may be done with an electric hand-drill, but a faster and more accurate drilling job can be done with an electric drill-press.

The holes in the template should be 1/4 inch in diameter and the bit for drilling the tags should be 7/64 inch in diameter in order to prevent the holes in the template from becoming out-of-round during the drilling process. Also, in order to facilitate changing from one jig to another, the template should be made long enough to extend about one to two inches beyond the base of the jig.

Figure 2 shows the coding system for dating the tags. (The illustrated template will permit dating thru day 29. However, if additional days are needed, additional holes can be drilled in the center area of the template for day 30, 40, etc.) The "reference" hole is drilled in all tags. When the nail (or string) hole is away from the holder (12 o'clock position) this reference hole is always in the upper left-hand corner. This makes it possible to distinguish between days 1 and 9, days 2 and 8, etc., when reading the tags. To make tags for any specific day, the reference hole, and the proper "units" and "tens" holes should be drilled (e.g., holes 9 and 10 for Day 19).

In order to determine boll periods, the initial blooms are tagged each day; subsequently, the tagged bolls are harvested as soon as they mature and the "day" of harvest recorded. Then by subtracting the "day" on the tag from the harvest "day", the boll period is readily obtained. For example, if a tag was marked day 17 and the boll to which it was attached was harvested on day 72, the boll period would be 55 days.—J. D. BILBRO, JR., Research Agronomist, Crops Research Division, ARS, USDA, Texas Agr. Exp. Substation 8, Lubbock, Tex. In cooperation with the Texas Agr. Exp. Sta.

A FLOTATION METHOD FOR EASY SEPARATION OF ROOTS FROM SOIL SAMPLES

The need for efficient and economical methods of separating roots from soil is frequently mentioned in reports of root studies. Many investigations of plant growth would not be complete without root data. Soil and roots in cores or blocks removed from the field or in containers used in greenhouses must be separated by some process, usually by washing.

Several methods described for separating roots from soil involve soaking a large number of samples in water, spraying with a stream of water over a fine-mesh screen, or mechanical agitation. Jacques used a continuous spray of water and a horsehair sieve to separate soil from roots of pasture plants. Gates constructed a screen-bottom cradle with 14 compartments which was set into a tank of water and alternately raised and lowered to wash the soil from the roots. Upchurch put soil samples containing roots into 33-gallon drums and pumped a large volume of water from a 50-gallon drum of water. After the soilblocks in the trays were sprayed with a garden hose, Feherenbacher and Alexander used a shaker-type machine that gently agitated a root-soil mixture and put the soil into suspension before it passed through a 16-mesh screen that removed roots. Baker built a washing machine with roots which a continuous spray of water was directed to wash the soil free from the roots.

One disadvantage of most of the methods described is the failure to separate roots from soil particles which pass through a screen. An additional process is necessary to make such a separation.

The method described herein is based on the principle of soil-elution described by Upchurch. In his method include a pressure stream of water to circulate the soil-root-water mixture, the use of a small volume of water, and an assembly-line arrangement of root-washing units.

The soil sample containing roots is soaked in water containing about 2 gallons of water, or enough to wet the sample, for a short period. When a longer soaking period is required, samples can be soaked in additional cans. After sufficient soaking the samples the entire contents of the can are poured into a second 5-gallon can equipped with an overflow spout. A pressure stream of water from a garden hose held about 2 inches above the bottom of the can and washes the root-soil-water mixture (figure 1). The rate of upward circulation of water in the can is adjusted by changing the nozzle setting. Fine particles of soil and wash are carried into suspension by the stream of water and overflow, and caught on the screen. The roots of soil and gravel will be found at the bottom of the container and should be checked for adhering roots. Occasional stirring of the soil during the washing hastens the suspension of the fine soil particles. When dense, interconnected root systems are present, it may be necessary to remove some of the soil hand after the soil has been washed away. Roots may not float to the surface. The roots on the screen may be refloated in water in a plastic or foreign matter. The final inspection is best done using a fine spray and a screen basket (figure 2). After approximately 15 minutes, depending upon the amounts of clay and silt in the soil, the overflow water will run clear and the roots will have been washed free from the soil particles, overflow, and caught on the screen. The roots of soil and gravel will be found at the bottom of the container and should be checked for adhering roots. Occasional stirring of the soil during the washing hastens the suspension of the fine soil particles. When dense, interconnected root systems are present, it may be necessary to remove some of the soil hand after the soil has been washed away. Roots may not float to the surface. The roots on the screen may be refloated in water in a plastic or foreign matter. The final inspection is best done using a fine spray and a screen basket (figure 2).

Soil samples of various kinds have been tested with this root-floation method. Pot samples from greenhouse experiments and undisturbed soil core samples from field studies have not been complete without root data. Soil samples of various kinds have been tested with this root-floation method. Pot samples from greenhouse experiments and undisturbed soil core samples from field studies have