

has taken place. There are other types which have a broad leaf blade, such as *Forsythia* and *Chaenomeles lagenaria* which are particularly subject to leaf burn if not properly shaded during the hardening-off process.

It has been reported that cuttings treated with one of the rooting powders have been generally easier to transplant than those not treated at the time of sticking.

As has been previously pointed out the propagator should attempt, as nearly as possible to keep the cutting growing. Any protracted delay in this growing process, before the end of the season imposes a period of delayed activity, during which the cutting may be lost or severely set-back. Since the ability of a cutting to grow is tied up with maturity, timing again is very important.

Since eighty-five percent of the nurserymen using the Electronic Leaf control experienced some trouble as a result of the malfunction of the unit, we have asked Mr. Harvey Templeton, its originator, to describe how it functions, temporary repair methods, and the progress he is making in its improvement.

Mr. Harvey Templeton, Winchester, Tennessee presented his paper entitled: "The Electronic Leaf." (Applause)

## THE ELECTRONIC LEAF

HARVEY M. TEMPLETON

*Phytotector, Winchester, Tennessee*

From the reports that I received this summer, those of you who tried it were pretty disappointed and discouraged with the Electronic Leaf control. I sympathized with you, for I was experiencing the same difficulties myself.

Although we developed the "Leaf" and had an experimental model working in the early Fall of 1953, we didn't have the nerve to depend on it for our 1954 production. So it was in March, of this year before we began to use it on our main production.

We immediately ran into difficulties. At first we had the wires between the "Leaf" and the control box too long, and the control acted in a very erratic manner. A little experimentation proved that the trouble was due to the capacity effect between the two long wires. By using a very short connection, that trouble was permanently cured.

By spring we were using 4 or 5 separate Electronic circuits with 3 or 4 beds on each circuit, attempting to provide a variety of mist conditions, including a hardening-off circuit. We were occasionally running two Electronic Leaves in parallel on the same circuit so that either one saftied the other and either would automatically take over correct control if the other failed.

We finally concluded that we weren't going to succeed until we knew exactly what each Electronic Leaf was actually doing throughout the day and the night.

Confronted with the problem of a 24-hour a day vigilance we built three recording devices, using time switch mechanisms, bailing wire,

rubber bands, and pencils. The recorders ran continuously and made a pencil mark on a paper chart each time the mist came on. In addition, we connected a self-starting electric clock to each circuit. Thus we had a permanent record of periods of operation (from the recorders) and a record of total spraying time from the clocks. From those records we began to learn something about the operation of the Electronic Leaf.

We discovered that, if the recorder chart showed long "on" periods, the vacuum tube in the control box was going bad. If the chart showed frequent operation during the night it was an indication that the surface of the "leaf" needed cleaning. These indications are consistent and significant. Before we got far we had to get a sensitive ohmmeter with which we could measure the electrical resistance of a "leaf" as its surface dried off. The significant range of resistance was (with our water) between 2 and  $3\frac{1}{2}$  million ohms. We then knew the control box must be sensitive within that range. A simple variable high resistance with a calibrated dial then enabled us to test the performance of the control box whenever the recorder indicated the possibility of the deterioration of the vacuum tube.

We use a sensing element (the "leaf" part) of our own design with two graphite contacts sealed in polystyrene plastic and with vinyl insulated lead wires. This element is very simply cleaned by wetting its upper surface with about 20% hydrochloric acid and gently rubbing with a soft wood stick. You should never touch the surface as it might become greasy. Scraping and sanding should be avoided at the original surface seems to improve with use. The "leaves" seem to be quite durable.

We find that the vacuum tube in the control box doesn't last long—varying between a couple of days and a thousand or so hours. Its life definitely seems to be shorter if the control box is hot. Since our controls, of necessity, are out in the sun by the side of the bed and are enclosed in a partially ventilated waterproof metal can, we find it desirable to shade them to keep the temperature down. This winter the 3 or 4 we are still operating seem to show better tube life, probably due to the lower temperature.

Each one of our Electronic Leaf controls is a special heavy duty model with an additional high capacity relay capable of controlling 20 or more solenoid water valves with each valve supplying 12 nozzles. Any one of the controls can be connected very simply to any one or all of the many beds we are operating at one time.

At first we used 3 or 4 control circuits with the idea of providing different conditions in each group of beds. This was not necessary. Also, the hardening-off circuit didn't work out in practice. If the plant material was easy to harden-off we didn't need the circuit. It was difficult, the hardening-off circuit didn't help. In fact, it was worse than nothing. Even if it operated just barely enough to keep part of the leaves and plants wet all the time, those leaves and plants would not harden. After we discovered this fact, we put into operation for the hardening-off process the old interval timer which was limited to certain hours by a time switch.

We now have in operation a special sensing element (or "leaf") which will keep the leaves *less than wet all the time* to any degree we wish within reason, and which is still perfectly weather conscious. This new



“leaf” should solve the hardening problem which, incidentally, is not particularly difficult, except with a few plants of which very soft *Viburnum juddii* is the worst.

Even though 3 or 4 different sets of conditions provided by 3 or 4 different leaf control circuits are not necessary, we still have to use the multiple circuits because our water supply isn't adequate to supply at the same instant all of the 34 or 25 beds (that is about 300 nozzles) we are usually operating in the summer. So we put 6 or 7 beds on one leaf circuit, 6 or 7 on another, etc., so as to split the water load, since it is not likely that all will come on at the same time.

The unit is not as complicated as it may sound. You do have to realize, though, that production with the Electronic Leaf is not as simple as we at first thought it would be. I would not consider trying to operate without some kind of recorder to tell me what was actually happening. If everything is right you know it. If something is wrong you know what it is. You can set up a control circuit and be sure it is going to do just what you want it to do.

Don't be discouraged with the device. It isn't going to be as simple as we thought but it does eventually work fine. It is not going to be as cheap for you as we originally thought. A complete workable system of controls, with recorders and test instruments, will be nearer to \$150.00 than to the \$30.00 most of you paid.

I deplore the fact that I seem to be in the position of defending the Electronic Leaf. It doesn't need defending. We all just jumped in too quickly and thought it was too simple. I know I wasn't willing to market it myself for fear it might not be perfected enough.

Actually, I suppose, I shouldn't care whether or not you like it or whether or not it works for you. If it does not it just gives my own production a little edge on yours. But, after all, it is my baby and I cannot help but want it to work for you. So, if you have trouble with it, call on me and we will see if we can't correct it.

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MODERATOR MAHLSTEDDE: Thank you Harvey for that very fine discussion. I believe that your willingness to provide helpful guidance to others exemplifies the objectives under which this organization was founded.

The second speaker this afternoon, and I might add, a heavy contributor to the mist report is Bob Eshelman, who is going to speak to us on the subject of “Rooting Response under Intermittent Mist.”

Mr. Eshelman presented his paper. (Applause)