point because in order to prove it I should have to induce you to go to some South American country to make the demonstration and that would be too much of a task I fear. There are, however, some, not a few of whom are from your own state, who are investing both capital and energy in Porto Rico and Cuba. How much of a competition they have created, you probably know much better than I do. Some of you have undoubtedly felt the competition in the citrus and pineapple trade although your mango and avocado market may not have been affected by it yet.

Now the question with you is: What may this competition amount to? And if it increases what will be the cause of

such increase? The answer is simple enough, the development of the fruit industry in the tropics will depend on people. The soil is there and the climate is there but there are not yet enough people with the knowledge and temperament which seems to be necessary for successful fruit growing. It is no easier to grow fruit in the tropics than it is in Florida. The problems are not exactly the same as those you have, but anyone who would grow fruit in the tropics must be awake and ready to solve problems. Perhaps some one may say, it is well enough that fruit can be grown, but what kind of fruit is it, can it compete with ours? Yes, it can. You may hear the statement at your meeting that Florida produces the finest fruit in the world. But that is merely a patriotic remark, you will hear the same kind of remarks at the Cuba and Porto Rico Horticultural Society meetings. There is no such thing as *the* best fruit or *the* best fruit section. You have good oranges, mangoes and avocadoes in Florida and they differ according to the variety, the locality in which they were grown and the man who grew them. Exactly the same is true in the tropics. It may be possible that some Island has an avocado, for instance, that is absolutely superior to the best one of some other Island, but the reverse may readily be the case next season.

The situation of quality may be summed up in the one word "development." Compared with Florida we know very little about varieties in the tropics, and it is very difficult to find out. One frequently finds magnificent fruit in the market but it is very difficult to find the tree on which it grew. I once heard a rumor about a seedless orange in Porto Rico, and I finally obtained some of the fruit. It was said to come from a certain district in the mountains and I went there. Hired horses, and guide and hunted for the tree for two days. I finally gave it up and I never did succeed in finding the tree although I offered a good price for the information. A year later I did find one in another district which was seedless and a perfect naval but that was just a chance. In Cuba I found an avocado in the Havana market which had but a rudiment of a seed but I never could find the tree. Mr. Van Herman, a nursery man there, has searched for that tree for several years but has not found it yet. In Guadeloupe I found fine avocadoes in January, but in trying to find where they came from I was given vague information about some mountain district away off. This I think will show you that there is good fruit but the development is liable to be slow.

I do not think that it will be interesting to you to hear about the various tropical fruits of economic value. You are already familiar with the most important ones and none of those in which you are, or might be interested are commercially developed in the tropics. You of course know of the development of the banana industry as well as the cocoanut, but are not much interested in either. Of the various tropical fruits which are seldom very plentiful in the markets in the tropics I find specimens occasionally in the New York market. There is, however, no regular supply and possibly there will not be before you stimulate the demand. Possibly the opening of the Panama Canal

may increase shipping facilities so as to bring a larger amount of the lesser known tropical fruits into the Northern markets. But if trade and shipping conditions should continue for a number of years as they have been in the past you will undoubtedly have to pave the way as you did with citrus fruits and pineapples, and as you have later done with mangoes and avocadoes. Of course after you create a demand the tropics will help to supply it as they have done in the past.

Ornamentals

Marion A. McAdow

Mr. President, Ladies and Gentlemen:

How would you like to go out in your back yard and help yourself to a choice of 100 different kinds of fruits? This is one of the possibilities of life in the southern part of Florida where a temperature of 32 degrees is not kept up for too many consecutive hours. These trees are now growing in various parts of the state as an assurance that it can be done. The most that are mentioned in the list that follows are right now growing in Prof. Simpson's garden near Miami. He has, in fact, many more than one hundred different kinds of fruit trees doing well with him but 100 different tasting fruits would be a sufficient number to satisfy the average individual. Some of these assume great proportions and make noble trees, some are handsome shrubs and others are plants that are suitable for hedges and windbreaks. Others are vines that help to add adornment to a home and if one wished to confine himself to this list for its decorative qualities as well as its economic value, one could surround his home with all the loveliness that trees and plants afford for their varied habits, shapes, foliage and flowers and then have something that would afford food as well and that of many different types. There would not be a day in the year when a few of these would not be in a state of maturity and ready for plucking. There are probably many more desirable fruits that may be added to this list that are now unknown to us. Our Agricultural Department at Washington has men in foreign countries constantly looking for just these additions to our already large one of trees, shrubs and plants that have had to be introduced in this country from the other side of the world or South America, Central America, and Mexico.

The list that follows contains sometimes many different kinds of fruits in one family. For instance, in the citrus family there are 18 quite different kinds of fruits embraced. The Anona family is another with a number of very different fruits under that head. One hundred different kinds are easily found in the list that follows:

Anacardium occidentale or Cashew Nut is a strangely formed apple with its nut or seed on the outside, the different varieties ranging in size from a cherry to a pear. It is slightly acid and both the apple and the nut are edible, the latter needing roasting first. The gum that forms on the trunk is the base of a fine varnish that is used to protect books and woodwork from the ravages of the white ant, in tropical countries that are infested with it.

Florida is happily free from this formidable pest. The Anacardium is sensitive to cold and will probably not stand

lower temperatures than are found below a line drawn across the State through Punta Gorda in DeSoto county.

Aberia or the Kei or Kai Apple is the fruit of a spiny plant grown as a hedge in southern Florida and it tastes somewhat like the cranberry and serves a like purpose.

The Ananas sativus or Pineapple is probably the finest fruit bearing plant that thrives in Florida but to get it at its best, it should be cut from the plant during the summer, allowing the summer suns to do the mellowing of this fruit right on the plant.

This fruit matures at any time of the year, but the summer apple is the sweet one. There are half a dozen varieties, but the smooth Cayenne seems to be the one with the greatest merits.

Some of these reach a great size and often weigh as much as 15 pounds. The pineapple fruits in from 18 to 24 months after the suckers are planted and may be grown as far north in the state as freezing temperatures are not found, but if artificial heat is provided they may be grown north of Orlando.

The Averrhoa, one species of which is known as the Carambola Tree and another as the Cucumber Tree are native in India and China, but may be grown in lower Florida. The half grown fruits are made into pickles and the mature ones can be preserved. The tree grows from 20 to 30 feet high.

Antidesma bunius is a quick-growing small tree bearing small acid berries that can be preserved and in the country where it is native, the fiber of the bark is also used.

The Anonas comprise somewhere near 50 small trees and shrubs that are extensively planted in tropical and sub-tropical countries, for their delicious fruits or their ornamental appearance. Common names for some of the members of this family are Custard Apple, Sour Sop, Pond Apple, Mamon, Alligator or Monkey Apple, Cerimoya, Jamaica Apple, and Sweet Sop or Sugar Apple.

So great a difference exists in the peculiar characteristics of these various fruits that this family alone could furnish half a dozen excellent specimens for the hundred different fruits in a tropical orchard. These fruits are highly prized by the natives in the countries where they are indigenous but it sometimes takes a little cultivation of the taste to make a Floridian appreciate their good qualities. It very rarely happens that a stranger likes the Guava on his first introduction to it, but time changes his opinion of it almost invariably.

The Sour Sop makes a most refreshing sherbet on a warm day and the Custard Apple which produces two crops a year, is quite as pleasant eating as its name might indicate when one gets well acquainted with it.

The Artocarpus incisa is a very handsome tree bearing one of the Breadfruits of the South Seas. The variety "Integrifolia" is the Jack Fruit Tree.

Adansonia digitata is the Bacbab Tree, whose trunk has been known to reach a diameter of 30 feet. Its fruit is called "Monkey Bread."

The Banana or Musa is one of the most desirable of all sub-tropical fruit plants to cultivate, particularly for its early fruit-

ing habit. Strong suckers in rich, moist soil will bear fruit in from 12 to 18 months after planting. It will survive 6 or 8 degrees of frost even though it may be frozen to the ground. There are three or four varieties that do well in Florida and among these are the Cavendish, Hart's Choice and Orinoco.

Catesbaea Spinosa is a hedge plant bearing yellow fruits that are edible.

Carica Papaya is an odd appearing tree with a hollow trunk and great, ornamental, cut leaves. The fruit, weighing often more than 10 pounds, grows directly out from the trunk and those who have cultivated a taste for it consider it one of the special gifts of the gods to man. It is one of the salad fruits that is eaten with condiments. The leaves, when bruised and wrapped about tough meat, render it tender in a few hours.

It is another of the early fruiting trees that newcomers get results from in from 12 to 18 months. The Agricultural Station in Miami has succeeded in grafting this plant and finer varieties may soon be obtained than have so far been possible from seeds. It is necessary to have several plants in order to be sure that both sexes are present or there may be a fruitless maturity.

Carissa arduina or Amatungula is a choice, evergreen shrub with spines that makes a desirable hedge with its thick, glossy leaves like the Camellia. The dark red fruit has a diameter of an inch and a half and its flavor is like that of the raspberry. The jam made from this fruit is as desirable in every way as that made from the raspberry.

Carissa grandiflora or Natal Plum has a fruit as large as a cherry and is considered very good. "Acuminata" is still another variety of this fruit.

The Casamiroa or White Sapota is an evergreen tree that comes from Mexico, whose fruit is highly prized in that country. There are trees in California that have borne crops yearly with no attention or fertilizer for 80 years. It has a pretty leaf formed somewhat like the Virginia Creeper of the North.

Cecropia palmata and peltata are known as Trumpet Tree and Shakewood. They have an exceedingly odd-looking fruit, shaped like the fingers of the hand. This tree would be highly desirable for its ornamental appearance even if it bore no fruit.

Coccoloba uvifera or Seagrape is a native small tree growing in the southern part of Florida. It has large, almost round leaves with a red petiole and the fruit makes a pleasing jelly. The appearance of this tree is highly ornamental during its different stages of growth. In April, when the old leaves are shed and the new appear, they are a sort of claret color and so glossy that they look as if they had been varnished. Gradually these leaves turn a rich, bright shade of green and at maturity they are a very dark green. This shrub or small tree may be pruned to make a thick clump, or it may be trained over a veranda, like a vine.

Coccoloba laurifolia is commonly called Pigeon Plum.

Cupania sapida or Akee Tree bears red fruits that are edible after being cooked. The flowers of this tree are exceedingly fragrant. The variety "elegantissima" has been offered by northern florists as a

handsome plant with large leaves and racemes of white flowers.

Chrysophyllum cainito or Star Apple, is another of the highly prized fruits of tropical countries. The fruit, which is about the size of an orange, has a very palatable pulp, varying from white to purple. The leaves of the different varieties of this tree are large, with an under surface of silky hairs that run from silvery white to deep russet colors, making it as ornamental as a tree bearing fine flowers.

The Citrus family presents many varieties of fruit that are more or less different in character. The Grapefruit should be represented by any of the standard varieties and at least one tree of the Foster with its beautiful rose-colored pulp. The Orange should be represented by a Pineapple, a Ruby, a Washington Navel, a Valencia Late, a Tangerona and a Tardiff.

Then should come a Mandarin, a Tangerine, a Satsuma, a Tangelo, a Kumquat, Lemon, Mexican Lime, Tahaiti Lime, a Sour Rangpur Lime and a Citron. In this list are 18 different kinds of Citrus fruit that are desirable for quite different qualities that each possess, that are different from anything else.

Coffea arabica is the Coffee Tree, a low growing tree that does very well in Southern Florida. It has a handsome, large leaf that is quite ornamental.

The Diospyros or Japanese Persimmon should be represented by at least one variety and probably the most desirable of these is "Tamopan," a very large, seedless kind that is not astringent.

Feijoa sellowiana is a fruit tree or bush of small size allied to the guavas. The fruit which is about the size of a peach and somewhat longer than it is wide, has a pleasant flavor and a perfume that is so strong, a basket will smell of it three weeks after the fruit has been removed from it. This shrub bears in three years from the seed. This shrub, unlike the Guava, will stand a temperature as low as 10 degrees above zero.

Mexico has several varieties of this fruit and already nurserymen are advertising more than one variety.

Ficus, or the Fig, of which there are four varieties that are quite different in character and all delicious, all do well in Florida.

These are the Brunswick, Celeste, Green Ischia and Lemon.

The Elaeagnus or Oleaster is a fine hedge plant bearing a fruit that can be used for making jelly.

Eriobotrya Japonica or Loquat is a winter and spring fruit with a delicious flavor that makes them palatable when eaten raw or in the preserved state.

Among the Eugenias are the Surinam or Cayenne Cherry with a ribbed fruit of an orange-red color and a peculiar flavor that is greatly relished by many persons. Then there is a black fruited variety of the Surinam.

The Brazilian Cherry and the Jambolam Plum are fruits resembling the above in their pulp.

The Malay Apple and the Rose Apple of this family have a very different meat with a very strong fragrance and flavor of a summer rose. These are ornamental trees with odd and peculiar flowers with a strong pineapple fragrance.

Flacourtia or Governor's Plum, is a berry that grows on a hedge plant.

Genipa Americana or Marmalade Box has an acid fruit that grows on an evergreen shrub with glossy, leathery leaves resembling the Cape Jasmine.

Grewia caffra is a bushy plant from Natal, having a pink, star-shaped flower that is almost constantly in bloom. The variety denticulata resembles the Mulberry, and produces great quantities of berries that are useful for wines, vinegar and table use.

Garcinia kola and Morella both bear edible fruits. The famous Mangosteen belongs to this family and it is possible that it may be grown in the rich moist lands in the far southern parts of our state. This fruit is rich purple on the outside and the pulp is said to resemble the peach and grape in flavor. The first two species are growing in Prof. Simpson's garden near Miami.

The Harpephyllum caffrum or Kaffir Plum promises to be one of the finest ornamental evergreen trees that can be raised in Florida. It is growing as far north as Orlando and may stand the temperatures even farther north. It has a particularly pleasing arrangement of foliage, different from the average tree and its composite, dark green, glossy leaves are very handsome. The new leaves in the spring time are a rich claret color. The fruit is of a pleasing flavor, but the tree would be desirable for its foliage alone. It is said to reach a good size for street planting, but as a rule fruit trees do not make good street trees on account of the messy condition that the dropping fruit makes on the walks.

Hovenia or Honey Tree makes a good shade tree. The peduncles of the fruit of this tree are edible.

Juglans cordiformis or Japanese Walnut is a magnificent tree with great leaves that spread out in a great umbrella top. The nuts of this tree are borne abundantly and are very sweet.

Lansium domesticum belongs to the Bead Trees and its sub-acid fruit is edible.

Lucuma mammosa, the Mammee Sapota of Jamaica or the Marmalade Plum, is a highly desirable fruit about 6 inches long and is borne directly from the bark and not from the angle of a branch or leaf.

It is said to taste like a very ripe pear, but more delicious. The variety Rivicoa is the Egg Fruit Tree, the fruit tasting like the yolk of an egg that has been sweetened.

Macadamia ternifolia or Queensland Nut is another of the nut trees that will do well in south Florida. The nuts resemble filberts.

Malphigia glabra or Barbadoes Cherry is a low growing shrub with a handsome flower and a pleasing, small, acid fruit.

Mammee Americanus or Mammee Apple is a fruit from 3 to 6 inches in diameter and is borne on an evergreen tree of very handsome appearance, resembling the Magnolia. The pulp of the fruit is eaten with wine and sugar or sugar and cream. The bark makes an astringent infusion that has several medicinal qualities.

Mangifera or Mango is a well-known fruit of south Florida that has as many fine qualities as any tree that can be grown in semi-tropical locations. It makes a

handsome evergreen tree of large size in a few years and although the fruits were once likened to a ball of string dipped in turpentine and molasses, the tree has been hybridized and grafted until the best varieties have a very small seed, an immense amount of pulp entirely free from string and the turpentine flavor so reduced that it is just enough apparent to give the pulp a different flavor from all other fruits. The green fruit makes as fine a pie as the apple and when this is stewed it does not taste unlike apple-sauce. The green fruit also makes a very palatable pickle or jelly.

A fine graft may cost $6 to $8 a tree, but it is better to have one perfect specimen than a half dozen inferior ones.

Melicocca bijuga, the Spanish Lime or Ginep Tree has a handsome appearance and its plum-like fruit with a grape flavor is generally liked. It is a tree that will stand several degrees of frost.

Monstera deliciosa comprises several species of clambering plants with thick stems that put out aerial roots that cling to the bark of trees as they climb upward. The enormously large leaves are cut out in irregular fashion quite unlike the average leaf and this gives it a very striking appearance that is always commented on by those who are strangers to it. The variety "acuminata" is called the Shingle Plant in warm countries where its great leaves reach their fullest size. These lap over each other as do shingles, and hence the name. The fruit grows 6 or 8 inches long and has a faint yellow color when ripe. The skin seems to be made up of hexagonal plates and these easily drop off at a touch when the fruit is ripe. The rich pulp resembles a combination of the Pineapple and Banana in flavor.

If the plant is desired for its fruit, it is well to keep it cut back in spreading fashion. If it is desired for its ornamental appearance, the leaves take on more grotesque shapes, the greater the length of the stems.

Moringa, which is the Horse Radish Tree, has a seed that may be eaten when it is first formed, having an odd, pungent flavor. The tree itself with light green leaves that resemble the Maidenhair Fern in shape is very handsome and although the white flowers are not especially striking, yet the tree always has a few on it at all times of the year.

The Morus or Mulberry Tree is deciduous, but in the springtime it bears enormous quantities of large berries that resemble the blackberry. The "Stubbs" is the best variety if one wishes but a single tree and if an early variety is desired, the "Merritt' has this quality. Mulberries may be eaten uncooked, or made into pies and they make a fine wine and vinegar. They are specially good trees for the poultry yard as they make a fine summer shade and the fruit that drops is greatly relished by poultry, and pigs as well

Nephelium is the Litchi Nut which is a great favorite with the Chinese. The pulp surrounding the nut has an aromatic, pleasing flavor and the seed has a kernel that is delicious. One often finds this nut served on trans-Pacific steamers. It makes a handsome tree but does not seem to grow readily in conditions that are much different from its native habitat in China.

Opuntia or Prickly Pear is a Cactus. There are several varieties of Cactus that bear delicious fruit. Burbank has two edible varieties that are very fine. The Indian Fig Cactus has a large, yellow fruit on an almost spineless plant. Opuntia tuna has a dark-red fruit that furnishes a rich red coloring for ices, jellies and drinks.

Phyllanthus distichus or Otaheite Gooseberry is a most ornamental small tree bearing bunches of greenish white berries that are palatable when cooked. Phyllanthus Emblica or Myrobalan is an exceedingly handsome small tree with fine, almost fern-like foliage and an acid fruit.

Persea gratissima, called Alligator Pear, Avocado, Aquacate, and Midshipman's Butter is a native of the Western Hemisphere and as a salad fruit stands at the head of that class.

It is an evergreen tree of very quick growth. Three year old trees are often 20 feet high if they are well fed, this being one of the trees that needs more fertilizer than most trees. It will bear in from 3 to 5 years and it is best to buy stock that is known to have these qualities —large fruit with a small seed, and enough hardiness to stand a temperature of 32 for a short time. Such a tree may cost from $3 to $8, but it will be worth it when it comes into fruit. These may be picked while they are green and taken in the house when they will turn purple in a few days, and when the skin is easily dented with the finger-nail it is ready for salad. Cut in halves and eaten with lime juice, salt and pepper or salad dressing, it is highly relished by those who have cultivated a taste for it.

Peaches, Pears and Plums do well all over Florida, if certain conditions are provided for them and only the varieties are attempted that are recommended by the nurserymen who have experimented with them. For success with Peaches they should be grafted on the native Plum which insures freedom from root-knot. They need well-drained land and the graft must be set at least 6 inches below the surface of the soil. One has half a dozen varieties to choose from and these have Chinese parents for the most part.

Pears grow well on any citrus land, but one should confine their choice to those with Chinese parentage.

Plums are grown successfully if a few native trees are set with the nursery varieties. These are needed for proper pollinization. Four varieties grow well in the southern part of the State and there are half a dozen varieties to chose from for the middle and northern parts.

Psidium or the Guava is one of the quick fruiting trees that are most desirable where the temperatures do not get too low. They will stand rather low temperatures and if they freeze they readily sprout from the roots and bear again in a year. One may get a great number of varieties of this fine fruit. Some will be very acid and more desirable for jellies than for eating from the hand. Guava butter, vinegar, wine, preserves, marmalades and jellies and various sweetmeats are made from the fruit of this tree. Two varieties of Cattley Guavas make handsome evergreen trees with fine fruit for cooking. All orchards in south Florida

should have at least one of the various va rieties that are offered by our southern nurserymen of this most desirable fruit.

Punica or Pomegranate bears a large fruit that is desirable for eating from the hand or for cool drinks. It makes a pleasing small tree with a beautiful flower.

Rollinia orthopetala is a little known fruit tree of small size, but it seems to have adapted itself to the conditions in Professor Simpson's garden.

Rheedia edulis and Rheedia macrophylla are fruit trees that are also doing well with him.

Rhodomyrtus tomentosus is a shrub with broad, evergreen leaves and bright, lilac-colored flowers that are freely borne. Although the fruit is edible it is not specially desirable, being very sweet and too full of seeds.

Rubus flavus is an Indian Raspberry of gigantic size and most palatable. Rubus hybridus or Northey Berry and the Manatee Dewberry are blackberries of great size and delicious flavor. These do exceedingly well in Florida.

Sapota zapotilla or Sapodilla is a fine fruit for tropical locations. Its fruit is very sweet. The sap of this tree is used as the base for chewing gum.

Spondias dulcis or Othaheite Apple has a fruit flavored like the pineapple. The Golden Plum, Hog Plum and Jamaica Plum are other varieties of the Sapota that have desirable qualities.

Strychnos spinosus or Natal Orange is a new fruit from South America. The pulp is aromatic and of the consistency of a Banana.

Roselle or Jamaica Sorrel is a Hibiscus-like shrub, growing 5 or 6 feet high or higher in very rich soil. The calyx of the flower furnishes a sort of acid drupe that much resembles the Cranberry after it is cooked.

The Strawberry is an almost constant fruiter in Florida if one cared enough for the fruit to have it served 52 times in a year. During the summer months it is necessary to grow it under a lattice, giving it a little shade during the months when the sun is very hot.

Syzygium jambolanum or Java Plum is an East Indian tree resembling the Rose Apple, but with smaller, purple fruit.

Tamarindus indica is a very ornamental tree, having acid pods that are preserved or cut up to make an acid drink.

Terminalia catappa is a deciduous tree of large size with much more gorgeous autumn foliage than the maples of the North. Its fruit is a nut resembling the almond but the shell is much harder.

Triphasia or Bergamont Berry makes a fine low hedge.

Vaccinum myrsinites, or Huckleberry grows wild in Florida and any desirable variety that one would wish to experiment with can be depended on for results.

Vangueria Madagascariensis or Voa Vanga is a shrub or tree of small size with a delicious berry.

Vitis, or the Grape, offers half a dozen varieties that do well in the State provided a few plants of the wild varieties are also grown to insure pollinization. They are usually grown on strongly built trellises and are not pruned yearly as are the Northern grapes.

Ximenia Americana, the native Hog Plum of Florida, also called Mountain or

Seaside Plum, False Sandalwood and Wild Olive, makes a small tree with an acid fruit that is quite generally preserved by the natives of the State.

Several Palm trees furnish excellent fruit and at the head of this class stands the Cocoanut palm. Other members of Cocos that have edible fruit are "Australis," "Alphonsei," "bonnetti," "campestris," "eriospatha," "romanzofia" and "Yatai."

The Phoenix Palms furnish the Date of commerce and the varieties "humilis" and "farinifera" also have an edible fruit.

Bactris Gasipaes or the Peach Palm has a fruit with a delicious pulp.

ORNAMENTAL PLANTING

Mrs. P. H. Rolfs

Mr. President, Ladies and Gentlemen:

The subject of ornamental planting has been a great favorite with the Florida State Horticultural Society. It has a place in the hearts of Florida Horticulturists next to the citrus fruits. In looking over the old reports we find that almost from the first some one in the society has had something to say on this subject; even in those dark days of 1896 it had a favored place on the program. It is true that frequently the members of the Committee have found it more convenient to remain away than to prepare a paper.

With all that has been said on this subject it is far from exhausted. I am inclined to predict that we are just beginning an era of a very generous and elaborate ornamentation in Florida. Some of the wealthiest estates are planting many thousands of dollars worth of plants, and hiring the most expert of landscape architects to lay out their ground. This is then further subsidized by hiring a corps of experienced gardeners. The result, as may be predicted, is a dream of beauty.

The Citrus growers of Florida are not all millionaires, consequently there is a considerable percentage of them to whom I can speak today. The millionaire does not need my message, he can pay for specialists on the subject, however the pleasure and enjoyment that he gets out of his dream of beauty cannot be considered in the same class with the enjoyment that the average citrus grower, and the average horticulturist, get out of the results of his own enterprise and struggles.

In a paper before this society in 1896, I discussed the use of Sweet Allyssum, of Alternathera, of Cosmos and of Solanum wendlandii. These are plants that every one can have at his home place. The first three are especially adapted for border purposes, and the last for the covering of trellises or arbors.

