Chairman: You will all agree Dr. Camp justified everything he said, with his charts and beautiful pictures.

Next on the program we have a symposium conducted by Mr. F. M. O’Byrne of Lake Wales, on “The Protection of Groves Against Cold by Firing.”

Mr. O’Byrne: Mr. Varn is rather a modest man and when requested that he present this paper before the Convention body he said he just couldn’t do it because he never spoke in public. However, he consented for me to interview him and I wrote down what he said and he OK’d it. I have some pictures taken in his grove to show you, and I will read his talk.

MY VIEWS REGARDING GROVE FIRING

W. A. VARN

My attention was first called to the value of firing a grove in the freeze of February 13, 1889. Mr. W. B. Lyle, who lived near my home in Bartow, had his grove provided with wood and fired it during that freeze. On inspection, after the freeze, I found that he had saved both his fruit and foliage.

My father owned a grove which had been badly hurt by the freeze. I made him a proposition to care for his grove on a percentage basis. This worked out satisfactorily for both of us. I have made it a regular grove practice from that day to this to fire my groves when necessary.

During the past winter I fired my grove ten times and I saved all my fruit and foliage and even young growth as well as some bloom. I now have a very early crop, due to a very early bloom. It has been my experience as a result of forty years of firing, that it pays. This is particularly true during these days of over production for about the only chance to make real money is during the years following a freeze when many acres are out of production and my groves are in full production.

One thing that my experience has shown is that firing is a job for which thorough preparation must be made. One should be prepared to fire six nights in succession, if necessary. This requires plenty of wood and plenty of labor, and the labor should not be asked to work both day and night. There should be a day crew to fix fires and a night crew to burn them.

Were I taking over a new ten acre grove, I would make my plans during the summer for firing during the winter. I would buy two hundred cords of wood, putting half of it out through the grove under the trees and stacking half of it near the edge of the grove. This would give me about ten four foot pieces of fat pine under each tree and the same number in reserve at the edge. In stacking the wood under the tree, I would lay down one four foot piece near the tree trunk and rest the ends of the other nine pieces on piece No. 1. This reduces the amount of wood in contact with the soil and saves decay. I get wood in pieces as large as one man can handle con-
veniently. Do not use small wood.

As soon as cold weather arrived, I would lay my wood for firing in every other middle between the trees so that the grove could be worked at right angles to the “firing Middles”. Trucks can use every other middle in which no fires are laid. In case of a light freeze, firing every other middle is sufficient. If a severe freeze is indicated, I would lay fires in every middle so that there is a fire laid for every tree. In laying a fire, I lay two four foot pieces end to end with the ends overlapping about fifteen inches. Split pine kindling is placed between the two four foot pieces and some short pieces piled on top. A little grass in the kindling helps by holding the fuel oil or kerosene at starting time.

For firing labor, I have one man for every one hundred trees. I had rather be over supplied with labor than undermanned. When it comes time to fire I must be able to start my fires quickly. When I want to increase the fire, I move one stick along the other so that a greater length of the sticks is burning. To reduce the fire, reverse the process. When full firing is required, the two sticks will lay side by side with one on top. At such times, I add a four foot stick every hour. If a little less fire is needed, I lay one end of a stick on the fire so that about half or less of the stick burns. This requires about half a stick an hour.

Do not let the temperature get too low before starting the fire. It is easier to keep the temperature up than to bring it up after it gets down. If the ground is dry, fires should be started sooner than if there is ample moisture. Likewise, a tree that is dormant will stand more cold than one in full growth. If there is new growth and bloom on the trees, I will start firing as soon as frost starts forming. If there is no growth or bloom and the ground is dry, I would start firing at 28 degrees, but, if there is sufficient moisture, I may wait till it reaches 27 degrees. The temperature will probably fall as much as one degree after I start firing before the temperature starts up again.

Fires are started by pouring about a gill of fuel oil or kerosene on the kindling and applying a torch made of asbestos wired about one end of a three foot iron rod or strap. Lighting torches are used to rekindle fires which did not catch.

A grove must be supplied with plenty of accurate, sheltered thermometers, if firing is to be done accurately. Regulations call for one thermometer for each five acres and one outside to the north or west so one can see how the outside temperature is going. If a grove is rolling, one will need more thermometers than if it is flat.

Do not make the mistake of being under supplied. The most tragic situation is that of a grower who has fired three nights at great cost and then loses everything the fourth night because he is out of fuel. That was the experience of many growers this year.

Do not wait too long to start your fires. Remember that you are almost sure to lose one degree after you start firing. Do not stop too soon in the morning. Wait until your outside thermometer has gotten up to 30 degrees. Do not make the mistake of being under-manned. Speaking from forty years of experience, I can say that firing, intelligently done, has paid me handsomely on the investment. Better be prepared to fire half your acreage right than to be half prepared to fire the entire acreage.

