

opening for the graft in the side of the stump perfectly straight; then drive a chisel into top of stump and insert your wedge shaped graft at one side in opening, make the barks meet. I was late in commencing, but I am still grafting, have four hands at it today (7th of May), and I ex-

pect ninety per cent. of them to live. I split or cut the stump with a sharp thin knife, using a handful of clay mortar around each graft and shade it with moss till they start to grow. They grow much faster than buds after the start.

ORANGE DISEASES AND INSECTS.

The Cotton Stainer—Thrips—Conditions Favorable to Thrips—Remedial Measures—Ornamentals Attacked—Treatment—The Orange Maggot—Red Spider—The Soft Scale—Foot-rot—Melanose.

Paper prepared and read by Prof. P. H. Rolfs of the Florida Experiment Station,^{*} Lake City, Fla., with discussion following the reading of the paper and remarks as to a new remedy for the Red Rust.

[SEE MINUTES PAGES I TO 6, ITEMS 42, 43 AND 79.]

COTTON STAINER.

(*Dysdercus suturellus*.)

This insect has been reported more times from the oranges this year than all the others combined, though we cannot say it has done more harm than other species. Its peculiar way of affecting the orange is by puncturing fully developed fruit and causing it to fall from the tree. While in many places they are said to have destroyed a great number of boxes of fruit, in other places they have been almost entirely absent.

An interesting part of this insect's life history is, that during the earlier stages it lives upon the weeds in uncleared land or in neglected orange groves. In the fall, when these die and dry up, the mature insect is forced to seek other food, so that it does not really feed on the orange from choice but from force of circumstances. In

States to the north of us, where it hibernates, they are not met during the winter season, but our mild winters allow them to be active during the entire year, consequently they congregate in warm places in orange groves.

In the younger state they are known to feed upon the Spanish cocklebur (*Urena lobata*), the night shade (*Solanum nigrum*), Jamaica sorrel (*Hibiscus sabdariffa*) and the melon papaw (*Carica papaya*). As the habits of the insects are solitary in their earlier stages they are quite difficult to combat, nor do they attract any attention until they congregate in considerable numbers upon the sides of the oranges or near the orange tree. Ofttimes several hundred of them congregate on the trunk of a single tree and later suck the juice from many oranges. Their damage is rather of a secondary nature; that is, their frequent

punctures leave openings in the orange through which fungi and bacteria may enter and destroy the inner tissues. Of course, if a great number should congregate on a single orange they might be the primary cause for the wilting of the orange and its dropping.

Some points of interest have been brought out in this year's correspondence and that is that the adult insect seems to be very resistant to effects of kerosene emulsion, one correspondent stating that he was unable to kill them with the pure kerosene emulsion. If this experience should be general it indicates that a different form of insecticide had better be applied. Unfortunately, we have had no opportunity at

kills by suffocation. Figure 1 represents the insect about natural size as seen from above and below; together with an egg, natural size and enlarged, also a larva of this insect.

THRIPS.

(*Thrips tritici*.)

This insect has been known to infest the orange for several years. On many occasions it has been reported as doing a great deal of damage especially in the way of preventing the fruit from setting. Last year and this year this insect has been unusually abundant and quite generally disseminated throughout the State. Its destructiveness has not been confined to the orange but includes the pear and all small

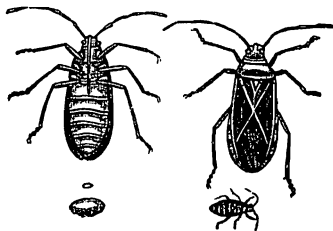


Fig. 1.

the Experiment Station to try different remedies and consequently can only suggest others that might be more effective than kerosene emulsion. The resin wash has been found to be very much more severe than kerosene and might be good, also a decoction of tobacco, especially if this decoction at the same time contains some sticky substance, as syrup, so that the insecticide could not be removed from the body of the insect. Nicotine is known to be a powerful insecticide, affecting the nervous system, so that mere contact with the poison is sufficient and that it is not necessary to cover the entire animal with it as in the case of kerosene emulsion and resin wash in which case the insecticide

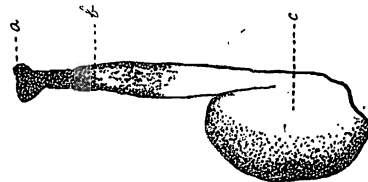


Fig. 2.

fruits, especially the blackberries and strawberries. Nor is its destructiveness confined to cultivated plants for we find that many of the wild blackberries and sparkleberries (*Veccinnium arboreum*) suffer great destruction of blossoms from this same pest.