In 1905, I discussed the Angolonia, which has nearly disappeared from the lists of useful herbaceous plants, the Hibiscus which has become a great favorite in nearly all parts of Peninsular Florida. The George Washington Palm, which has proved a splendid ornament in

Florida, and which may be grown with confidence in any portion of the State. The Canary date palm, a much larger one, is a strong competitor for the first place. I also discussed the use of the cabbage palmetto as a tree for street planting. This palm is less appreciated than it would be if it was of a foreign introduction.

GIVE PLENTY OF ROOM.

In my paper today I want to discuss the purpose of planting about the home place. We have such wealth of beautiful plants belonging to almost every family mentioned in the Horticultural Manuals that we hardly know which to choose. We see so many splendid specimens every time we look about us that we do not know which one to prefer above another. I fear that some of us are like the donkey in Aesop's Fables, who was very hungry, and was placed between a sheaf of oats and a sheaf of wheat, when he made up his mind to take a bite of the wheat, he remembered how splendidly the oats tasted and turned his attention to the oats, and before he could get a bite of oats the sweetness of the wheat turned him to the wheat, and in his indecision he died of starvation between the two sheaves.

To be able to plant a home place correctly, one must have the power of projecting himself into the future. He must see in his mind's eye what the place will look like not in a few weeks nor a few months, but after the lapse of five or ten years. I fear that many fail to perceive what results the planting will give at the end of five or ten years, hence a great deal of the home planting gives one the feeling that the author of the planting has had no plan in mind, but simply a medley of confused ideas. The first nice plant we get is too frequently set out on the most conspicuous portion of the ground whether it will finally give good results, or not. It so happens therefore that the home planting shows very little or no individuality of the owner, so he loses the greatest pleasure of all. The millionaire can pay some one else for the brains of carrying this out. He will have the only satisfaction of knowing that his money has been well spent or has been wasted. The home planter, on the other hand, will have a chance of working out his own ideas.

The first mistake generally made is that we plant too much stuff about our dwellings. When a tree is small it occupies no more space than a pot plant. The first effect gives us the feeling of bareness, we therefore repeatedly make the mistake of planting closely. After we have nursed the plant for five or ten years it becomes endeared to us, and it is impossible for us to cut it down and destroy it. To avoid this disaster, we frequently have our plantings look like a medley rather than the mortification of rudely destroying some of our best friends.

I am presenting to you today some photographs which will illustrate the points I have in my mind much more fully than could be explained by words.

The dwelling which we inhabit becomes the central figure, and whether it becomes a house or a home, it depends entirely upon the way we treat it. How often

we hear the expression, "Oh! what a beautiful home," and before we have passed a mile we say, "Oh! what a beautiful house." Without knowing it we have expressed the sentiments in our hearts.

Palms are the most esthetic plants that we can use for the home grounds' ornamentation. They have a wealth of foliage, a grace of bearing and a permanency ideal that is not approached by anything else. In spite of this, when we find a jungle of a very fine specimen of palms, we are not very much attracted to them. They must be set out in such a way as to express our idea.

The ideal home is not a place of seclusion, yet we must plant in such a way that we can have the privacy that goes with a home. We must constantly bear in mind that the special point of view is from the home. The view from the street to the home is of secondary consideration. By a proper grouping and setting out of the plants, the approach to the house can be so arranged as to make it possible to have all of the breeze and air that is going, and at the same time have it screened from the highway, leaving here and there, glimpses or vistas to the home. If you will notice the photographs that I have passed you, you see that the view of the home to the high-way is almost unobstructed, while the row of palms along the highway is so near to the travelers, that there is little opportunity for publicity, and at the same time there are many angles at which it is possible to see the interior of the grounds in riding past slowly. Almost every species of palm, which include at least twenty, is in view at one time or another.

PLANTING TO EXPRESS AN IDEAL.

The landscape architects and landscape gardeners have their perfectly proper place, and they are useful even as adjuncts to planting our home grounds. If, however, you rely on these sources of information entirely you will get a stereotype form for your home grounds. This stereotyped form may be very much better than anything that you can do. It has, however, one serious defect, and that is that it does not express your own ideals. I should not be understood to mean that you should not get all of the help possible, but the help should be in such a way as to make a part of yourself. Books on landscape gardening are accessible to every one. It will cost only a trifle, when we compare what we spend on our home ground ornamentations. Photographs of beautiful plants and beautiful grounds, and even photographs of fine estates are readily obtained at a trifling cost. These photographs are taken by professional photographers, or made as "snapshot," and do not as a rule present the picture. It requires a great deal of time and most careful study on the part of the real artist to locate his camera properly. Lastly we have an opportunity of visiting any number of well-ornamented grounds in almost any section of the State. I have very frequently visited such in company with members of the Horticultural Society. It is worth the while for one to study the feelings of others while visiting such beautiful grounds. The unconscious ex-

pression of feelings gives one the best index as to the success or failure.

My plea today on home ornamentation is, that every one who hears my paper make it their special study to see what are the special merits of the beautiful planting that we see on this trip. It seems to me that the ones who take care of the home are the ones who might well study this subject. It might well receive the consideration of the mothers and daughters. They are by temperament much more likely to have good taste than a man; they are likewise by their nervous organization much more likely to be favorably or unfavorably affected by esthetic or unesthetic surrounding, and lastly but not least, the mothers and daughters should take a greater interest in the home grounds and home associations than anyone else.

Let us be able to say with the great poet, Tennyson—

"Oh, Love, what hours were thine and
mine
In lands of palm and southern pine!"

FLOWERING TREES FOR FLORIDA

E. N. Reasoner

Mr. President, Ladies and Gentlemen:

By all means let us plant freely of flowering trees, especially in our parks, along city streets and country roads, our gardens, and wherever the slightest suggestion of shade would be welcome, choosing so far as possible the evergreen subjects for the middle and southern portions of the state.

A cardinal principle in the setting of trees in town or city is that each street should have but one kind of tree, thus avoiding confusion and giving dignity to the view. Also, choose wisely for every location, taking both soil and latitude into proper consideration, as well as the size and character of the tree.

In north Florida it is necessary to use more deciduous trees as this portion of our state is liable to more or less frost and some years is almost wintry, rendering this class of tree perfectly suitable. Following is a select list of trees adapted to these conditions.

EVERGREENS

Acacias in most hardy species as A. melanoxylon and decurens.
Gordonia lasianthus.
Magnolias glauca and grandiflora.
Nerium oleander in a select list of the most hardy, upright growing sorts.
Prunus caroliniana.

DECIDUOUS.

Acer rubrum.
Catalpa speciosa.
Cercis canadensis.
Chilopsis liniaris.
Cornus florida.
Gleditschia ferox.

Liriodendron tulipifera.
Melia azadarach and sub-variety unbraculiformis.
Parkinsonia aculeata.
Vitex agnus-castus.

TROPICAL TREES FOR SOUTHERN FLORIDA AND IN PROTECTED LOCALITIES.

Adenanthera pavonina.
Albizzia lebbek and other species.
Andira inermis and jamaicensis.
Bauhinias alba, krugii, purpurea, triandra, and others.
Bischofia javanica.
Bombax milibaricum.
Brownea spp.
Butea frondosa.
Caesalpinia sappan and others.
Carolinea princeps.
Cassia florida, fistula, and others.
Colvillea racemosa.
Dalbergia sissoo.
Delonix regia.
Eriodendron anfractuosum.
Eucalyptus robusta, ficifolia and perhaps others.
Gliricidia maculata.
Grevillea robusta, hillii and others.
Heterophragma adenophyllum.
Jacaranda mimosaefolia.
Ormosia dasycarpa.
Oroxylum indicum.
Paritium elatum.
Peltophorum ferrugineum.
Pithecolobium dulce.
Saraca indica.
Schizolobium excelsum.
Spathodea campanulata.

Most of these in the tropical list are evergreen or nearly so and adapted to the tropics generally. Some kinds are able to withstand more frost than others, of which Grevillea robusta, Bauhinia purpurea and alba, Bischofia javanica, Dalbergia sissoo, Eucalyptus robusta and Jacaranda mimosaefolia, are prominent examples and are grown well up into the middle portion of peninsular Florida. The more hardy trees recommended for north Florida may be used quite generally all over our state down to extreme south Florida, with few exceptions.

In all this subject of avenue trees it must be remembered that proper pruning and growing must be followed to make a permanent success: do not plant with the notion that "nature will do the rest," for she usually does, with advantage neither to the tree nor to the street.

THE GROUPING AND CARE OF ORNAMENTALS

John Schnabel
GARDENER, FLORIDA EXPERIMENT STATION

Mr. President, Ladies and Gentlemen:

Any home can be vastly improved in attractiveness and value by the proper planting and grouping of ornamentals. In no section of our great country are the possibilities for such improvement more

marked than in our own state, with its wonderful climate and wide choice of subtropical plants, both native and introduced. No matter how small the estate, or how commonplace its surroundings may be, it can be made both attractive to the passer-by and homelike to the owner.

The first consideration in planning such an improvement is the soil. There are many plants whose natural habit of growth is in swampy places that can be planted on sandy soils if proper care and cultivation are given. On the other hand, no one builds a home on a place too low and swampy to be drained. As a rule the soils of this state require considerable fertilizer, especially when the plants are first started. While there is considerable latitude, the choice of plants adapted to certain conditions must be borne in mind, and this choice must be governed somewhat by conditions.

PREPARATION OF SOIL

In preparing the soil, it must be spaded or plowed very deeply, and a lot of well-rotted barnyard manure should be well worked in. Where the soil is dry and sandy, muck and clay or other decayed vegetable matter should be added and well incorporated into the soil. This should be at least 18 inches deep. or for trees and deep-rooted plants, still deeper. If hardpan is near the surface, it should be well broken up, and the beds may be raised in order to secure proper drainage. Cow manure and stable manure, the latter thoroughly rotted, are the best materials to use if obtainable. Unrotted stable manure is liable to heat and burn out the roots. If sufficient cow or stable manure cannot be obtained, a liberal application of muck that has been well decomposed should be made. Commercial fertilizer will be found indispensable. Cottonseed meal is among the best materials. Potash and phosphoric acid will not be needed so much as in groves and for field crops. Bone meal will give fine lasting results. Certain soils may require liming, but it must be borne in mind that some plants do not do so well with lime. As a rule, the more slowly available fertilizers should be used for shrubs and trees, and quickly available for herbaceous planting.

Special care must be given to the soil preparation for foreign or introduced plants. Our native plants are more used to the condition they find here.

The first essential in improving the home grounds, no matter how the location is to be treated, is a good lawn, and the ground must be properly graded for this. Without a green lawn, no matter how much care is given to the ornamentals, the premises will always have a bare appearance, and even the best ornamentals will not show off to advantage. With a good lawn for a foundation, a few plants may be made to give most ornamental effects, and such a place would be more attractive than a large number of plants on bare sand. No picture is complete without a background.

As a rule, plants should be chosen of a size to correspond with the extent of the grounds and to harmonize with the architecture of the home. Too heavy a planting around a house will tend to make it damp and gloomy and impart a "shut-in" feeling, especially during the rainy season, when a thorough circulation of air is necessary for health and comfort.

GENERAL ARRANGEMENT OF GROUNDS.

The color of the house, barns, and all out-houses should be such as to harmonize with the general surroundings and the vegetation. For instance, a large and imposing mansion on an elevation and standing out by itself, may be most imposing if painted white; a smaller house or barn surrounded or imbedded in shrubbery would give a much better effect if painted gray or brown. In other words, the effect sought should be to strike the observer, whether trained in landscape gardening or not, as natural, harmonious and beautiful.

By the observance of a few simple rules an effect may be produced equal or often superior to that produced by professional landscape gardening. The professional gardener too frequently falls into the habit of following a stereotyped plan with nothing original in it. There may be too much monotony in his plans.

GROUPING OF ORNAMENTALS.

Larger trees may be used for the backgrounds in extensive grounds, medium-sized plants should be chosen for medium-sized areas. In town homes, and on adjoining lots, co-operation between the owners may produce harmonious effects, with much better results than individual efforts; and the general effects of large areas may be produced by proper co-operative planning and planting.

On large lawns specimens of medium-sized and large trees may be planted singly, but this should not be done on small areas, where smaller growing plants must be chosen. Where single specimens are planted by themselves they should have a proper background of shrubbery to set them off. The worst fault with much of our planting in Florida is overcrowding and an attempt to have every tree or shrub possible on a home ground the size of a city lot.

With a large house set back from the highway, the arrangement should be such that from whatever direction the approach is made one may have a view of the lawn and house with appropriate groupings of shrubbery. The view from the house should be unobstructed. Vistas should be open from every point of view.

CHOICE OF VARIETIES FOR ORNAMENTAL PLANTING

In selecting the following list I have confined myself chiefly to those plants with which I have had personal experience, and others that I have had opportunity to observe. My remarks will apply more especially to the central and northern parts of the state. The plantings for the southern parts of the state have been so ably presented by others.

Among the native trees I will mention the following:

Oaks—Both the live oak (*Quercus virens*) and the water oak (*Quercus nigra*) are very ornamental and form excellent backgrounds to large areas, as well as good shade trees. I would select trees not over three inches in diameter. All branches should be pruned back to the main trunk, and this cut off at a height of ten or twelve feet. The trees should be selected from those not surrounded by too thick a growth, and from a soil that is not too wet. The root system should be well

formed, and any injured roots be pruned off. The trees should be set at the same depth at which they naturally grew. The best time of the year for transplanting is from late fall to the middle of February. Select the water oak for quick growth. The live oak is a rather slow growing tree but lives to a grand old age.

Among the maples the red maple (*Acer rubrum*) is a very ornamental tree, but is subject to borers. These can be killed out with carbolineum. The same precautions should be observed in transplanting maples as were mentioned with oaks. They may be planted in either wet or dry places. They grow fairly rapidly.

The sweet gum (*Liquidambar styraciflua*) can be used in wet as well as dry places. It is good for fine single specimens as well as for grouping. It is rather a fast-growing tree.

The magnolia (*M. grandiflora*) is one of our most beautiful native trees. It is rather difficult to transplant except when very young, and may be either grown from seed or secured from nurseries. It grows slowly, but makes one of our grandest specimens. It should be planted out as a single specimen and not used as an avenue tree.

The swamp bay (*Persea pubescens*) and the upland bay (*P. borbonia*) are fine trees for large grounds. They are somewhat difficult to transplant successfully.

Among the larger introduced trees the sycamore (*Plantanus occidentalis*) is a fast-growing deciduous tree of good shape, and can be used to advantage on large grounds.

The tulip tree (*Liriondendron tulipifera*) is a fine shaped deciduous tree with tulip-shaped flowers. It is not a very tall growing tree, but forms a luxuriant crown. It is of fairly rapid growth.

The mulberry (*Morus*) is a handsome tree, and useful in supplying food for birds. There are many varieties. They should be obtained from a nursery, as the native varieties are not good.

Of the palms, the cabbage palmetto (*Sabal palmetto*) from my own experience is difficult to get started on high, dry land, but on lower moist soil this can perhaps be more successfully done. In the higher and drier regions it is best to grow the palmettos from seed; although they are very slow growing. Large specimens can be obtained from nurseries in tubs, and may be transplanted more succesfully. We have tried many times to get them to grow on the Experiment Station grounds without success.

The canary date (*Phoenix canariensis*) is, in my opinion, one of the best ornamental palms that we have. They are best grown from seeds, or they can be bought from nurseries. The wood date (*Phoenix sylvestris*) is also a fine palm of a bluish-green color, but it is not much advertised, and is difficult to secure.

The George Washington palm (*Washingtonia robusta*) is quite hardy in the central part of the state, and is very ornamental with large fan-shaped leaves. It may be used on large or small areas to great advantage.

GROUPING AND BORDER PLANTS

Many plants that grow naturally to a large size may often be kept down to a medium size to advantage by proper pruning. Some of the varieties, therefore,

that are classified under this heading might also have been placed among the larger trees. The cherry laurel (*Laurocerasus Caroliniana*) is a native of this state, and one of the best plants for ornamental purposes. It can be used for screening for out-buildings, and is also very ornamental as single specimens and in groups. It may be pruned to any desired shape. It blooms in early spring with clusters of white flowers, and retains its foliage the year round. It should be pruned twice a year to make the growth more compact. It is suitable for extensive grounds as well as small areas. It should be transplanted during the winter months. It has a tendency to produce suckers from the roots, which should be removed.

The holly (*Ilex opaca*) is another of our best ornamental native plants which can be used under almost any conditions. It does not require pruning to the extent that the cherry laurel does. It makes very ornamental single specimens as well as small groups. Through the fall and early winter, when covered with its bright red berries and glossy leaves, which are not shed, none of our native plants show off to better advantage; and it should be placed with this in view. On removing from the woods it should be severely pruned and defoliated. Then planted in a nursery for a year. Larger specimens should be cut back to the main trunk and the root system should be carefully preserved. There are other varieties of Ilex, as *Ilex vomitoria,* and *Ilex cassine,* that are natives here, which also may be used as ornamentals.

The American olive (*Osmanthus Americanus*) is a good native plant. It blooms in the spring with clusters of small white flowers and is evergreen. The remarks made in regard to transplanting the holly will apply also to this plant.

The wax myrtle (*Myrica cerifera*) is especially valuable in spots inclined to be wet and swampy. They should be well pruned back before transplanted in the spring.

The dogwood (*Cornus florida*) is a well-known native plant. It is best transplanted in December or January. It is subject to borers, but these may be kept under control by going over the trees twice a year and killing the worms with a small wire inserted in the holes in the trunk and painted with carbolineum. This is the only remedy I have found to be successful.

The red bud or Judas tree (*Cercis canadensis*) I consider one of the best of our native ornamentals. It may be used as a background or in groups. I have found it one of the easiest to transplant, and it requires but little care.

Some of our native hawthorns (*Crataegus*), of which there are many varieties, are very ornamental, especially in mixed groupings.

Among the introduced medium plants should be mentioned the camphor tree, a well-known plant suitable for single specimens, but not for avenues. Transplanting is best done in early spring, and the plants should be defoliated.

The Japanese varnish tree (*Sterculia plantanifolia*) is a fine deciduous tree for winter effects on account of its bright green bark. It can be procured from nurseries.

The soap-berry tree (*Sapindus saponaria*) and the tallow tree (*Sapium sebiferum*) are good for large and mixed groupings as well as single plants. The leaves are shed in the fall.

The *Pittosporum tobira* is a very handsome plant. I have seen very fine specimens of this in this state. It is good for grouping.

A somewhat neglected ornamental plant is the loquat (*Eriobotrya Japonica*) or Japanese plum. It is suitable for single specimens on lawns with a proper background. It sometimes produces a good crop of delicious fruit.

The *Camellia Japonica* is a very slow-growing plant. It blooms during winter and early spring.

Among the azaleas the A. indica should be treated like the cammellia. There is a native variety, the white flowering honeysuckle (A. *viscosa*) that is fine for low shrubbery borders. It grows best in damp places. On higher places it must be well watered or it will die out.

Another handsome native shrub that is much neglected, found on high hammock land, that goes well in groups and massing with other plants is the French mulberry (*Callicarpa Americana*).

The *Abelia grandiflora* is a handsome shrub which bears a mass of white flowers throughout the summer. The *Duranta plumieri,* golden dew-drop, is also very ornamental with clusters of yellow berries in the winter.

The pomegranate can be used on large grounds, but it is only suitable for groupings and backgrounds. The banana shrub magnolia is highly ornamental when grouped with plants which hold their leaves the year round. There are a few varieties of *Jasminum* (*grandiflorum Sambac* and *humile*) that can be grouped with the above-mentioned plants. The *Plumbago capensis* is a fine low-growing plant for borders. By grouping specimens of the above-mentioned varieties one can secure a succession of bloom the year round.

The crepe myrtle (*Lagerstroemia Indica*) comes in many varieties of color. They can be used in mixed groupings as well as for screenings. The light pink variety is useful as a low-growing plant, while the darker varieties tend to make larger shrubs. They will be found much more satisfactory when treated as shrubs than when trained into tree forms. The white and the light pink varieties are especially attractive in mass groupings and in hedge rows.

There are many evergreens that should be included in the list. Among the native varieties is the pencil cedar (*Juniperus Barbadensis*) which is found on high hammock land. It is best transplanted when it first begins to show new growth. It will not grow well unless a sufficient root system is preserved, and it must be kept continually moistened. If the roots once dry off they will not grow. It is very suitable for grouping with other evergreens or as single specimens, and may be used for avenue treatment. It can be shaped as desired by proper pruning. The white cedar (*Chamaecyparis thuyoides*) is another native evergreen with good qualities. It should be treated like the above.

Of the introduced varieties of evergreens I will mention the Japanese juniper

(*Chamaecyparis pisifera plumosa*) one of the handsomest evergreens. It is suitable for single specimens or for groupings. This is my favorite variety for this section of the state. A low-growing, trailing evergreen, useful for borders, angles or corners or on rockeries, is the *Juniperus sabina prostrata.*

There are a number of varieties of arborvitae or thuya; tall, medium and low-growing, including the Rosedale arborvita. They are very fine for grouping at corners of buildings. The *Cupressus sempervirens* makes fine single specimens on a lawn. All evergreens and conifers should be transplanted with a ball of soil around the roots, if possible, and these must not be allowed to dry out. They must be watered for the first year. They should be set out in well-drained places, as they will not do well on wet places.

Some of the bamboos are hardy in this section, as *Bambusa argentea striata, B. argentea arundinaria falcata,* and *A. Metake.* These are fine for backgrounds or for side plantings in groups.

In general, in planting, close contact of roots and soil is essential. The soil should not be kept wet, but always moist. Most plants, especially trees and evergreens, are often planted too deep. As a rule these should not be planted deeper than they were where they grew. The soil should be sprinkled in all around the roots. After the hole is full a slight ridge can be made around the tree and this basin filled with water. In planting large groups I would tramp the soil around the plant with the heel of the shoe, but not so firmly as to break the roots.

In pruning, care should be taken that all broken roots are removed. Trees or shrubs should be pruned to a good shape and all dead growth removed. Some plants require and stand more pruning than others. Some evergreens require little or no pruning. After planting, for the first year especially, the plants should be well cultivated and watered during dry seasons.

In all things experience is the best teacher, and one should not be discouraged if things do not grow as desired at first.

LANDSCAPE GARDENING IN FLORIDA

Karl A. Haltenhoff

Mr. President, Ladies and Gentlemen:

The art of landscape gardening is still in its infancy in Florida. The material is there for the production of effects which shall have all the romance and mystery that only a tropical jungle possesses. Attention is to be called to some of the possibilities of genuine landscape work with the indigenous growth of the state itself. The grandeur of mountain scenery is lacking, but the dense forests or rolling lands, the numerous lakes and rivers, the abundant evergreen trees, the palmettos which are characterized by a grace and stateliness rarely equalled, furnish material which can be combined in picture of

infinite variety and interest.. A natural grandeur is not one given over to the spontaneous and uncontrolled growth of nature, but one in which a finished artist intensifies the effects that nature produces by emphasizing a feature here and there and eliminating every element that distracts from the central purpose of the scheme. It is my belief that landscape art reaches its highest development when it deals successfully with the fundamental and permanent features of scenery, and with a broad handling of a few simple elements presents typical pictures which are instinct with the poetry of nature. The lesson to be enforced is that whether in the low levels of the South, or on the rocky coast of New England, or in the glen among the Alleghenies the aim should not be to transform home-grounds into something foreign or fanciful, but to unfold and enhance the native and peculiar beauty of the spot; to develop its own beauty rather than to decorate it with imported ornament. This is not an easy achievement, it is true. It implies an artist's sense, and it means to treat nature with respect, if not with reverence. Surely one who agreeably leads you to a point where you unconsciously pause before a well-composed picture from which all incongruities are shut out by a frame of foliage, is accomplishing what the landscape gardener aims at in his best constructive efforts. Many who attempt this kind of work in Florida or elsewhere will fail of every high attainment, but they will not be in such danger of displaying impertinence and pretentiousness as will those who endeavor to obliterate from their land everything that is distinctive, and rid of everything common so that they can trick it out in exotic finery of their own choosing.

Hotels, with every modern urban appointment are to be found in the most untamed sections of the state, and evidences of luxury are seen in clearings where stumps are still standing. But well-kept gardens are not noticed among the marks of refinement. This does not imply a lack of taste or of inclination to the art, for elaborate gardens cannot reasonably be looked for in a country comparatively new.

The whole aspect of nature must be softened and mellowed by years of human control before fair gardens are developed naturally and harmoniously out of their surroundings. It is not to be inferred from this that Florida has no ornamental planting to show. On the contrary, examples are seen everywhere, and they are full of promise. Great numbers of the shrubs and vines that are ornaments of Northern greenhouses are here in full flower in February and March to the constant surprise of tourists from the colder latitudes.

The possibilities for landscape gardening in Florida, with the abundant indigenous growth of the state itself, are unlimited. And there is no better pattern for the style to be used, than the wild natural hammock. If this general scheme is made use of in planting our home grounds we can produce effects that cannot be rivaled in the northern gardens. Nature itself recommends dense planting so as to shade the ground, and here is the place for the native material where it will fur-

nish a background for rare and more delicate exotic shrubs and trees. These must be so arranged and planted as to do justo their peculiar individuality.

