sorption. An impressive feature of the results is the surprisingly large amount of thrombin which can be removed from solution. For instance, 10 mg of fibrin removed 750 units from a solution originally containing 3,750 units. We may assume 1,400 units per mg dry weight for the specific activity of thrombin[4] and calculate in terms of weight that 10 mg of fibrin removed about 0.53 mg of thrombin.

The results were obtained by using thrombin prepared from bovine plasma as described by Seegers,[5] and fibrinogen prepared by cold alcohol precipitation. The protein in the fibrinogen solution was 98 per cent. clottable with thrombin. The thrombin and fibrinogen preparations were found by test to be free of antithrombin. A solution of fibrinogen in 0.9 per cent. NaCl was adjusted to contain 10 mg fibrinogen per cc. One cc of this solution was added to 1 cc of thrombin solution (various concentrations) in such a way as to produce virtually instantaneous mixing. After 10 minutes the fibrin was removed with a glass rod and the remaining thrombin was measured quantitatively.[6]

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN EASILY ASSEMBLED MACHINE FOR MAKING COTTON PLUGS FOR CULTURE TUBES

A NUMBER of years ago Dr. H. W. Batcheler, of the Wooster Experiment Station, Wooster, Ohio, demonstrated to the Ohio Academy of Science a machine for the rolling of cotton plugs for culture tubes. Apparently this has not been published, and the writer has not seen the apparatus. As manpower shortages and cotton shortages have developed, the need for such a machine has become increasingly evident. As a result of this, a machine has been developed which is so efficient it is thought others might be interested.

The essential unit of our machine is a Waco Power Stirrer[1] which has two shafts, one running at 300 r.p.m., the other at 600 r.p.m. The faster of the two is the more satisfactory. The only additional requirement is a foot-controlled rheostat for starting, stopping and controlling the speed of the motor. We use an old foot control from an electric sewing machine. This is wired in series with the motor and provides positive control. The actual spindle on which plugs are rolled is a three and one-fourth inch applicator stick which has enough one-inch gummed paper tape rolled on one end to make it fit the quarter-inch chuck available with the stirrer motor. As the applicator stick gradually wears smooth it is necessary to roughen it slightly from time to time with the edge of a sharp knife blade.

We use University Plugging Cotton from the Rock River Cotton Company, Janesville, Wisconsin. This is spread out and strips, as wide as the length of the plug to be made, are cut lengthwise of the roll. This method of cutting assures the fibers running lengthwise of the strip. For test-tube plugs it is desirable to decrease the thickness of the strip by separating it into two layers of approximately equal thickness to assure ease in manipulation. The end of such a strip is brought in contact with the rotating applicator stick and a little pressure starts the roll. The motor is run slowly until the plug has accumulated sufficient cotton. The cotton strip is then pulled loose from the plug and the plug is tightened by applying very light pressure with the thumb and three first fingers held parallel to the rotating plug. A test-tube is then pushed on the rotating plug and the exposed end of the plug is shaped with the thumb and finger to make the fibers compact so the plug will not be pulled apart in use. The motor is then stopped and the plug is removed from the applicator stick while still in the test-tube by pulling both away from the motor.

With a little practice it is possible to make about 150 plugs per hour. The plugs are of any desired firmness and can be used time after time, thus effecting a great saving in cotton. The labor cost per plug is very low and considering the long service which such a plug will give, the final cost is less than for conventional methods of plugging.

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MICROVISCOMETER

USUAL methods for viscosity determination require specimens of considerable volume. In dealing with small samples, *e.g.*, biological fluids, the simple device described permits rapid, accurate determinations on volumes of less than 0.1 ml.

Measurements are made in terms of resistance to the torque developed by a small synchronous, self-starting

[4] W. H. Seegers and D. A. McGinty, *Jour. Biol. Chem.*, 146: 511, 1942.

[5] W. H. Seegers, *Jour. Biol. Chem.*, 136: 103, 1940.

[1] Wilkins-Anderson Company, 111 North Canal Street, Chicago, Illinois.

[6] W. H. Seegers and H. P. Smith, *Am. Jour. Physiol.*, 137: 348, 1942.

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

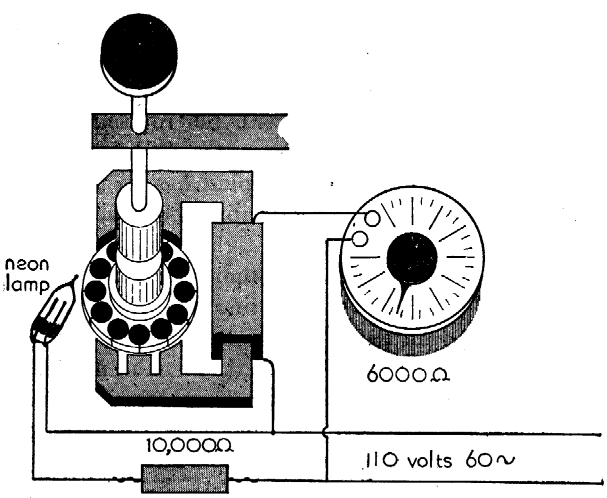

FIG. 1

(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.

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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.

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[1] Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

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