A SIMPLE LABORATORY GLASS STILL WITH AUTOMATIC WATER CONTROL

In some laboratories, the demand for glass-distilled water is often erratic and short-term, and the cost of purchasing an automatic all-glass still is not always warranted. Distillation of water in a simple still requires frequent refilling and attention. The still described, which is readily assembled from standard "Quickfit" glassware, overcomes the difficulty of maintaining a constant level in the evaporating vessel and thus reduces the amount of attention needed.

A photograph of the unit is given in Figure 1, which shows a board A, 26 in. x 11 in. x 1 in., placed on a fulcrum F mounted on a base board B, 16 in. x 11 in. x 1 in., so that A may move freely with a rocking motion. A piece of 2-in. angle-iron 6 in. long serves as a suitable fulcrum. A heating mantle with a round-bottom, 2-necked, 2-l flask is placed on one side of board A and connected via a splash head with inlet tube to a coil condenser P, which acts solely as a preheater for the feed water, and then to a Liebig condenser C. The weight of the mantle, flask and water is counter-balanced by weight W, approximately 6 lb.

An increase in volume of water in the evaporating flask will cause that side of the board A to move downward and the opposite side upward. As water evaporates, the flask will become lighter and the movement is reversed. These movements are utilized through lever L and connected rods to close and open stopcock S. A small tension spring T dampens the movement and helps establish equilibrium.

Lever L is made from 18-gauge sheet metal, one arm 2 in., the other arm 4 in. long. An axle, made by cutting off the head of a 2-in. nail and soldering the nail through a hole in the lever, is sleeved with short pieces of copper tubing. Two saddle clamps secure the axle under board B so that the longer arm projects through a slot, approximately $\frac{1}{4}$ in. wide and $1\frac{3}{4}$ in. long, which has been cut into the board $1\frac{1}{4}$ in. from its outer edge. The shorter arm of the lever is attached to board A by a rod approximately 3 in. long. The longer arm is connected to stopcock S by two linked rods, so that the oblique movement of the longer rod (attached to lever L) is changed into a horizontal movement in the shorter rod, which is guided by a screw-eye K to prevent sideways movement.

An extension arm $1\frac{1}{2}$ in. long, made of wire, is fitted to the stopcock by means of a thin sheet-metal clamp bent around the stopcock and secured with a suitable adhesive. An eyelet at the end of this extension arm links the stopcock via the two rods to the lever L. All connecting rods are made from 12 S.W.G. galvanized wire, formed into eyelets where required.

In order to overcome the vapour pressure in the preheater and feed line, a head of at least 4 ft is necessary, and the carboy R used as a feed reservoir in this laboratory is placed on a shelf 4 ft above the still. This carboy is

conveniently filled from floor level by connecting it to a vacuum pump, and utilizing the difference in pressure to fill it with water, previously distilled in a metal still. By this double distillation, water of low conductivity is obtained.