Openings should be left here and there for some striking object framed in with the moss-draped branches of a live-oak or magnolia, and the cabbage palm, which is remarkable for its height and dignified expression that only comes with age, should tower over the jungle to give us a point in the tropical sky-line.

The tropical jungle style of gardening can best be applied when the grounds are large and spacious enough to afford massive plantings and where the artificial construction may be so arranged as to heighten the charm of the picture and add to our appreciation the creative genius, for the skillful landscape gardener always aims to bring into unison the beauties of art and nature.

Trying to duplicate the Northern gardens here in Florida is one of the greatest mistakes too many of us make. The general scheme, namely, border planting of trees and shrubs on a lawn may be followed. But this style is only to be recommended where the home grounds are of limited dimensions, such as city lots, and where irrigation can be supplied for the upkeep of the lawn; also here it holds true that the more trees and shrubs are observed and studied, the more evident it is that our native species give best satisfaction and in front of these the exotic specimens may be arranged to best advantage. To group trees and shrubs successfully requires the eye and skill of an artist and the knowledge of a botanist. A man must not only know how the trees look at the time of planting, but what forms they will take twenty or fifty years hence.

A few of the northern trees and shrubs do well here and an occasional specimen may be worked in the scheme; but the foundation must consist of the indigenous growth of the State itself. A few of the more tender annuals found in the northern gardens do well and their wealth of bloom is harmonious with the tropic verdure and bright sunshine. These may be worked in along portions of the shrubbery in a tasteful manner that is pleasing to the eye.

The above cited styles of gardens come under the general style of naturalistic gardens. Here we strive for a natural effect by massing the varieties decided upon and grouping them for contrasting color; but the appropriate massing of foliage, so as to secure the best effect, from soft, harmonious or bold contrasts of color requires much study and critical knowledge. The arrangement of walks and drives must be as direct and inconspicuous as possible and the first and fundamental study is to provide for human use, for comfort and convenience.

The modern or naturalistic style of gardening may be defined to be the forming of artificial scenes on principles learned from natural ones, although the copying of the natural prospect is not feasible, it is there that the principles of our art are based, whether they are applied to the smallest city lot or the largest park, and it is there that we must go for instruction, either from its beauties or imperfections. It is there only that the aspect of nature,

whose essence is of the shifting lights on wood and meadow, the nameless charm of water, at rest or in motion, the mysteries of recesses between massed trees from different points of vision, and the appearance of them all under different skies and seasons. The selection from these parts and their composition into a new and consistent whole is the art of naturalistic landscape gardening.

Camphor Production

Dr. W. O. Richtmann

Mr. President, Ladies and Gentlemen:

I would like to preface my remarks with a story I heard the other day concerning a civil engineer. One comment that was made of the man in question was that it was the opinion that he was about as good a man as they could find to *dis*locate a line.

In my remarks, I would like, not only to dislocate some impressions you have, but break them entirely in two.

A great many people believe that the taking up of the production of camphor in this country is being done for ulterior motives; that is not the case. If you are interested in growing camphor for commercial purposes, the people interested in it would be only too glad to give you any information or assistance possible. The field is ample and the market is large.

The greatest use to which commercial camphor is put at the present time, is not as a great many people believe in the manufacture of smokeless gunpowder. Camphor probably never will be used in the manufacture of any explosive. In reality, it is exactly the opposite. It is highly inflammable but very slow burning and exactly the opposite of what is wanted in an explosive.

The greatest single use to which it is put at present, is the manufacture of celluloid and like products. I make that distinction because celluloid is a trademark now. There are many products really exactly similar to celluloid, but they go under other names, celluloid being a trademark.

The method we have followed since we have been in the State, is the propagation of the plant from the seed, keeping the tree in our nurseries for two years, and transplanting them during the winter season. In the summer we cannot transplant successfully.

The trees are cultivated under ordinary conditions, keeping the ground free from foreign growth until June or July, when the native grasses are allowed to come in.

After about three or four years after transplanting, the trees are large enough to yield trimmings. We trim our trees to form hedges, and we trim the hedges "A" shaped. We hope ultimately to have our trees form solid hedges. The trees should be planted, the hedges about fifteen feet apart, and kept trimmed back to about eight feet high. We trim them with a modified cutting machine.

These trimmings are then collected and brought into the large building in the center of the plantation, put through an ensilage machine to reduce the bulk and blown to the top of the retort. The tanks are then sealed and steam passed through

the charge. The steam takes up the camphor, and the camphor-laden steam passes through a special condensing apparatus, where it is condensed to water.

The only complicated process is the removal of the camphor gum from the condenser. Any modification of the copper worm which turpentine people are familiar with, is not practical because the camphor is solid and congeals. The machine we have, to all intents and purposes, is an ice-cream freezer. It has two fixed paddles instead of one.

The product as it comes away from the condenser consists of three things; the major portion of it is water; probably outside of the ten or fifteen minutes, practically 95 per cent of the material that comes away from the condenser is water. The camphor oil and gum are practically insoluble in water and they float on the surface of the water.

An automatic separator permits the water to flow away and the material floating on the surface is retained. By a refining process the oil is removed. During the latter part of the distillation process, all of the oil is eliminated and we get nothing but the crude camphor gum. The sample I have here represents practically the conditions under which we turn this product over to the market. We do not refine at the plantation, as our output is too small to justify the installation of a plant to do this work.

This sample is to all intents and purposes a commercially refined camphor. It is a product which the refiners themselves have no difficulty in turning over to the market, under the same conditions as the imported refined product.

Here is a sample of the oil which has been deposited. It is a by-product in a way, and yet it is a commercial product, also. That oil as you see it in the last container, consists of three commercial products. One is known as the light oil of camphor, which enters into the manufacture of linens largely, also to a slight extent in the manufacture of some varnishes.

After you reach the point at which the light oil begins to decrease in quantity, camphor begins to distill. The oil is dissolved, practically its own weight in camphor. 50 per cent is gum camphor dissolved in the oil. At this point the camphor begins to distill until you reach a point of 225 centrigrade, when oil begins to come over. This is then stopped and the solution is put on to the market as the heavy oil. It contains a large percentage of the same constituents as that in the oil of sassafras. It is the presence of these constituents that causes the oil to enter into commerce as a blending agent. Sassafras has the peculiar property of mixing well with other principals, and especially those which are delicate and not very lasting. The sassafras takes hold of them and blends with them so that the perfumery stays with the safro as soon as the safro is present.

Now, as to whether the production of camphor in this country is a success. At the present time I cannot say definitely that it is. So far as the oil is concerned, there is no question but that it should be a success. So far as the product is concerned, there is no question but that it is a success. If we had nothing but that

to contend with, our sailing would be easy.

But we have found that in the production and cultivation of it on a large area—we have now 1000 acres of it in trees, we are finding various unfavorable conditions that affect the plants. We are finding physiological conditions that are adverse to the growth of the plant and a number of fungi that attack the plant, and a number of insects that are going after them. They were exceedingly serious with us last year. We feel that we are getting the greater part of these adverse conditions under control, but they are not completely eliminated, by any means.

From conditions as they exist at the present time, it would appear that these conditions are going to be the controlling factor determining whether the production of camphor in this country is going to be a success or a failure.

What is a Good Looking Town?

By J. Horace McFarland, President American Civic Association.

Mr. President, Ladies and Gentlemen:

It is an especial pleasure to speak on this subject to this audience, because of what I see as I go about Florida. Comparing the conditions I find now with those prevailing on my first visit to the flowery state twenty-three years ago, I can be sure that the state with its vast resources, its unique soil and climate and its wonderful opportunities, has awakened to its needs and its duties with respect to the sort of improvement work for which the American Civic Association stands.

A quarter century ago Florida was dull, dirty, slow and lazy. Something has happened to change this state of affairs, for now I face alert men and women whose homes are lovely with the loveliness that belongs to Florida alone, and whose very air as they sit before me is that of prosperity and advance.

Therefore in speaking to you on "What is a Good-looking Town?" I can almost say any Florida town is good-looking—almost, but not quite, for, as I shall show you on the screen, some Florida communities have not yet awakened to their needs, their duties or their opportunities. Some towns do not observe how they are educating travelers to stay away, how they are extending the repelling influences of disorderly surroundings along the railroad to those whose money and help is so desirable.

To talk about what makes a town good-looking one must adopt a certain systematic order. First it is proper to consider the approaches to our towns, in relation to their looks, for in some way we must get into town, by trolley, by steam, by rail, or by water transportation, if we are to make any judgment or express any preference concerning it.

Now the approaches to American communities are not always encouraging. I show to you certain contrasts, some from the north and some from the South, dealing with good and bad conditions. You will at once agree that this billboarded filthy approach to Trenton, New Jersey, does not make it a good-looking town; nor does this mis-spelled advertisement of a liquor dealer who has located himself where every one who passes through Plant city must see what he has to offer. You will, on the contrary, agree that the trolley entrance to Hockanum, in Connecticut, and the pleasing premises of The Florida Citrus Exchange, near the station at Winter Haven, are of most attractive type and tend to attract visitors, while certainly helping to make good-looking towns.

The other contrasts that I show you, as between Chicago and Paris; between San Diego in California and Lucerne in Switzerland; between Milwaukee in Wisconsin and Rotterdam in Holland, in-

dicate how the foreigner has capitalized good looks and succeeds in making us Americans pay the most of the interest.

It is not generally realized that the travel tribute to Europe paid by Americans every year approximates three hundred and fifty million dollars. This is largely paid to see good-looking things. There are some towns in Florida to which it would not be expected that any sane person would come with the thought of geting at good-looking things, you will all admit!

But once inside the town we want to examine the places where people live. The views I show you indicate differences, and, sorrowfully enough, the advantage is with those communities abroad that have come to realize that those workers do best who live best, in the sense of clean, sightly and attractive and restful surroundings. We have paid in America a vast tribute to learn this definite truism. We must look carefully at the highways of a community concerning the appearance of which we are to decide. A wise city planner, John Nolen, has said: "Streets are the most important of all the features of a city. They are the frame work. They control and regulate the development in the center of the city, and ramify to the remotest corners. No one feature is so permanent, no other so difficult to change."

The sort of streets Mr. Nolen thus introduces to us must, if successful, be fitted to the uses to which they are to be put. It is sheer folly, for instance, to pave with heat-radiating material in unnecessary width on a residence street, which on the contrary ought to have only adequate, and not excessive, traffic space, joined to adequate sidewalks, both being united by the beauties of tree and grass, such as, for instance, I show you in connection with my pictures, but particularly in respect to Buffalo, Syracuse and Miami.

The handling of the street is an expert matter, too often left to inexpert hands. Great trees are cut down which as in the instance I show you in Washington from the sidewalk fronting upon the White House enclosure, had better be left standing. Few cases there are so well combining efficiency, beauty and attractiveness as Oxford Street, Rochester.

Trees on the street must, if they are to be successful, be controlled municipally. If the selection, planting and care of the trees be left to private initiative there will be incongruity, inefficiency and ugliness. Washington has ninety-three thousand municipally planted trees, and many communities in New Jersey, Pennsylvania, and the state of New York are benefiting immensely by the same sort of control. There can be no such painful beheading as that I am showing you in graphic pictures if municipal control exists.

A feature which makes a town good-looking or the contrary is often its lighting arrangements. You will all call to mind towns in which the exceedingly ugly poles used to distribute electric energy are the adornment of the streets. I show you communities in which a better condition exists, and in which light is distributed scientifically, economically, practically and beautifully. I want to have you all realize that this is not a matter proper to be left to the ordinary city engineer, or to the ordinary electric plant manager. The first man usually knows noth-

ing about it, and the second man has lamp posts and current to sell. The city authorities ought to consider the experience of other cities and act with care and propriety toward better lighting. In the city of Washington there is now model lighting, conducted at great economy, because those handling the matter first studied the situation from the expert standpoint and produced a unit system in consequence, which you will agree with me, as you look at pictures of it, is admirable.

Viaducts, or bridges, have much to do with making or marring the good looks of a town. In these days of good concrete work it is easy and economical to avoid either wire work bridges or those which speak only for the iron-maker. With proper attention it is possible to secure forms of beauty combined with efficiency, in concrete.

Particularly would I call your attention to the public spaces in the town that is to be good-looking. The pictures you are viewing, showing how the central soldiers' monument has been made subordinate to an absurb flag-pole and to ugly electric light poles, will indicate that good taste has not yet taken possession of all American towns. The billboard surroundings of the statue erected to the memory of George Washington, in Chicago, is another insance of thoughtless impropriety. The mawkish sentimentality of the green-painted cast-iron fountain which disgraces the street in a Pennsylvania town indicates to us that it is necessary to look a gift horse in the mouth always, and shows why in the city of New York, for instance, no structures are permitted to be placed on the public property until and unless they have been approved by an Art Commission, so selected as to make sure of its good taste and its wisdom.

"No man lives to himself," and most assuredly no man builds to himself." A recent visit to Paris impressed me strongly with the canny economy of the Frenchman who puts no structure on the public streets that does not contribute something beyond its own utilities to the general sum of the city; that is, the value of vista and placing is there considered. This beautiful church which I show you in Buffalo, indicates how much additional value the church authorities have received and how much value they have contributed by the same thoughtful consideration, while the million dollar City Hall of Trenton, apparently dumped out of an airship without regard to where it struck, is an intsance of how a vast expenditure may be made ineffective where there is no thought or consideration for present or future surroundings.

In this scheme of considering the effect of buildings, all public and semi-public buildings should be included, and all private builders ought to care enough for their home towns not to disgrace the neighbors and to decrease values by intrusions or unpleasantness. It might well be considerd that it is not fair for one man to do that which, if all did it, would make the community either ridiculous or uncomfortable.

It is hardly necessary to say much in Florida concerning the emission of black smoke. Your industries are not largely in the direction of coal; but where it is used I want you to know that it is entire-

ly feasible to have it burned so as to avoid the ruin and damage of black smoke.

Another of the nuisances which beset the community and which make it unpleasant to look at is the billboard nuisance. You will see by the picture how the city hall at Jacksonville is made tributary to beer and the other things, and you will see also how the approach to Jacksonville from the railroad station is an alcoholic approach, by means of lanes of beer and booze. Unquestionably this is a misfortune and it cannot continue to exist in a community which is to be good-looking.

Poles and wires are now going underground from economic reasons. There is no excuse for great pole lines, maintained altogether for private advantage on the streets owned by all the people. The methods of burying the wires are economical and advantageous.

Recreational conditions must be taken into account in a good-looking town, not only because they are good-looking in themselves, but because they tend toward that service to the citizens which is a part of every self-respecting American community. I show you pictures of how this work is done all over the United States, including the school garden, the Cleveland sixeen-cent garden, and the parks and play grounds which are so notable and pleasant a feature of our American life. There are in the pictures some dreadful contrasts which will point themselves to your eyes. You do not want in Florida gutter or street children. You prefer, I am sure, playground children. You see the value of recreational provision. You observe the advantage of the public bath and of all the other beneficences that are included in modern park and playground work, no longer considered as a luxury for the well-to-do, but instead as an investment for the benefit of those whose prosperity is vital if they are to live and grow at all.

All that I have said bears toward one end and one plea. I have tried to show you what a good-looking town is, and I now say to you that you cannot have it except by thoughtful planning. Good things do not often happen at random. City planning is the keynote of modern advance. It is not new, for the first great instance of it is in connection with the planning of our federal city, Washington, by the immortal "father of his country," who laid down its lines when the United States was a struggling nation, with barely three millions of population, hanging on with difficulty to a thin fringe of the Atlantic coast. Yet this immortal man could look ahead and plan for a hundred millions of people and provide for the building of a city which should distinguish and dignify us among the nations of the world. Washington, then, is the one greatest example of city planning. Other communities all over the country have taken up the subject, and whether it be the village of a thousand or the metropolis of a hundred thousand, the possession of a plan for the development is the sane, sensible and logical thing. It saves frequently its cost many times over in each year, and whether or not its provisions can always be directly carried out, it is, when once obtained, a check against unwise

action and a provision for right things that is of inestimable value.

It is toward the insistence upon community planning that I have been coming this evening. It is the function of the American Civic Association, in connection with its great work for American building, to insist upon city planning, and its offices in Washington are always open to those who inquire concerning ways and means of accomplishing this notable good.

In order that responsibility may be properly placed, I conclude with the following bit of doggerel:

WHO IS "THEY"?

Why don't they keep the streets a little cleaner?
You ask with deep annoyance not undue.
Why don't they keep the parks a little *greener?*
(Did you ever stop to think that they means *You?*)
How long will they permit this graft and stealing?
Why don't they see the courts are clean and true?
Why will they wink at crooked public dealing?
(Did you ever stop to think that they means *You?*)
Why don't they stop this miserable child labor?
And wake the S. P. C. A. up a few?
While thus you gently knock your unknown neighbor,
Did you ever stop to think that they means *You?*)

Question Box

Questions and Answers

The question box, introduced by the secretary at the opening session was well patronized. The questions placed in the box were answered in part at one of the regular sessions and the remainder of them on the boat during the afternoon trip, Thursday, April 30th.

QUESTION 1. Has coquina shell, which runs 40 to 70 per cent in lime in powdered form, been tried for lime?

Mr. Hart: I do not think it would help, because shell disintegrates very slowly indeed. You can dig down in old Indian mounds, thirty feet deep, where the pottery is of the very oldest type, and yet the shells which are buried there are just as sharp on the edge as though they had just been opened. I think they would have to be burned some way to get the lime out of them. I don't think it would be practicable.

Mr. Street: I have seen the oyster shell burned and put on the ground. That has been done about a mile from my place.

Mr. Hart: I am speaking of the donac clam shell. The oyster shell is excellent. Many claim it is even better than rock lime.

QUESTION 2. Is any commercial peach growing done in this State, and with what success?

Mr. Mace: We are out of the business entirely in our section. There are quite a good many grown around Seville section, but I cannot answer the question as to what success they are having. In our section we gave it up on account of the many pests that have grown up with it; scale, etc. The trees seem to have become very short lived, only living three or four years.

QUESTION 3. Why is there a slight exhibition of frost when our thermometers register 36 or 37 degrees?

Mr. Hubbard: The reason for that is that the coldest air is on the surface of the ground, on a still night. When the air is in motion the temperature does not vary much. On a still night I have seen a thermometer ten feet from the ground register 42 degrees, while on the surface of the ground it registered 32 degrees. It is coldest at the surface of the ground and the temperature rises gradually as you go upward.

QUESTION 4. What is the cause of foot rot? What to do to prevent it? What is the cure?

Mr. Hume: That is a good, healthy question. I see Prof. Rolfs coming around the corner, and I will get him on that. Professor Rolfs, you have two minutes to answer. (Laughter)

Mr. Rolfs: Well, foot rot, according to Dr. Briosi, the Italian Plant Pathologist, is due to Fusarium limonis. Now,

if you know what that means, you know what causes foot rot. (Laughter). He told us that nearly forty years ago and we have just gone on the plan that Prof. Briosi knew what he was talking about, and American pathologists have not given it much attention.

Foot rot was a fatal disease in the Azores along in the '30s and in about ten years destroyed about 25 per cent of the citrus trees. Along about the '70s it had been almost completely subdued. It was transported to Portugal, and then worked eastward to Sicily and Messina and throughout the Mediterranean region where the citrus fruits were grown.

Later it came into the United States and the first authentic records we can get of it in Florida seems to be about 1876, and up to about 1880 it was a very rare occurrence. Then it spread very rapidly and by the middle of the '90s it was a very common thing in Florida. Since that time it has appeared intermittently.

Now, as to how to take care of it, Mr. Hume showed us the picture last year of how the Spaniards take care of the disease. Or was it at the Seminar he showed the pictures?

There is no great difficulty in handling the disease so we see no special reason why we should spend much time in working on the cause of foot rot. We know it is an infectious disease but, as I said before, we have spent very little time in finding out *what* it is. The method used to cure it is efficacious, and even if we knew what it was our method of treatment would probably be the same.

In curing it, you want to bear in mind it is a disease that does not always show the lesions. In my inoculations it was a number of months after placing infected material under the bark of the tree before the tree began to show the symptoms, and when it did show the symptoms it was usually some distance from where the infection was introduced; sometimes on the other side and above or below where it was put in.

I think I have given you the whole story in a nutshell.

Mr. Hart: You haven't told us how it can be cured.

Mr. Rolfs: The method used in Italy, and the one that Prof. Hume showed us at the Seminar, is that of removing the soil from the crown, letting in plenty of air and light around the crown of the root, removing the dead and diseased material where the outbreak occurred and then applying an antiseptic. The only reason for applying the antiseptic is to keep from contaminating the other trees. You are likely to spread the disease from the infected into the healthy tissues unless the utmost caution is used. I have seen cases over and over again where it has been spread by using instruments such as hoes and prunning shears, on healthy trees that had been used on diseased ones.

Some people advocate throwing bluestone under the trees and curing it in that way. It reminds me of the Irishman with his flea medicine. A Dutchman bought some of him and asked him how to use it. The Irishman said, "First you catch the flea and choke him until he has to open his mouth to breathe. Then you put two teaspoonsful of the medicine down his throat." The Dutchman said, "Why, I can stamp on him quicker." "Well," said

the Irishman, "that's a good way, too." (Laughter).

The main thing is to get the area around the crown, exposed to the air and if possible, to the sun.

Mr. ———: What is the antiseptic, and how strong do you apply it?

Mr. Rolfs: The first antiseptic tried out was *sulphurous* acid. Through a mistake in the literature, some people have been using *sulphuric* acid. Sulphuric acid is an antiseptic—so is a red-hot poker.

Another good antiseptic is crude carbolic acid. Carbolineum is also fairly good. We have also used the mercury chloride which you can get at the drug store; directions come with the tablets—just how to use them. I like best the carbolic acid or carbolineum because there is no danger of an animal drinking them. They are also of vegetable origin and not likely to cause much damage to the tree.

Don't think when you have treated a tree and no more foot rot is visible, that the tree is cured, but wait six months or even two years before you feel assured that the disease has disappeared.

Mr. Temple: I have heard it stated that foot rot never occurs on budded trees. Is that correct?

Mr. Rolfs: Oh, bless you; no. It occurs on budded trees, seedlings, and a good many places where people say it cannot occur. All you have to do is to become a plant pathologist and you will see lots of things happen that people say simply can't happen.

Sour orange stock is more resistant to it than the others we have, unless it is the bitter-sweet. The sour stock is very resistant. Rough lemon is very susceptible. I have seen the disease on trees budded on grapefruit stock. We may have a totally immune stock in the bitter sweet. The sour stock is very resistant.

Mr. Temple: What strength of carbolic did you use for the wash?

Mr. Rolfs: The carbolic acid you get is of variable strength. I like to use about one part of water and one of carbolic acid. Sometimes we have used it straight and no harm came from the use of it. Some people have reported some scalding, but what if it does? That very scalding will make the spot resistant to infection.

I like the crude carbolic acid simply because it is cheap. I would not hesitate to use the other if people will pay for it, but I would rather pay for crude carbolic.

Mr. Hart: In looking for foot rot, you have oftentimes to dig the dirt away to find the gum. Use your knife and other tools and also the hoe. It has been my practice to disinfect my tools by using formaldehyde, one part to twenty of water. I think you will find that important in dealing with foot rot. It is a good thing to have a bottle of formaldehyde or carbolic acid with you and a brush, and you can brush over your tools very quickly with the antiseptic before you leave the infected tree to go on to the next.

Question 5. Tell us about setting trees without the use of water.

Mr. Hume: It can be done if the soil is moist, but if it is dry I would not advise it. Use the water.

Mr. Hollingsworth: I presume that question was thrown at me. I am one of those people who set without water. We oftentimes learn many things by having circumstances force them upon us.

In setting nursery trees by the thousands, we set row after row without the application of water, and those little trees have only a tap root, and hundreds of them live without the application of water. Then we experimented to see if the larger tree would not live with the same care. We have tried it for a number of years, and it will work. By way of experiment, I wish you would try a few of them. I have been setting out trees for other people as well as for myself. I have set a large number of trees and guarantee them to live, and the other fellow laughs because we do not give them water.

Of course, if the sand is dry, you have to put water in then, but otherwise you do not need to water them.

QUESTION 6. How to obtain relief from red bugs.

Prof. Watson: I have had some experience with red bugs; like all newcomers, but I am getting somewhat immune to them. Simply have patience with them. (Laughter). If you expect to be exposed to the red bugs, rub sulphur on the exposed parts. I obtained relief, after being bitten by bathing the affected parts in about a 4 or 6 per cent formaldehyde solution. Alcohol is good. Alcohol or formaldehyde are good to relieve the pain, simply.

Dr. Berger: I have had some experience with them. I think it is rather important to remember to use flowers of sulphur. I tried some flour of sulphur and it does not work so well.

QUESTION 7. Where can we get a publication on lettuce culture?

Mr. Rolfs: You will have to get that from the horticulture books. Mr. Kennerly, at Palatka, and Mr. Walden, at Miami, have both published articles on lettuce culture. Mr. Bateman has, also.

