

Irrigation.

By Francis L. Wills.

Mr. President, Ladies and Gentlemen:

In reply to your letter asking me for a paper on irrigation, would say that we installed our irrigating plant on this grove in April, 1905. The plant consists of a twenty-horse-power, White-Blakeslee gasoline engine and a No. 4 Rumsey Improved Rotary Pump, located in a house thirty feet from the pond and about two hundred feet from the grove. The pump has a five-inch suction and a four-inch discharge giving two hundred fifty gallons of water per minute; we have a four-inch main pipe, running the entire length of the grove, every 150 feet; laterals branch off from the main, running the entire width of the grove; the laterals start out with two-inch pipe, running down to one-inch pipe, at the extreme end.

Our stanchions consist of a three-quarter-inch pipe, with a hose valve on top, and are 150 feet apart throughout the entire grove. When irrigating we use 100-foot sections of three-quarter-inch hose, connecting one end to the stanchions and the other end to a six-foot piece of three-quarter-inch iron piping, drawn together and sharpened at one end to stick into the ground with a tee and nipple for hose connection eighteen inches from the bottom, the top fitted with a three-quarter-inch brass Magowan Spray,

the stanchions when running throw a spray that will cover thirty feet and we move the stanchions from one middle to another, until every middle has been thoroughly wet down.

We usually run twenty stanchions at a time and leave them standing in each middle forty minutes, thus giving each middle or tree 480 gallons of water, which I think is equal to a little over three-quarters of an inch of rain.

We have made it a practice to irrigate the grove whenever the moisture sinks three inches below the surface. summer or winter, during the months of March, April and May we run an Acme Harrow over the grove as soon as it is irrigated. During a drouth we find it necessary to irrigate once every two or three weeks, harrowing the grove once every week; this keeps a good moisture under the sand mulch at all times.

We have under irrigation thirty acres of grove.

The plant, as I have described it, cost us a little over \$6,000 and as yet, the plant being new, we have not had to lay out anything for repairs. I run the engine myself and have one man at \$1.50 a day to move the stanchions from place to place.

The engine consumes practically twenty-five gallons of gasoline, running from nine to ten hours a day, and

it takes practically two days to irrigate ten acres; so I calculate that to irrigate ten acres costs—

My time nothing.....	\$...
One man	3.00
Gasoline	10.00
Incidentals, such as oil, washers, waste60
Total	\$13.60

This does not include wear and tear on machinery.

When irrigating in hot weather we start our engine up as soon as it is light enough to see, and run it five hours; then we start up again in the afternoon at three and run until seven.

The first year we irrigated we ran the engine steadily from daylight until dark; but I became convinced that it was not a good plan to throw water into the grove in the heat of the day. Of course, it would be much better to irrigate at night rather than the day, but this is not practical, as I have yet to find men who will drag hose around through the grove in the dark.

Some say it is a question whether or not irrigation pays. All I can say is that our trees look well and we seem to get a pretty fair crop of fruit each year.

By J. W. Hoard.

Mr. President, Ladies and Gentlemen:

To the tourist or winter visitor, Florida presents a most beautiful picture or panoramic view of flowers and sunshine; of magnificent and extensive evergreen forests, dotted here and there by beautiful lakes whose waters are as clear as crystal, and as pure and sparkling as the morning dew. He is delighted with our glorious climate, our orange groves laden with their golden fruit, and our truck farms embracing broad acres of growing vegetables. He is impressed by the scenes of nervous activity and evidences of enterprise and prosperity on every hand, and especially in and around our packing houses during the shipping season. He hears and reads of vast sums of money being made by the fruit and vegetable growers in various parts of the state. He is delighted with all he sees or hears, and, in fact, it seems

to him that Nature has almost exhausted her resources in making of Florida a veritable horticulturists' paradise, leaving nothing to be desired which could in any way contribute to his happiness or success. And from his standpoint the tourist is right in his conclusions. Florida is a grand state, possessing many natural advantages and horticultural possibilities for which we hereby express our thanks and gratitude to the One from whom all such blessings must come. We all love our Florida and appreciate her many natural advantages and also those which have been brought about by the efforts of her enterprising citizens; and our hearts are bound to her by invisible and mysterious ties which we cannot possibly understand nor explain and which grow stronger as the years go by.

