

To Measure Trickle Outflow

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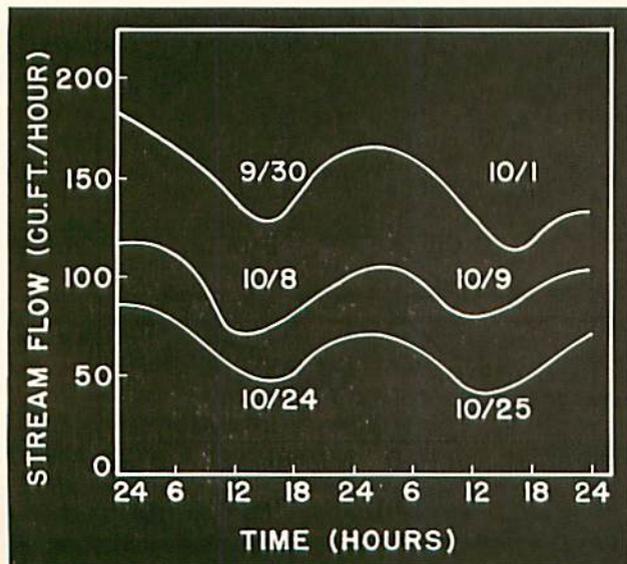
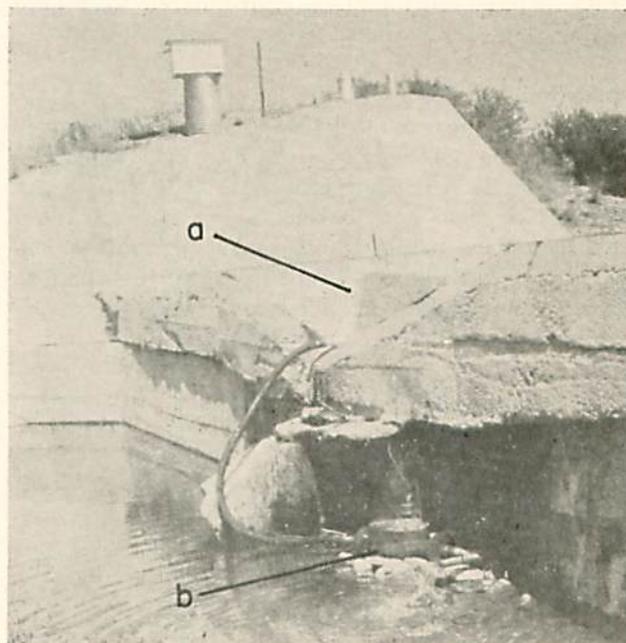
WATER balance studies at Arizona's Walnut Gulch Experimental Watershed require accurate measurement both of trickle outflow and flash storm runoff. A large critical-depth flume at the outlet measures runoff at peak discharges up to 18,500 cfs. This flume cannot, however, accurately measure the sustained low rates of subsurface outflow. This prolonged cyclic outflow (Fig. 1) now is measured with a commercial water meter and the flume's water level recorder.

The foundation of the flume extends to bedrock to intercept the subsurface outflow which continues to move out at low rates for several months following the summer runoff season. Phreatophyte vegetation is adjacent to the stream channel.

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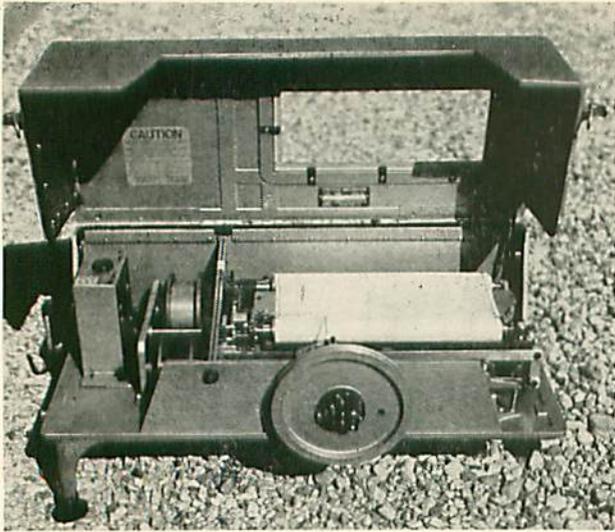


First a thin sheet metal funnel was fabricated with a flexible hose leading downstream to the water meter (Fig. 2). This collecting funnel then was attached to the flume with synthetic rubber to make a watertight seal between the concrete and the funnel. In heavy surface runoff the funnel will easily become dislodged to allow the flume to operate normally.

The water meter first was modified to indicate volumetric increments of flow on the flume's recorder chart by inserting a microswitch on one of the totalizing gears. This switch is installed so that each gear revolution makes a contact, activating the relay and a pen on the recorder (Fig. 3).

The pen is attached to a relay wired to the meter's contact points across a 6-v battery. Flow rates are determined by the frequency of volumetric increments recorded. Each gear revolution makes one mark on the water level recorder's strip chart to represent 10 gal of water.

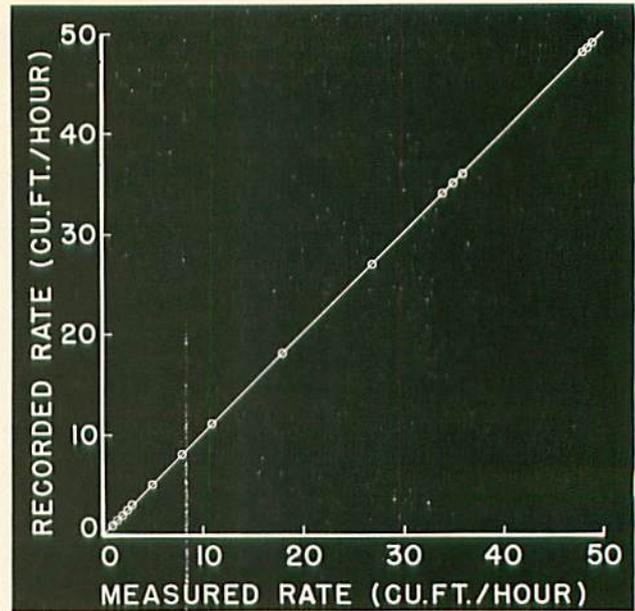
To measure these very low flow rates, the closure time



of the microswitch must be short to eliminate unnecessary battery drain but yet long enough to eliminate burning of the contact.

Operation

Water flowing over the flume enters the funnel through a screen which removes any coarse litter. The water then passes through a sieve which collects the fine sediments. An aeration pipe removes air bubbles before the water enters the meter. Water passing through the meter turns the impeller to which the gear with the microswitch is attached. Periodic cleaning of the screen is necessary when leaves are



falling.

The unit was calibrated volumetrically in operation by using 6 cu ft barrels of water and a stop watch. The calibration (Fig. 4) reveals a direct linear relation throughout a wide range of discharge rates. In other words, the water meter had neither an acceleration bias at high flows nor a lack of sensitivity at low flows.

This simple unit requires a minimum of maintenance — yet it performs accurately for long periods. • •