Mr. Hume: There are three or four books published on vegetable growing in Florida. Mr. Bateman's book, Mr. Kennerly's and Mr. Walter Walden, of Miami.

QUESTION 8. What are the differences in the Valencia Late and Hart's Late or Hart's Tardiff orange?

Mr. Rolfs: I think we ought to insist upon Mr. Hume answering that question. If he is not an authority, I think the rest of us would have to pass it up.

Mr. Hume: I will say frankly that for the past fifteen years I have been hunting for the difference. I went back to several sources where I thought I could get the two things separated. A friend of mine said he knew in California where there were some trees of an absolutely genuine strain of what the Californians called Valencia Late. Shortly afterwards I received a package from him containing 1500 buds. Then about two weeks after that, I got a letter from him in which he said he had been delving into the history of those Valencia Late orange buds he had sent me; and found that about fifteen or twenty years ago they came from Florida and were, no doubt, what the Floridians called Hart's Late or Hart's Tardiff.

In my opinion, there is no difference between them.

There is one thing you must always remember about fruits. You may take any fruit, of exactly the same strain, carry trees of it to one region of the world,

and cultivate it, and carry other trees of it to another part of the world, and cultivate it there, and if you bring together fruits from the two regions for comparison you will probably find them slightly different.

QUESTION 9. Is it harmful to bury dropped oranges in orange groves, leaving out the consideration of fungi?

Mr. Hume: I would not think there would be any danger in burying them if there were no fungi on them, if too large numbers were not put in any one place.

Mr. Hollingsworth: Last year we had some experience on that line, by taking out the seeds from oranges in large quantities, at a cool, shady spot. We dumped the refuse right there and it acted as a fertilizer and the results have been good.

QUESTION 10. What is the success of pecans budded or grafted on the scrub hickory?

Mr. Hume: I may say, in a general way, that the budding of pecans on any kind of hickory has not been very successful. If I were advising anybody to plant pecan trees, I would advise them to plant trees grown on pecan roots. Trees can be top worked on hickory, but the results are not satisfactory.

Mr. Barber: I know two patches, one in Jacksonville and one in Suwannee County where the pecans were budded to the hickory and both lots were, you might say, a complete failure. There are a few trees left, but they are almost worthless.

Mr. Gaitskill: I have some trees ten years old or over. They have borne a few nuts. I could not ask for a more beautiful tree, so far as the tree itself is concerned, but they bear no nuts worth speaking of.

QUESTION 11. Does close planting cause heavy fruiting in oranges. How is 30x21 feet on high pine land for oranges?

Mr. Robinson: We have had very little experience with oranges; our experience is almost entirely with grapefruit. With the oranges we noted no special effect either for heavy bearing or light bearing.

Mr. Hart: In Jaffa they plant their trees about four and six feet apart; I guess six feet is a good ways apart. You can almost reach to the top of the trees, and yet a grove of that kind is almost a solid mass of oranges. When they get too large they cut out every other one or cut it back so as to give a little more room for the alternate trees. I have seen no trees there that grow up as big as ours do, but they certainly have a heavy crop of fruit.

QUESTION 12. What is the function of a tap root of an orange tree? Does it go to water? Then what does it do?

Mr. Street: In '95, I dug up some orange trees that seemed to be no good, and I hunted for the tap root as far as I could go. I never could find where it ended. They were all decayed.

Mr. Hume: I think it is quite general that when trees grow old, the tap root disappears. I am speaking, of course, of trees in general.

Mr. Temple: You would not think so if you had to use a Hercules stump puller to get the pine trees off your land, where the tap root seems to be about twice as big around as the tree, and be-

fore they come out seem to be about as long as the tree. (Laughter).

QUESTION 13. Which is better, a two year bud or one year bud orange?

Mr. Hart: I think the larger the trunk is, up to four or five inches, the quicker you will get a good, bearing grove. They are stronger and put on a much more rapid growth. I would rather plant a large tree and save all that time that is spent in waiting for the smaller tree to make its growth.

QUESTION 14. Would spraying fungus spores for whitefly control be likely to spread lemon scab on sweet orange trees?

Mr. Hume: I would advise the inquirer to obtain and read Experiment Station Bulletin, No. 103. He will find full information in that Bulletin.

QUESTION 15. Would spraying for the whitefly be apt to spread the whitefly fungus?

Mr. Hume: I think this question can safely be answered in the negative.

QUESTION 16. Please inquire where whitefly fungus can be obtained, both red and brown.

Information was given that these fungi could be purchased from the following:

Frank Sterling, DeLand, Florida.

J. A. Stevens, DeLand, Florida.

G. E. Story, Eustis, Florida.

QUESTION 17. How does sheep manure compare with fish guano? Have been asked this many times and would like the views of others.

Dr. Coffin stated at Winter Park he had obtained the most beautiful growth by using sheep manure. The question was discussed more or less generally. Mr. Hume finally stated that those who had secured excellent results by this line of fertilization might keep it up, but to look out for die back.

QUESTION 18. What about using muck?

Mr. Gaitskill: I can answer that briefly: It does not pay.

Mr. Rolfs: I think we can repeat a quotation used before the Horticultural Society fifteen or twenty years ago, in connection with this same question as to using muck: "Applying muck to a citrus grove is harmless amusement."

QUESTION 19. What about using ground phosphate rock "float" as a citrus grove fertilizer.

Mr. Poole: Several years ago a considerable number of groves were fertilized by ground phosphate rock, but in more recent years very little of the material is being used.

Capt. Rose: The ground soft phosphate rock compares favorably with Thomas Slag in the availability of phosphoric acid.

QUESTION 20. How many applications of fertilizer do you think best for a grove?

Mr. A. H. Brown makes about three applications of fertilizer to his groves. The first application is made in June, the second in October and the third in January, varying the formula according to the time of the year. Making the formula high in the nitrogen for the January application and high in potash and phosphorus for the October application.

Mr. Poole makes six applications to young trees, making the first application in February, the second in April, the third

in June, the fourth in September, the fifth in October, and the sixth in November, but these are varied according to the weather conditions.

Three pounds of fertilizer per tree is allowed for the first year, and then the amount gradually increased as the tree seems able to use all the material applied. Mr. Poole uses a uniform formula for the different applications, using 2½ per cent ammonia, 10 per cent to 12 per cent potash, and 8 per cent phosphoric acid, but would vary the formula for bearing groves according to whether the crop was large or not.

Mr. S. J. McKinney applies a fertilizer composed of 4 per cent ammonia, 7 to 10 per cent potash and 8 per cent phosphoric acid.

QUESTION 21. Do you believe that grass in a grove is harmful?

Mr. Stanley, Drainage Engineer of the United States Department of Agriculture, discussed the question at length, and thought it would become harmful in that it decreases the amount of moisture present in the soil in the spring. Mr. Seple then asked whether the grass in the grove was bad or good as a whole. He wanted to know whether the presence of grass in the grove causes any other harm than drying out the soil in the spring. Was the advantage to the grove in other directions greater than the harm by loss of moisture.

To this, Col. Gaitskill replied that he had not plowed or cultivated in his grove in ten years. He made two applications of fertilizer, one in the spring and one in the fall. His grove is on high hammock land. He allows any kind of grass, including Bermuda, to grow in the ground and make a solid sod if it pleases. He uses the fertilizer at the rate of one thousand pounds per acre at each application. There are about 170 trees to the acre. He finds this method of procedure much better and more economical than his former methods of clean culture.

QUESTION 22. What size is best to use in setting citrus trees?

Mr. Hart: Personally, I would prefer to take the largest sized trees—the larger the better, up to those that had a trunk four or five inches in diameter. The larger the size, the sooner you get a crop from it. Of course, the larger trees cost more to transplant and need greater attention to prevent suffering a severe shock in transplanting.

The opinion was also expressed by others that for general grove planting two or three year trees were very desirable where these could be obtained.

QUESTION 23. Can you advise a spray for the rust mite and what time would you use it?

The rust mite is easily and satisfactorily controlled by the use of the dry sulphur or sulphur lime mixture. The lighter the sulphur the better it will work in the grove. Large power machines can be used so as to distribute the sulphur very evenly and thoroughly through the grove. If the work is to be done by hand it will probably be better to use some of the soluble sulphur compounds.

Col. Gaitskill explained that he was not inclined to make much use of spraying mixtures of any kind, and cited the experience of Mr. Sampson, where he greatly increased the scales by spraying.

Senator Darby used sulphur solution in the form of Sulpho-Citrol on his citrus trees to a very good advantage by keeping his fruit bright.

QUESTION 24. Can you give us any information as to whether the waste or slag from the acetylene gas plant can be used on plants, vegetables or fruit trees, and also just what effect it will have on the soil?

Mr. Jack Peters spoke of the great improvement of the appearance of the grass along the drainage way where this slag was carried off.

Capt. Rose stated that as acetylene gas slag was carbonate of lime, it would be a good corrective of soil acidity. It would prove beneficial in the same way that ground lime stone proved advantageous.

QUESTION 25. Have any experiments been made (and with what results) in the use of finely ground phosphate rock as a citrus grove fertilizer?

Capt. R. E. Rose, State Chemist, replied that finely ground soft phosphate rock was approximately as available to the citrus trees as was Thomas slag, and while it was not being used very largely, it would probably come into general favor.

QUESTION 26. Will the whitefly fungus applied during a continued dry period, live and be effective, although not spreading? We know it does not spread in dry weather.

There are said to be two kinds of fungi which will eradicate the whitefly. Is this so? If so, what are they and which is the better? What is the difference?

Do you consider a spray more effective to destroy the whitefly than a fungus, and if so, what kind of spray and when is the proper time?

To all these questions, Mr. Hume recommended the inquirers to obtain and read carefully Florida Experiment Station Bulletin No. 103.

QUESTION 27. Will sweet potatoes do better on a soil more sandy than a low, heavy soil?

Mr. Jack Peters stated that he preferred to use the high, rolling pine land, but that there was a difference whether you are growing sweet potatoes for market or were growing sweet potatoes for home use. A lower and heavier land would be liable to give a higher yield, but not as good a quality as the higher land.

Dr. Stockbridge stated that the heavier lands would produce a much larger crop than the lighter soils.

QUESTION 28. Will barnyard fertilizer make scabby potatoes? If so, what will prevent it?

Mr. Hume replied that scabby potatoes resulted from the presence of scab-producing fungus, which was usually carried to the field by the seed tubers. This fungus does not occur readily in acid soil, but will grow readily in neutral or alkaline soils. The germs are likely to be present in many of the barnyard manures. There are, therefore, two lines of preventatives; dipping the seed potatoes in formaldehyde or corrosive sublimate solution and thus keeping from spreading the disease on the field, or another way is to keep the soil acid.

QUESTION 29. Why does the Florida grower pay more for fertilizer materials.

Mr. Jack Peters here quoted from memory which had been submitted to him by circular, and explained that he should have brought the circular with him for definite verification.

Capt. Rose, State Chemist, discussed the question. He explaned how the valuations in the Quarterly Bulletin were made up. The quotations were gotten from the fertilizer houses in the State. In addition to this, the quotations were obtained from Savannah and New York houses, the cost of transportation added to the quotations given to the out-of-State houses. Then an average of the State prices and the delivery prices of the out-of-State houses was calculated.

Capt. Rose then called attention to the fact that the Florida grower was able to secure fertilizer material just as cheaply as could be secured anywhere else, and that they had further advantage of being able to buy unmixed chemicals. In former years it was impossible to buy anything but mixed goods.

QUESTION 30. Is there any danger, or is it detrimental to a young grove to grow sweet potatoes between rows for the first year?

Mr. Jack Peters replied that sweet potatoes can be grown splendidly in a young citrus grove. He stated it was wise to keep at least six feet from the tree, and then make as many rows as the middles will permit. The sweet potatoes may be dug at any time they are marketable. After the sweet potatoes have been taken off, the land should be sown to some legume. This would replace the nitrogen taken out by the sweet potatoes.

Mr. Condon asked about salamanders eating off the young trees when sweet potatoes are planted in the grove. There is some danger from this source; however, by means of proper trapping, and by shooting the salamanders, no great trouble should be experienced.

Mr. Lamont advises to plant only two rows in the middles between the citrus rows.

QUESTION 31. Does dynamiting citrus trees help to overcome any of the diseases or insects to which they are subject?

President Hume explained the central idea, the general question was not whether the dynamite would kill the insects and cure the diseases, but whether the effect on the trees was such that the diseases and insects would be less destructive.

Mr. Robinson, of Terra Ceia, stated that he had used dynamite under his trees. He inserted the amount of dynamite necessary to loosen up the ground around the tree without blowing the tree out of the ground. Where a tree was tilted over by the force of the dynamite, the tree was placed back in its proper position. He put the dynamite down about two feet, and used about a half of a stick right under the tree, at other times where the tree did not seem to need shaking up the dynamite was placed in the middle. Mr. Robinson thinks it a good plan to use dynamite on compact soils.

Senator Darby used it on his hammock land at Rockledge, and comparatively it is giving good results.

QUESTION 32. Is there any method by

which tangerines can be made to mature earlier than they otherwise would? Can it be done with fertilizer?

Mr. S. E. Inman says that he has wrestled with that proposition for years and that he had used all methods that seems reasonable and that have been recommended. He has given up the question. He saw no appreciable advantage or results from the various materials applied. He had used the iron sulphate (copperas) without any appreciable results.

QUESTION 33. What is a good fly repellant to keep flies from our stock?

Dr. Stockridge replied that a good fly repellant could be made by the use of two parts of whale oil or fish oil and three parts crude petroleum. Apply this to the animal by means of a brush, swab, or even by spraying. This repellant will last for an indefinite time, depending upon the condition of the atmosphere. If very dry and windy it is like to dry off pretty soon, otherwise it may last for a day or so.

QUESTION 34. How about using saw palmetto and all such trash as mulching and shall we leave it there or plow it under.

President Hume replied that if you want to mulch your citrus trees, use anything that may come to hand, including daily newspapers providing the news is not "too hot."

QUESTION 35. I have three grape vines which bloom freely every year but do not put on much fruit. They were raised from cuttings six years ago, are vigorous growers, each different variety, name unknown. One is a white grape, one small black, the other medium sized purple. The original vines came from some Florida nurseries. What is cause and remedy?

President Hume replied that he did not know, and no one else in the audience was willing to give an explanation on the difficulty.

QUESTION 36. If fertilizer containing nitrate soda, H. G. sulphate, potash and basic slag is broadcast over grass in a grove and the grass is cut and left on the ground, after a few good showers of rain will the results be satisfactory or will a part of the fertilizer be lost, and what part? Would you advise some other source of phosphoric acid.

Col. S. H. Gaitskill concluded that less of the sodium nitrate was lost from the soil that was generally assumed.

Professor Rolfs discussed the question, and stated that the amount of phosphorus lost per acre was quite negligible, and that the amount of potash lost was equal to 20 or 40 pounds of the high grade sulphate of potash, the amount of ammonia lost would vary according to the elements from which it was derived in the open sandy soil. The amount would not be very large in the compact clayey soil. The amount would be less than generally assumed. In open sandy soil it is frequently very large.

Precooling and Handling Investigations

WITH ORANGES AND LETTUCE, FLORIDA, SEASON 1913-14.

H. J. Ramsey.

Mr. President, Ladies and Gentlemen:

The Bureau of Plant Industry of the United States Department of Agriculture has been conducting extensive investigations during the past six seasons in Florida relative to the relation of handling methods to decay of oranges in transit and on the market. The results of these investigations published recently in Department Bulletin 63 clearly demonstrates that the decay occurring in transit and at the market end is due largely to rough and careless methods of handling. These results have been corroborated in commercial practice and you have all about you in the citrus sections of this state clear-cut demonstrations of the practical application of the fundamental principles developed in these investigations. The results of the experimental handling and shipping and the results obtained in the various packing houses in this state clearly demonstrate that if a fruit is handled with sufficient care, it can be delivered on the market in practically sound condition.

There are, however, two factors which make it extremely difficult to continuously and under all conditions deliver oranges on the market in absolutely sound condition, and to have them remain sound for a reasonable time after arrival on the market. Under commercial conditions it is almost physically impossible to handle fruit with a sufficient amount of care to avoid inflicting injuries of some sort. High winds oftentimes are the cause of much fruit being thorn punctured on the trees, and it is impossible to grade out all such injuries in the packing house. If the weather following such winds is moist and rainy, there is certain to occur considerable decay, both in transit and on the market, which cannot entirely be avoided by the most careful methods of handling. Another factor which enters into the problem of delivering the fruit in sound condition is the stem-end rot more or less prevalent in most sections of the state. Decay of this kind cannot be controlled through careful handling methods.

Many of the leading growers and the industry as a whole have for some time felt that the blue mold decay, due to injuries more or less unavoidable in the most careful commercial handling, and the stem-end decay, which, during certain seasons or portions of a season may be very serious, could be held in check or largely prevented through the utilization of refrigeration or precooling. They accordingly requested the Department to extend the handling work to include precooling investigations with oranges. The

pineapple and vegetable industries of the state also made urgent requests for both handling and precooling investigations with a view to reducing loss and deterioration of these products in transit to a minimum. In response to these requests and in view of the importance of the handling and shipping problems as relates to the marketing of the fruit and vegetable products of this state, the Bureau handling and shipping investigations were extended to include precooling of oranges; handling and refrigeration of pineapples; and vegetables, particularly lettuce. The orange precooling and the lettuce handling and precooling investigations have been in progress for but one season. Preliminary investigations with pineapples were commenced last summer and will be continued on a commercial scale this season providing crop conditions permit. We feel that the results here reported are only more or less indicative and should not therefore be accepted as conclusive. The data and results, however, obtained in these preliminary investigations are in a measure so striking and consistent with results of similar lines of work with other fruits and vegetables that it is deemed desirable to give them to the industry at this time.

Before taking up a discussion of the results of these various lines of work, I think it would be well to discuss in a general way the subject of precooling. There seems to be a misapprehension as to what precooling means or involves. The same is true to some extent as regards ordinary refrigeration. Precooling is a term used to designate the prompt and quick cooling of fruit, vegetables or perishable food products before shipment. It involves the cooling of the fruit and vegetables themselves, and not only the empty refrigerator car or the air only in a fully loaded one. The precooling may have several objects in view, the two principal ones being the delivering of the produce on the market in sounder and fresher condition and the cheapening of the cost of transportation.

The physiological and chemical changes that constitute ripening of fruits and vegetables go on with considerable more rapidity after the fruit is removed from the tree, especially if held in a high temperature. One of the objects of precooling, therefore, is to retard the ripening processes by retarding the temperature down to a point where the ripening processes will be checked or very materially retarded. This is not as important with citrus fruits as with quick ripening fruit like peaches and most other deciduous fruits. The rapid ripening of fruits in transit under ventilation or under ordinary refrigeration is oftentimes one of the causes of quick deterioration on the market. In addition to this, there are various fungi which cause decay both in transit and on the market. The blue mold decay, as above mentioned, can be pretty well eliminated, through careful methods of handling. Stem-end decay, however, cannot be controlled in this way. When the blue mold or other fungi have commenced to grow, further growth is not absolutely stopped even at a temperature of 32 degrees. The spores of these fungi, being analogous to the seeds in

many of our higher plants, germinate only under certain conditions of temperature and moisture. They do not readily germinate where the air is perfectly dry or when the temperature is very low. Another object, therefore, of precooling is to reduce the temperature down to a point where germination of fungus spores will not take place.

There is also considerable misunderstanding in regard to ordinary refrigeration, but few people realizing the length of time that it requires for the ice to fully cool the contents of a refrigerator car. Temperature records that we have taken in fully loaded refrigerator cars enroute from Cadifornia and other Pacific Coast points, as well as from Georgia to northern and eastern markets, conclusively show that it takes the ice from three to seven days to reduce the temperature in a refrigerator car to a point where the ice will finally hold it. During the first part of the journey much of the fruit is unaffected by the refrigeration, and the ripening processes and the development of decay continue under rather high temperatures. The fungus spores germinate while the fruit is still warm during the first part of the trip and the growth of the fungus, though finally somewhat retarded, continues somewhat during the whole trip. A number of temperature-recording trips were made with oranges from California to New York under various methods of refrigeration and precooling. Under full icing it required usually about seven days to reduce the temperature below an average of 45 degrees, and I see no reason why Florida oranges under full ice should cool much faster. During the first three or four days out, the decay develops at about the same rate as it would under ventilation, and the full effect of the icing is not obtained, especially as regards most of the fruit in the car, until the last day or so in transit. In the case of Florida shipments under full icing, therefore, the fruit is not all thoroughly chilled in the majority of cars even by the time it reaches the market.

You should all bear in mind that even though precooling has had considerable commercial application, particularly on the Pacific Coast, it is still more or less in the experimental stage and there are still many problems to be worked out in connection with the application of precooling the different varieties of fruits and to different sections. Illustrative of this is the problem of rapid cooling. In order to accomplish the cooling in the shortest time possible, especially in car precooling, some of the fruit, at least, is necessarily subjected to temperatures considerably below freezing. Some varieties of fruit can stand very low temperatures without injury, while with others it is necessary to run the temperatures rather high even at the beginning of the precooling process in order to avoid injury by freezing or rapid reduction of temperature. The minimum temperatures that the various varieties of fruits and vegetables will stand without injury have not yet been fully determined.

There are two methods of doing precooling; that is, in the cars after they are loaded or in warehouse cooling rooms before the fruit is loaded into the cars

for shipment. Where car precooling is employed considerable more refrigeration is required then in a warehouse room due to the leakage of air through the car walls. The cooling in a car is also necessarily more or less unequal, the fruits near the blast being cooled rather quickly while the fruits in the center of the car or half way between the doors will cool rather slowly. There is also a great difference, sometimes as much as 30 degrees, during cooling between fruits in the outside of the package and in the center of the same box.

In a warehouse room the cooling can be accomplished with less refrigeration. As there need be practically no loss of refrigeration through the walls, the cooling can be somewhat more even or equal as the air can be distributed to better advantage. There is an added advantage in using a warehouse room for precooling in that the fruit can be placed in the room and cooled immediately after it comes into the warehouse. In the case of car precooling the actual cooling cannot be commenced until the car is fully loaded, and in many instances, moved to the precooling plant. This oftentimes involves considerable delay which is fully as serious in the case of precooling as is the slow and delayed cooling under ordinary refrigeration.

In general it may be said that precooling at its best is an expensive proposition. It is essentially a business undertaking. Anyone contemplating, therefore, the establishment of precooling plants should satisfy himself that it is a paying investment from the standpoint of delivering the produce on the market in sufficiently better condition to command a price commensurate with the expense involved in precooling. The Department instituted these investigations primarily to determine exactly what there is in precooling from a practical standpoint and what the effect will be on the various fruits as regards condition in transit and after arrival on the market. We have no particular system to recommend, in fact no recommendation for precooling itself, until we are certain that it is a desirable adjunct to the Florida fruit and vegetable shipping business. Preliminary results indicate that precooling in this state will have a large field of usefulness, but we feel that further extensive investigations are necessary before the status of precooling is fully established.

The granting of initial icing privileges to Florida shippers makes possible combined precooling and refrigerator at less expense than full ordinary refrigertion. During several months of the shipping season precooling with initial icing may be entirely practicable. This is a phase of the precooling and refrigeration problem that we want to test out fully the coming season.

The question of whether a mechanical ammonia plant or an ice and salt plant is best depends upon conditions such as number of cars to be precooled, length of season, cost of ice, labor, etc. Mechanical ammonia plants require rather heavy expensive machinery and expert attention during operation. There is, therefore, heavy initial expense, as well as a relatively high running charge. The practicability of utilizing such a plant will obviously depend upon the number of cars

to be precooled and the length of season during which it can be operated. There are in operation several warehouse plants in California, designed for the precooling of oranges, built and operated by growers' associations. Figures compiled by the Citrus Protective League of that state give the average cost of precooling and initial icing in these various plants at $32.50 per car. This, in addition to the $7.50 charge for the use of the refrigerator car, makes a total refrigeration charges of $40 per car. The cooling is accomplished in from 36 to 72 hours in the different plants.

The Department has designed several ice and salt plants now in operation by associations shipping two to three cars a day of berries and deciduous fruits. The refrigeration is obtained by drawing air through a mixture of crushed ice and salt. The cold air is distributed in the precooling rooms and through false floors giving rather equitable cooling and the system is effective and entirely practicable where ice can be obtained at a reasonable figure. The cost of construction is relatively low, the insulated rooms being the principal item. Practically no machinery is required aside from the electric motors and fans and no skilled labor necessary in its operation. The cost of precooling with this type of plant is therefore dependent largely on the cost of ice.

ORANGE PRECOOLING EXPERIMENTS IN FLORIDA 1913-14.

