IN THE LABORATORY

An Automatic Recording Siphon

E. WILLIAM LIGON, JR.

George Washington University School of Medicine
Washington, D. C.

An experimental study (*1*) required simultaneous records of intralumen pressures in, and flow through, Thiry-Vella loops in dogs. The pressures were recorded photokymographically, using modified Frank capsules as tambours, and flow was similarly recorded by means of the automatic siphon devised by the author for this purpose.

Since the use of optical manometers is rapidly gaining favor among investigators interested in studies involving accurate measurement of pressures and flow, it is felt that a brief description of this siphon may be helpful.

The siphon (Fig. 1) is constructed of pyrex glass, utilizing a test tube of convenient size and sections of tubing and reinforcing rod, and can be readily made by anyone able to weld pyrex tubing.

The fluid to be measured enters the receiving chamber, B, at A and continues to fill the system until the level reaches f,

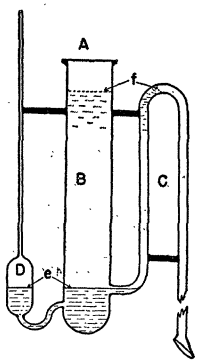

FIG. 1

when the fluid escapes through the siphon arm, C. The system empties until the fluid level reaches e and air enters the siphon arm. With the fluid level at e, the side chamber, D, is connected by rubber tubing to an optical manometer. Subsequent additions of fluid to B cause increased pressure in D which is transmitted to a sensitive manometer and recorded photokymographically in such a way as to give a rising line which falls suddenly each time the siphon empties. Rate of flow is shown by the slope of the line at any point, and total flow is indicated by the change in height between any two points (plus the volume of the siphon multiplied by the number of times it has emptied in the meantime). The manometer can be accurately calibrated by adding known increments of fluid to B and taking short strips of record. The size of chamber B can be adjusted to the investigator's needs. The size of chamber D should be such that there is little variation in the level of fluid. The internal diameter of the siphon tube, C, however, is critical. If it is too great, there is a tendency for fluid to spill over without emptying the system; if it is too small, a column of air bubbles and fluid is retained in the right-hand limb, and the system empties before fluid reaches level f. With water, the best operation was obtained with a siphon arm 5–6 mm. in internal diameter. In addition, the siphon arm empties itself more efficiently if one end of a small string is tied to one of the upper supporting rods and the other end passed into chamber B and out through the siphon arm, its function being to aid in preventing retention of bubbles in the siphon arm after each emptying of chamber B.

Reference

1. LIGON, E. WILLIAM, JR. *Proc. Soc. exp. Biol. Med.*, 1943, **52**, 282–284.

A Low-Temperature Continuous Extractor[1]

MERWIN MOSKOWITZ

Departments of Chemistry and *Bacteriology*,
University of California, Berkeley

When extracting proteins and other organic materials with organic solvents it is often necessary to carry out the extractions at reduced temperatures to avoid denaturing or destroying them. This is usually done in flasks, necessitating large volumes of solvent and much handling. An extractor requiring relatively small amounts of solvent, very little handling of the material being extracted, and with safeguards protecting the solvent from absorbing water is described (Fig. 1).

The material to be extracted is placed in a thimble, H (43 x 123 mm.), which is then inserted in the vacuum-jacketed extraction chamber, F. The solvent is placed in the round-bottomed flask, I (1 l.), and some is also placed in the trap. On boiling the solvent, the vapor rises up the glass column, is condensed in the bulb condenser, passes through the cooling coil, C (8-mm. tubing), into the extraction chamber, and then siphons off and returns to the flask.

Cooling is achieved by the bulb condenser and the cooling coil. When using solvents with high boiling points, ice water can be circulated through the condenser, but with those such as acetone and ether, the temperature of the tap water suffices. A solvent such as acetone is circulated in the jacket, G (35 x 8 cm.), surrounding the cooling coil, and is cooled by passing through a copper coil, B, immersed in a Dewar flask containing a cooling medium such as CO_2-acetone. The acetone enters the

[1] The work during which this development occurred is supported by a grant from the Rockefeller Foundation.

bottom of the jacket and leaves by way of the glass tube suspended in the center of the cooling coil. By using CO_2-acetone as a coolant, temperatures as low as −65°C. can be maintained in the extraction chamber.

