AN IMPROVED COLORIMETER.

By William Gabb Smeaton.

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The instrument permits an accurate comparison of the heights of two columns of liquid enclosed between parallel glass plates. Reflectors consisting of a ground glass plate superposed over a plate of opal glass, are adjusted to project parallel rays from the source of light (Welsbach) vertically through the solutions under investigation.

The solutions are contained in glass cylinders of approximately 33 mm. inside diameter and 100 mm. height, ground plane at the bottom and closed by a plate of the best mirror glass. Each cylinder carries a side arm and stand-pipe near the bottom. During a series of measurements the side arm is connected with a reservoir containing the solution in question, which permits the introduction of any quantity of solution into the cylinder. The latter is placed in a brass sheath to shut off horizontal light. Sheaths and cylinders are fitted in grooves on a metal plate which has circular openings 32 mm. in diameter for the transmission of the light and adjustment of a float cylinder.

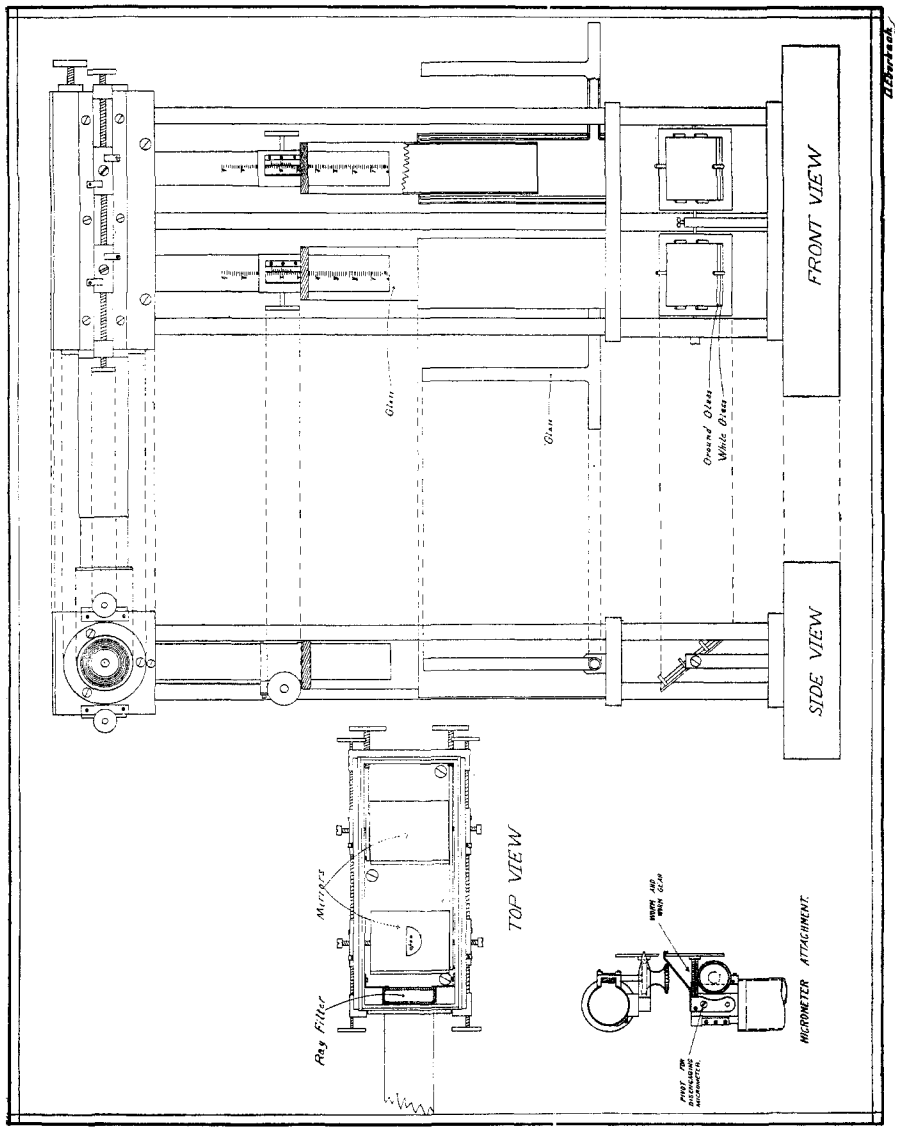
The height of the liquid column is adjusted by a glass float cylinder, 30 mm. in outside diameter, 110 mm. long, ground plane at the bottom and closed also by a plate of the best mirror glass. This cylinder is movable vertically over a brass tube by means of a rack and pinion. It is adjusted so that the two glass plates of the respective cylinders are exactly parallel.

The brass tubes are 22 mm. in external diameter and 125 mm. long. They are permanently attached to a metal plate and have a millimeter scale reading upwards. A vernier indicating 0.1 mm. is riveted to a short brass tube which carries the pinion. To the lower edge of this brass tube the glass float is cemented.

The upper part of the apparatus consists of a box riveted to the metal plate to which the brass tubes are attached. The inside measurements are: width, 45 mm.; height, 47 mm.; length, 130 mm. At one end projects a telescope tube with a total length of 175 mm. when drawn out. The orifice is a pinhole and diaphragms of suitable dimensions may be attached to the inner end of the draw-tube.

The light passing vertically through the solution impinges on

plane glass mirrors above the openings of the brass tubes and is deflected horizontally through the telescope tube. By means of a series of springs these mirrors can be adjusted in three planes. A portion of the silver coating of the mirror next to the telescope



tube is removed, thus giving passage to the beam from the rear mirror. The principle is therefore that of the Donnan colorimeter. The form and dimensions of the silver surface removed will be a matter of personal choice. I have tried many different forms and prefer to use the instrument as a half-shade apparatus, diaphragming the field to about 5 or 6 mm. diameter. When desirable a light filter is used to increase the delicacy of observation.

Measurements are made by comparing the solution in question with some standard. The millimeter scale and vernier are used when the height of the liquid column is several centimeters. To permit accurate comparisons with solutions only a few millimeters in height a simple micrometer, reading 0.01 mm., has been devised. This attachment is thrown into service by a pivot and can be released when not needed.

A high degree of accuracy can be attained if the eye has been trained to make color comparisons for several weeks. In working with various copper- and nickel-ammonia complexes I have repeatedly checked observations to 0.1 mm. The micrometer attachment has been devised only recently and consequently I am not yet in a position to state the ultimate delicacy of the observations recorded with this instrument.

The apparatus has a compact form, as is evident from the diagram. It is, moreover, inexpensive. As a substitute for the etched scale on the brass tube a paper scale such as is provided with galvanometers might be used. It is necessary, of course, to calibrate both the millimeter scale and the micrometer. For very accurate measurements a zero reading is made with each determination by lowering the float cylinder until the two glass plates are in contact, the scale having such a range that this zero reading is always positive.

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ANTIMONY IN BABBITT AND TYPE METALS.

BY H. YOCKEY.

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IN the May number of this Journal a paper by the author of this article appeared describing the analysis of Babbitt metal as practiced in this laboratory. Antimony was described as being determined by the method of Walters and Apfelder. Since appearing, a number of objections to this method have been received