The precooling experiments with oranges were carried on at Palmetto, Florida, the fruit for precooling being obtained from the surrounding section in Manatee County. Conditions over which we had no control made it impossible for us to carry on these investigations in just the way we had planned. On account of crop and market conditions it was impracticable to obtain any number of cars going to the same market, and during the major portion of the season it was not even possible to have the precooled and the comparable check cars sent to any one point. This made it necessary to make the inspections at Washington, forwarding the experimental lots by express from the different points to which the cars were consigned. The difference in the time of arrival and the different lengths of haul by express in many instances made impossible a correct determination of the effects of precooling on the particular lots. The difference between the precooled and the non-precooled lots very often were not discernible by the time the fruit reached Washington, the comparable lots arriving sometimes a week or more apart. The conditions above mentioned made it necessary to discard a number of shipments in making up the data. We have, however, a fairly good line on the effects of precooling in the holding lots held at Palmetto. Comparable lots in the precooled and non-precooled series were held in a fully iced car at Palmetto to check up the results of the shipping experiments. These holding lots of both precooled and check series furnished the most dependable data we have this season on the effect of precooling. These were all held in the

iced car for ten days, were inspected once on withdrawal and one or two weeks after withdrawal. The following table gives the data on fifteen series of commercially handled fruit, both precooled and non-precooled held in the iced car. On withdrawal there was about three times more decay in the non-precooled than in the precooled.

ORANGE HOLDING LOTS 1913-14, COMMERCIALLY HANDLED—15 SERIES.

BLUE MOLD DECAY.

Time of Examination	Non-Precooled	Precooled
Withdrawal	3.5	1.2
After 1 week	15.0	10.7
After 2 weeks	19.6	16.6

STEM-END DECAY.

Time of Examination	Non-Precooled	Precooled
Withdrawal	0.3	0.1
After 1 week	10.8	4.1
After 2 weeks	33.5	25.8

TOTAL DECAY.

Time of Examination	Non-Precooled	Precooled
Withdrawal	3.8	1.3
After 1 week	25.8	14.8
After 2 weeks	53.1	42.4

While the differences are not so striking one or two weeks later, nevertheless they are consistent. There was little or no stem-end decay on withdrawal, but one week later, the precooled showed 4.1 per cent as compared with 10.8 in the non-precooled. Two later there is also a consistent difference. It is interesting, therefore, to compare the total decay in the precooled and the non-precooled lots, that is, the total of stem-end and blue mold decay. On withdrawal there was three times more decay in the non-precooled than in the precooled. One week later the non-precooled showed almost twice as much decay as the precooled. Two weeks later the differences are not so great but consistent. At the time of arrival the fruit usually shows little or no stem-end decay. However, at the end of one week there is a considerable development of this trouble and the effect of precooling is here most pronounced. The following table gives the results of an average of 14 shipments during December and January, seven of these being precooled and shipped under half ice, the other seven under ventilation only.

PRECOOLING AND ICING VS. SHIPPING UNDER VENTILATION COMMERCIALLY HANDLED.

Average of 14 Lots Shipped During December and January.

BLUE MOLD DECAY.

Time of Examination	Non-Precooled	Precooled Iced
Arrival	4.7	0.5
After 1 week	10.4	3.1
After 2 weeks	12.7	8.1
After 3 weeks	14.7	12.5

STEM-END DECAY.

Time of Examination	Non-Precooled	Precooled Iced
Arrival	1.6	0.04
After 1 week	9.8	1.4
After 2 weeks	21.5	7.6
After 3 weeks	37.6	28.1

TOTAL DECAY.

Time of Examination	Non-Precooled	Precooled Iced
Arrival	6.3	0.5
After 1 week	20.2	4.5
After 2 weeks	34.2	15.7
After 3 weeks	52.3	40.6

While this is hardly a fair comparison, it does bring out rather strikingly the effect of temperature and quick cooling as regards decay and deterioration in transit. The effect of temperature on the development of stem-end decay is here even more striking than in the holding lots. In the fruit under ordinary ventilation there is 9.8 per cent after one week

on the market as against 1.4 in the precooled and iced. A discussion of these figures is hardly necessary, but in drawing conclusions from them, one should keep in mind the fact that the check lots were neither precooled nor iced. A number of comparable shipments of both precooled and non-precooled fruit was sent out without any ice whatever and the following table gives an average of 14 shipments, precooled and non-precooled, shipped without ice. The difference between precooled and non-precooled on

ORANGE PRECOOLING AND HANDLING 1913-14—AVERAGE OF 14 SHIPMENTS SHIPPED WITHOUT ICE.

TOTAL DECAY.

Time of Examination	Careful Pick & Pack Precooled	Careful Pick & Pack Non Precooled	Com'l Pick & Pack Precooled	Com'l Pick & Pack Non Precooled
Arrival	0.1	0.2	1.7	4.8
After 1 week.	0.9	0.7	10.4	11.0
After 2 weeks	2.0	3.1	17.4	19.5
After 3 weeks	3.0	4.9	20.8	28.5

arrival are consistent with the data already given. At the end of one, two and three weeks, however, there is little or no difference in the amount of decay. The long express shipments from various market points may, however, account for the apparent inconsistencies in these figures as regards decay at the end of one and two weeks. You will observe that the effect of handling is even more striking than that of precooling and fully corroborates the work carried on by the Department for a number of seasons past. The results of these investigations this past season, I think, should be considered only as indicative. The holding lots give the most dependable data. The data obtained from the shipping exepriments is not quite as satisfactory owing to the impossibility of having the cars sent to any one market. The fact, also, that no initial icing rates were not in effect the past season made it impossible to obtain cars for precooling with initial icing only. This next season, if crop and other conditions are favorable, we will take advantage of the initial icing privileges recently granted and will carry on the experiments at some point or locality where a number of cars are sent regularly to some one market. This will permit of inspection of fruit of both precooled and non-precooled lots at one point and at the same time. In addition, temperature records will be taken in transit of a number of cars in order to obtain accurate and definite information in regard to temperature conditions in transit, both in precooled and non-precooled cars under both full and initial icing. The data above is given only as being indicative of results that may be expected under more favorable conditions for carrying on these investigations.

LETTUCE PRECOOLING AND HANDLING INVESTIGATIONS

The lettuce investigations included a study of the methods of cutting and handling and the effect of precooling on carrying quality in transit and keeping quality after arrival on the market.

The special method of cutting employed consisted in removing the heads in such a way as to leave all of the lower leaves which touched the ground still attached to the roots. The object of this was to eliminate, as far as possible, infections of "lettuce drop," a fungus disease which causes serious loss both in the field and also in transit and on the market. The fungus causing this disease passes through unfavorable seasons in the ground and usually first attacks the bottom of the lower leaves of the lettuce plant. By removing these lower leaves it was possible to a large extent to keep these fungus infections out of the baskets, both those which appeared as distinct rots and those which were not yet noticeable to the ordinary observer.

The precooling was done by means of the portable precooling plant of the Office of Horticultural and Pomological Investigations, cold air being blown through the car after it was loaded and ready for shipment. The initial temperature of the lettuce, as determined by readings of electric thermometers placed at various points in the load, varied in different cars according to the weather conditions from about 50 degrees to slightly less than 70 degrees, while the final temperature at the end of the precooling period averaged somewhat over 41 degrees.

The experimental work was carried on in the vegetable section in the vicinity of Palmetto, in Manatee County. From this point experimental lots of lettuce were shipped in ordinary commercial cars to northern markets, where they were inspected by Bureau representatives as soon as the cars were unloaded and again three days later. The experimental series shipped in this way consisted of two baskets each of carefully and commercially cut lettuce, comparable baskets of each being loaded in the top and bottom tiers in the car. Corresponding to each experimental shipment a comparable series was held in an iced refrigerator car in Palmetto, similar to the lots shipped except for the fact that fewer baskets of carefully and commercially cut lettuce were used, no comparison being made between top and bottom tier conditions in the car. Corresponding to each precooled holding and shipping lot there was a comparable non-precooled lot held or shipped in an ordinary iced car. In the case of the holding lots the non-precooled baskets of lettuce were first placed near the roof of the car, then two days later brought about half way down, and finally, four days after loading, were placed on the floor of the car, the temperature being thus reduced gradually and conditions brought about that corresponded as closely as possible with

average temperature conditions in an ordinary iced car in transit. The precooled lots held in Palmetto were all held on the floor of the holding car. The holding lots were removed for inspection five days after the completion of the precooling, or six days after cutting, then held for three days in a warehouse and inspected again.

RESULTS OF EXPERIMETS.

Holding Lots.—The following tables give a summary of the results obtained in 16 full experimental lots held in Palmetto, as regards the general market condition of the lettuce treated in different ways, as well as the comparative amounts present of two of the most serious troubles affecting lettuce in transit; "lettuce drop" rotting, and a bacterial rot.

TABLE I.

MARKET CONDITION. SIXTEEN EXPERIMENTS HELD IN PALMETTO.

	At withdrawal		3 days after withdrawal			
			Repacked		Undisturbed	
	Careful	Commercial	Careful	Commercial	Careful	Commercial
Regular Iced:						
% Prime	90.0	40.1	32.2	3.4	31.8	4.1
Total % marketable...	100.0	93.3	87.3	51.3	81.5	49.5
Precooled:						
% Prime	98.4	70.9	65.6	15.8	53.8	9.4
Total % marketable...	100.0	99.5	90.0	75.6	94.3	63.4

TABLE II.

PER CENT DECAY SIXTEEN EXPERIMENTS HELD IN PALMETTO.

	At withdrawal		3 days after withdrawal			
			Repacked		Undisturbed	
	Careful	Commercial	Careful	Commercial	Careful	Commercial
Regular Iced:						
Slight Drop Rotting....	8.6	36.2	27.1	25.6	22.9	19.8
Bad Drop Rotting	1.4	22.5	25.5	69.2	30.0	73.8
Total Drop Rotting ...	10.0	58.7	52.6	94.8	52.9	93.6
Bacterial Rotting	0.0	2.4	7.5	5.8	7.8	9.2
Precooled:						
Slight Drop Rotting	1.6	24.0	14.6	36.5	22.6	25.0
Bad Drop Rotting	0.0	4.5	11.1	41.8	13.7	57.3
Total Drop Rotting	1.6	28.5	25.7	78.3	36.3	82.3
Bacterial Rotting	0.0	0.7	2.6	3.4	6.4	8.5

As used in Table I, the term "Marketable" was made to include all those heads which it was thought could be used in any class of market. Some of these showed rather severe rotting in the outer leaves and would not be suitable for first class trade, but in every case the greater part of the head was still sound and edible.

The most striking point brought out by the tables given above is the marked effect of careful cutting in improving the carrying quality of the lettuce. By far the greatest amount of decay was found to be due to "lettuce drop," the same disease which causes so much damage in the field, and the method of cutting by which the infected lower leaves were kept out of the baskets resulted in a great reduction in the amount of decay which developed. Precooling also had a very decided effect in reducing the amount of "drop" rotting, cutting down the average amount at the first inspection from 10.0 per cent. to 1.6 per cent. in the careful cut, and from 58.7 per cent.

to 28.5 per cent. in the regular commercial cut. In the carefully cut precooled lots the rotting was so slight as to be of almost no commercial importance, while in the commercially cut non-precooled lots considerably over half of the heads showed some rotting, and in nearly one-fourth of them the rotting was sufficiently advanced to seriously impair the market value of the lettuce or even make it entirely worthless.

At the first inspection of the experimental lots held in Palmetto, the heads from one-half of each basket were removed and inspected, the lower half being left undisturbed. The half which was inspected at first was afterward repacked and the whole basket held until three days later, when the two halves were inspected and recorded separately. This was done in order to learn the effect on the heads of removal from the basket and handling while on the market. As shown by the tables, the two methods show very little difference in effect, the difference that there is between them being chiefly in favor of the heads which were removed and repacked. Apparently handling has little or no harmful effect on lettuce, and the exclusion of air from the center of the package may result in a more rapid deterioration than is the case when the heads are removed from the basket and have access to air.

It was apparent to all who saw the different baskets from any experiment opened up for inspection that a mere record of the percentage of the different troubles present, as described above, did not fully express the difference in their commercial value. In almost every case the carefully cut lots were distinctly more attractive in appearance, not only in being less decayed, but also because the removal of the dirty lower leaves resulted in much cleaner and more attractive looking heads. Likewise, the general condition of the precooled lots was decidedly better than that of the non-precooled; the precooled baskets could usually be distinguished without difficulty by the crisper condition and brighter appearance of the outer leaves, aside from any difference in the percentage of decay.

Shipping Lots.—The results of inspections of experimental lots shipped to northern markets are given in the following tables:

TABLE III.

MARKET CONDITION. NINE EXPERIMENTS SHIPPED TO NORTHERN MARKETS.

	At withdrawal		3 days after withdrawal	
	Careful	Commercial	Careful	Commercial
Regular Iced:				
% Prime	59.6	25.7	46.4	17.3
Total % marketable 100.0		96.5	99.2	91.8
Precooled:				
% Prime	71.5	33.7	58.0	22.8
Total % marketable 100.0		99.6	100.0	98.4

TABLE IV.

PER CENT DECAY. NINE EXPERIMENTS SHIPPED TO NORTHERN MARKETS.

	At withdrawal		3 days after withdrawal	
	Careful	Commercial	Careful	Commercial
Regular Iced:				
Slight Decay ..	7.9	24.2	11.7	30.3
Medium Decay .	0.9	16.9	3.3	19.6
Complete Decay	0.0	3.4	0.3	5.9
Total Decay ..	8.8	44.5	15.3	55.8
Precooled:				
Slight Decay ..	4.7	20.6	8.5	26.8
Medium Decay.	0.4	6.3	1.4	8.3
Complete Decay	0.0	0.3	0.0	1.6
Total Decay .	5.1	27.2	9.9	36.7

The experimental shipments included in these tables were made to New York

and Philadelphia, where the inspections were made immediately after the lettuce was unloaded from the cars. As shown in the tables, the effect of the different methods of treatment employed on the carrying quality of the lettuce is practically the same as in the lots held in Palmetto. While there was considerably less deterioration in all lots inspected in the north, owing to difference in temperature, yet the relative amounts of the different troubles found in baskets treated in different ways was very much the same as in the holding lots. In the shipments, as well as in the lots held in Palmetto, the precooled lots were in crisper, sounder condition than the non-precooled, and the difference between the carefully and commercially cut lettuce was even greater than the difference between the precooled and the non-precooled.

The difference in the amount of decay found in experimental shipments inspected at the northen markets and in corresponding lots held in Palmetto is shown below in Table V.

TABLE V.

COMPARISON OF HOLDING AND SHIPPING LOTS. TOTAL PER CENT DECAY.

	At withdrawal		3 days after withdrawal	
	Careful	Commercial	Careful	Commercial
Regular Iced:				
7 Holding Lots	28.1	55.9	78.9	96.2
7 Comparable shipments.	20.1	39.9	30.6	53.2
Precooled:				
7 Holding Lots	2.0	9.6	22.2	50.6
7 Comparable shipments.	4.9	7.2	10.4	15.5

This table shows that the average decay was rather greater in the holding than in the shipping lots even at the first inspection, in spite of the fact that inspections in the north were made, on an average, nearly two days later after loading than the corresponding lots held in Palmetto. At the second inspection these differences were much greater, as would be expected from the great differences in temperature between the two parts of the country at the time when the experiments were carried on (December to February.)

General Conclusions.—The investigations outlined above show distinctly that by changing somewhat the methods of handling the crop, lettuce can be landed on the northern markets in much better condition than is now common, and can therefore be made to command a considerably higher price. This fact has been recognized during the course of the season's investigations by shippers and dealers who have been in touch with the results obtained. Representatives of a commission firm which handled a considerable quantity of the experimental lots shipped north have stated that, on the average, the precooled lots were in noticeably better condition than the non-precooled, and that the effect of careful cutting was even greater than the effect of precooling, the carefully cut lettuce being worth from 25 to 75 cents more per basket on the wholesale market than the commercially cut.

As indicated above, the experimental lots were not sent out wholly during wearm weather when precooling would be expected to have its greatest effect. Owing to the unusually cool weather prevailing in Florida through most of

the winter of 1913-14, a number of cars were precooled and shipped when the temperature was so low that it did not seem as though precooling could be of much benefit. Yet even in these cases some effect in improving the carrying quality of the lettuce could be seen. At times when the temperature at the shipping point is above the average and when lettuce drop is especially prevalent the effect of both careful cutting and of precooling would undoubtedly be considerably greater than is shown in the average of these experiments.

The special method of cutting lettuce described above could probably be adopted on a commercial scale without serious difficulty. Removing the heads in such a way as to leave the bottom leaves attached to the roots requires a somewhat longer time than the ordinary method of cutting, and discarding these bottom leaves means a slight reduction in the total quantity of lettuce harvested, although this loss in quantity is by no means great when the heads are of fairly large size. Neither of the objections mentioned is of much importance when the improved keeping quality of the carefully cut lettuce is considered.

Memorial Session

MR. E. O. PAINTER AND THE FLORIDA STATE HORTICULTURAL SOCIETY

H. Harold Hume

Mr. President, Ladies and Gentlemen:

It is fitting, that, at this time, we should pause to make mention of a friend who was with us for many years; a friend who went in and out among us; a man whom we loved; a man whom we esteemed and whose presence we greatly miss today, our late Secretary, Mr. E. O. Painter. As we look back through the history of our society from its very beginning, we find he was one of the most live and active members who took part in its work, both during its formative periods, and in the later years when the society was firmly established. He was one of those who helped to shape its policies and to put them into execution. He represented the spirit and thought of this body. The measure of success which this Society has attained is due, in a measure, to the time, effort and foresight he gave to it. To my way of thinking we may count it as no small honor that Mr. Painter should have been the Secretary of our society for so long a time and he has left to us a cherished memory.

It was my pleasure to know him through many years, both as a co-member and as a co-worker in the management of the Society's affairs. It is my belief that after his own private business and his home life, the welfare of this society was dearer to his heart than all else. In the years of my association with him, I have never found him too busy to talk over matters pertaining to the Horticultural Society. He would lay aside anything he might have in hand to give unstintingly of his time to its work.

Let me briefly review his connection with our Society.

Mr. E. O. Painter was a charter member of the organization when it was started in 1888.

In the first published report of 1892, his name appears as a member of the Committee on Marketing, and he continued to serve as a member of various committees from year to year.

In 1892 and in 1894, he was Corresponding Secretary after which the office appears to have been abolished.

In the report for 1894, his name appears among the short list of life members, and in the same report his picture appears.

In 1895 he was elected as vice-president for 1896, which office he held until

January, 1898. During 1901 to 1904, inclusive, he was a member of the executive committee. Early in April, 1904, he was appointed Assistant Secretary to act until the meeting of that year, which was held April 26-27-28. At this meeting he was elected Secretary, which position he held until his death, May 22, 1913.

In 1909 he was made an honorary member.

You will thus see that he played a very important part in the work of the Society. In his life he worked diligently for its best interests. In his death he remembered it, for he left as a legacy, to the Society, the income from $500.00

It is not my purpose to dwell upon Mr. Painter's life and activities. Others who knew him well, will speak on other phases of his work. The measure of life is service. If it is a laudable ambition for a man to serve his day and generation well, then Mr. E. O. Painter achieved that ambition.

E. O. PAINTER, HIS LIFE AND HIS WORK

Edwin S. Hubbard

Mr. President, Ladies and Gentlemen:

I was surprised to find myself assigned to the topic of the Life and Work of E. O. Painter on this memorial occasion as I feel I cannot begin to do justice to this subject. Although I had an acquaintance and friendship reaching back to Colonel Codrington and Mr. Painter's early work with the Florida Agriculturist, I necessarily have not enjoyed the intimate relations that would arise from being a fellow townsman or social and business associate.

The main facts of E. O. Painter's life appear in the report of the Necrology Committee and as the special life activities of Mr. Painter are dwelt on by other members of the society in this memorial session, I will confine myself to consideration of Edward Okle Painter as a *man*.

The greatest glory of this great republic is the opportunities it gives for the development of self made men. Lincoln, the rail splitter statesman, Edison, the newsboy inventor, Rockefeller, the grocer clerk capitalist, and yet though opportunities may be equal the capacity of men to grasp opportunities is not equal and success is the popular rule for the measure of men.

Some years ago, John D. Rockefeller gave a lecture on thrift before the Sunday School of his church in Cleveland and read items from the little account book with which he started business life to show how carefully he considered and kept down expenses to save money and acquire capital. Does anybody suppose this lecture on thrift will make many of its hearers millionaires? Of the hundreds of pupils of Joachim, the virtuoso violinist, how many ever became artists? Of the thou-

sands of employes of the steel trust who had opportunity of becoming stockholders how many ever became more than day laborers? Energy, honesty, industry and morality are foundation stones on which true success in life must be built, but it is his natural ability, the instinct or genius or Kismet, that drives a man, right or wrong, onward he knows not where, often after the rainbow's pot of gold, that is the true measure of a man, and whether his memory is honored or execrated, revered or vilified depends on the reputation he has established for character.

Mr. Painter was a typical honored and honorable self made man. The story of his early struggles, his everlasting thirst for practical knowledge, the unwavering and intense application for mastering and improving his business opportunities and the intellectual and social growth that went hand in hand with his business success is worthy of emulation by every young man entering on life. The benefits cannot be measured that this state has received through his gathering and publishing information in the Florida Agriculturist during the early days of Citrus culture and experiments and advice for improving the culture and growth of all Florida crops in later years have added immensely to the growth of this state.

Who that ever received one did not look on Painter's Almanac as a household friend?

And then there was the human side of the man which was strikingly shown in his letters while traveling in Europe and South America. The quaint and original points of view with which, fresh from this high pressure civilization, he reported his impressions of foreign countries. But as Secretary of this Society we will most greatly miss him in Florida. Where is the man with the vast circle of friends and acquaintances who can fill his place? Who will ever forget the unfailing good humor and courtesy, the knowledge of all subjects under consideration and the editorial and printer's trade knowledge that made the reports of our annual meetings a credit to this society and invaluable to horticulture.

I am sure no member who was present will ever forget that meeting in the chapel of Stetson University last spring when this Society witnessed the college opening exercises and Mr. Painter as a trustee made the students an address. I am sure there was never a prouder moment in Mr. Painter's life than when, on that occasion, in his former home city, he addressed those students on the seriousness of the work they should do in building up intellect and character for the battle of life.

It is thus I would remember Edward Okle Painter, standing on that college platform, surrounded by the college students and members of this society, in the prime of life, with a noble and honorable career behind him and the promise of years of usefulness to come, which promise, alas, has been unfulfilled.

E. O .PAINTER AND FLORIDA HORTICULTURE. — A QUARTER CENTURY OF PROGRESS IN FLORIDA.

Prof. P. H. Rolfs

INTRODUCTION

Mr. President, Ladies and Gentlemen:

I am proud to be on the program and to be able to present to you a short paper on Mr. E. O. Painter and Florida Horticulture. I will not presume in this discussion to speak of Mr. Painter as a man. We have met here this afternoon not to eulogize his many virtues, his abilities and his greatness. These would only be marred by our attempts. We have come out of the gratefulness of our hearts to commemorate his life as an influence over us. There was no movement proposed for the betterment of horticulture but found his ready response. In my many calls at his office, I have never found his door closed for a moment; it always stood open to my entrance. The many conferences were always most pleasant and inspiring. Optimism might be said to be his primary trait.

I have traveled with him, labored with him, and even slept in the same bed with him. He always seemed a companion rather than a co-worker.

While he may be absent in body, his spirit is round about us. I feel his influence as if he were present at this meeting. The spirit of our departed friend is ever with us to encourage us and urge us on to even better and nobler work. God in his infinite mercy has permitted him to journey into that bourne from which no traveler returns. This bourne lies within us, about us and beyond us.

The great and lasting good that is wrought in this world is brought about by gradual development. Cataclysms rarely produce a lasting result. The greatest epochs in the advance of civilization are wrought in the everyday toil of the masses. Our common education has inculcated into our minds that the great events and epochs are ushered in by great heroes. This hero worship is drilled into us from the nursery to the end of the college course. Rarely is any account taken of the masses who have toiled to make it possible to have a hero to worship. Lest we forget, I remind you that the great work wrought for the advance of Florida Horticulture was done by such men as Mr. E. O. Painter. His name was rarely seen attached to long articles. Self assertion had the least thought in his mind.

In scanning the horticultural literature of the State one is surprised by the few times that his name appears in public print. I know, however, that when it came to giving moral and financial support to a wholesome and worthy cause we find E. O. Painter foremost on the list.

The pleasant task of bringing to your attention his life and works in other di-

rections than the broad one of Florida Horticulture has been assigned to competent and worthy associates, who each have a message for you.

SOURCE OF INFORMATION

In preparing this paper for you I have drawn on my own memory extending over nearly twenty-three years, as well as published data occurring in my private library as well as the data in the Experiment Station library.

The amount of the horticultural literature available for the period covered by Mr. Painter's life is so great that it would fill a large volume. The usefulness of what I am presenting to you today will depend entirely upon whether or not I have exercised the necessary skill in selection and ability to present it in proper form. To get a comprehensive view of the progress of horticulture in Florida in the period covered it will be necessary to study the literature of the period covered.

THE FLORIDA AGRICULTURIST

I have no intention of entering on an extended discussion of The Florida Agriculturist. That phase of the program belongs to one of my able colleagues. I must, however, mention this journal, founded, owned and edited by Mr. Painter, as it is necessary to my thesis. It had a profound effect on the horticulture of Florida. No paper has so completely covered the field and served the needs of its readers so satisfactorily as did The Florida Agriculturist.

