NOTES AND NEWS

EQUIPMENT FOR THE DOUBLE VARIATION METHOD OF REFRACTIVE INDEX DETERMINATION

I. An Improved Stage Cell

II. Variable Temperature Control Apparatus

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Abstract

I. The cell used in the double variation method has been modified by placing the inlet and outlet channels on opposite ends of an elliptical cell, thereby eliminating the trapping of air-bubbles and reducing to a minimum the turbulence of the water flowing through the cell.

II. A convenient apparatus has been devised to provide hot and cold water at a constant pressure used in the production of any desired temperature in the double variation apparatus. By heating electrically a constant flow of cold water, it is possible to provide a supply of water maintained at an approximately constant temperature of fifty degrees Centigrade.

I. An Improved Stage Cell

The operation of the ordinary form of cell[1,2] used in the double variation method of refractive index determination is marred by considerable turbulence of the water flow and the spinning around of air-bubbles in the center of the cell, which usually is also in the field of the microscope. These annoying air-bubbles may be removed by momentarily shutting off the water, but they soon reappear and obscure the field.

The author wishes to describe a modified form of cell, which eliminates the air-bubbles and reduces the turbulence of the flowing water. The new cell is illustrated in Fig. 1 and may be compared with the original Emmons cell shown in Fig. 2.

The cell consists of two brass plates of the specified dimensions separated by a cork composition gasket, which not only determines the thickness of the water compartment but also its shape. The circular opening in each plate is closed by sealing a cover glass on the inside of the plate in a prepared seat with hard Dekhotinsky cement. The plates are fastened together by means of six screws which, by tightening, prevent any leakage from the cell. The inlet and outlet tubes enter the top plate at either end of the elliptical cell produced by the cut-out gasket. The water entering this cell flows in a thin sheet between the two cover

[1] Emmons, R. C., *Am. Mineral.*, **13,** 504 (1928).

[2] Emmons, R. C., *Am. Mineral.*, **14,** 414 (1929).

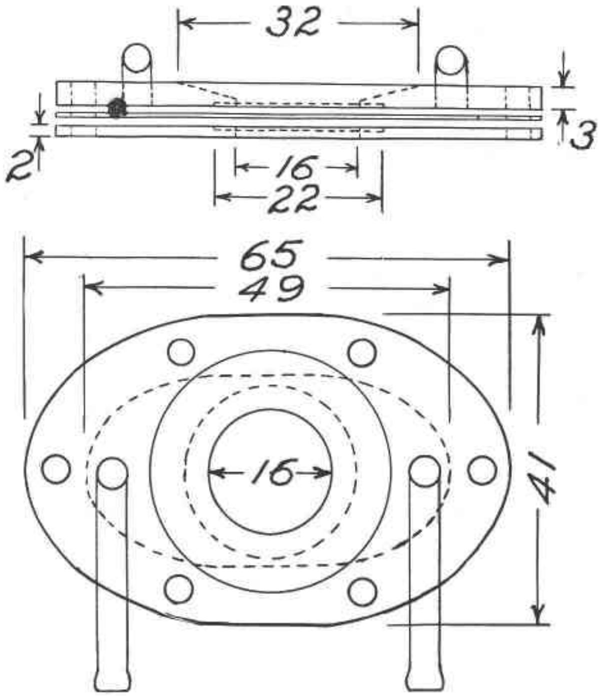

FIG. 1. Improved Stage Cell.
(Dimensions in Millimeters)

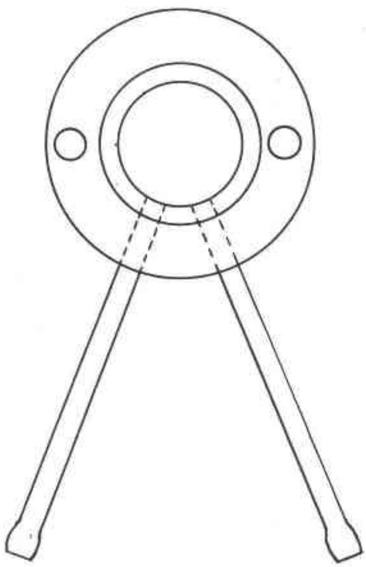

FIG. 2. Emmons Stage Cell.