Last year Prof. Quaintance made a careful study as to just how the injuries were committed. It has been generally reported to such an extent that it is almost patent that these insects feed upon pollen, but much to his surprise he found that this particular species cares very little for pollen but confines its work to the much more vulnerable point of the plant, i. e. the stigmatic surface of the pistil. When the insects are

very abundant they have to feed on the style and incipient leaves, as well as upon the petals. In the case of the orange, where the stigma is exceedingly large they have to be very abundant before they can cause the fruit to drop, but in flowers, such as the strawberry and blackberry, where there is an aggregation of pistils and each pistil is quite small, the insects do a very great damage in a short time. The adult insects enter the unopened flower and begin their rasping upon the stigmatic surface and by the time the flower is open and ready to be receptive the stigma has been so mutilated that the pollen tube fails to enter and fertilize the ovule. In this case the ovule is aborted and the fruit becomes small and knotty. In the case of the strawberry the same process (see Fig. 2) is carried out and as soon as the ovule is aborted the receptacle of the berry fails to develop and forms a little black knot which is commonly called a button.

CONDITIONS FAVORABLE TO THE THRIPS.

Rainy weather is decidedly unfavorable to the propagation of the thrips. While it does not interfere with the hatching of the eggs the adults are dashed into the sand and destroyed by myriads, so that the epidemic of thrips is usually accompanied by dry weather and in many instances the dry weather is given credit for the blight of blossom and fruit when it should be duly credited to this insect.

While moist weather is decidedly unfavorable to the pest, as a whole it appears in greater numbers in moist places on the most vigorous plants.

REMEDIAL MEASURES.

While a great many insecticides have been recommended in a sort of off-hand

way, several entomologists have worked with more or less care with different substances. All insecticides that will kill by contact are more or less effective. Those that contain nicotine as a basis seem to be the most deadly for this insect. Among the substances used, the tobacco decoction seems to be one of the best of the home remedies. Among the substances that are manufactured for commercial purposes we have a substance known as Rose Leaf Insecticide, manufactured at Louisville, Ky. The basis of this seems to be nicotine and it contains also some substance that makes it adhesive—possibly syrup. The effectiveness of this insecticide seems to be from the fact that it paralyzes the insect almost instantly upon contact and then adheres to it until after death.

ORNAMENTALS ATTACKED.

Among the ornamental plants, the roses seem to be the worst sufferers. A great many reports have been sent in with requests to know how it should be treated. The trouble is usually called rose blight. The disease manifests itself by the outer petals of the bud either wilting or becoming greatly contorted. In severe cases the outer petals dry down over the bud preventing it from opening. Our treatment of this has been most highly successful.

TREATMENT.

Just before one is ready to spray the rose with some nicotine insecticide, for example, all of the roses that are open and those showing the petals between the sepals must be picked and dropped into a pailful of the insecticide. After all buds and roses have been removed from the plants and treated they should be buried. In picking the roses care should be taken to remove three

or four inches of the stem together with the rose. Immediately after removing the roses and buds the bushes should be sprayed thoroughly with this insecticide. If the work has been done thoroughly a crop or two of roses can be raised before a second spraying will be necessary. In our experiments the roses were contiguous to pear trees. The roses were treated while the pear trees were not treated, yet the roses remained uninfected for several weeks after a single spraying. This was quite unexpected since the younger leaves of the pear trees were greatly injured by the thrips.

THE ORANGE MAGGOT.

(*Trypeta ludens*, Loew.)

This insect has been known for a long time to entomologists, being described by Loew in 1873. In 1888, Dr. C. V. Riley published an illustrated article on Insect Life, calling attention to the danger attend-

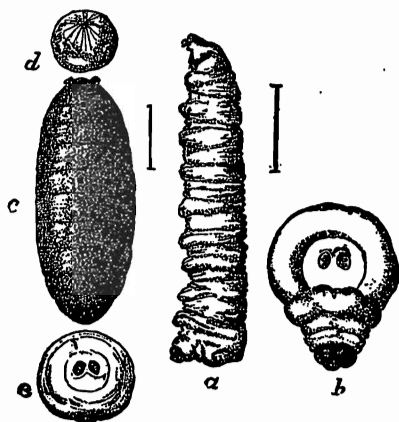


Fig. 3.