WRITINGS ON HORTICULTURE

Mr. Painter could not be classed as a voluminous or gifted writer. In his earlier work especially while editing The Florida Agriculturist, frequent papers from his pen appeared, but before long his larger business affairs absorbed so much time that it was a difficult matter to get a paper from him, even before the Horticultural Society.

His fund of wit and his aptitude for pun pervaded his writings as well as his everyday conversation. In presenting a paper on Bermuda Onions at the Ormond meeting, 1892, he opened his talk with the quotation "In (U) Onion there is strength." I want to quote here an extract from his paper printed in the Interlachen meeting of the Florida State Horticultural Society in 1891. It gives us his style of writing fairly well and is also of special interest to us at this Palatka meeting since it describes Hastings as she was twenty-three years ago. I remember visiting the cucumber house referred to.

"Last August the place now known as 'Hastings' was only flat woods, and indeed they are flat woods.* It would be hard to find as many acres in one body anywhere in the State so nearly on the same level, to all appearance to the eye, yet with a gradual slope so that perfect drainage can be had by ditching."

"The soil is similar to other flat woods, with hard-pan from one to three feet below, with considerable prairie land intermixed, which, after draining needs

*Proc. Fla. State Hort. Soc. V: 137, 138, 139 (1891).

only a plow to break it up to render it ready for cultivation."

"As before stated, last August, Hastings was not, but soon after he put in an appearance, and judging from what he has accomplished, we should say a good deal of Hastings has been done."

"He built his house and barns among the pines and used the prairie land for his garden, and as we walk around the premises and see the tomato plants loaded with fruit, some growing, too, on a land that has never felt a plow; cucumber vines that are about through bearing, yet still boast of 'cukes' over two feet in length, cabbage in huge piles that is being fed to 'razor backs' instead of being shipped to fill the coffers of the railroads and commission merchants, we can't help but wonder, how did he do it all."

"We soon dicovered the great factor of it all in a four-inch artesian well. This well is but 250 feet deep, yet the volume that arises is enormous and with such force that no pumps are needed to elevate the water to any part of the house or barn. The temperature of the water remains at about the same (79 degrees) the year around, which is a great advantage in gardening during the winter season.

"Close to the well the 'cuke' house is built, being 156x22, containing four beds which run the whole length. This house is covered with glass and built similar to greenhouses North, only that it does not have to be so strongly protected against cold and has no steam heating apparatus. The heating of this house during the cold spells that occur during December, January and February is quite novel as well as original, and we venture the assertion that nowhere in the world is it done the same way. When the 'signs' indicate that a cold night is approaching, the well is opened, and the stream of water is conducted to the 'cuke' house where it flows under the beds in a stream from three to six inches deep. This current of water keeps the temperature at an average of 60 degrees on cold nights, frequently making a difference of from 20 to 30 degrees between inside and outside."

* * * * *

"Here we saw the finest potatoes that we have ever seen growing in the State. Large size, smooth skin and thoroughly ripe. All this was done with the aid of irrigation, the artesian well furnishing the supply, although nearly half a mile off. Irrigation is done by means of ditches dug along one side of the field. When a certain piece of land is needing water, the trenches on both sides of it are dammed up and the water is allowed to fill the intervening trenches till level with the surface, and is then dammed in and left to percolate through the soil, which it will do in a very short time."

"We have reserved to the last one grand feature of the irrigated land and one which will, we believe, ere long, bring many a dollar to our borders. This is raising rice. After vegetables are all harvested, and the land plowed, it is planted to rice and the water turned on. In a great deal shorter time than one would think, the ground is thoroughly saturated and the rice soon sprouts and a good stand is the result. Thus the land can be kept in continued use the year round. All

that can be done on this land remains yet to be proven, for the work that has been done is only a beginning, for it would be impossible for any one or two men to develop it in so short a time. Mr. Hastings has started the ball rolling and others can join in pushing it along."

* * * * *

"In conclusion we would state that Mr. Hastings informs us that he is making arrangements with a German to make into sauerkraut all the cabbage that is not shipped another season, also may start a tomato canning factory if the outlook warrants."

THE TRANSPORTATION QUESTION.

The transportation question has always been a worrying one among the Florida horticulturists. In the seventies it was mainly a worry of getting the fruit to the market. In those days it meant getting them to Savannah or New York. There were no trunk lines of railroads and every plug line was doing all in its power apparently to kill off the other roads whether a competing one or a connecting one. I say apparently, because the policy adopted and carried out could not have been more discouraging to the shipper of perishable fruits. The steamship and boat lines were somewhat better, but served only a few of the growers.

Transportation has not reached a perfect stage yet, still we will get a large grain of comfort by listening to an extract or two of almost forgotten literature. They make one feel as he does after awakening from an attack of night mare. The following is taken from a paper read by Mr. E. G. Hill, of Lawtey, at the DeLand meeting in 1890:

"I have some statistics from California showing what freight the Californians pay on their shipments to New York, and I find that we pay more from Florida than they do.* They have an organization in California known as the Shippers' Union, and they ship in train lots. Seven cars constitute a train, and this train takes preference over any other train on the roads. They are loaded by the shippers and placed ahead of the express trains, which are not allowed to pass them. For that service they pay $44 per car-load, and the time is 7 days. We pay $815 for the same service. They will carry any kind of perishable fruits, plums, peaches and anything that can be shippel in carload lots to New York in refrigerator cars with the same service that we have for strawberries for $475 per car. For that same service we pay $1,040."

The following extract is taken from the presidential address of Dudley W. Adams, delivered in 1891, at Ormond, who was one of the most forceful and vitrolic of horticultural writers we have had.

"The Florida Fruit Exchange reports its gross sales this season at about $1.75 per box, and net the grower about $1.† This analyzes thus: Grower, 54c; box, etc., 45c; fruit exchange, 14c; transportation, 62c; total, $1.75. The grower gets a trifle under one-third what his oranges sold for, and someone get two-thirds."

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*Proc. Fla. State Hort. Soc. V: 126 (1892).
†Proc. Fla. State Hort. Soc. V: 19, 20 (1892).

"The transportation from Florida is more than double what it is from California per mile, notwithstanding our roads are largely sustained by way of business, while the Pacific roads run hundreds of miles through an uninhabited waste, and over grades and curves that to our own coast lines are unknown. A man in Minnesota can send a bushel of wheat to Liverpool, 4,500 miles, for less money than I can send a box of oranges to Jacksonville. In a matter like this, where the success of a business depends on a fair division of income, it ought to be amicably arranged, so that producer and carrier can each have a fair proportion. Much was hoped from our State railroad commission, but it proved such an abject failure that the legislature legislated it out of existence, and very few tears have been shed over its grave. That same legislature proved itself a flatter failure than the commission, by failing to enact something better in its place."

"If the fruit growers of the State have any influence, it should be steadily and actively exerted in favor of such legislation as will have the rates of transportation fixed by a competent and disinterested tribunal, which will deal fairly and justly with producer and carrier."

"One of the burning questions which confronts us is, how to sell our fruit. We have made perceptible progress in growing fruit, but not in marketing it. It takes very little penetration to see that consigning our fruit to the tender mercies of the commission merchants, in distant markets, is a crude and unsatisfactory way, but as yet we have found nothing better."

The following is an extract from the report of the Committee on Transportation to the Florida State Horticultural Society at its Ormond Meeting (1892). The report is signed by C. A. Bacon, N. W. Woodworth, and E. J. Cox.

"Assured that there are wrongs to be righted, there comes the all-important question: How may this be accomplished?"

"I would first suggest a State Railroad Commission, with absolute power to make maximum rates, and power to enforce the same, and if the courts should overrule such acts of commissioners, let the people nominate and elect court judges that will go on the principle that the government is made for the people, and not the people for the government. Create a general Government Commission, who shall have absolute power to make and enforce interstate rates, from which there shall be no appeal. Third, the nationalization of railroads and use the same at absolute cost in the interest of the people and for the people."

* * * * *

"It takes time to bring about these great reformations, and the dear people must be educated up to think and act for themselves and not allow a lot of politicians to think and act for them. And until these things can be done—allow me to make one more suggestion—let us, as fruit and vegetable growers, do a little transportation for ourselves."

"Let us, as a company, raise $100,000, build three iron steamships of 1,000 tons

carrying capacity each, fit them for carrying our products to market, by well ventilating and heating pipes, place them on the line between Jacksonville and New York, and carry oranges and lemons at 25 cents per box and vegetables at same rates; and have our ships pay us a profit of 20 per cent on the investment. This is practicable and can be done; such ships can be run at a cost of about $200 per day, and will carry 10,000 boxes of oranges and leave storage room for 400 tons of miscellaneous freight. Are there 99 men who will unite with me in putting up $1,000 each and try the experiment?"

"This would solve the problem of cheap freight rates."

In 1894, the low prices made matters still more serious for the citrus growers, and an effort was made to establish a market in Europe. Some trial shipments were made the previous year. In the spring of 1894, the ship Ethelwoold was chartered to take a load of fruit to England. Mr. Painter consented to go as super-cargo and look after the business end in England. The freezes of 1894 and 1895 put an end to the work in this direction.

THE DISEASE AND INSECT CONTROL QUESTION.

At the beginning of Mr. Painter's career in Florida we had no such sciences as Plant Pathology and Economic Entomology. The whole literature relating to the combating of plant diseases and to the control of insect pests, has been written since that date. It is true that volumes had been written on the descriptions of fungi and insects, but the directions for remedial treatment were purely of an academic nature. As an illustration of how little was known about handling scale insects 30 years ago I want to repeat an anecdote told me by an orange grower at Eustis about fifteen years ago. His orange trees were badly infested with the round scale and so he applied to his brother-in-law, a practicing physician in New Jersey. In due course of mail the orange grower receive a bottle of iodine in solution and a camel's hair brush, with the written assurance that this would fix the bugs. The directions were to use the camel's hair brush in putting the iodine on the insects, but be careful and not let any of it touch the leaf.

The progress in the study of plant diseases has been a little more rapid than that of insects due to the fact that the plant pathologists have attacked their problems from a more fundamental standpoint.

The entomologists have given more attention to the study of insect morphology while the plant pathologists have laid greater stress on the study of fungus physiology. This trend in the studies of the two branches is directly traceable to the leaders in the respective sciences.

RISE OF CONTACT INSECTICIDE.

A study into the chapter of insecticides and fungicides is probably the most intertesting of all in connection with this resume. A glimpse into the literature is like studying a fairy-tale, or, as some might say, like the opening of Pandora's box. In the latter part of the seventies the only

ills that seemed to befall a citrus grove in Florida were scale insects, and if only this could be controlled, the citrus grower felt that all he had to do was to pick the golden fruit and jingle the golden dollars. This would have been quite true if greater evils had not been added to the existing ones. As early in 1881 Prof. H. G. Hubbard was stationed in Florida to investigate the insects of citrus. He was located at Crescent City, and responsible to Dr. C. V. Riley, Chief of the Division of Entomology. As a result of Professor Hubbard's work in Florida a bulletin was issued from the Division of Entomology covering the ground of citrus insects more extensively than anything that has since appeared. This bulletin has long gone out of print and although originally it could have been obtained for the asking, it now costs about ten cents a page to buy the bulletin, and even at that price there appear to be more buyers than sellers.

Coincident with the work done by Prof. Hubbard in Florida was the rise of contact insecticides. Previous to that time the poisonous insecticides had been used largely in the form of Paris Green, for the destruction of the Colorado Potato Beetle and in some cases for grasshoppers. There was, however, a large class of insects which obtained their food supply by sucking it from the interior of the plant tissues that were not reached by the poisonous insecticides. Dr. A. J. Cook, who is at the head of the California Horticultural Commission, appears to have been the first to publish on the use of kerosene emulsion for handling insects of this class. This publication brought about a wordy and acrimonious battle bewteen Doctors Cook and Riley. Prof. Hubbard, before that time, had been using kerosene emulsion at Crescent City, though apparently this had not been published to the world as the experiments were going on and methods were being perfected.

During 1881-82, Prof. Hubbard was making experiments with kerosene emulsion made from condensed milk and kerosene.

It appears from the records that Dr. J. C. Neal, then located at Archer, Fla., wrote to Dr. Riley (Oct. 10, 1882) in regard to the whale oil soap and kerosene emulsion formula that he used. He also had a formula that was made up of ordinary laundry soap and kerosene emulsion. This formula is practically the same as is used at the present time. It appears, however, that these gentlemen were all antedated by Mr. George Cruikshank, of Whitinsville, Mass., who seems to have begun the use of a mixture of whale oil and kerosene emulsion as early as 1870.

It is quite probable that these are a number of independent discoveries of how to make kerosene mix with water and was the beginning of our progress in the production of contact insecticides.

From this period on there has been a very rapid movement and an almost endless multiplication of contact insecticides, until now all you have to do is to name your bug and the specialist can tell you just what form of anæsthetic will put him

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Mich. Agl. Exp. Sta., 1890. M. C. H. Bul. 58, 5.

Ann. Rept. U. S. Com. of Agr., 1881-82, 113, 114.

"T. E.," Gardener's Monthly, 1875, Feb., 45.

permanently to sleep. There is really little to be desired so far as insecticides are concerned in the direction of killing insects. We have now arrived at the point where it is not so much a matter of the medicine to be used as the method of administering it.

DISEASES THIRTY YEARS AGO.

We have already discussed the discovery of kerosene emulsion, which introduced the period when rapid development occurred in the scientific study of insecticides and fungicides.

At the beginning of this period we find that mal-di-goma, or foot-rot, was the disease uppermost in the minds of citrus growers. This disease raged in all its fury in the Azores from 1832, when in about a ten-year period, 25 per cent of the trees were destroyed by it. Then came a quiescent period and in 1873 the disease had nearly disappeared, due to handling it by preventive and curative methods. In 1845 it spread to Portugal and eastward, reaching Messina about 1863, thence to Sicily. It is conservatively estimated that at least $2,000,000 damage was done by it. Prof. Briozi, an Italian plant pathologist records publishing on the disease and regarding the fungus Fusisporium limoni. Since the curative and preventive methods have been so well worked out and the treatment so successful no very serious attempts have been made in this country to establish the identity of the causative agent.

This disease does not appear to have reached California, my investigations there lead me to believe that what is frequently called foot-rot in California is quite a distinct disease. Prof. Fawcett, who has spent a great deal more time in the study of citrus diseases in California than I have, concurs in this conclusion.

In Australia the disease was found to be destructive around Sydney as early as 1867.

The disease seems to have been absent from the Asiatic countries, Japan, China and India, during the time when it was quite prevalent in Europe, America and Australia. This rather indicates that the disease was of European origin.

The first printed authentic notice of it in Florida dates back to 1876, and as late as 1880 it was of rather rare occurrence. From that time on the disease seems to have made rather rapid progress and has been disseminated to every citrus growing region of the State. During the middle nineties it appeared to reach its culmination of destructiveness.

Scab is produced by the fungus known as Cladosporium citri. This was described by Prof. Lamson Scribner.

The origin of this disease is pretty certainly Asiatic. It was not noticed to any great extent until the latter part of the eighties.

Dieback has probably been with us from the beginning since it appears to be due to physiological conditions. In the early part of the studies it was confused with other troubles. In one publication, for instance, we have a fine colored plate of dieback and the suggestion that it is due to insect attacks.

The earliest information that we can

Bull. Torr. Bot. Club, Vol. XIII, p. 181.

get about blight seems to date back to about 1878, when some trees in Lake County were affected by a mysterious disease that later was connected up with what we know to be blight.

INSECTS THIRTY YEARS AGO.

At the beginning of this period citrus trees were affected with a number of insects that were thought to be exceedingly destructive, and it was thought that if only a remedy for these insects could be obtained not much would be left to be desired in the way of handling this line of pests. The early literature teems with leaf-eating insects that are scarcely known today.

The most prominent scale insects that they had were the long scale ( ) purple scale ( ) chaff scale ( ) soft scale ( ) and wax scale ( )

At the present time no one thinks these pests serious, unless perchance it is the novice in citrus growing.

LATER INTRODUCTIONS OF DISEASES.

Withertip and anthracnose are caused by the same fungus. This was probably introduced from South America during the middle nineties. Most likely with budwood. While a form of the fungus Colletotrichum gloesporioides had been known to exist for some time it had never developed into serious proportions, and was known only as specimens in herbaria. During the middle nineties and toward the beginning of the 1900s, a very virulent outbreak of this disease occurred. Previous to this time Fritz Noak had observed this disease as proving destructive in parts of Brazil.

Melanose and stem end rot may be endemic and may also have been introduced. The strong probability is in favor of believing that the fungus was introduced to the State. It seems quite improbable that a disease which can be so destructive should escape attention from such keen observers as Dr. Webber and Mr. Swingle, Dr. Irving F. Smith, Dr. L. M. Underwood, all specialists on plant diseases. If it is an introduced disease it seems quite certain that its introduction was some time during the nineties.

Nail-head rust (Cladosporium herbarum var eitri) also known in Florida as scaly bark, is confined to a very small portion of the State. Its distribution and behavior are such as to point very strongly to its being an introduced disease.

All of the occurrences in the State have been traced back to one nursery. Fortunately this nurseryman distributed a very small amount of stock over a small region.

Diplodia rot (Diplodia natalensis) has at no time assumed destructive proportions though it is met with from time to time. We have not studied the conditions sufficiently to enable us to form an opinion as to whether it is native or introduced.

Black rot (Alternaria citri) is quite certainly an introduction from California. This has never proven to be sufficiently destructive to be of serious consequence to us as it is mainly a rot for the navel orange.

Citrus canker, the newest and probably one of the most vigorous of the diseases, is knocking lustily at our doors to

be admitted. As a matter of fact if it had not been for the vigilance of our nursery inspector, Dr. E. W. Berger, it would probably have been disseminated in Florida in such a way that it could not be stamped out. We believe, however, that the measures adopted will clear the State of any of this disease. As nearly as we can tell from the work that has been done by Prof. Stevens, it would prove a very much more formidable disease to handle than either scab or withertip with probably all of the destructive qualities of anthracnose.

LATER INTRODUCTION OF INSECTS.

Among the insects that are of later importation those that I mention in the following paragraphs could easily have been kept out of the State by an efficient horticultural inspector working under a satisfactory law. Immediately after the introduction of the first of these pests, the San Jose scale, active steps were taken to have laws passed for the control of diseases and insects in the State. A committee was appointed by the Horticultural Society to draft a law and have this presented to the Florida legislature in 1897. The committee consisted of myself, Dr. Webber and another gentleman.

We used the best State laws then in existence as models and worked it out on the most economical plan possible. It failed of passage on account of the fact that little effort outside of the committee was made to further the interests of the horticulturists.

The cottony cushion scale was accidentally introduced into Florida from California. At the time it was discovered it occupied a very small territory, only a small fraction of an acre being infested. Just as vigorous work as the State laws permitted was made by the Entomologist of the Experiment Station, he was, however, powerless under the conditions to do more than recommend what should be done and then stand by and give his services heartily in carrying out the work. Later, the State spent a considerable amount of money, both from public funds and also from private funds to suppress the pest, and we are now losing annually more from its depredations than would have bought out the entire premises and destroyed every living plant upon it. As later introductions may be mentioned, the mango scale and the California citrus scale. There are many others that are knocking lustily at our door. We are waking up somewhat tardily to the fact that we need an efficient policeman at our gates to keep out the rogues.

The whitefly was introduced either directly or indirectly from India, and the ravages of this pest have caused the loss of many millions of dollars directly in fighting it, to say nothing of the loss that has been caused by its presence. Then there is still that larger loss which has deterred the investment of many thousands and possibly millions of dollars, in the business. At the close of the great freezes of 1894-95, Prof. H. G. Hubbard, seconded by Dr. Webber and myself, pointed out strongly how we had the opportunity of limiting the spread of this pest. Drastic and active steps taken at that time would have limited the spread of it very materially. Even so

crude a form of limiting it as would have been brought about by a conscientious nursery inspector with power to act would have kept it from hundreds of centers where it now occurs. There are still sections in the State of Florida that are not infested with whitefly, and every effort should be made to suppress it should any outbreak occur in these sections. That this can be done has been conclusively proven by the outbreak that was suppressed in a California citrus growing section.

One of the latest introductions is the woolly whitefly (Aleyrodes howardii) from Cuba. Fortunately the woolly whitefly has a native parasite which causes very large inroads on the pest. Prof. J. R. Watson will present a paper on the subject later. We can say, however, that the presence of this check-mate on the woolly whitefly is nothing to the credit of us horticulturists it is simply a matter of having a fortunate combination of conditions.

There are many other pests we might enumerate of minor importance, but these are sufficient to show clearly that whatever progress we have made as horticulturists the pests of the horticultural crops have been much aggressive and the dilatory let-alone policy pursued by us has been extremely expensive.

SPRAYING MACHINES.

At the beginning of the epoch about which I am writing, spraying machines were really not machines at all in the present sense of the word. They were merely toys and makeshifts. As long as our principal insecticide work was confined to applying Paris Green little was needed beside a sprinkling can. With the introduction of more perfect methods for applying this material came the added advantage of doing the work in a more thorough manner. Much time has been given to the question from an engineering standpoint. The small knap-sack sprayer slung over the shoulders in which one carried 5 or 10 gallons of water proved to be a very great step in advance. The U. S. Division of Plant Pathology under the leadership of our present efficient Assistant Secretary of Agriculture, Dr. Gallaway, did a great deal to advance the work of producing efficient spraying machines. Those of us who have carried a knap-sack sprayer all day long in a tomato field can well remember the aches and pains endured after the day's work was over. From this was rapidly developed the barrel sprayer and finally the sprayer mounted on wheels and those used on a wagon. At the present time we have spraying machines that are run by gasolene engines and mounted in such a way that the work can be carried on efficiently and with the minimum amount of discomfort. These machines are perfected beyond the most sanguine dreams of those who carried the old knap-sack sprayers. No spraying machine is now thought to be worth while, either for the truck field or the citrus orchard unless it can develop a pressure of 80 to 120 pounds.

CO-OPERATION.

It is a well-known principle in mechanics that a team composed of two horses will do more effective work when

it comes to heavy hauling, than can be done by two horses acting singly. We recognize this all through our social organization by combining into families, groups of families, communities, counties, states, and at last and finally into nations.

The interests of the horticultural people, however, are likely to be so varied that there is a great deal of reluctance to give up the personal independence that comes from going it alone. However, it is very certain that if three fruit growers mutually agree to handle their stuff in exactly the same way and in the form adopted by the best grower, more efficient service will be had and a larger profit accrue than by each going it by himself. The question of co-operation or no co-operation is more largely founded on the inherent sentiment of everyone regarding himself to be superior in all respects to his neighbor. Practical experience, however, has shown that this is an erroneous way of looking at our existence.

The basis for much of our trouble in Florida is this one fact that apparently every man thinks he knows more about everything than does anyone else. I meet this constantly, and especially is it true of the man who knows the least about any particular subject. Take an illustration from the field in which I am most likely to be spending my activities,—the citrus grove. The man who comes to the State and has had about six months' experience in handling citrus trees is the one who is most likely to importune me very greatly about advice and recommendations, and then in about thirty minutes prove to his satisfaction that I do not know anything about the business.

We know so little about practical and thorough co-operation in Florida that we are very unwilling to take up the yoke and follow the other fellow's dictation as to how we shall pack our fruit, when we shall market it, when we ought to spray and what other operations we should carry on.

The Florida fruit industry, however, has gotten into some very serious difficulties from pursuing this independent and "go as you please" method. Just as soon as our fruit production reaches the point where we nearly supply the demands of the existing market, our prices drop so low that it is absolutely impossible for the average grower to come out even with his expenses.

The Florida Fruit Exchange was organized in 1884, according to the Florida Dispatch, (March 23, 1885, p. 272) with a capital stock of $50,000. This was increased the next year to $300,000. This exchange handled citrus fruits, vegetables and pineapples. One of the objects of the exchange was to force the buyers to come to the state. This it succeeded in doing admirably and the results of the working of the exchange were satisfactory to quite a number of the members.

On April 24, 1894, a convention was held in Orlando to formulate plans which matured in the formation of the Florida Fruit and Vegetable Growers Association. The immediate cause for the formation of these two organizations was that both fruit and vegetables were bringing

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Fla. Agriculturist, 1894, Feb. 14, p. 97.

less than the cost of production. It was either a question of organizing and doing away with some of the disadvantages of individual effort, or quitting the business. Both of these organizations came to an untimely end by the freezes of the winters of 1894 and 1895, the first occurring on the night of December 29, 1894, and the second on the 9th of February, 1895. As is shown by the statistics attached to this paper there was a very large slump in the amount of both vegetables and fruit produced in the State. This in a measure evened up matters and did away with the necessity of organization. However, if the organizations had been continued it would undoubtedly have proven profitable to the members of the Associations. These and a number of succeeding very cold winters culminating in the very low temperature of February 13, 1899, seemed to put an end to all hopes of citrus growing in the northern portion of the peninsula of Florida. Had the freezes of '94 and '95 occurred singly the damage would not have been serious. Likewise had the freezes of '94 and '95 not occurred the succeeding cold winters would not have upset the citrus industry so badly.