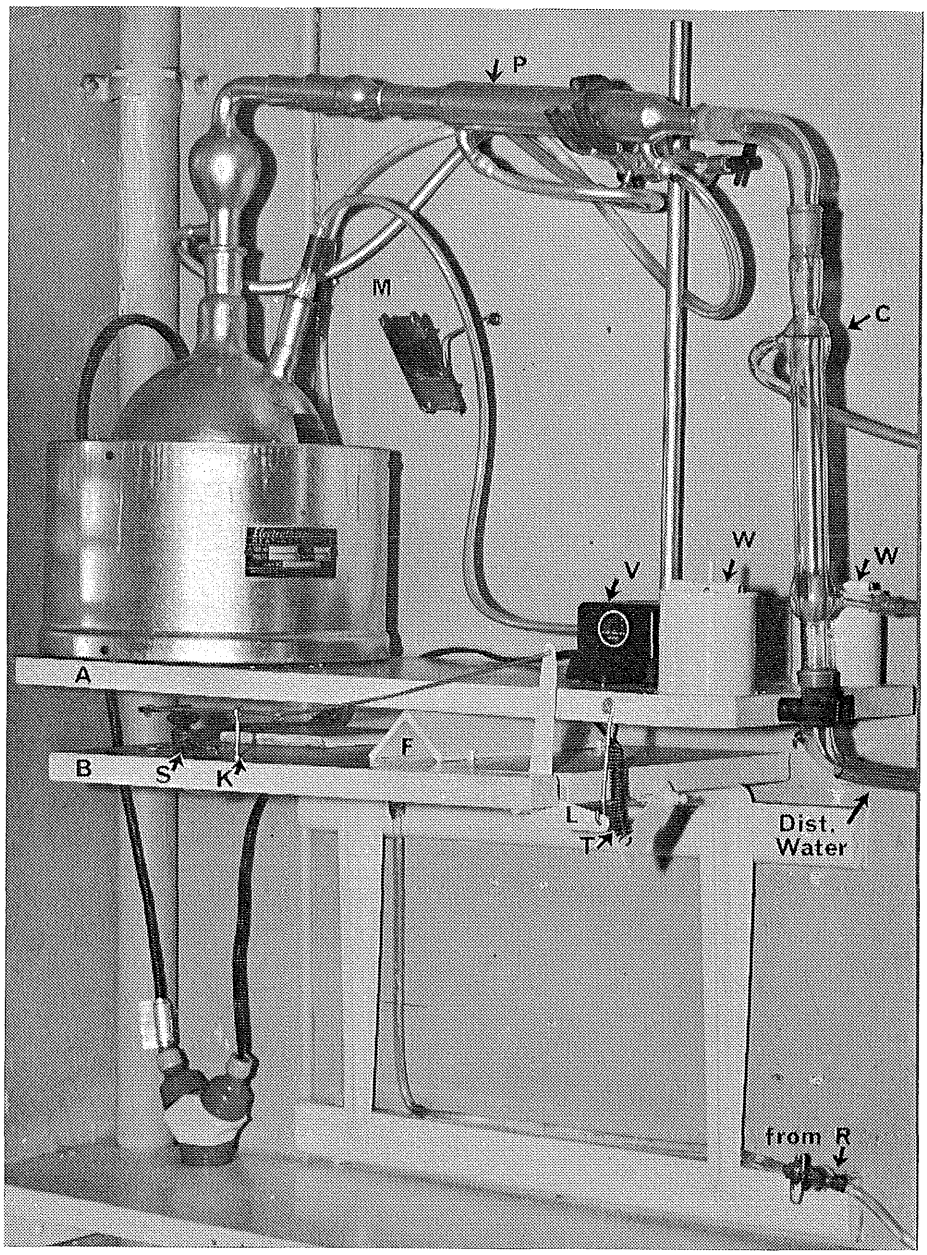

Fig. 1.—Details of still unit.

To prevent superheating and bumping in the evaporating vessel, a small vibrator pump V, such as is commonly used to aerate aquaria, passes a stream of fine air bubbles through the water from a sintered-glass gas diffuser fitted into the second neck of the boiling vessel. This method appears to be the most durable and satisfactory. Other boiling aids were tried, but were found to require frequent replacement.

By using a heating mantle of 500 w capacity and applying an insulating coat of aluminium paint to the evaporating flask and preheater, an output of approximately 650 ml per hr can be expected. The water level may be observed through a window in the paint, and a small mirror M at an appropriate angle facilitates this observation if the apparatus has to be installed above eye level.

A bench-model may be constructed by fixing suitable supports under base board B so that sufficient clearance is maintained to operate lever L. Such a model can easily be assembled and dismantled for irregular use.

To convert this still to automatic operation, a device as described by Joliffe (1963) may be incorporated in the feed reservoir or receiving vessel as required.

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REFERENCE

JOLLIFFE, G. O. (1963).—*Lab. Pract.* 12:446.

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