But, at the same time, those of us

who have spent many years here, and have on several occasions seen the smiling features of our fair state disfigured almost beyond recognition by natural causes, are forced to admit that Florida also has several natural disadvantages, among which may be mentioned the poverty of the soil, unexpected visits from Jack-frost in winter, the insufficiency of rainfall during the growing season, and a pretty good supply of insect pests of all of the leading and up-to-date varieties; and one or two other disadvantages from which nature is not responsible, viz.: the high freight rates and poor services imposed upon us by the railroads.

Some of these adverse conditions have been overcome by artificial means, and most of the others can and must be, or the horticultural industry will be overcome by them; and as I understand it, one of the principal objects of this Society as a body, and of each member as an individual, is to give each other the benefit of whatever knowledge or experience we may have gained in our attempts to meet and overcome any one or all of these difficulties.

The problem of poor soil has been solved to the satisfaction of all concerned by the fertilizer manufacturers of the state, who have placed within our reach, in convenient and available form, all of the necessary elements of plant food so essential to plant life, and in which our Florida sand is so deficient; thereby enabling us to not only make two blades of grass grow where only one grew before, but even making it possible for us to grow good crops of fruits and vegetables where nothing could grow before; thus, in

my opinion, placing the fertilizer manufacturer in the front rank of public benefactors. The Florida Experiment Station and also the United States Department of Agriculture have given and are still giving us valuable information along the line of insect extermination, by sending to our assistance specialists of the highest order, men specially trained and fitted for this kind of work, who are industriously devoting their time and talents to scientific investigations and experiments along these lines. It has been my privilege to become acquainted with several of these gentlemen during the past two years and make myself somewhat familiar with the work they are doing, and it gives me pleasure to say to this Society that they are meeting with success and are getting results which could never have been obtained in any other way and which will be of inestimable value to the horticulturists of Florida.

We look to the Railroad Commission, to the Inter-State Commerce Commission, and the Florida Fruit and Vegetable Growers' Protective Association, for reduced freight rates and better transportation facilities.

So with all of the other problems disposed of, we now come to the question of irrigation. This scarcity of rainfall during the growing season, just when rain is most needed, is, in my opinion, the most serious difficulty with which the fruit and vegetable grower has to deal. It causes him more disappointments, more heartaches than all of the others combined; it sours his disposition, causes him to

grow old before his time and, in fact, at times it causes him to almost doubt the existence and guidance of an impartial and all-wise Providence.

These conditions have been gradually growing worse for the past two or three seasons, until at the present time irrigation, which is, of course, the only remedy, is regarded as an almost absolute necessity. A good many growers who happened to be favorably situated as to water supply, who were sufficiently informed as to what kind of irrigation they needed and had the means to pay for it, have put in irrigating plants which are working successfully and which have made their owners independent of rainfall. But most of these plants have been installed at an expense which places them out of reach of the orange grower, one of my neighbors having just completed a plant which cost him over \$10,000.00. It consists of one mile of six-inch wrought iron pipe, enough smaller pipe to form a complete network under his grove of about 120 acres, and a rotary pump driven by a fifty-horse-power engine. The water is delivered through patent sprinklers which are placed in the centre between each four trees; he can run forty of these sprinklers at once, thus watering forty trees at one time.

This kind of irrigation is all right for those who can afford it, but is beyond the reach of about ninety-nine per cent. of us, and for this reason it is not necessary for me to enter into a detailed description of it at this time. What is needed is a system of irrigation which can be installed at a cost within the reach of the average grower of limited means and yet of sufficient

capacity to meet all of his requirements.

For the past eight years I have had charge of the property of Chase & Co. at Waco. This property consists of the famous Isleworth groves and nurseries and, incidentally, an extensive irrigating plant of about the same capacity in gallons of water as the one above mentioned and costing about one-eighth as much. I have visited and made myself familiar with the workings of irrigation plants of nearly every kind or system now being used in our part of the State, but for handling vast quantities of water at the least possible expense, which is, of course, what the grower of limited means wants to do, I have never seen anything to equal our plant.

A description of our pump and method of distributing the water over the grove will be found in the report of last year's meeting, but for the benefit of those who may not have been present at that meeting I will give a brief description here. The pump consists simply of a square box two feet in diameter inside and about eighteen feet high, or about six feet above the highest point in our grove. This box stands one end in the edge of the lake, where water should be two to three feet deep. Through the center of this box, from top to bottom, there is a steel shaft, with a water wheel on the bottom end; another one of the same kind in the middle and a pulley at the top for connecting with the engine. This bottom wheel, by being revolved at a high rate of speed, lifts a column of water two feet square, up to the upper wheel, which catches it in the same way and carries it out at an opening near the top of the box,

and just below the belt and pulley. In case of a higher lift being required all that is necessary would be to increase the length of the box and shaft, put in another water wheel about seven or eight feet higher up, put on more power and go ahead. From the top of the pump the water is conducted across the middle of the grove through a ten-inch terra cotta pipe; thence from this ten-inch main to either side of the grove through a five-inch galvanized-iron pipe of about the thickness and weight of small stove pipe and connected up in the same way, but in sections ten feet long.