In the early nineties the Indian River and Lake Worth Pineapple Growers' Association was formed for the handling of pineapples in that region. This continued in existence until after shipping the crop of 1911.

Many people have said that the great freezes were a blessing in disguise, but the disguise is so completely veiled that even the keen scrutiny of statistics will not reveal the blessings. Just how these optimists are successful in seeing the blessing is more than I can tell. The visible blessing is certainly not to be taken into consideration. Every industry in the state felt the effects of these disastrous freezes and even those lines of work that we would have expected to be benefited by the freezing out of the citrus crops languished as a result.

It took Florida over fourteen years to catch up with the procession, in other words it was not until 1908, that disaster was again staring us in the face. Both in the vegetable and citrus line. This disaster being due to the individualized efforts that had been put forward in the last decade or decade and a half since the freezes.

The demoralization of the work due to lack of organization reached its maximum in the winter of 1907-08. At this time the citrus crop in California was very heavy, but the Florida crop had not reached the porportions it attained in 1894.

In 1908 the Florida Orange Growers' Company was organized, mainly through the activities of Mr. Josiah Varn.

This was a step in the right direction but most of the citrus growers in the State thought it was not sufficient to remedy the trouble. As a result of the agitation and an excursion to California, a convention was called for a more perfect organization of the citrus growers. This was held at Tampa on July 22, 1908, and

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Fruit and Produce News, November 3, 1908, p. 9.

the Florida Citrus Exchange, with M. E. Gillett as manager, was organized.

In 1913 arrangements were made for the organization of the Florida Growers' and Shippers' Protective League. This agitation culminated in the employment of Prof. Lloyd S. Tenney as secretary and manager of the association. Prof. Tenney and Mr. L. B. Skinner will present the merits of this association to us tomorrow. Every good horticulturist ought to be a member of the league.

LOSSES ACCRUING FROM LACK OF CO-OPERATION

Almost every business with which we come in contact either on the selling or purchasing end of the business, we meet face to face individuals who belong to strong organizations and who are not fighting as individuals but are fighting under the management of able leadership. The losses that accrue to us from lack of co-operation are many and below I give a few that have occurred to me.

1. Losses at the Marketing End of Our Business.

(a) Thousands of dollars every year are lost in the just claims that we have against transportation companies. Either our claims are so badly made that the transportation companies must look upon them with suspicion or if they are made correctly we are worn out by trying to unravel the endless red tape connected with the questions. My personal experience in this matter is not very different from that cited to me by numerous other individuals. At one time I paid $16.35 on a shipment of live trees, the transportation expenses of which had been paid but the bill had become separated from the shipment. I paid the freight claim and was assured that it would be re-paid to me as soon as the prepaid bill arrived. When the documentary matter was all straightened out it was found that the cash had been sent to the treasury of the railroad. To make a long story short, I was about eight months in getting the refund, and by keeping actual account of my time, I found I had spent over $30 worth of time to get back that $16.

(b) Our lack of organization has also made us the prey of dishonest and shady commission men.

(c) Our lack of co-operation has also made it impossible to make collections from sales of our fruit when if we had been members of an organization the bills would have been paid promptly.

2. Losses at the Growing End of Our Business.

(a) We suffer immense losses in our citrus crop in making improper grading of our fruit. It does not make very much difference what the stencil is on the outside of the box. When the box is opened and examined and found to contain a lot of seconds no matter if 75 per cent of the box is firsts, the whole sells as seconds.

(b) Rough handling, either in the grove, packing house, or by the local railway hands is very largely eliminated by being thoroughly organized, making it a serious matter for anyone who is hauling the fruit or transporting it, to handle it more roughly than should be.

(c) Through lack of organization every man has to organize his own picking crew. He has therefore no experi-

ence to fall back on except his own as to whether the individual he hires for picking purposes is mentally or physically suited for the position as picker or handler of the fruit. This experimenting and trying to find efficient men becomes a costly experience every year. By effective co-operation the individual who proves to be unsuited for the work would have to find work to which he is by temperament suited.

3. Losses from Insufficient Information Relative to Market Conditions.

This is probably the most difficult point to handle, yet with efficient co-operation every man who has a carload of fruit to sell should receive for it the best price any market will pay.

4. Losses accruing from Conditions that We Have Directly Under Our Control Locally.

(a) By proper State laws we can keep out scores of insects that are now ready to pounce upon our crops. The dictum of the scientists of twenty-five years ago has been proven to be correct so many times that further demonstrations are entirely useless.

(b) There are in addition to the insects scores of diseases some of which are as bad as any of those with which we now have to deal. While the minor diseases would probably not in themselves attract much attention they are simply adding that much more weight to our burden, and some of them might prove to be the proverbial "last straw."

(c) One of the directions in which we have been most dilatory and recreant is that of discouraging or stopping local dissemination of insects and diseases. We have been so prone to stand on our personal rights that we have simply permitted all sorts of diseases in the State to be disseminated at will and with impunity. I could cite case after case until it would fill a volume of illustrations to bear out this particular point. The amount of good that has been accomplished by our State Nursery Inspector, Dr. E. W. Berger, can never be fully realized by the citrus growers of Florida. From the evidence at hand it is safe to say that the one effort of controlling and stamping out of citrus canker is worth one hundred times more to the citrus industry of Florida than the cost of running the whole inspection service.

RISE OF THE VEGETABLE CROP.

VEGETABLE CROP, 1890.

	Acres	Quantity	Value
Tomatoes	4,350	503,000 cr.	$317,500
Cabbage	2,240	147,500 bbls.	270,000
Watermelons	2,700	1,491 cars	96,000
Beans	804	84,000 cr.	73,800
Cucumbers	767	65,000 cr.	61,800
Irish Potatoes	1,619	40,700 bu.	54,300
Eggplant	111	4,400 bbls.	12,800
Squash	206	7,400 bbls.	9,400
English Peas	93	4,500 cr.	6,400
Beets	91	2,900 bu.	2,700
	12,981		$904,700

VEGETABLE CROP, 1893.

	Acres	Quantity	Value
Tomatoes	4,800	361,000 bbls.	$471,000
Cabbage	2,254	176,000 bbls.	197,000
Beans	1,214	107,700 cr.	152,900
Irish Potatoes	1,156	59,000 bu.	74,000
Watermelons	3,387	1,633 cars	41,400
Squashes	482	25,000 bbls.	41,000
Eggplant	209	7,700 bbls.	26,700
Cucumbers	360	25,500 cr.	24,500
English Peas	290	35,321 cr.	21,400
Beets	171	19,000 cr.	17,000
Cantaloupe	68	2,700 bbls.	4,500
	14,391		$1,071,400

VEGETABLE CROP, 1896.

	Acres	Quantity	Value
Tomatoes	5,529	370,000 cr.	$392,000
Beans	2,770	246,000 cr.	297,500
Watermelons	3,375	3,243 cars	164,000
Irish Potatoes	1,278	103,000 bu.	124,000
Cabbage	1,304	77,600 bbls.	104,000
Eggplant	471	18,000 bbls.	60,000
English Peas	479	46,900 cr.	48,600
Cucumbers	495	38,000 cr.	41,000
Squashes	309	21,000 bbls.	27,000
Beets	199	20,800 cr.	22,100
Cantaloupe	220	10,560 bbls.	12,600
	16,429		$1,292,800

VEGETABLE CROP, 1901.

	Acres	Quantity	Value
Tomatoes	6,675	770,600 bu.	$928,000
Watermelons	3,256	2,380 cars	222,000
Irish Potatoes	2,517	180,644 bu.	213,800
Beans	2,118	152,000 cr.	202,000
Cabbage	1,820	141,770 cr.	175,800
Cantaloupe	2,507	81,670 cr.	95,400
Eggplant	471	38,750 cr.	79,500
Cucumbers	497	47,000 cr.	49,600
Lettuce	68	48,163 cr.	49,100
English Peas	544	47,600 cr.	46,300
Squashes	235	16,800 cr.	23,500
Celery	25	20,739 cr.	20,900
Beets	104	15,000 cr.	14,900
Peppers	19	3,442 cr.	5,300
	20,856		$2,126,100

VEGETABLE CROP, 1912.

	Acres	Quantity	Value
Tomatoes	13,213	1,752,000 cr.	$2,113,000
Irish Potatoes	10,647	1,082,215 bu.	1,641,000
Lettuce	2,598	625,000 cr.	818,000
Beans	6,297	768,300 cr.	798,000
Watermelons	15,724	6,895 cars	511,000
Celery	932	420,000 cr.	483,000
Cucumbers	2,081	363,000 cr.	344,000
Cabbage	2,307	194,000 cr.	295,000
Peppers	1,062	251,000 cr.	288,700
Cantaloupe	4,444	280,600 cr.	285,000
Squash	547	98,400 cr.	133,000
Onions	624	65,200 cr.	102,000
Eggplant	438	39,500 cr.	40,000
Beets	281	23,123 cr.	35,000
English Peas	261	12,100 cr.	21,000
	61,456		$7,907,700

RISE OF FRUIT CROP OTHER THAN CITRUS.

FRUITS OTHER THAN CITRUS, 1890.

	Trees, Etc.	Quantity	Value
Peaches	240,800 trees	246,000 bu.	$150,000
Pineapples		1,716,000 fruits	117,200
Strawberries	602 acres	1,088,000 boxes	96,000
Pears	129,000 trees	21,000 bbls.	57,000
Grapes	2,040 acres		52,000
Bananas		32,000 bchs.	15,000
Figs		4,600 bu.	6,000
Plums		18,400 bu.	5,800
			$499,000

FRUITS OTHER THAN CITRUS; 1893.

	Trees, Etc.	Quantity	Value
Pineap'l	15,972,000 pl'nts		$679,000
Grapes		3,678,000 lbs.	293,000
Strawberries	797 acres	811,000 qts.	97,000
Peaches	239,000	120,000 bu.	89,000
Pears	194,000	36,600 bbls.	59,000
Bananas		67,000 bchs.	30,000
Guavas		31,000 cr.	22,800
Pecans	1,852	1,813 bu.	5,600
Figs		2,900 bu.	3,100
Plums (no record)			
			$1,278,500

FRUITS OTHER THAN CITRUS, 1896.

	Trees, Etc.	Quantity	Value
Pineapples		3,099,000 (?)	$182,000
Strawberries	1,043 acres	1,295,000 qts.	161,000
Peaches	191,344 trees	96,950 bu.	111,000
Pears	114,591 trees	62,000 bbls.	97,700
Grapes		1,528,000 lbs.	76,000
Guavas		12,500 cr.	12,400
Pecans	10,451 trees	2,030 bu.	9,000
Bananas		12,500 bchs.	6,200
Figs		764 bu.	1,250
			$656,550

FRUITS OTHER THAN CITRUS, 1901.

	Trees, Etc.	Quantity	Value
Pineapples		6,531,000 fruits	$717,600
Strawberries	950 acres	1,664,000 qts.	312,000
Peaches	191,000 trees	142,000 bu.	152,000
Pears	47,300 trees	32,800 bbls.	38,900
Grapes		503,000 lbs.	25,000
Pecans	5,483 trees	2,561 bu.	10,000
Guavas		10,353 cr.	7,400
Avocadoes		1,900 bbls.	6,000
Bananas		10,000 bchs.	4,600
Figs		384 bu.	700
			$1,274,200

FRUITS OTHER THAN CITRUS, 1912.

	Trees, Etc.	Non-bearing	Quantity		Value
Pine-apples			355,658	cr.	$383,200
Peaches	233,373	92,819	178,566	bu.	225,600
Straw-berries	1,785	acres	3,513,108	qts.	147,500
Pecans	20,409	1,306,459	16,893	bu.	94,900
Pears	53,155	16,790	31,000	bbls.	78,300
Grapes	9,063	17,673	1,054,945	lbs.	74,600
Avoca-does	67,108		19,373	cr.	53,700
Guavas			56,172	cr.	49,300
Mangoes	82,095		26,559	cr.	26,600
Figs			16,534	cr.	25,600
Plums	21,352	12,216	17,716	bu.	23,100
Bananas			27,061	bchs.	18,600
Cocoa-nuts	77,819		227,550	nuts	8,400
Kaki	44,838		4,376	cr.	6,700
Sapodillos			4,051	cr	5,200
Sugar Apples			2,700	cr.	4,200
					$1,225,500

RISE OF CITRUS FRUIT CROP.

CITRUS, 1890.

	Trees: Bearing	Non-bearing	Boxes	Value
Oranges	1,895,300	4,996,341	2,665,000	$2,700,000
Grapefruit	13,600		18,100	20,400
Limes	13,800		7,800	5,500
Lemons	20,200	78,800	18,400	29,500
	1,942,900	5,075,141	2,709,300	$2,755,400

CITRUS, 1893.

	Trees: Bearing	Non-bearing	Boxes	Value
Oranges	2,687,000	3,724,000	4,164,000	$4,148,000
Grapefruit	64,000		52,000	86,800
Limes	7,100		3,370	5,400
Lemons	44,900	105,200	57,000	75,500
	2,803,000	3,829,200	4,276,370	$4,315,700

CITRUS, 1896.

	Trees: Bearing	Non-bearing	Boxes	Value
Oranges	88,355	2,808,000	46,580	$ 65,000
Grapefruit	60,100		4,582	5,153
Limes	9,600		559	716
Lemons	1,690	50,000	713	1,000
	159,745	2,858,000	52,434	$ 71,869

CITRUS, 1901.

	Trees: Bearing	Non-bearing	Boxes	Value
Oranges	596,000	2,945,000	973,000	$1,471,400
Grapefruit	136,500		22,800	142,000
Limes	18,800		4,100	9,300
Lemons	4,900	11,000	1,500	2,987
	756,200	2,956,000	1,001,400	$1,625,687

CITRUS, 1912.

	Trees: Bearing	Non-bearing	Boxes	Value
Oranges	2,776,526	1,836,016	4,769,312	$5,665,500
Grapefruit	794,408	739,923	1,405,308	2,684,500
Limes	37,572		35,417	61,800
Lemons	9,196	34,079	11,810	32,800
	3,617,702	2,610,018	6,221,847	$8,444,600

SUMMARY HORTICULTURAL CROPS.

	Vegetables	Non-citrus	Citrus	Totals
1890	$904,700	$499,000	$2,755,400	$4,159,100
% of whole	22	12	66	100
1893	1,071,400	1,278,500	4,315,700	6,665,600
% of whole	16	19	65	100
1896	1,292,800	656,550	71,869	2,021,219
% of whole	64	32	4	100
1901	2,126,100	1,274,200	1,625,687	5,025,987
% of whole	42 1-3	25 1-3	32 1-3	100
1912	7,907,700	1,225,500	8,444,600	17,577,800
% of whole	45	7	48	100

CONCLUSIONS.

After reviewing the whole horticultural situation I can see clearly how one large question after another has come up. Strenuous efforts have been made to solve it. Some questions have been studied until a reasonable solution has been found. Often this has come about by forces entirely or largely outside of our own region.

(1) The transportation question has been settled largely by the establishment of a non-partisan Interstate Commerce Commission with power to act. We have done our share of the work to bring this about.

(2) Our present State Railroad Commission can be traced directly to the horticulturists of Florida.

(3) The introduction, propagation, and dissemination of valuable fruits, vegetables and ornamentals has been due entirely to our efforts. In the last twenty-four years the vegetable crop has increased over 900 per cent. The citrus fruits have increased 400 per cent, in spite of the fact that it had to be entirely rehabilitated. The other fruits have increased over 250 per cent.

(4) The chapter on fertilization is the most brilliant one that we have written. Nowhere else in the world will you find such a large fund of information on this subject as is possessed by the horticulturists of Florida. Nowhere else is the fertilizer business on so solid a foundation. Nowhere else will you find State laws so favorable to the horticulturist.

(5) The chapter on the knowledge of diseases and insects is also an extremely brilliant one. The scientists have made themselves nationally and internationally famous. A large number of individual horticulturists are the most progressive that can be found anywhere. It has, however, an extremely discouraging side to it. The horticulturists as a co-operative body are far behind the most progressive.

(6) The chapter on co-operation is just beginning to be written. A great many vigorous attempts have been made but all of these have fallen far short of receiving the hearty co-operation of the persons interested.

The whole horticultural situation as brought out by my history of its development in the last 25 years may be summed up in the one sentence,—Our work as individuals has been the most brilliant that can be found anywhere in the world, but our team work has fallen so far short of what it ought to have been that as individuals we have had to suffer the severest humiliations, both personal and financial.

With these concluding words I lay before you, ladies and gentlemen a brief study of the development of horticulture in Florida as it has occurred during the life of Mr. E. O. Painter. I have brought out clearly that he has had more to do with its correct development than any of the younger members can realize.

A TRIBUTE TO THE LATE E. O. PAINTER.

Capt. R. E. Rose

Mr. President, Ladies and Gentlemen:

I deem it a privilege and an honor to have been selected to pay a slight tribute to our late Secretary, my personal friend, one of the founders of this society, the late E. O. Painter, and to briefly state some of his many efforts to build up, from a comparatively small industry, the great horticultural industry of Florida, our now prosperous and growing citrus fruit industry, and to particularly dwell upon his efforts and signal success in intelligently and successfully teaching the horticulturalist of Florida, how to properly fertilize, intelligently, economically and successfully, our citrus groves and other crops of the State.

While I can not hope to be able to so eloquently and feelingly portray the high character, great usefulness, sturdy manhood and unselfish devotion to his state, as a man and a citizen, I shall endeavor to the best of my ability to pay tribute to one of the most loyal citizens of the State, a man who has done much to develop her latent industries, and upbuild her most important agricultural and manufacturing industries.

My acquaintance with Mr. Painter began in the early eighties, when he was owner and editor of the *Florida Agriculturalist*.

In those early days the art of fertilizing was purely empirical. Little, if anything, was known of what is now called commercial fertilizer, scientifically prepared and generally discredited. Those few who experimented with various chemicals were ridiculed as cranks, visionary enthusiasts, and book farmers.

Our friend, E. O. Painter, from experience, practical demonstration, close observation and correct conclusions, discovered and applied many of the fundamental principles and necessary materials to induce profitable and heavy growth on our citrus groves, thus securing profitable returns, sound handsome fruit, with good shipping qualities.

In those early days it was well nigh impossible to obtain materials for manufacturing commercial fertilizer, and much more difficult to obtain information as to the effect of the various materials, how to properly combine them to obtain the best results.

Many serious and expensive mistakes were made by the growers of the State, many tons of inferior, and often injurious materials were sold to our people.

E. O. Painter was the first man in Florida to intelligently and systematically experiment with various so-called chemical plant foods, and certainly the first to establish a factory for their manufacture in proper proportions to meet the different conditions of soil, climate, and the various classes of soil.

He was studious, observant, and above all, industrious and persistent, having the peculiar mental capacity of a true scientist; that of close observation of facts

and conditions, and to deduct proper conclusions therefrom, together with the skill to apply the knowledge so obtained, practically and efficiently. Soon his theories, demonstrated by actual results, began to be acknowledged, his advice and counsel sought. He early recognized the now accepted truth, that different soils and different crops demanded different materials in different proportions to insure success. That no one material or combination of materials was suited to all conditions of soil, age of groves, or variety of crops.

We were all working in the dark, empirically, each with a pet method or "formula," a formula made up of materials the composition of which we knew little or nothing.

He was the first in Florida to combine his materials in definite proportions, containing definite percentages of what is now known as the three principal plant foods: "Nitrogen, Potash and Phosphate." Outside of a few agricultural colleges and states the combination of various materials in definite amounts to insure proper percentages of the necessary elements, suited to various crops, soils and conditions, was unknown. The few "brands" of fertilizer sold in the state depended solely on the name or brand, and the claims of its makers.

E. O. Painter was among the first to recognize the necessity of a knowledge of the compounding of commercial fertilizer, not only the materials entering into it, but the percentages of the peculiar element furnished by each material—its origin, organic or otherwise, and effect upon the soil and the crops. This knowledge he obtained by studying the best known authorities on scientific and practical fertilizing. He was the first to make it possible for the grower to obtain the necessary raw materials with which to supply the most necessary elements demanded by his grove. As well known to each of you, for years it was practically impossible to obtain the salts of Potash, Phosphate or Ammoniates, as such, in unmixed condition. Northern manufacturers controlled the supply, and refused to sell anything but their peculiar brands or mixtures.

E. O. Painter was one of the most potent factors in the enactment of the present fertilizer law of the State, by which the business was made no longer a simple matter of "brands" of various and unknown composition, and made it possible for a grower to order and obtain a fertilizer of certain desired composition, or to obtain the necessary materials by which to get the results desired.

His interest in the work of our experiment station was at all times great. His contributions to the cause of careful scientific investigation of the effect of various fertilizers and soils, under scientific control, are well known to each of you, experiments made possible by his liberal contributions to the work, not only financially, but also by his practical suggestions, earnest co-operation, encouragment and advice to the scientists in charge.

I have had the pleasure for many years to meet Mr. Painter on occasions of this kind, he being one of the charter members of this association. Also at many other meetings of growers, Farmers' institutes, and other gatherings, where the important question of proper fertilizing

was generally the principal topic. On all such occasions he was anxious and willing to impart his great knowledge of the subject to the people of the State.

As a lecturer on the proper use of various combinations of fertilizer for various crops, soils and conditions, he had few equals and no superior. Pleasant and courteous, a ready debater, quietly humorous, fair in argument, with a single desire to instruct and assist in spreading the gospel of truth, as to the proper use and economical application of fertilizers, for accomplishing the desired ends, an art of which he was past master, by reason of his indefatigable industry, research, close observation and correct deduction, practical experiments and demonstration.

A Christian gentleman, a loyal friend, a good neighbor, a loving husband and father, an upright business man and loyal citizen. His friends, his family, his State, and this society, in the untimely death of E. O. Painter, suffered an irreparable loss. May he rest in peace and his example be followed by each of us.

Necrology

E. S. Hubbard and Edgar A. Wright

REV. J. F. SUNDELL

Rt. Rev. J. F. Sundell was born near the city of Upsala in Sweden in 1843, and died at Lake Mary, Florida, Sept. 26th, 1913, aged 69 years, and 10 months. He was survived by a widow and three children. Mrs. Aubrey Moran, Mrs. Samuel McBride and a son, Oscar D. Sundell, who died Dec. 16th, 1913, and also by two step-daughters, Mrs. J. E. Rose and Mrs. W. A. Willsey. Mr. Sundell came to this country when he was about 30 years of age and owned a farm in the State of Maine for 14 years, but tiring of the cold winters, he moved to Florida in 1883. He was interested in real estate and worked for the settling and upbuilding of Florida. He was a Presbyterian clergyman for twenty years and after retiring from the ministry, for several years had charge of the orange grove of Mr. C. Marot Townsend of Philadelphia, at Lake Mary. Mr. Sundell was an even tempered man of a sunny disposition who was loved and respected by all who knew him.

CHARLES S. BUSHNELL

Charles S. Bushnell was born in New York State, Feb. 13, 1847, and died in Arcadia, Feb. 1, 1914, aged nearly sixty-seven years. His father, F. S. Bushnell, went to New York State from Louisiana when a boy and was educated and married there, removing to Florida after his children were grown. Mr Charles S. Bushnell lived in Florida many years. For ten years he was employed by the old F. C. & P. R. R., now the Seaboard Air Line, and then resigned to move to Arcadia and live on his orange grove. He was a public-spirited man who worked in every way for the advancement of Arcadia, DeSoto County and horticulture. He was president of the local Farmers' Institute, President of the former Arcadia Citrus Growers' Association and member of the Growers' and Shippers' League and the Florida State Horticultural Society. He is survived by his wife. Public spirited men like Mr. Bushnell are missed in any community.

HENRY M. FLAGLER

Henry M. Flagler was made an honorary member of this society at the meeting in Miami in 1903, where he addressed this society and said in the course of a few remarks: "It is not the size of the thing we do, but the way in which we do it"; and, "The man who cultivates his five acres or ten acres industriously and soberly, that man has his reward."

No more striking personality than Mr.

Flagler, viewed either as a man or by his work, has ever been identified with Florida. His face conveyed the impression of unconquerable will, determination and perseverance.

The commanding forehead, the strong, straight, symmetrical nose, the square and massive, but finely molded jaw, were combined in a countenance that done in marble would make a fit companion piece for Canova's bust of Napoleon Bonaparte.

Born in Canandaigua, New York, in 1830, the son of a minister, he left home at the age of fourteen to cease being a burden to the family and made his way in the world by himself, beginning work in a grocery store at a salary of five dollars a month.

As years went by he made and lost money till in 1867 at the age of thirty-seven years he became identified with the men who later formed the Standard Oil Company.

Mr. Flagler abominated waste and his development of the waste products of oil distilling added largely to the success of the oil industry.

Having made a fortune in Standard Oil in 1884 at the age of fifty-four years, he first came to Florida and finally decided that instead of devoting himself to financial business and becoming one of the richest men in the world, he would develop the East Coast of Florida.

