The advantage of this BIF System are many fold.

1. Ease of operation.
2. Accuracy ± 0.1% of water flow.
3. Versatile, i.e. one head may be used to meter nitrogen, the other potash or otherwise with different proportioning ratio.
4. A second pump may be added to the transmitter to meter for water correction, i.e. sulfuric acid.
5. Minimum maintenance.
6. Installation ease. With the technical staff of BIF only a pipe filter is needed.
7. Cost. The entire installation of the unit is $1500.00 plus piping costs, approximately $100.00.

Since the installation of this equipment we have had more accuracy in the application of either nitrogen or potash since each suction tube of the Chem-O-Feeder is placed directly into a solution of 20-0-0 or potash as delivered from the manufacturer and the dosage is adjusted by the micrometer screw settings. This then eliminates the inaccuracy of mixing various fertility strengths as before. This particular method of fertilizer metering is another endeavor to grow better plants more economically for the ever increasing consumer.

MECHANIZED IRRIGATION FOR NURSERIES

LARRY J. BOOHER, *Extension Irrigationist*
N. W. STICE, *Farm Advisor*
University of California

The production of large numbers of plants in containers has created a problem on how to irrigate and fertilize to assure uninterrupted growth. Plants growing in gallon cans are now irrigated by overhead sprinkler systems, and proportioners are available to inject fertilizers into the irrigation line. Trees growing in 5 and 15 gallon containers are being watered by hand, which is too slow and costly.

The Oki Nursery of Sacramento decided to build a system to irrigate 15 gallon containers and asked for assistance in designing it. They wanted the system to irrigate 12,000 containers from a pump delivering 200 g.p.m. containers to be spaced on 4 foot centers.

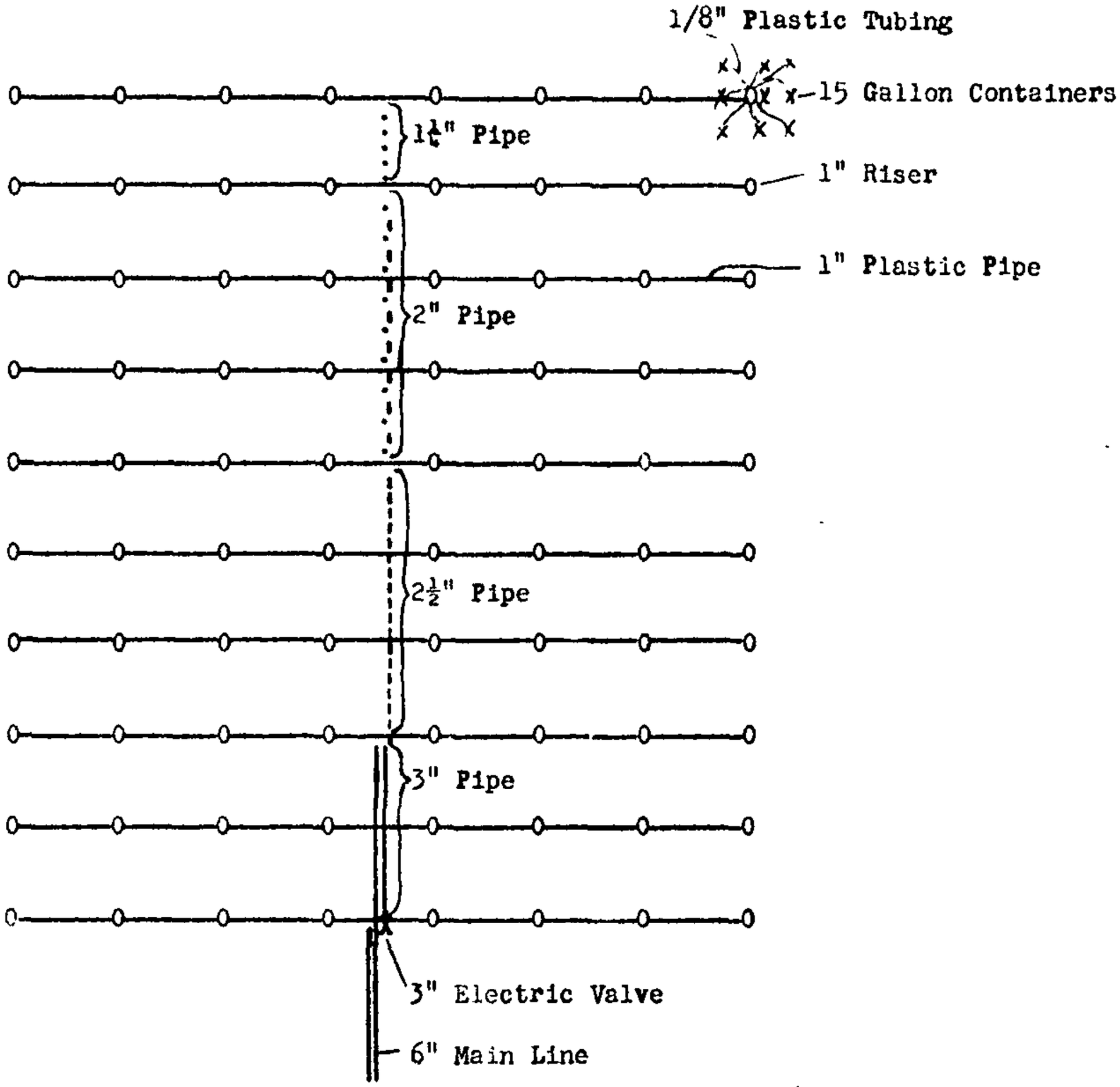
The first step was to determine the amount of water needed and the rate of application to uniformly wet the soil mix in the container. Plastic tubing with 1/16 and ⅛ inch inside diameter was tried, but at low pressure the rate of application was too slow. There was no spreading in the coarse soil mix, so the water traveled down from the point of injection and ran out the bottom leaving more than 50% of the soil mix dry. In trials with ⅜ and ½ inch plastic tubing, it was found that a flow of at least 1¼ gallons per minute at low pressure to prevent wash-