The temperature can be controlled by empirically determining the temperature in the CO_2-acetone bath necessary to keep the extraction chamber at the desired level or, more easily, by a thermoregulator, D. The thermoregulator used in this laboratory is of the type commonly employed in commercial refrigeration. It controls the circulating pump, E, and with the CO_2-acetone in the Dewar kept from 20°–30°C. lower

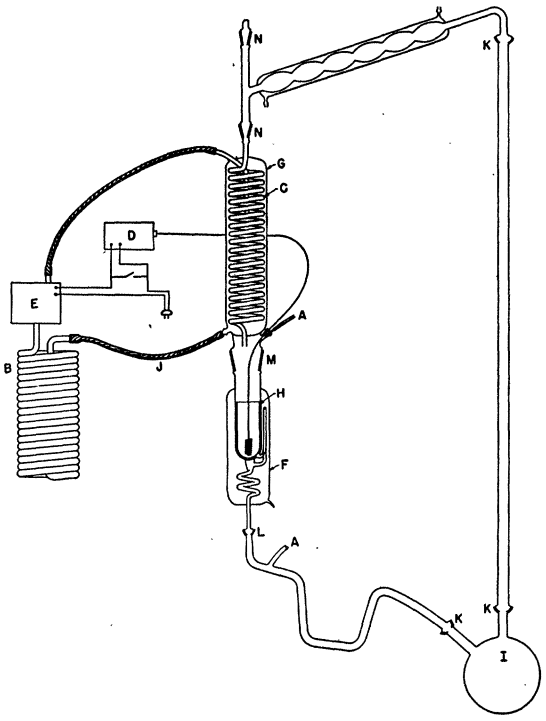

FIG. 1

than that desired in the extraction chamber, the temperature can be maintained within ±1° C. down to −20°C. For lower temperatures the thermoregulator is shorted out, and the pump runs independently of it.

The temperature in the extraction chamber is obtained by placing a thermometer outside the thimble and observing it through the walls of the chamber. A thermocouple may be inserted through the same opening at which the thermoregulator enters.

Openings to the atmosphere, provided at A, are connected to $CaCl_2$ tubes. Ball and socket joints, K (28/15) and L (18/9), permit easy handling and prevent strains in the setup; the other joints, N (19/38) and M (60/50), are standard taper. Rubber tubing, J, connects the copper coil with the cooling jacket.

The apparatus lends itself readily to successive extractions with different solvents merely by changing the solvent in the flask and trap. The residual solvent in the extraction chamber is removed by applying suction to the outlet of the extraction chamber, L.

An Alternate Method of Cleaning Mercury

LEON SEGAL

402 Rose Avenue, New Orleans, Louisiana

The classical operation of squeezing mercury through a chamois often leads to extensive spilling unless a mercury press is used. A simple and thoroughly satisfactory alternative method utilizes nothing more than vacuum filtration in place of squeezing through the chamois. The schematic arrangement is shown in Fig. 1.

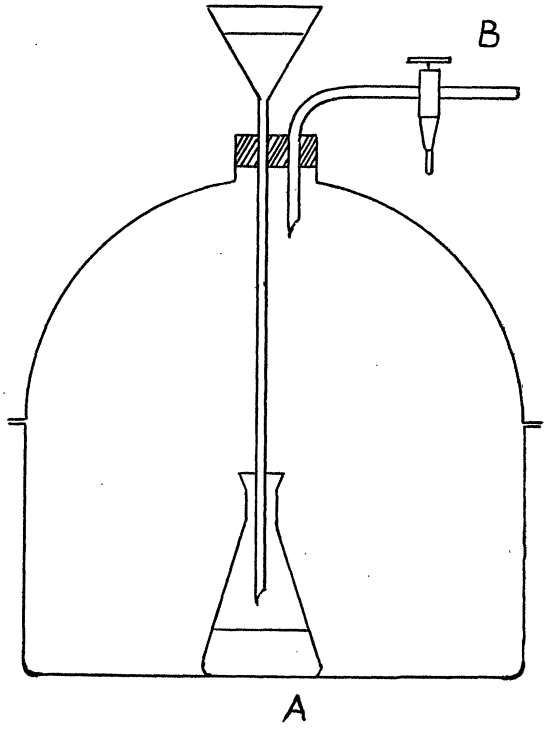

FIG. 1

The vessel, A, is a Pyrex low-vacuum distilling apparatus, and B is a three-way stopcock with an outlet through the plug. In operation, a 2-inch, long-stem funnel requiring only a 4-inch square of chamois will filter, on house vacuum (ca. 25–35 mm.), 5 pounds of mercury within a few minutes. As a receiver, a 500-ml. Erlenmeyer flask will hold splattering down to a minimum. The weight of the mercury and the effect of the suction are sufficient to hold the chamois snugly against the funnel so that air does not leak between the funnel wall and chamois.

When cleaned mercury is to be used immediately, a filter flask of the appropriate size can be substituted for the receiver and vacuum chamber. When, however, it is desired to catch the mercury directly in a cleaned container for storage, the vacuum chamber is preferred, permitting the use of almost any size and shape of container. The container may be removed, stoppered, and put away without again handling the filtered mercury.

This method has been used by the author over a period of time with excellent results in rapidity of filtering; in cleanliness of mercury, and in minimum of loss.