ing the importation of this insect. From this time it seems to have remained unnoticed, until after the freezes of '94 and '95 which led to extensive importations of

Mexican fruit. The following quotation is taken from Insect Life, Vol. 1, page 47: "The full-grown larva is three-eighths of an inch in length, of a dirty white color, with the extremities brownish. Its shape is shown in the figure, and it may be readily

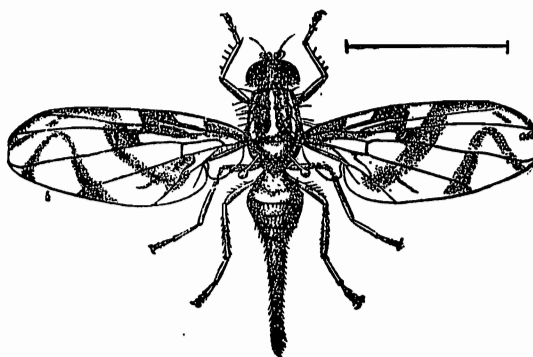


Fig. 4.

distinguished from other larvae so far known to affect oranges by the two anal spiracles, each with its three transverse slits. The puparium is shorter, oval, and of a dark brown color. The general color of the perfect fly is ochre yellow, with slightly darker markings, as indicated in the figure. The markings on the wings are yellowish toward base and smoky toward tip." See Figures 3 and 4 reproduced from Insect Life, Vol. 1 pg. 47.

Professor W. G. Johnson, of Maryland Experiment Station, records his experience with it as follows: "From what I have seen of this insect it seems to me that it is extremely probable that it will sooner or later find its way into the orange growing districts of the United States. The fly is very hardy, and will stand considerable neglect. I kept a male and female for several days in close confinement in a glass covered dish, and they were seemingly as active as ever when removed. They can

withstand a considerable variation in temperature, as shown by Mr. Bruner. On several occasions during the progress of his experiments, the mercury fell below the freezing point in the room where his breeding cage stood. With the present facilities for transportation, it would be an easy matter to carry this pest in oranges even from the local markets of Chicago to Florida, Louisiana or California."

The foregoing makes it clear that this insect is capable of withstanding any range of temperature that would be liable to occur in any orange district.

RED SPIDER.

This common name covers a multitude of evils, many of which are not recognized as described species by entomologists. A very destructive form is in the six-spotted red mite (*Tetranychus sexmaculatus*). This insect becomes exceedingly severe especially during the dry season. As a whole, this class of insects is very easily treated and controlled. Consequently we have very little difficulty in caring for our groves as soon as we recognize the condition. The treatment is very simple, either a thorough spraying with water or with sulphur spray being sufficient. Even flowers of sulphur, when thoroughly applied, is quite effective, though not nearly so good as sulphur spray. All of the other insecticides that kill by contact are exceedingly useful in destroying this pest, but curiously enough, this insect is exceedingly resistant to the fumes of cyanide gas, it being among the last to be killed. In fact, some plants are as easily killed as this insect.

THE SOFT SCALE.

(*Lecanium hesperidum*.)

This insect has become very conspicuous

in the orange groves since the freeze, but fortunately it does very little damage except on young growth or in the nursery rows. It is very quickly followed by a sooty mold, so that very few people overlook an infested tree. The simple remedies, such as kerosene emulsion, resin wash, resin soda compound, will be found very effective against this pest.

FOOT-ROT.

This disease has been reported from many different groves and from places where we formerly considered it would not occur, i. e., on high dry pine land. On the lower lands where it formerly occurred it is quite severe in some groves. Where the tree is a good, vigorous specimen, there is very little difficulty in controlling this disease by the remedies reported by members of the Horticultural Society, i. e., to remove the soil from the crowns of the roots, remove all diseased portions, and where practicable, wash it out clean. In groves that are headed low the foliage protects the crown from the hot summer sun; in other cases it may be necessary to supply fresh soil or protect the crown with mulching.

MELANOSE.

This disease which was described several years ago by Prof. Webber (See Florida Horticultural Report for 1895, page 51) has been reported fewer times this year than during previous years since the freeze. It is probable that it will disappear almost entirely as soon as the effects of the freeze have passed away. Prof. Webber tells me that the disease is contagious, but it can be controlled by the use of Bordeaux mixture.

DISCUSSION.

Mr. Waite: I would like to ask Prof.

Rolfs if he knows anything about the white fly in the Manatee section, whether it is exterminated or still at work. I understood that they had to defoliate the Foster grove because the fungus did not do the work; perhaps he might give us some information?