glasses and out at the other end without turbulence due to irregular surfaces, while air-bubbles pass through with the flowing water and are not trapped in eddies or circular flow. The top plate is bevelled for some distance around the cover glass to render the latter more accessible for the preparation of a mount. The placing of the cover glasses flush with the inner surfaces of the plates reduces turbulence and also makes possible a much thinner cell. If the cell is thin enough, it may be possible to observe interference figures in mineral grains, which would be advantageous for purposes of identification of the mineral or in determining directions of vibration.

II. Variable Temperature Control Apparatus

The operation of the double variation apparatus requires a constant supply of hot and cold water. The apparatus described herein was de-

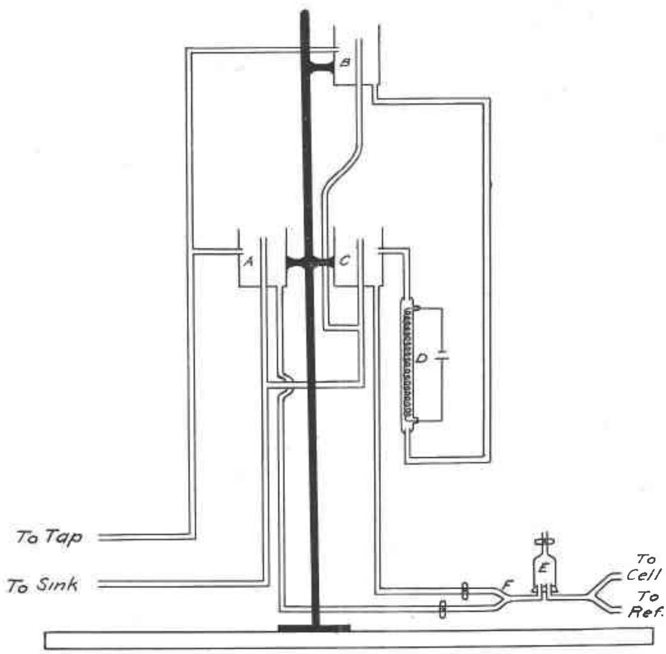

Fig. 3. Variable Temperature Control Apparatus.

vised for this purpose for use in laboratories having no hot water line, or where the hot water supply is unreliable. It has been used to provide constant temperature conditions in refractometric and polarimetric measurements as well as for temperature variation in the double variation method of refractive index determination. Fig. 3 shows a diagrammatic representation of the apparatus.

The copper vessel *A*, having a capacity of approximately 200 ml., is supplied from the cold water line and acts as a constant level vessel providing cold water at constant pressure to the mixing tube *F*. A similar vessel *B*, placed at a higher level, supplies the hot water vessel *C* with water at a constant pressure and approximately constant temperature, maintained by the heater *D*, which consists of a glass tube containing a coil of seven feet of No. 24 B. and S. gauge nichrome wire, connected directly, or through a variable resistance, to the 110 volt direct current supply. The heater, using a current of ten amperes, will raise the temperature of four hundred milliliters of water flowing through in one minute from 20°C. to 50°C. The hot water outlet is connected by means of rubber tubing to the mixing Y-tube *F*. The inlets enter each vessel slightly below the upper level of the over-flow pipes and are bent so as to produce a circular motion of the water with consequently better separation of entrained air. The temperature of the water going to the cell and refractometer is readily adjusted by means of screw clamps applied to each line or by means of easily adjusted valves found on the Bausch and Lomb apparatus.

Since the mixing of hot and cold water tends to release some dissolved gases, a bubble trap *E* should be placed in the line to the water cell. A Gooch funnel with two-hole stopper fitted with inlet and outlet tubes serves as an excellent bubble trap. Air collected may be released by means of the clamp on the rubber tube attached to the funnel.

This apparatus has the advantage of being readily assembled from materials available in any laboratory.