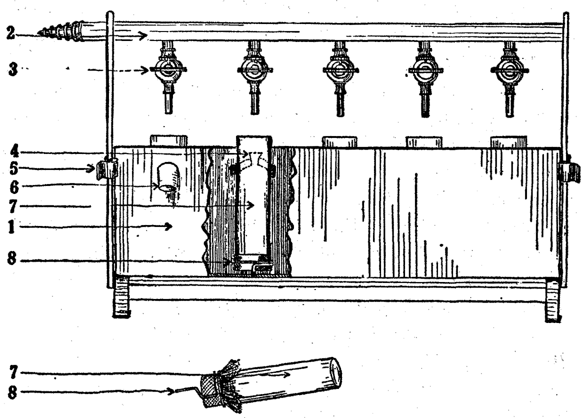
SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN APPARATUS FOR WASHING HISTOLOGICAL MATERIALS

FOR years in preparing materials for histological study I had felt the need of a simple, practical piece of apparatus for washing from such materials the reagents used in killing and fixing them. Being unable to find any such apparatus listed by the leading dealers in biological equipment I had made and installed on a shelf above the sink in my laboratory a device that meets this need.

The apparatus, as shown in the accompanying



sketch, consists of a framework of brass supporting a tank (1) made of tin-lined copper. This tank is held in place by the springs (5) and may readily be detached for cleaning. Above the tank are a series of petcocks (3) attached to a brass water-pipe (2) supported by uprights of the frame and fitted with a coupling for attaching the pipe by pressure-resistant rubber tubing to the water-supply. To the inner side of the back wall of the tank near the top are attached a series of spring-clips (4), one immediately below each petcock. These clips hold in place the washing tubes (7) and permit their ready insertion and removal from the tank, which, when in use, is filled with water to the level of the overflow pipe (6), through which, when the apparatus is in use, the excess water overflows into the sink.

The washing tube consists of a simple piece of glass tubing of suitable diameter over one end of which is placed a strainer of cheese cloth, marquisette or other suitable material. This strainer is held in place by a brass wire spring (8), which is continued downward and under in such fashion as to form a "leg" under the center of the bottom of the tube. This leg rests on the bottom of the tank and thus prevents the strainer from coming into contact with the bottom of the tank.

Material to be washed is put into the washing tube and the tube is placed in the spring-clip holder under the petcock, from which water is admitted into the tube. Washing is positive, the water entering the tube at the top and passing gently downward over and around the material and out at the bottom of the tube. The rate of flow of the water can be regulated at will by means of the petcock, and the leg on the spring holding the strainer prevents the tube from dropping to the bottom and stopping the flow of the water through the tube. In putting material into the tube, the killing fluid together with the material in it is poured into the tube, from which the fluid escapes through the strainer, leaving the material to be washed in the tube. When washing is complete, the tube is lifted from the tank and inverted in a wide-mouthed bottle or other suitable receptacle and a stream of water from a faucet, or preferably from a washing bottle, is directed upon the strainer, thus washing the material out of the tube into the receptacle. In this way materials can be handled without touching them with instruments and the most delicate can be manipulated without injury.

The tank is fifteen inches long, four inches wide, and four inches deep. I have found a tube four inches long and one inch in diameter the most satisfactory for general work, but tubes of greater diameter may be used and also of shorter length, provided the leg on the spring be made correspondingly longer. My students have found this piece of apparatus entirely satisfactory.

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SPECIAL ARTICLES

DIAGRAMS RELATIVE TO HAMILTON'S CANONICAL EQUATIONS

HAMILTON'S equations are so extensively appealed to in modern physics, that the following diagrams which contain considerable information, may be found useful. The masterly treatment given by Sommerfeld has been followed.

1. In figure 1, the arrows denote differentiations of the total energy H, either partial relative to the individual q_k, p_k, variables, or partial gradients.[1] Differentiations along parallel lines are equal and if the direction is up or to the right both are positive; otherwise one of them is negative. Thus the diagram is to be read

$$\partial H/\partial p_k = \partial q_k/\partial t \text{ or } \nabla_p H = \dot{\mathrm{q}} \;\ldots\ldots\; \text{(speeds)}$$

and

$$\partial H/\partial q_k = -\partial p_k/\partial t \text{ or } \Delta_q H = -\dot{\mathrm{p}} \;\ldots\ldots\; \text{(forces)}$$

[1] Vectors are given in roman, scalars in italics.