THE PROTECTION OF GROVES AGAINST COLD BY FIRING

W. F. WARD, Brooksville, Florida

Just what have we learned in recent years regarding the protection of groves from cold by firing? Each of the cold spells or freezes in recent years seems to have some characteristics not exhibited by the previous one, but if we can get enough growers from various sections to relate their experiences in firing, we may be able to learn enough to help ma-
tentially during future freezes. To conserve time, I shall confine my remarks to the firing of groves with lightwood, commonly called "fat pine," since others taking part in this symposium will doubtless tell of their experiences with various types of grove heaters.

During the freeze of 1934-35, some of the groves at Chinsegut Hill Sanctuary, near Brooksville, were fired eleven nights in all, and during the January, 1940, cold spell, fires were lighted in some of the groves for five nights. The groves at Chinsegut, comprising 65 acres, are located on top, on the slopes and near the bottom of a very steep hill. In one 40-acre tract, the difference in altitude from the top to the bottom of the grove is about 160 feet and in this 40 acres, there has been a difference of 16 degrees in temperature at the same hour on nights without wind. That is the maximum difference in temperature, averaging about one degree for each ten feet of elevation, but on cold, still nights, we usually expect a variation of 8 to 12 degrees. The result is that the grove near the bottom of the hill may have to be fired to save the trees from damage, while the trees on top may be well above the danger point. Growers will therefore, do well to consider the location for groves to be planted in the future, locating them on the slope of a hill where possible.

On the morning of last January 29th, the temperature in the groves on top of the hill was 31 degrees at 6 o'clock, while on the lower slope it was 19 degrees, and at the bottom of the hill the temperature was 15.5 degrees, or a maximum difference of 15½ degrees. With this knowledge, who would want to plant a grove where the temperature may be fifteen degrees colder than at an adjoining location. This difference in temperature alone may mean the difference between a profit and a loss on grove operations over a period of several years.

There are a number of things which we have learned in the last seven years among which are the following:

On very cold, windy nights when the temperature may go as low as sixteen degrees for several hours, it is absolutely impossible to save the fruit by firing the grove with wood. Some fruit will freeze on the trees even though a fire may be burning in every check. The wind will carry the heat off too fast. The best we can expect under such conditions is to save part of the bloom wood, and prevent maximum damage to the trees. The small limbs in the top of the trees may be killed, while the lower two-thirds of the tree may be saved. When the wind is as strong as it was one night during the 1934-35 freeze and again on Friday night, January 26th, of this year, we could not raise the temperature in the groves in exposed locations over three or four degrees, while we were able to raise the temperature from 8 to 11 degrees in locations well protected by either natural or artificial windbreaks. On such nights a dense windbreak is a tremendous help in maintaining safe temperatures, especially if it extends on the north, west and south sides of the grove. The direction of the slope in the grove, however, will have an important bearing on the nature and location of the windbreaks. I am not sure whether it is desirable under some conditions to have a windbreak on the lowest slope of the grove, as there is too great a tendency to retard the movement of the air on nights that are comparatively still, in which case the nearby trees or fruit may suffer frost damage.

The following "don'ts" may be helpful to the growers who have not had experience in grove heating with open wood fires:

1. Don't attempt grove firing without having made careful preparations in advance to have all necessary equipment, materials and labor for doing the job well. This includes an adequate supply of grove thermometers, which have been tested and are accurate, placed in easily accessible locations both inside and outside the groves, at both warm and cold locations; a good supply of good, heavy wood, easily accessible, together with the proper material for starting the fires easily, such as batting dross, a by-product of the turpentine industry, fat pine splinters, rosin chips, or other desirable material; prop-
Varn--My Views Regarding Grove Firing

The wood yard for the grove.

Wood stacked for measurement.

Arrangement of wood in grove for firing.
er flashlights, lanterns, safety lighting torches, axes, and shovels.

By an adequate amount of wood is meant enough to fire for at least four consecutive nights. Not less than 5 cords of wood per acre should be on hand and preferably more.

(2) Don't put sap or poor pine wood in a grove and expect the men to do a good job of firing — it is hard enough to fire satisfactorily with large sticks of "fat" wood.

(3) Don't let the men selling you wood put in small, crooked limbs and knots. In the first place you will not get full value in the amount of wood, next it will be harder to haul and to distribute properly, and last, but very important, is that the small wood will burn out so quickly that many fires may get too low or go out entirely before the man doing the firing can get back to build them up and thus endanger the fruit.

