A PRECISION SPRINKLER FOR SOIL MOISTURE STUDIES

LEROY SCHULTZ, *Mechanical Engineer,* and ROLAND STOLESON, *Forester, Missoula Equipment Development Center, U.S. Forest Service, Missoula, Mont.*

A special watering system was needed for a study at the Coeur d'Alene (Idaho) Nursery. Five plots, 25 by 50 feet, were to be at various moisture levels during the study. The watering system maintained had to permit the following:

1. Delivery of predetermined volumes of water (up to 1 inch in 4 hours).
2. Even distribution of the water over 25- by 50-foot areas with a 3-foot overlap on all sides.
3. Operation by one man.
4. Automatic shutdown when the selected water volume has been delivered.
5. Low cost.

Selecting a System

Two types of systems were investigated: An overhead sprinkler arrangement and a portable, motorized system.

The overhead sprinkler system was rejected for several reasons. Rotating or oscillating fixtures could not be used because of the amount of drift expected from strong southerly winds common at the nursery. Fixed nozzles on short, individual risers would not be as affected by wind but would be too expensive. Complete coverage would have required many risers. Spray patterns would overlap, making distribution uneven. The risers would prevent the use of nursery equipment within the plots.

The portable motorized system (fig. 1) met all requirements. The system consists of two parts: (A) The boom unit, and (B) the control-power unit.

The boom unit, upon which standard spray nozzles are mounted, is drawn back and forth over the plot at a constant speed by the control-motor unit. The position of the nozzles on the boom unit and its constant speed results in an even water distribution over

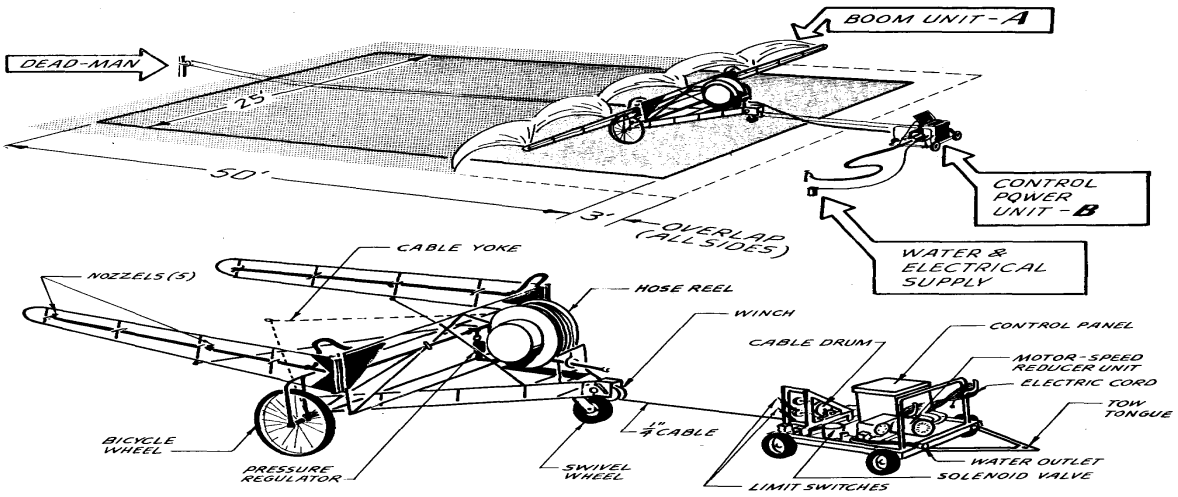

Figure 1.—Instrumentation of the portable, motorized system.

the entire area. The amount and rate of water application can be varied by:

1. Changing the number and type of nozzles used.
2. Changing the water pressure.
3. Changing the motor speed.
4. Varying the number of passes made by the boom unit.