Prof. Rolfs: I have had no experience with white fly. Prof. Webber was working on that, and consequently I have done no work at all on it, and know nothing in regard to the case that you speak of. There is so much for us to do that it is not well for us to duplicate our work, and as he was working on that especially I have not attempted any experiments on the white fly fungus nor have I heard anything regarding this case.

Mr. Reasoner: I will say we did not defoliate the trees at all; the freeze took the leaves off. The white fly is not in evidence now. The fungus appears to be doing all the work that has been claimed for it, clearing trees of all flies.

Cyrus W. Butler: At St. Petersburg last fall the fruit of many groves was injured by the cotton bug. On all trees so infested, I think the loss of fruit to be from ten to one hundred per cent. The fruit continued to rot for ten days or more after being picked and sorted every other day. I tried various methods of destroying them, but found their fondness for the oil of cotton seed meal and the juices of their dead fellows to be my best aid. A quart or so of cotton seed meal was placed in a lard tin, which was held under the clusters of the bugs and the latter shaken into the can and crushed with the hand. This mass of cotton seed meal and crushed bugs constitutes the bait. Traps were made by trimming off the split parts of palmetto leaves with shears and braiding the stems of two

fans together so as to leave a space of an inch or less between the two fans. A teaspoonful of the bait was placed between the two fans, which were laid on the ground under the infested trees and especially near the trunk. What bugs had not been caught in the can were then brushed to the ground and the next tree attended to. When all of the trees had been attended to we began going the rounds of the traps, finding from a few up to seventy-five in each trap, which were shaken into the lard can and thus the supply of bait kept up. We usually placed from six to ten traps under each tree. In this way we killed, I think, ninety per cent. of the bugs. This method would not be so practical in case of large seedling trees. The bugs refuse the bait where poisoned with arsenite of lime. From a few trees first infested, all fruit was lost, both tangerine and oranges, some of the tangerines taking on a withered appearance around the puncture.

Another hemipter, the green soldier bug, sucks the orange in the same way, and not only the fruit but the tender growth, giving them a die-back appearance. In connection with the green soldier bug, I would like to mention the velvet bean. This bug feeds upon the velvet bean until the vine becomes hard, when he leaves for other food, and if oranges are near, lives upon them. Last year a ten acre patch of beans grew well, but in August were entirely eaten up by larvae. Small vines soon sprung from the roots and furnished food for numerous green soldier bugs, which, when the vines began to harden, moved to the row of orange trees nearest the patch, sucking the fruit just as its relative, the cotton bug, does and with the same bad results. Kerosene emulsion and sulphur solution were

thoroughly tried, and were found wholly useless as were also other washes. The only efficient method that I devised was the slow one of shaking into pans of water and kerosene, but by this method we kept them from invading more than four rows of trees nearest the bean patch. They destroyed over \$200 worth of fruit and but for our continued warfare would have done more. As for the beans, they were repeatedly offered to four horses, all of which refused to eat them, or oats in which they were mixed; chickens, ditto. A friend ate some but was made so seriously sick that as soon as he was able he hastened to warn his friends. This year, on account of its pest breeding capacity, I am having all my volunteer velvet bean vines pulled up and I regard the cow pea open to the same objection in an orange grove. I have grown beggar weed for eight years and am satisfied with it as a source of nitrogen, humus, pasture and hay.

A Member: I would like to ask Prof. Rolfs if he has any remedy for foot-rot.

Prof. Rolfs: The one remedy that is giving general satisfaction is to clear the dirt away from the crown roots and exposing that to the atmosphere and removing all the soil and exposing the crown to the air. Some people use copper sulphate, carbolic acid and other materials and other washes on the wounds, but the main thing is to give ventilation around the crown of the roots. I think Mr. Hart can tell us more about the curing of foot-rot, because he has had more experience in that line.