The most desirable size of wood varies from 110 to 130 sticks of 4-ft. wood per cord, with an average of about 120 sticks. Such wood, if fat, will burn about one hour per stick. If the "fires" are laid with three large sticks per fire or pile, these first three sticks will usually burn about three hours, if properly "punched up," and one additional stick will be required per hour thereafter. Of course, two sticks may have to be added at one time and the man doing the firing should watch the temperatures and fire so as to hold the desired temperature if possible. The idea is to burn the wood most efficiently and economically to secure the desired results. "A" or "V" shaped fires are most desirable with the open end of the pile toward the wind or the point towards the tree to be benefited. If the wood is reversed, it will make a large fire which will burn too quickly and may scorch or singe both foliage and the limbs of the tree.

We prefer having the fires laid in every check, with at least five or six sticks of wood by each pile. It is seldom necessary to light all of the fires in any one night. If there are 60 trees per acre, it will require 1½ cords of wood per acre to "lay" the fires and six sticks at the side of each pile would require three more cords, or a total of 4½ cords per acre for a well stocked grove, with more wood piled nearby for use later.

(4) Don't pile the wood in the groves while there is still litter in them which may catch fire and damage the trees. Disc it in or dispose of it in some manner so it will not be a fire hazard.

(5) Don't fail to select a good dependable man to read the thermometers and make a record of such readings at hourly intervals during the early part of the night and 30 minute intervals during the period before firing.

(6) Don't use all of your experienced men for firing the first night. Have one go to bed that night so he can supervise the work of putting out the fires next morning, relaying the fires, hauling extra wood, cleaning and refilling lanterns, lighting torches, etc., and getting everything in readiness for the following night. This is extremely important for successful firing.

(7) Don't light the fires too early in the night and don't put them out too early next morning. The first course will mean a loss of wood and the second one might mean the loss or damage of the fruit crop. The time of starting the fires will doubtless be discussed by others or can be brought out in the discussion later.

(8) Don't think you can do a half-way job of firing which will be profitable. If it cannot be done thoroughly and efficiently, it will pay better dividends not to do any firing at all. You can either make all necessary preparations, check and recheck your plans, plan and replan your procedure, then use your head, work long hours and finally save your fruit and trees, in which case the job will usually be profitable, or you can go to bed, leave the matter in the hands of the Lord and Mother Nature and take your chances of not being hurt too bad — but for pity sakes! Do not attempt the third alternative, which
Mr. Chairman, members of the Society.
To begin with I will say we had about 6000 cords of wood and about a quarter million gallons of oil to protect our own plantings. Our attempts at firing have been based on saving the trees rather than on saving the fruit generally. In attempting to save our fruit and trees we found out that what Mr. Ward said was absolutely true. We made all of the preparations enumerated, we used wood, but left out two very important things — coffee and sandwiches for the workers.

In firing with wood we use the triangular method, as outlined by Mr. Ward, and we found that it was easier for us to raise the temperature by the use of wood than by the use of oil. We found it absolutely necessary to have a sufficient supply of wood, where we used it to carry us over 8 nights. We found it impossible to get an adequate supply of extra fuel, as far as wood was concerned.

Now, one value of the oil heaters is you can get an added supply of fuel when needed, if previous arrangements have been made. We have a storage capacity to take care of approximately two hundred twenty thousand gallons of oil, in addition to facilities whereby we can have 8 carloads come in and unload those 8 carloads by pumps and transfer them to the heaters by means of tanks which slip on our trucks. Really the hardest thing we found in our experience was to get an adequate supply of extra fuel, as far as wood was concerned.

In attempting to fire a large acreage, not only do you have to have adequate supervision, but you have to have willing workers and competent workers. We had about 450 men in our daytime crew and the same number at night, and I know, and so do the various men who had more active control of the situation than I, that during the night time some of those men were hiding out or wandering around the grove and not doing their duty. Fortunately we were able to tell in what section such dereliction occurred, but there wasn't anything we could do about it the next morning when we found the damage. We found in the use of oil heaters, (and this is a generalization please, and not for any specific grove, because each grove is a story in itself), that heaters should be placed in every other row and this is sufficient to take care of the trees. This, however, is not sufficient to take care of the fruit. Where we attempted to take care of the fruit with oil heaters we tried to put 1 heater to every tree and we had very favorable success.

Of course, some of our firing was under conditions identical to those in the hills. One grove lies on a slope and we have had to do considerable firing in that grove with trained and experienced personnel. We had excellent results during our recent chilly weather.

In other groves where we didn’t have an opportunity of training our personnel, given the same conditions, the same amount of oil and the same number of heaters the results were far less satisfactory. Now, how we are going to get this experience is a question I cannot answer. You can talk to your men and then have them arise and go through all the motions but when the time comes to go into action somebody loses his head or somebody gets careless and you don’t get the result you should have in theory.

The man who has the smaller acreage is the man who can look after firing himself and he is in an enviable position in that he can do something that his good common sense