electric clock motor. Under a uniform AC potential (110 volts, 60 cycle current) the motor develops a definite amount of power which is sufficient to maintain its own phase relationship with the AC current, plus an additional force, sufficient to overcome the torque resistance of a viscous fluid. When electrical resistance is introduced, however, a point is reached where the current is insufficient to maintain a synchronous relationship.

The motor is mounted in such a position that its rotor turns in a horizontal plane. A cylindrical platform (1 to 2 cm in diameter) is made from lucite or other plastic rod, and is mounted in concentric fashion on the rotor. A similar stationary member is held by bracket above the rotating platform and is provided with a screw mechanism to vary the clearance between the two members. A variable radio-type resistor

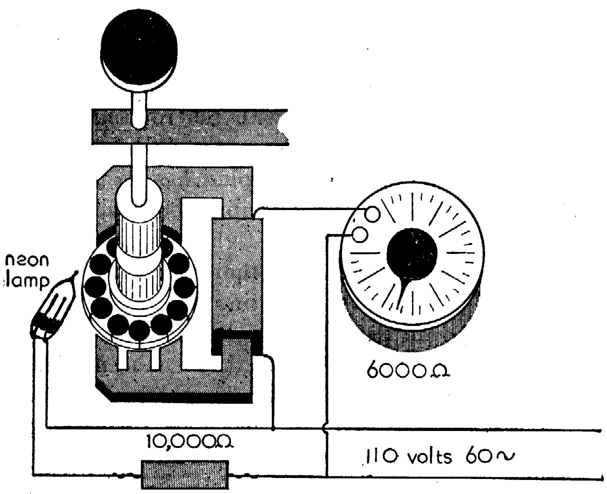

FIG. 1

(preferably wire-wound) is connected in series with the motor, and a small neon lamp is provided, to scan stroboscopically the speed of the rotor.

In making a determination, clearance is first adjusted to a suitable value (±1 mm) using a gauge metal "feeler." The specimen is then introduced between the opposed surfaces by pipette and the motor is started with no resistance in the circuit. Resistance is then cut in slowly while observing the stroboscopic pattern of the rotor. In the light of the neon lamp it will appear stationary; as the end point is reached this rotor pattern suddenly breaks. The resistor dial setting is then correlated with data derived from determinations upon fluids of known viscosity.

Refinements of this apparatus include a constant voltage source, demountable rotor platforms in various diameters with annular troughs to collect any overflow, stroboscopic disc for scanning in lieu of the rotor itself, resistor dial calibrated in centipoises.

The chief possible source of error lies in torque changes due to heating of the resistor after prolonged operation. This may be overcome by intermittent use or by use of a precision type variable resistor.

ELLIOTT R. WEYER

RESEARCH CORPORATION,
NEW YORK, N. Y.

THE USE OF DOUBLE-CYCLE A AND B SCALES ON STRAIGHT SLIDE RULES[1]

THE index of the single-cycle, movable C scale on straight slide rules is shifted (or replaced by the other index) essentially to extend the length of the single-cycle, fixed D scale, as the figures of the product or quotient sought are outside the single logarithmic cycle (but always in an adjoining one). This shifting may be eliminated, without loss in accuracy, on rules having folded C and D scales (or CF and DF scales) by using these scales essentially to extend the length of the D scale from 1 to 1.314 cycles. On other straight rules the shifting may be eliminated, with reduction in accuracy to half (but still with sufficient accuracy for most purposes), by the use of the double-cycle A and B scales present on practically all slide rules. The use of the folded scales is described in most slide-rule manuals, but the use of the double-cycle A and B scales for multiplication and division is not, or at least it is not stressed, probably because the procedure is only half as accurate as the use of the single-cycle scales and because of the similarity of the procedures to those on the single-cycle C and D scales.

The possibility of so using the A and B scales must be known to most slide-rule users, but realization of the lower accuracy of this procedure or oversight probably accounts for the rare use of these double-cycle scales for multiplication and division. The reduction in accuracy from their use, for many purposes, is far outweighed by the convenience of not having to decide which index to use and not having to shift indices in multiplying or dividing by the same factor. In multiplying or dividing by the same factor on the A and B scales, after setting the B scale, it is merely necessary to move the indicator, an operation that can be done by one hand on rules which have an indicator that rides along the top of the rule.

CARLTON E. BROWN

U. S. BUREAU OF MINES,
PITTSBURGH, PA.

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BOOKS RECEIVED

CARTER, GEORGE F. *Plant Geography and Culture History in the American Southwest.* Illustrated. Pp. 140. Viking Fund, Inc., New York. 1945.

MOORE, ARTHUR R. *The Individual in Simpler Forms.* Illustrated. Pp. x + 143. University of Oregon Press. $1.25. 1945.

WERTHEIM, E. *Textbook of Organic Chemistry.* Second edition. Illustrated. Pp. xiv + 867. The Blakiston Company. 1945.