Our pump will supply about four of these lines of five-inch pipe at one time; sometimes in case we are short on piping we run one or more of these five-inch openings in furrows. This running water in furrows in Florida sand has always been theoretically impossible, but we have proved beyond question, by actual experience, that it works very successfully indeed; and, in fact, I consider it one of the best, if not the very best, method now being used; and I would especially recommend it to vegetable growers. We can fill four or five furrows from each opening in our ten-inch main, and by using the furrow system exclusively we can have about twenty furrows 600 to 700 feet long running at one time. This will give you some idea of the capacity of our pump, and also give you an idea how effective this system would be in irrigating vegetables. The imagination of the trucker could not possibly conceive a more pleasing picture than to go out some evening about sundown and find twenty little rivers of cool, fresh water flowing

gently down between twenty rows of his withering vegetables.

I had, as the title of this paper suggests, intended giving quite an extensive collection of facts and figures as to cost of irrigation supplies of different kinds, but as I believe this part of the subject will be more thoroughly and ably covered by Mr. Skinner, I will only give a few points along this line in connection with this particular system of irrigation.

The pump we are using is known as the Menge pump and is manufactured in New Orleans at a cost of about \$150 at the factory. The terra cotta piping of various sizes can be had at about the following prices, delivered to different parts of the state:

10-inch	25 cents per foot
8-inch	17 cents per foot
5-inch	10 cents per foot
4-inch	8 cents per foot

The five-inch galvanized pipe comes at about ten cents per foot, delivered. For locations where lake water is available, and the lift not more than fifteen feet, there is nothing better nor cheaper than the Menge rotary pump. For higher lift I would recommend a centrifugal pump, which will not only lift the water but also force it to any height up to about thirty-five feet.

The capacity and cost of these fourteen pumps range about as follows: A pump with a capacity of 100 gallons per minute will cost about \$110; 450 gallons per minute, \$210; 1,000 gallons per min., \$360; and others, large or smaller in proportion. A pump furnishing 600 gallons per minute will cover one and three-tenths acres one inch deep in one hour, or 13 and one-fifth acres one inch deep in ten hours.

1,000 gallons per minute will cover two and one-fifth acres one inch deep in one hour, or about twenty-two acres one inch deep in ten hours. One inch

of water over an acre or, in other words, one inch of rainfall, will wet thoroughly six to eight inches of perfectly dry Florida sand.

By L. B. Skinner.

Mr. President, Ladies and Gentlemen:

I received a letter from Prof. Rolfs asking me to give a little talk on irrigation. I am always ready to talk on irrigation, but I was not posted as to what special branch of irrigation I was expected to talk on, until I came into Gainesville.

My experience has been entirely with what is called the sprinkling system. When I first had an idea of taking up irrigation, I felt that I had to take it up if I were going to grow oranges as a business and make a success. Of course, the first question that came into my mind was, where to get the water. There were only two ways: from a pond and from a well. I spent a little time going to see the irrigating plants through the state, and among them was one of Mr. Adams of Thonotosassa. His struck me as being the best I saw. It consisted of large pipes with small mains connected with them, running to different parts of the grove. From these laterals were standpipes to which the hose was attached. By using the hose he was able to get along without using so much iron pipe. To the hose were attached the McGowan sprinklers, which he considered the best in all respects. They throw a large amount of water and throw a very fine spray with plenty of force all over between

the trees. It struck me as being the best and most successful system I had seen, and he had a fine crop of fruit from his grove.

At that time, iron pipe was beyond my reach, and I investigated the advisability of using cement pipe. The best iron main will cost thirty-five and forty cents a foot for four-inch pipe. I think a six-acre grove irrigating plant with steam pump and boiler, iron pipe, etc., will cost in the neighborhood of \$1,000.00. I had plenty of muscle, time and some labor. I investigated the cement pipe and made up my mind that it would do. I bought a machine and a car of cement and went to work. We turned out lots of pipe; I now have about 35,000 feet of that cement pipe. It has cost from three to six cents a foot; generally about four cents; but there is no time to stand around when you make it at even four cents. I think you can possibly make it at an average of five cents.