Mr. Flagler is said to have spent $50,000,000 in Florida and on the East Coast he undoubtedly made it possible to grow more than two blades of grass where only one had grown before and ended with the oversea railroad to Key West a monument that will vie with the pyramids of Egypt and the triumphal arches of the Roman Emperors to perpetuate his memory. Mr. Flagler's artistic temperament was shown in the beautiful architecture of many of his hotels and the exotic plants and shrubbery with which when possible they are surrounded.

His direct interest in Florida Horticulture and agriculture was shown all along the East Coast. In the early days of Hastings, he had a demonstration farm on which a variety of crops were grown, even cucumbers under glass, and these experiments added largely to the development of Hastings. From his eighty-acre grapefruit grove at Kendall, Dade County, 25,000 boxes were gathered this year.

It was after the 1895 freeze that finding practically no damage at Miami and good citrus fruit growing, he decided to extend his railroad there and distribute 5,000 grapefruit trees to encourage planting. It is also said he offered up to $1,000,000 to assist growers after the freeze. As a constructive force we may never see Mr. Flagler's like in Florida again and he had the gratification of living to be eighty-three years old and seeing his dreams completed. The largeness of the man is shown by the remark he often made that he was always contented but never satisfied.

ARNOLD BENJAMIN HARRINGTON

Mr. Harrington died in Jacksonville, Nov. 2nd, 1913, while on his way to his winter home at Winter Haven, aged sixty years. He had been an invalid for

several years. He is survived by his widow, Mrs. Elizabeth Harrington, and one brother, C. W. Harrington. Mr. A. B. Harrington was born in Rhode Island, but spent most of his life in Connecticut, coming to Florida in 1885. Mr. Harrington is spoken of as "a splendid type of Christian manhood. Honest, kind and public-spirited, he was beloved by all who knew him. His death has caused a vacancy in the business and social circles of Winter Haven that can never be filled," and by the board of directors of the Snell National Bank of Winter Haven in resolutions of respect, "The deceased was always a man of unquestioned integrity, a citizen of progressive enterprise, always in the front rank of every movement for the betterment of the community. He was a loyal, loving and tender husband, and a most efficient and honorable member of this board, and the remaining members of the board cannot express the sense of loss they feel on account of his sudden and untimely death."

EDWARD OKLE PAINTER

As different phases of Mr. Painter's life work relating to horticulture have already been dwelt on in the Memorial Session, we will here present only the biographical sketch.

Edward Okle Painter (1860-1913), printer, publisher, editor, fertilizer manufacturer and horticultural benefactor, the eldest child of George and Charlotte Dadswell Painter, was born in Ontario, N. Y., Nov. 3d, 1860.

His early boyhood was spent in Webster and Fairport, N. Y., and when a lad of 16 years of age, he went to DeLand, Florida, with his parents, who had been induced to go South by Mr. H. A. DeLand, the founder of DeLand, Florida, who then resided in Fairport.

His chances for a schooling were limited, consisting of about four years in the public schools of the State of New York. He was a close observer, a master of intricate details, a reader and thinker, and possessed a wonderful retentive and analytical mind. These natural gifts he used to offset the loss of an early education.

DeLand was an agricultural and horticultural community, and Mr. Painter applied himself to studies, researches and experiments in plant life and culture and was looked upon as one of the most advanced men in these lines in the South.

At the age of 17 he was the U. S. mail carrier between DeLand and Cabbage Bluff, Florida, meeting the St. Johns River steamers. About this time he obtained a tract of land which he cleared and set out as an orange grove, working for himself and others between mail hours and during the evenings. He gave up the position of mail carrier for that of "printers devil" on the Volusia County Herald. In this office was published the Florida Agriculturist, which was then, and for many years afterward the only agricultural publication in Florida. From the position of "devil" he rose to a full journeyman printer and later on was promoted to the position of foreman.

As a young man, in whatever work was assigned to him, he established a reputa-

tion for thoroughness—he was not a "clock watcher," but was known as a "dependable boy."

In the fall of 1883, he went to Louisville, Kentucky, where he was employed on job press work for the Courier-Journal. On October 3rd, of the same year, he was married to Miss Martha S. Brinly, of Louisville, Ky.

Returning to Florida in 1885, he purchased a one-half interest in the Florida Agriculturist, and later on became sole owner, turning over the orange grove which he had set out as part payment. He continued as editor and owner until 1907, when he sold all his rights and interests in the publication.

In the early days of horticulture in Florida, fertilizers were hedged about with walls of secrecy and mystery, and when he began his experimental work in fruit and vegetable growing at his home near DeLand, Florida, he was met with opposition and refusals from Northern fertilizer manufacturers in his endeavor to procure raw fertilizer materials. Through the influence of a friend, he finally secured several hundred pounds of materials and with these began the mixture of fertilizers according to his own ideas. He operated extensive experimental grounds in connection with the work of the publication of his paper. On these grounds careful experiments and records were made in the application of different plant foods in different proportions, and as a result, in the course of years he gained an accurate knowledge as to the plant food requirements of the various crops in conjunction with different soils, which could not be obtained in any other way.

He was the first to manufacture fertilizers within the State of Florida, and the first to contend that no manufacturer of fertilizer could make any one plant food suited to all conditions. He was the first to advocate special formulas for special soils and crops.

His efforts in behalf of the soil tillers of the State of Florida did not end there. Realizing the difficulties the grower had to combat in the field in the way of diseases and insect pests he made an exhaustive study of these conditions.

The results of his experiments and investigations were published from time to time in the Florida Agriculturist and revolutionized the use of plant foods.

In order to supply the growers with the plant foods his experience and experiments had proven was needed, in 1890 he commenced the manufacture of fertilizers on a very limited scale at DeLand, the then center of the orange region in the State of Florida.

In 1897, his fertilizer business having increased to such proportions it became necessary on account of transportation facilities to move to Jacksonville. Up to 1901 the business was owned and operated by him individually, but in this year it was incorporated under the laws of the State of Florida, as the E. O. Painter Fertilizer Company.

Possibly the one thing which he accomplished which has more than any other redounded to the benefit of the growers of the State of Florida, was that he made

it possible for a grower to get any kind of complete fertilizer, raw materials or chemicals that the grower's experience indicated were best to use. It is a well-known fact, that at the present time (1913), nowhere in the United States is there such a variety of commercial plant foods immediately available to the farmer and horticulturist as in the State of Florida, and this can be attributed to his efforts.

He was largely instrumental in securing the enactment of the present Fertilizer Inspection Law and in having created the office of Commissioner of Agriculture and State Chemist in the State of Florida.

He was interested in everything that tended to the upbuilding of the State and the communities in which he lived. At the age of 21 he was one of the three inspectors of the election held for the incorporation of the town of DeLand, Fla.

He was one of the charter members of the First Baptist Church in DeLand, which was organized in 1880, and from early life he took a specially active part in Sunday School work. He was an active and earnest worker on the Board of Trustees of John B. Stetson University at DeLand, being one of the oldest members of the board at the time of his death.

He was a charter member of the Florida State Horticultural Society, and served as its Secretary for a number of years. He was a member of the Masonic Order and Odd Fellows, an active worker and member of the Jacksonville Port Commissioners, a member of the Building Committee of the Young Men's Christian Association and was foremost in the work of the Children's Home Society and the Central City Mission. He was most active in the cause of temperance and in procuring proper legislation to control the liquor traffic and served for a number of years as treasurer of the Anti-Saloon League.

He was truly classed as a developer, a man of distinctive, far-reaching and progressive ideas and endeavors.

He threw his whole soul and energy into the bettering of the horticultural and agricultural conditions throughout each and every section of the State of Florida.

His eyes were on South America. He foresaw vast opportunities for Florida in the development of closer relations with South America and was giving his most earnest co-operation in opening the way for closer trade communications. He was the first chairman of the Committee on Foreign Commerce appointed by the Jacksonville Board of Trade, the creation of this committee being largely due to his report to the Board of Trade, after his extended trip to the West Indies, Venezuela and Latin-American states—upon the advisability of encouraging the South American trade.

Early in the forenoon of May 22d, 1913, when crossing the St. Johns River enroute to his fertilizer works at South Jacksonville, he was seized with a fit of coughing and stepping to the outer rail of the boat, lost his balance and fell into the river and was drowned. His body was not recovered until some hours afterward.

He is survived by his wife, Martha S. Painter, and one daughter, Okle C. Paint-

er. The latter has succeeded her father as President of the E. O. Painter Fertilizer Company.

The closing sentence of the last bequest of his will, granting a month's salary to the employes of the E. O. Painter Fertilizer Company, both white and black alike, who had been in the Company's employ for one year or more, emphasizes this man's teachings and belief, through his all too short life, of loyalty of service and sincerity of purpose:

"To each and every employee who has worked faithfully, conscientiously and loyally, I leave my richest blessing. To those who have worked simply for their salary and have lacked conscientiousness or loyalty, I commend them to their own conscience."

Great men are gentle and the beautiful gentleness of his nature finds illustration in the high esteem in which he was held in the business and social commercial world.

Annual Reports

REPORT OF THE AUDITING COMMITTEE

Messrs. Burton, Sample and J. A. Stevens, having been appointed auditing committee by the president, submitted the following report:

To the Florida State Horticultural Society:

Your Auditing Committee beg leave to report that we have examined the accounts of the Secretary and Treasurer of the Society, have checked up vouchers for expenses and find the accounts to be correct as reported.

Respectfully,
R. P. BURTON, *Chairman,*
J. W. SAMPLE,
J. A. STEVENS.

Moved, seconded and carried that report of Auditing Committee be accepted by Secretary.

REPORT OF SECRETARY

Mr. President, Ladies and Gentlemen:

In returning to Palatka after many years, we find the Horticultural Society grown from a young and rather weak organization with only a few members to one of the strongest in our fair Southland. We now have enrolled 106 life members and 809 annual members making a total of 915. The enrollment at the opening of the meeting was 585 against 427 last year and 224 have joined since Tuesday. Last year DeLand gave us 47 members. This year Palatka has furnished 51.

Much of this nice increase is due to the good work of the Florida Grower, who put before the public in every issue of its paper the meeting of the Society and they have sent us in some 40 members. Thanks is also due to Mr. R. A. Conkling for 24 members, Mr. W. H. Brokaw for 10 or 15, H. E. Connell for 10 or 15, Mr. H. O. Hamm for 19 and Mr. E. M. Ernest for 16, also to the nursery and fertilizer concerns who have kindly assisted the Secretary in sending out application blanks with their correspondence.

Last year many of our good members came to our financial assistance enabling us to close this year's books with all bills paid and a balance on hand of $392.62. With an expense of something over $900.00 for printing and mailing the report, it is a question whether it will be possible to pull through this coming year without again having to ask for help. We have on hand quite a few of the reports for years past and anyone desiring copies for any of the years, with the exception

of 1912, from 1905 to now can purchase same at $1.00 each.

I beg to hand you herewith my report covering receipts and expenditures.

OKLE C. PAINTER,
Secretary,

Reports sold prior and for 1913	$	97.00
Life members, 3		30.00
Pins sold, 5		5.00
1915, 1916, 1917, 1918 dues, 7		7.00
Postage paid,		.27
1914 memberships 573		573.00
Donations paid		260.00
Received of Estate E. O. Painter,		

Cr.

Donation account	$	85.00
1913 memberships		36.00
Pin		1.00
Life memberships		20.00
		$142.00

Dr.

Postage	.21	141.79
		$1114.06

Dr.

Postage	$	38.68
Stationery		3.75
Telephone		.80
Freight on books		3.08
Circular work		128.07
Secretary's salary		100.00
To Treasurer Hart		628.32
	$	902.70
	$	211.36
Check to Treasurer Hart	$	211.36

Donations were received as follows:

L. B. Skinner, $80.00 trip to Washington R. E. Tariff, cash	$	20.00
M. F. Robinson		25.00
Mrs. F. W. Inman		25.00
Griffing Bros.		25.00
G. L. Taber		25.00
M. E. Gillett		25.00
C. Christiancy		25.00
W. R. Moses		10.00
E. S. Hubbard		10.00
T. R. Robbinson		10.00
S. H. Gaitskill		10.00
Mahlom Gore		13.00
Dr. O. W. Sadler		5.00
B. C. Skinner		5.00
A. F. Wyman		10.00
F. G. Sampson		10.00
A. J. Conrad		2.00
W. J. Ellsworth		10.00
E. O. Painter		25.00
D. Alvord		25.00
S. W. Watkins		25.00
J. G. Glass		5.00
		$345.00

OKLE C. PAINTER,
Secretary.

Moved, seconded and carried that Secretary's report be accepted by the Society.

REPORT OF TREASURER

1913 *Debit.*

May 1—To Balance in Treasury	$	.52
June 11—To Check from Miss Painter		370.83
June 14—To Fla. Nurseryman's Assn.		100.00
Mar. 8—To Roger E. Baldwin Fee		1.00
Aug. 6—To Miss Painter's check		328.32
Oct. 1—To Interest on Bank Deposit		2.91

1914.

April 10—To M. E. Levering's Fee		1.00
April 13—To L. E. Tourdbatte's Fee		1.00
April 17—To Miss Painter's check		300.00
April 29—To Miss Painter's check		211.36
		$1316.94

1913 *By Credits*

June 14—By Stenographer's bill	$	70.75
Oct. 1—By E. O. Painter Printing Co.		732.83
April 20—By Balance above bills		120.74
		$924.32
April 30—Balance in Treasury		$392.62

W. S. HART,
Treasurer.

Moved, seconded and carried that Treasurer's Report be accepted by the Society.

Mr. Hart: It came to me a year or two ago that perhaps I could make a more detailed report, as my reports have been very short. The financial system of this Association has been in the past that the Secretary receive all moneys except now and then a membership which was sent to me, and a few contributions that have been given to the Society. Most of them, however, went directly to the Secretary.

The large bills, like printing of the report, come to my hands and are paid by the Treasurer, but many of the small bills are paid by the Secretary. It seems to me that it would be a waste of time for the Secretary to go through all of the bills and give the items. Your Auditing Committee goes through all of these bills, where the different items are shown and approves them. The bills that come to me to be paid are approved by the Secretary, and my report gives a general idea of where your money goes. I believe in publicity, and believe in taking everybody into our confidence, and if this system is not satisfactory, I would very gladly adopt any other that may be suggested. There are very few items, either of receipts or expenditures handled by the Treasurer.

REPORT OF EXECUTIVE COMMITTEE

The Executive Committee met in De-Land, May 2nd, 1913, with the following members present:

Prof. P. H. Rolfs,
E. S. Hubbard,
H. Harold Hume,
G. L. Taber,
E. O. Painter.

The meeting was called to order and the Secretary was authorized to have 1500 copies of the report for 1913 issued.

Under date of May 26, 1913, the Executive Committee with the following members met:

Prof. P. H. Rolfs,
H. Harold Hume,
G. L. Taber,
E. S. Hubbard.

Appointed Miss Okle C. Painter to serve as Secretary until the next meeting.

On the evening of April 29th, 1914, the Executive Committee met in the parlor of the Putnam House with the following members present:

Prof. P. H. Rolfs,
G. L. Taber,
H. Harold Hume,
E . S. Hubbard,
Okle C. Painter.

It was moved by Mr. Hume and seconded by Mr. Hubbard that the Secretary be authorized to send out notices to all 1913 members who have not paid their dues for this year and also advise members that reports for the years 1905, 1906, 1907, 1908, 1909, 1910 and 1911 can be had by remitting $1.00 to the Secretary.

It was moved by Mr. Hume and seconded by Mr. Hubbard that the Secretary be authorized to have 1250 copies of this year's report printed.

As the Society will be something like

$400.00 in debt after issuing the report President Hume was authorized to ask for donations to help defray the expenses for another year.

The meeting stood adjourned.

P. H. ROLFS, *Chairman,*
OKLE C. PAINTER, *Secretary.*

The Executive Committee of the Florida State Horticultural Society met in the office of the Secretary on January 27, 1914, the following members being present:

H. Harold Hume, President,
P. H. Rolfs, Chairman,
E. S. Hubbard,
G. L. Taber,
Okle C. Painter.

Mr. W. T. Hamm, representing the Palatka Board of Trade, was present at the invitation of the Executive Committee.

The meeting was called to order by Chairman Rolfs.

The first item of business was the date of the next annual meeting of the Society. It was moved by Mr. Hubbard and seconded by Mr. Taber that the next annual session open on the evening of May 5th continuing through the 6th, 7th and until noon on the 8th.

Mr. Hamm advised that he could not say positively at that time whether that date would be convenient to the Palatka Board of Trade, as there was another convention booked for that month, but would promptly advise us as soon as he had this information.

An alternative motion was then made by Mr. Hume and sceonded by Mr. Hubbard that, "If May 5th, 6th, 7th and 8th had already been taken by the other convention, that the date be advanced one week, making it April 28th to include May 1st inclusive." Carried.

The question of how much time should be allowed the good people of Palatka for entertainment was discussed. It was moved by Mr. Hume and seconded by Mr. Hubbard that any entertainment in the way of a boat ride be limited to one afternoon, preferably Thursday.

It was moved by Mr. Hubbard and seconded by Mr. Hume that Mr. W. T. Hamm be appointed Chairman of the Local Committee with authority to appoint as many more on this committee as he wished. Carried.

The question of disposing of the balance of the 1913 reports was discussed and Mr. Hume was asked to take the matter up with Mr. Wright of the Florida Grower, and see if Mr. Wright would not take it up in the Grower.

Prof. Rolfs was authorized to prepare copy and have printed some slips advertising the 1913 report which could be sent out through the mails by different business firms.

The Secretary was requested to take up the matter of a stenographer for the next meeting and if possible secure the services of Miss Inez Ford.

The program for the next meeting was discussed. It was unanimously decided that Messrs. Hume and Rolfs be empowered to take full charge of the program for the next meeting and get same in shape.

It was moved by Mr. Taber and seconded by Mr. Hubbard that Mr. Hume be

authorized to communicate with Mr. McFarland and secure his services for the next meeting of the Society, the Society bearing Mr. McFarland's expenses.

Moved by Mr. Taber and seconded by Mr. Hume that the Secretary be authorized to get any assistance necessary to assist her.

Prof. Rolfs brought before the Committee the question of presenting to the Governor a resolution on the Mediterranean Fly. It was moved by Mr. Hume and seconded by Mr. Taber that Prof. Rolfs draw up resolutions along the line suggested and send to the Governor.

There being no further business to come before the Committee it was moved that we adjourn.

OKLE C. PAINTER,
Secretary.

Later the date of the meeting was changed to April 28, to May 1st inclusive, this having been done by order of the executive committee by correspondence.

We, all the members of the Executive Committee, except Mr. G. L. Taber, have decided to recommend to the Horticultural Society, that Mr. G. L. Taber and R. D. Hoyt be made honorary members of this Society. They are surviving signers of the first constitution of the Florida State Horticultural Society.

P. H. ROLFS, *Chairman,*
W. S. HART,
E. S. HUBBARD,
OKLE C. PAINTER,
H. HAROLD HUME.

Moved, seconded and carried that Report of Executive Committee be accepted by the Society.

Mr. Hume: Now we will have to take up a part of the program which I always dislike. Let's get it over with as soon as possible.

Briefly stated; our expenses are $1300.00. The income which we have in sight is about $900.00. Now, $900.00 does not cover $1300.00 We need the difference; approximately $400.00.

Mr. Taber	$ 25.00
Mr. Skinner	25.00
Mr. Temple	25.00
Mr. Cherry	25.00
Mr. Griffing	25.00
Mr. J. A. Stevens	10.00
Mr. A. H. Brown	10.00
Mr. D.	10.00
Mr. Hart	10.00
Mr. Barber	10.00
Mr. Hamner	10.00
Mr. Thomas	10.00
Capt. Rose	10.00
A friend	10.00
Mr. Gaitskill	10.00
Mr. — —	10.00
Mr. Ellsworth	10.00
Mr. Rolfs	10.00
Mr. Hume	10.00
Mr. Ralph	10.00
Mr. Hubbard	10.00
Mr. Bates	5.00
Mr. Mace	5.00
Mr. Yothers	5.00
Mr. Frank A. Lane	5.00
Mr. E. L. Ley	5.00
Mr. A. B. Snook	5.00
Mr. A. S. J. McKenney	5.00
Mr. Pennock	5.00

Mr. Chas. Burt	5.00	Mr. Sellers	5.00
Mr. Felt	5.00	Miss Painter	25.00
Mr. R. O. Conklin	5.00	Mr. Hollingsworth	20.00
Mr. B. G. Arnold	5.00		
Mr. Wakelin	5.00	Total	$400.00

SELECTION OF NEXT MEETING PLACE

Motions were received from Arcadia, Fort Myers, Gainesville and Tampa for the Society to hold its next annual meeting in these towns. On vote of the members present, Tampa was selected for the next place of meeting.

Election of Officers

Mr. Rolfs: Mr. Chairman, I believe there is one matter coming over from the Executive Committee and that is the election of a Secretary to serve until the Secretary we elect at the regular meeting takes the place. There has been a vacancy and the Executive Committee has filled the place of the Secretary up to the present meeting. It is now our duty at this meeting to elect a Secretary to act from this time until the first of January, when the new secretary will take the place. I, therefore, move that Miss Painter be elected to serve the interim from now until the first of January next. I move the nominations be closed and that the President be instructed to cast the vote of the Society for the election of Miss Painter, as Secretary.

Mr. Skinner: I second that.

Mr. Hume: I hereby cast the ballot of the Society for Miss Painter as Secretary to hold the office of Secretary until the first of January, 1915.

On Thursday, April 30th, 1914, the following officers were elected for year January 1st, 1915, to December 31st, 1916.

President, H. Harold Hume.
First Vice President, L. B. Skinner.
Second Vice President, W. C. Temple.
Third Vice President, H. B. Stevens.
Secretary, Miss Okle C. Painter.
Treasurer, W. S. Hart.
Executive Committee, P. H. Rolfs, E. S. Hubbard, G. L. Taber.

Report of Committee on Final Resolutions

Dr. Julian, Mr. Wright and Mr. Burbank, having been appointed by the president committee on final resolutions, submitted the following report:

Your committee on resolutions with sincerity and much pleasure submit the following resolutions, all of which are more than merited by those mentioned:

Whereas, The beautiful city of Palatka at our last annual meeting extended most graciously a cordial invitation to hold our convention this year among her most hospitable people, and held forth its advantages, and whereas, said invitation was accepted and all the advantages and words of praise have been found to have been meager, and her beauty, advantages and hospitality to far outshine the promises held forth, and whereas, the members of this Society have, by the various organizations of the city, and by her citizens, been most adequately provided for, and most royally entertained. Now, therefore, be it

Resolved, That a vote of thanks be extended by the 27th annual convention of the State Horticultural Society to the women of Palatka, and to the Woman's Club of Palatka for the entertainment and the morning boat trip provided for the women and children.

That a vote of thanks and expressions of appreciation be extended to the live, active and efficient Board of Trade for the carefully planned and admirably executed arrangements for our entertainment, and that it is the sense of this body that the trade bodies of the various cities of Florida can, with profit to themselves, emulate the spirit of co-operation shown by them;

That a vote of thanks be extended and a debt of gratitude acknowledged to W. P. Merriam, Chairman, and his Committee on Entertainment, Mr. Warner T. Hamm, Chairman and his Committee on Convention, E. M. Earnest, Howell A. Davis and Moses Folsom, Secretary, and other members of the Board of Trade for their cordial reception, and for the entertainment so thoughtfully prepared with a view to our comfort and pleasure, and with most profitable educational features.

That a special vote of thanks be offered for the afternoon excursion up the beautiful St. Johns River, which gives greater commercial importance to the city of Palatka, and the automobile trips which gave to our members an afternoon of pleasure, which will ever remain a treasured recollection.

That to Mrs. R. E. Rose there be extended our sincere appreciation for the beautiful flowers given by her, and which gave added pleasure to our opening session.

That a vote of thanks be extended to the hosts of the headquarters of our Society while in Palatka, The Putnam House, for their earnest efforts to make our stay a most pleasurable one.

Be it further resolved, That to the officers and the Executive Committee of this Society a vote of thanks and congratulations be extended for their untiring efforts, and that this Society and the Horticultural interest of the State of Florida are under a lasting debt of gratitude to them for the success of this Society and for the good accomplished by it.

That to those who took part in our program a vote of thanks be given for their painstaking research and careful thought to the subjects treated and for their papers which have been of such educational value. Be it

Resolved, That at this meeting much information of value has been given to the Horticulturalists of the State, and that all growers of the state for the good of Florida and for the prosperity of her people should more generally avail themselves of the benefits of this Society, and that it is the sense of this body that the Press of Florida should use their good offices to herald to the Growers of this State the advantages and the accomplishments of the Society which has been the fountain source of all needed reforms for the benefit of the Growers in this State, and has brought about a better acquaintance and friendly spirit among the growers, and has been the inspiration for all movements in Florida which have worked for the upbuilding of our Horticultural and Agricultural interests and that its field of usefulness is ever extending, and that for all these things we express our everlasting indebtedness, to these untiring members past and present who have made this possible.

T. G. JULIAN, *Chairman,*
M. S. BURBANK,
EDGAR A. WRIGHT.

Topical Index