ing was needed for uniform wetting, and about 5 gallons of water should be applied to each container. Later experience indicates 2 gallons is sufficient.

The first design was based on ¾" galvanized iron pipe risers with four ⅜" plastic tubes of the same length and without any spreading device at the ends to serve four containers. The 200 g.p.m. would irrigate 160 containers from one valve, and at 1¼ g.p.m. for each tube, it would take four minutes to irrigate them. Before the system could be tested, George Oki, found the Gates Type plastic nozzles were available at low cost and would fit into ¼ inch plastic tubing. They were available with 90° or 180° flat fan spray. Nozzle capacities or flow rates were checked at different pressures and the 90° and 180° were the same.

10	lbs.	pressure	0.2 g.p.m.
20	"	"	0.36 g.p.m.
30	"	"	0.48 g.p.m.
40	"	"	0.78 g.p.m.

Both nozzles appeared to be perform best at about 20 lbs. pressure.



A manifold containing nine plastic tubes was then made up by Jim Takehara. The manifold was connected to a hose and 90° and 180° nozzles were inserted in the end of the tubes. These were attached to the sides of containers and tried out at various pressure. The 90° nozzles appeared better than the 180° with less water striking the inside wall of the container.

A system was then installed in an area 96′ X 228′ that would accomodate 1368 containers placed on 4′ centers. Two 3″ electric valves controlled the water supply from a 6″ transit main. All pipe below the valves was rigid plastic graduated down from 3″ - 2½″ - 2″ - 1¼″ - 1″. See attached diagram for pipe details. The risers were 1″ plastic pipe, extending above ground 2′. The 1″ plastic caps were drilled to take nine ⅛ inch plastic tubes 6′ long, all with 90 plastic nozzles at the end. The end of the ⅛ inch tubles containing the nozzles were held in place by drilling a slanting hole through a 1″ X 1″ stake driven into the ground at the outside edge of the containers. (See