Mr. Hart: I think Mr. Felt can give us a little information that will interest us. I commenced to operate on the foot-rot nine years ago, the year of the first meeting we held in this building, I believe. It was

during that convention that I moved the appointment of a standing committee on insects and diseases because of my anxiety over the foot-rot and blight, which has been very useful ever since. At nearly every meeting we have held since, and I have attended them all but one, that time being held by court as a witness, I have made some report on foot-rot, so I think my plan of cure is familiar to all; it is simply taking the dirt away from collar of the tree and exposing the roots for one to two feet out. I stopped it in sixty odd trees, all I had affected, and they remained free from it and prospered up to the time of the great freezes of '94-'95. I will say that my remedy, that I have reported on each year, was simply taking away the dirt from the crown roots. That has stopped the progress of the disease in every case where I have used it; and it has not started again on any of those trees unless the dirt was allowed to wash in and fill it up again. But the effect of leaving these roots exposed was that the big freeze killed those lateral roots. I am sure that exposing the roots will stop the progress of the disease; I have watched it now for many years. Still, you can't always tell whether a tree has foot-rot or not. If you are busy and cannot attend to it at once it may get past curing. I have had some in my hammock grove and have lost three or four large trees that way; so that if we can find some remedy that is better than mine I shall be glad to use it.

Question: You use no local application?

Answer: No, sir, except sulphuric acid, which was recommended here last year. I have the material but have not applied it yet. The objection of leaving the roots exposed can be overcome by filling in with some porous substance. But we have got

to watch our trees or they will be injured before we discover it. If we discover it before the trees are two-thirds girdled I think we can stop the disease and save the trees by leaving the roots exposed or by covering the roots with some porous substance that will not get in a soggy condition.

Mr. Felt: I have one tree that I thought was dead. It was about a foot in diameter and it was all girdled except about two inches. Nine other trees around it were affected. I took a gallon of sulphuric acid and raked around the tree about twenty-five feet, or such a matter, sprinkled it and raked it in the soil. This tree came out and is one of the best in the grove. I have foot-rot scattered throughout my grove. I was troubled with it prior to the freeze. Now I have foot-rot, but none immediately next to those ten trees, and am inclined to think that the sulphuric acid was a complete cure. I find that the acid will eat up anything that you put it onto; it will probably be necessary to use it in a Japaned sprinkler or something of that kind.

Mr. Hart: I want to call especial attention to the fact that this is sulphuric acid. We used to think it would kill a tree, but sulphurous acid was supposed to be good. This is sulphuric acid, which we used to be afraid of. If that will work, as we have several evidences that it will, it is best to try it with care.

Mr. Bacon: If they are through discussing this matter, I would like to call up and get a reply to the letter of Messrs. Beed, Knox & Beed, of Ormond. These gentlemen are anxious to know if there is a preventive for wood-lice that will not injure the trees. Mr Knox was so afraid of injury from this insect that he did not bank

his trees until the day after the freeze, he was waiting for the ground to dry out so that they would not work as in wet ground. We all know that wet earth will encourage wood-lice in their work. This firm has some hundred acres of grove on which the trees were badly frozen in '95 and he has had a great deal of trouble with wood-lice.

Mr. Beers: We have banked something over 120 acres each year since the freeze. Mr. Felt follows the same plan; we take air slacked lime, four parts, flour of sulphur one part, put a little around or on each dead stump and we have not had a single tree injured by wood-lice.

Mr. Waite: I think the report was on citrus and banking with dry mulch, and then covering with earth, that will keep the wood-lice from working in the tree. There were others in Belleview that were troubled badly with wood-lice.

Mr. Bradt: I think that the statement that the use of sulphur and lime in banking has prevented wood-lice is negative evidence. I banked last year using sulphur and lime and had no wood-lice; I banked this year and used no sulphur and lime and had no wood-lice. In conversation with Prof. Hubbard some time since, he claimed that it was of no use as a preventive and he is supposed to be good authority.

Mr. Hart: I would mention that there is one here with us today who has a spray of his own preparing, rather discovery, that is said to be very beneficial in the matter of red rust, which is merely one manifestation of die-back, Mr. Froscher, of Titusville. I bring it before the Society, though it is entirely contrary to my theory of the disease to believe it can be cured through the leaves or limbs by any outside application. But, in investigating

it, I find there are very strong proofs of its being beneficial. As last year, one-third of the crop of the State was injured, and a good share of that one-third was lost through the effects of rust on the fruit, it is a matter of importance, sufficiently so to bring it before the meeting for the investigation of the remedy, or supposed remedy. I think Mr. Froscher is here.

