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An Improved Heating Apparatus for Maintaining Constant Temperatures in Work With Polarimeters and Refactometers

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AN IMPROVED HEATING APPARATUS FOR MAINTAINING CONSTANT TEMPERATURES IN WORK WITH POLARIMETERS AND REFRACTOMETERS.

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In the course of some work upon the effect of temperature upon the specific rotation of optically active substances in solution, it was found necessary to maintain constant temperatures over long periods of time. The conditions demanded that the heating apparatus be one which is simple and convenient and at the same time one which permits the easy reproduction of any given temperature.

Various forms of apparatus devised for this purpose are described in the literature. Some of these consist in principle of a coil for running water heated either by a Bunsen flame, or an electric coil. Where such methods are used in large crowded chemical laboratories the results obtained are unsatisfactory owing to fluctuations both in the gas and water pressures. Several modifications of this form were tried and discarded. While satisfactory as regards the regulation of temperature, the heating apparatus devised by Landolt for polarimeters is nevertheless inconvenient.

After several attempts the apparatus sketched in the accompanying diagram was perfected and the results obtained far exceeded our expectations.

In the figure, *A* is a round cylindrical vessel 25 cm. in diameter and 40 cm. in depth. Directly in the center and at the bottom of *A* is soldered the small cylinder, *B*, 6.2 cm. in diameter by 7.5 cm. in depth. Within the small cylinder rotates a motor-driven stirrer of propeller form. At *C*, slightly below the water level, is soldered a 9 mm. galvanized iron tube. A similar tube opening directly into the center of *B* is soldered to the bottom of the bath. The two open ends, *D*, *E*, are attached directly to the jacketed observation tube by means of short pieces of rubber tubing. Surrounding the bath is a layer, *F*, of felt or asbestos paper.

For temperatures near that of the ordinary laboratory temperature, the bath is heated by means of an immersed incandescent lamp and the temperature electrically controlled by means of a contact toluene regulator in series with a telegraph relay and battery. For temperatures considerably above that of the room, a second lamp is connected in parallel with the first. By applying the heat from a Bunsen burner the bath may be quickly heated and adjusted to any desired higher temperature. Owing to the presence of the small cylinder, *B*, the bath is

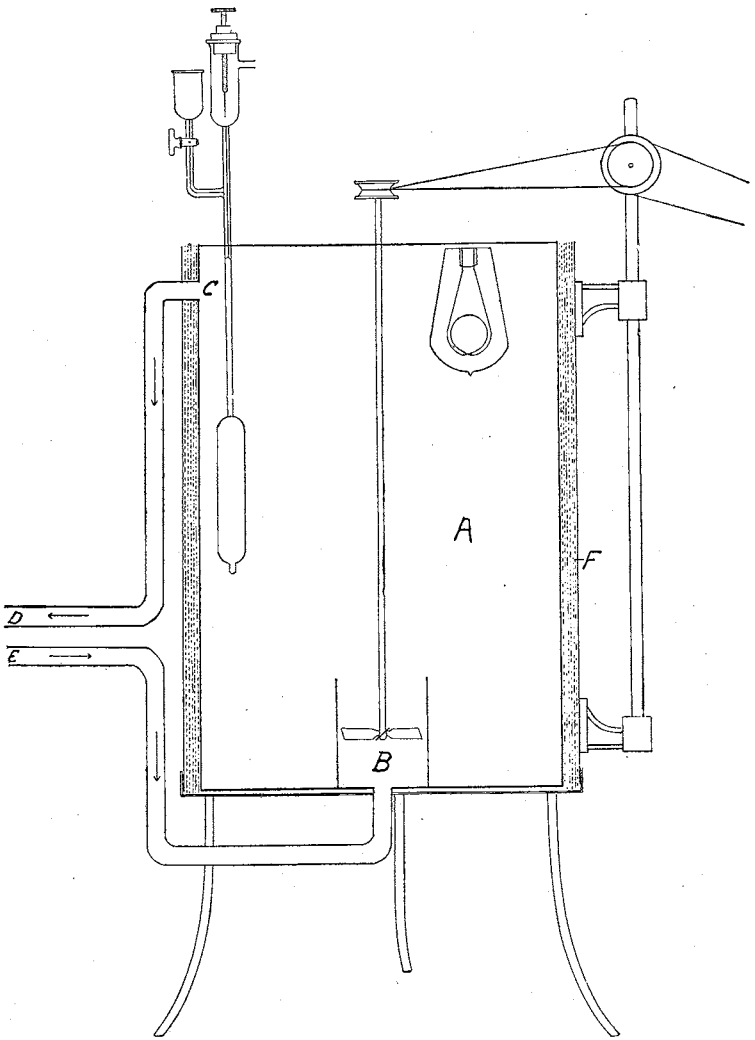

FIG. 4.—Diagram of heating apparatus.

equally adapted for use with ice at 0°, while for temperatures between 0° and that of the room a cooling coil connected with the water supply may be introduced.

When the bath is connected with the observation tube and the stirrer is driven at the rate of 500 to 600 r. p. m., the water circulates through the tube with an exceedingly high velocity. To judge of the force driving the water, it may be stated that when the tubes, *D*, *E*, are open and the stirrer is revolving at the above rate, the lifting power of the stirrer is sufficient to support a column of water eight inches in height. The speed with which the water is driven under hydrostatic equilibrium is, therefore, obvious. Under these conditions it is possible to maintain any desired temperature constant to ±0.01° — ±0.02° for any desired period of time.

Owing to the fact that the observation tube is of necessity at some distance from the bath, its temperature will be slightly lower and the difference will be greater, the higher the temperature to which the bath is heated. If the liquid in the observation tube must be at a definite temperature, the temperature of the bath can be adjusted easily so as to produce the desired temperature and the temperature of the tube regulated with the same degree of constancy.

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