OKI NURSERY IRRIGATION SYSTEM
15 GALLON CONTAINERS ON 4′ CENTERS

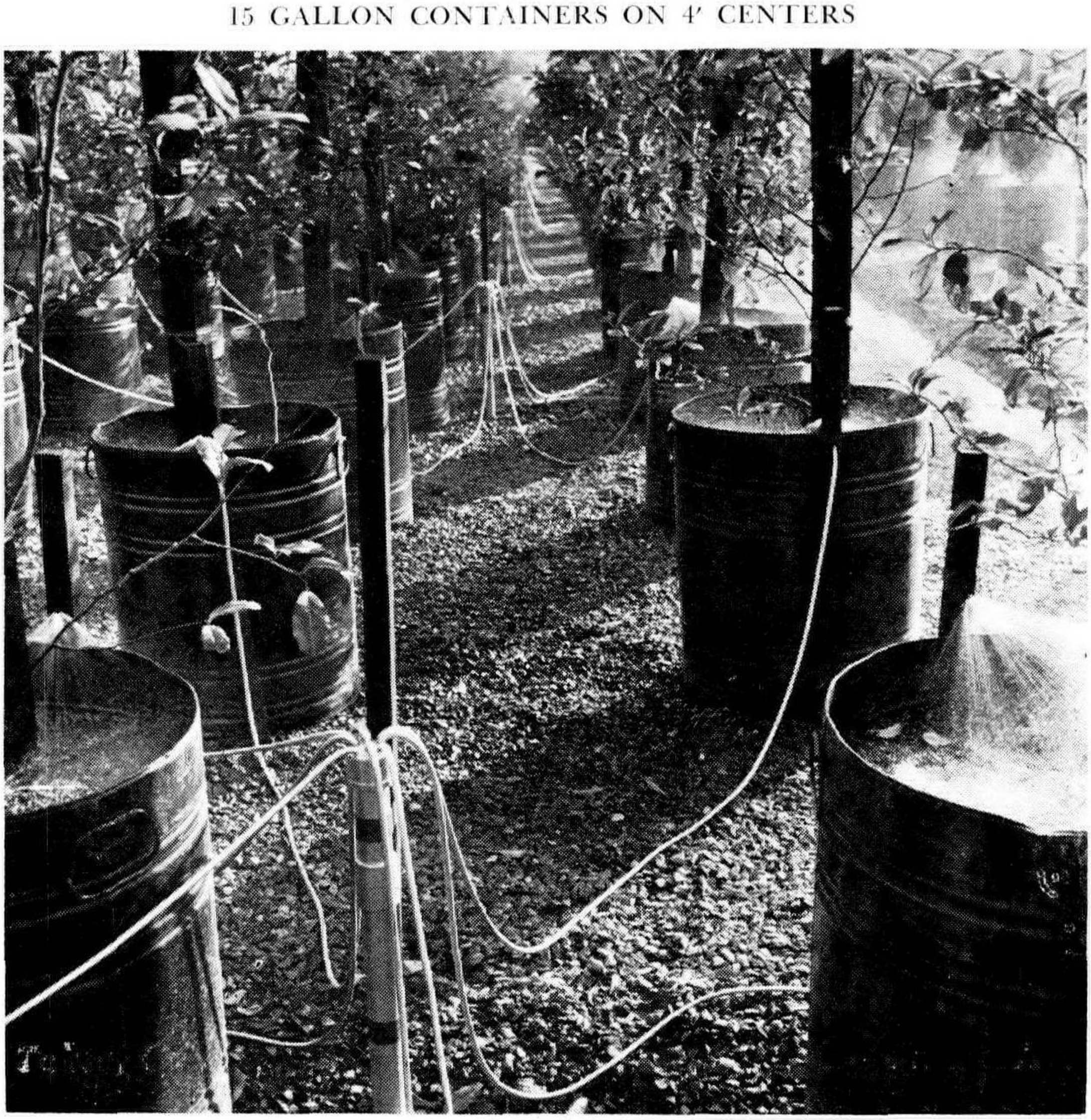


Figure 1. Oki Nursery Irrigation System.

photo). The entire area was graded to drain to the center with a small ditch to a natural drain. It was covered with crushed rock and the containers and plants were then set in place.

The system was then operated until water ran out from the bottom of the containers. After several trials, it appeared that five minutes were sufficient. The nozzles put out .4 inch per hour, so each container received two gallons of water per irrigation. One valve served 648 containers and the other, 720 containers. If each valve is operated for five minutes, a total of 1368 containers can be irrigated in 10 minutes.

Sand traps or filters should be installed to prevent nozzle stoppage. The adhesive used to cement the nine $\frac{1}{8}$ inch tubes into the 1″ plastic cap may plug the tubes. Be sure they are open before trying.

SATURDAY AFTERNOON SESSION

MODERATOR: George C. Dobbins

PRODUCTION AND RECORDS

EDWIN S. KUBO
Oki Nursery, Inc.
Sacramento, California

In the 1962 Twelfth Annual Meeting of the International Plant Propagators' Society — Eastern Region, Mr. George Oki spoke on, "Systems and Mechanization in a Container Nursery." Also he briefly mentioned Oki Nursery's record keeping system. Since then, we have had many inquiries from nurserymen from different states about our production record keeping system.

One of the questions asked by nurserymen is as follows: What form does Oki Nursery use to anticipate varieties to grow? We at Oki Nursery use the *Annual Production Schedule.* In this form we have information such as:

1. Variety
2. Method of Propagation
3. Approximate per cent of rooting or germination
4. Approximate amount to cut or seed
5. Best month to cut or plant seeds
6. Alternate month to cut or plant seeds

Another common question asked is how do we determine when to make the cuttings, plant the liners, and plant the gal-