Mr. Froscher: Mr. President, Ladies and Gentlemen—If my remarks are somewhat incoherent I hope you will pardon me as I am a German and am not accustomed to speaking in public. I was for several years troubled with red rust and die-back on my orange trees, and had for five years been experimenting in the hope of discovering a remedy; and it is of this I wish to speak to you. Last year I found what I had so long been searching for, and now have a remedy that I apply in form of a spray, which is a preventive and cure of the disease I have mentioned. You will think, perhaps, this is a bold claim to make; but I have proved my right to make it, to the satisfaction of myself and neighbors, by many trials upon trees in several localities and in every conceivable condition as to disease, age of trees and character of soil. The results were in every case so satisfactory that my friends and neighbors advised me to prepare the mixture for sale. This I have done, giving guarantee with each lot sold and agreeing to refund the money in case of failure. Among those who bought from me are Mr. H. S. Williams, of Rockledge, Mr. F. T. Budge, of Titusville and Mr. Frank Foster, of Orchid. Mr. Budge's trees had been badly affected by the disease for many years, but by spraying them twice with my mixture they were entirely cured. They have since been badly injured by the cold. I talked

with Mr. Foster a short time ago. He applied the preparation last fall to trees that had never done well. The trees put on a splendid growth and now are full of fruit and are looking well.

A Member: Have you a circular?

Answer: No, sir. I have been busy gardening, and have not got the capital to make a speciality of it.

A Member: Better let the gardening go and make a speciality of this.

Answer: I think it would be an advantage to the orange growers of the State if I were to do so. Mr. Foster thinks I have helped the orange growers immensely and that the orange belt can be greatly extended southward by a judicious use of my preparation.

A Member: What time do you put it on?

Answer: This year I put it on before the trees started their spring growth. I have too many chickens in my grove and some of the trees were almost dead. Now I have only healthy, thrifty trees. I would like to sell my recipe-discovery of this remedy to the society of orange growers or to the State or general government; this plan would suit me best. It would be a great saving to the orange growers in freight. An apparently healthy tree is benefited by being sprayed with this mixture. I thank you very much for your courtesy and manifest interest. I shall be pleased to correspond with anyone on this subject.

Mr. Phelps: I would like to suggest that Mr. Froscher put this matter in writing and let Mr. Hart or some of his neighbors experiment with it and report on the matter.

Mr. Hart: Mr. Froscher is a gentleman I have known some time; we are not intimately acquainted, and I am only inter-

ested in this matter as one of general interest to growers; and Mr. Froscher does not appear here as an applicant for help, though he has met with many misfortunes from fire and frost. If he has a good thing it would be very generous to give it to the public, and he thought of doing this until his friends persuaded him that he ought to have something out of it. I would like to know if we can devise means so that it can be got into the hands of the public for use and still allow him to realize some return for his discovery. It would hardly be fair to ask the recipe for the solution, but if he will state the condition, what has been done, it might be worked out.

Mr. Phelps: I do not ask him to give himself away in this matter.

Dr. Stockbridge: That this should take a business form there can be no question, if Mr. Froscher's claims are true; I would make a motion that a committee of three be appointed to whom Mr. Froscher shall furnish his material, and they shall be authorized to make a report of this discovery, and they shall report at the next meeting of this Society.

Motion carried.

President Taber: I will appoint as a Committee to investigate the claims of Mr. Froscher in this matter, Dr. Stockbridge, Dr. Kerr and Mr. F. D. Waite, of Belleview.

PROTECTING ORANGE GROVES FROM FROST.

The Experience of Mr. Kinney, of Pierson, in Carrying His Orange Grove Through the Freezes of the Past Four Years Without Material Injury by the use of Wood Fires in the Grove.—The Appointment of a Committee on Frost Protection:

[SEE MINUTES PAGES I TO 6, ITEMS 23 AND 24.]

Dr. Kerr: Mr. Kinney, on account of physical disability, is not able to be with us during these meetings; he asked me if I would make some remarks in regard to the protection of his orange grove during the past five or six years, commencing with the freeze that occurred on the last three days of December, 1894. I remember very well the morning after the first night of the freeze, calling at his home (he lives about two hundred yards from my house). He was running around with a kettle of hot water thawing the frozen water pipes. I said, "Mr. Kinney, what do you think of this!" He replied, "Everything has gone to the devil." He was greatly discouraged; but I am sure, during the past winter, with

the success that he has had, which has encouraged him so much, that he now believes that the orange industry is opening up to a greater extent in profitableness and to the advantage of the grower, than heretofore. He has spoken to many of the manner of procedure. In the first place, Mr. Kinney said, or will tell you, that the greatest thing to do is to *be ready for the cold when it comes*.

Now, what does he do? He first secures the wood, and I presume he has 200 cords of lightwood piled around his ten acres, cut in railroad size, thirty inch lengths. Early in November he has it distributed through his grove. Understand that clean culture is absolutely necessary—no velvet