Instrumentation and Operation

The boom frame is made of strong, light, welded steel conduit. Bicycle wheels permit the unit to be drawn easily over uneven ground. A wide, pneumatic swivel wheel is mounted in front of the bicycle wheels to make the unit self-guiding. The rest of the boom unit (fig. 2) consists of distribution lines, a pressure regulator, a hose with a retracting hose reel, and 120 feet of flexible, steel cable on a hand winch.

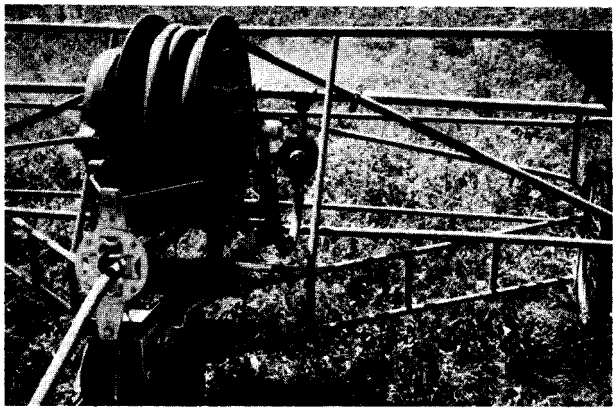

Figure 2.—Distribution lines, pressure regulator, hose, and cable of the boom unit.

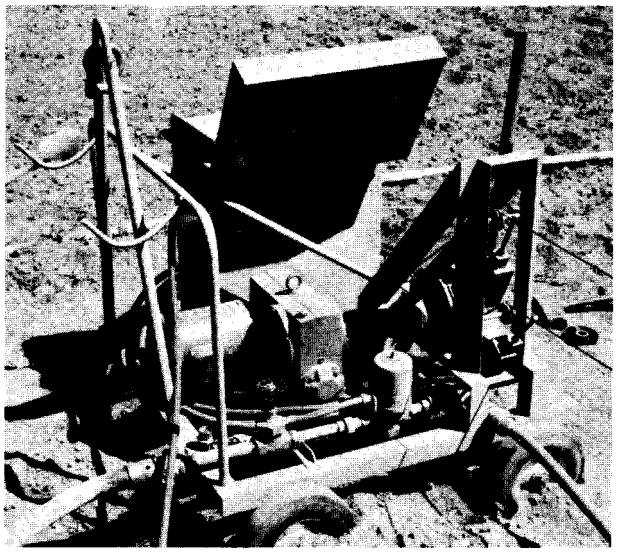

Figure 3.—The control-power unit.

The control-power unit (fig. 3) consists of an electrical control panel (fig. 4), a combination motorspeed reducer unit, and an electric solenoid water valve-all mounted on a wheeled frame. The two units of the system can be towed in tandem from plot to plot (fig. 1). Water and electrical outlets must be provided near the plots, and a deadman with a cable pulley hookup must be installed on one end of each plot.

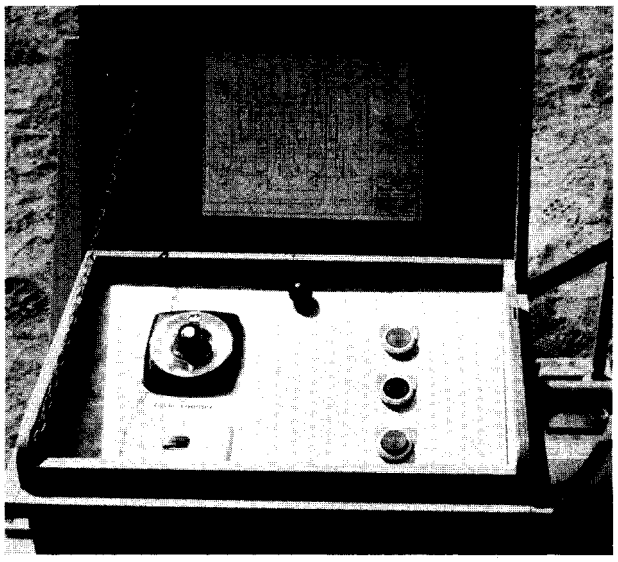

Figure 4.—The electrical control panel of the control-power unit.