You dig your ditch and put your machine right in it, and make the cement pipe as you go along, cleaning out your machine when stopping at noon or night and starting again. I tried to make a solid joint by pressing the cement together with my hands about the core of the machine, but found that it would not do. When I put on my

power, every joint burst and there was trouble right away. A gentleman who has made and uses this pipe told me that though the weak places in his cement pipe had broken, he had patched them until the pipe was all right. I began to find that there were weak places and fixed them up by this method. When I stopped making the pipe at any one joint, I set the machine down in the ditch farther along and went on, leaving that gap. Afterwards I put the machine on the ground and made some pipe for filling these gaps and sawed it into the proper lengths (you can pick up five or six or seven feet) and set it in the section. Then I set the right length into the gap and wrapped some wire loosely around the joint; then took some cement well mixed and spread it around and in the wire completely. That joint will never break. Just wind some wire loosely around it and fill it in with cement, spreading it quite liberally, and it will answer every purpose. Any small wire will do; I generally use small, galvanized wire.

We generally put in the hydrants the following morning after the cement pipe is made. Scrape the top of the cement away so as to give a new surface. When you are running your irrigating plant and the hydrants break out, by using this wire plan, winding wire around again and again loosely and filling it up with cement, it will be tight and ready for use on the following day.

I find this cement pipe very satisfactory. I have tried the McGowan nozzle. It has a little small top that screws down to regulate the amount of water. Sometimes it is screwed

down too tight and sometimes too loose and you are apt to have trouble if you don't look after it pretty carefully. Cement pipe will stand a good deal of pressure, but not as much as iron pipe. You have all heard the story of the man down at the Tampa Bay Hotel, who had a big head on him the morning after a festive evening. The manager took one of our finest Florida grapefruit and fixed it up with a little ice and sugar and a little French brandy and gave it to him. Pretty soon the man came down and asked for his bill and said, "I am going to New York to tell the boys, 'Eureka, I have found it.'" The Cactus sprinkler affected me very much the same way. When I saw it I felt like exclaiming, "Eureka, I have found it and must tell the boys." From a four-inch pipe I have seen it throw the water in a circle thirty-five feet in diameter, wetting it well in just a few minutes. It puts water on in the finest kind of spray. They are very simple and last a long time. There is only one that is any good for our irrigation, and that is No. 10, one-inch size. It will put on lots of water and in fine shape and at low pressure.

In the above system of iron pipe, the laterals are of two-inch pipe from a four-inch main. It waters about forty acres and costs about \$3,000.00. To fix it up with cement pipe it would cost about one-third as much. The Chase & Co. system at Lake Butler, where there is an ample supply of water, is the cheapest plan there is, but you must have unlimited water. If your water supply is unlimited, you can take terra cotta pipe and the Mean's pump and throw a world of water on

the ground, but where you have a limited amount of water and the ground is not situated where you can make the water flow, I think the cement system with Cactus sprayers is the best and cheapest system I have even seen.

DISCUSSION.

Dr. Inman—How far under the surface do you lay the cement pipe?

Mr. Skinner—Twelve inches.

Dr. Richardson—What is the name of the sprinkler of which you speak?

Mr. Skinner—Cactus Lawn Sprinkler, No. 10. They are made by the Phrenger and Hanger Company and are for sale by the Baird Hardware Company, Gainesville, who are the state agents.

The most perfect system of irrigation for vegetables that I have ever seen is at Sanford. It is a revelation. Their system of irrigation with artesian wells is really marvelous.

Mr. Rose—I am not well acquainted with the Sanford system. As Mr. Winters has described it, there are varieties of the same system. There are admirable systems where the tile is perfectly laid; where the irrigation where needed is perfect and drainage

where wanted is perfect. The greatest trouble is that the fields frequently get more water than they want and their plants take diseases and die.

Mr. Skinner—The place I visited specially, had the tile so arranged that the gardener could draw the water off. I was told by Mr. Chase and some of the men who lived there, that in former years water would stand all over the country, but now the drains are all open, and when the artesian wells are shut off by the gate valve, the water flows off in a few hours.

The men who had the best fields had level fields.

That system has gradually grown up by their needs and their wants, and it certainly has served their purpose. It certainly has proven a great success. I do not believe I have seen so many new homes going up in Florida. Men who used to get two dollars and three dollars a day are now getting thousands a year, easy.

We all agree that with plenty of fertilizer, plenty of water when we want it, and a way provided to carry off water when we do not want it, there is no place on earth that will blossom like Florida.