The boom and control-power units are positioned on the plot. The steel cable is run from the boom unit to a cable drum on the control power unit, across the plot to the deadman post pulley, and back to the cable yoke behind the boom unit. When cable tension is applied with the hand winch, water and electrical connections are made.

The number of passes needed to produce the desired amount of water is determined. This number is set on the counter dial, and the "forward" button is pushed. This starts the boom unit down the plot (fig. 5) and opens the solenoid valve, allowing the water to spray. When the unit reaches the far end of the plot, a limit switch shuts off the water, stops, reverses, and starts the motor, turning the water back on. This occurs at each end of the plot until the selected number of passes has been made. The unit then turns off auto-

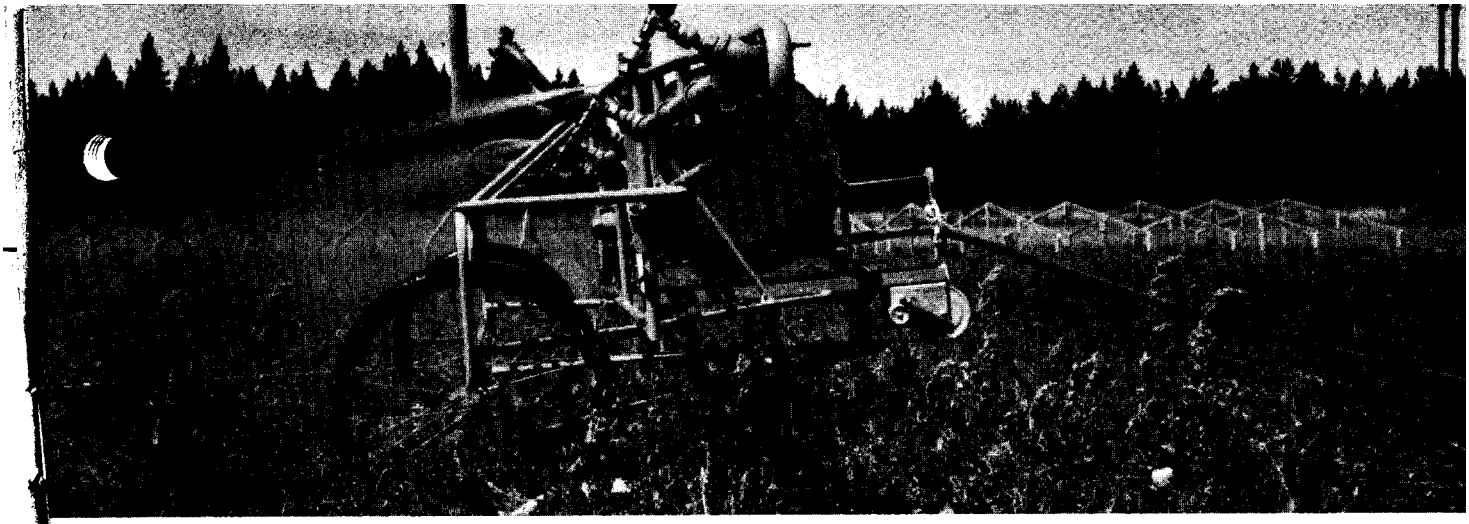

Figure 5.—The sprinkler boom unit in operation.

matically. Other controls are provided for stopping the unit during any part of the cycle.

The system described may have uses other than those shown in the study for which it was designed. The same design can be used for applications requiring exacting distribution of selected amounts of water (or other liquid) over preset areas. One man can operate the system and can leave it unattended during spraying operations. The system costs $1,750. Detailed information, including drawings, is available from the U.S. Forest Service Equipment Development Center, Missoula, Mont. 59801.