were made by T. Lavine. To Miss Hall belonged the care, injecting and measuring of the mice. Sections were made by Misses Chatalbash and Kiesel. Analysis of the results was the task of F. S. Hammett. Merck and Company generously supplied needed chemicals, and much support was given by The International Cancer Foundation.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN EASILY CONSTRUCTED RELAY

BLACK[1] has described a relay which possesses the features of being both inexpensive and efficient when using power up to 1.5 KW. A worker in this university has constructed a relay, employing the same principle Black used in his relay but has modified the construction.

When the current was broken by the thermoregulator in Black's relay, a plunger dropped by gravity on the column of mercury in one side of the glass tube and pushed the mercury up on the other side so that it made contact with a platinum lead. To construct the glass tube described by Black, considerable knowledge of glass blowing must be at the command of the technician.

The relay described below is much simpler to construct and any person with an elementary knowledge of glass blowing can build one. We have incorporated an entirely different principle in our relay in that the plunger *C* (see diagram), when dropped displaces mercury instead of pushing it up the other leg of the glass tube. By displacing mercury, the level is raised in a straight piece of pyrex tubing and electrical contact is made. We have retained in our relay, however, Black's magnetic coil method of raising the displacing plunger.

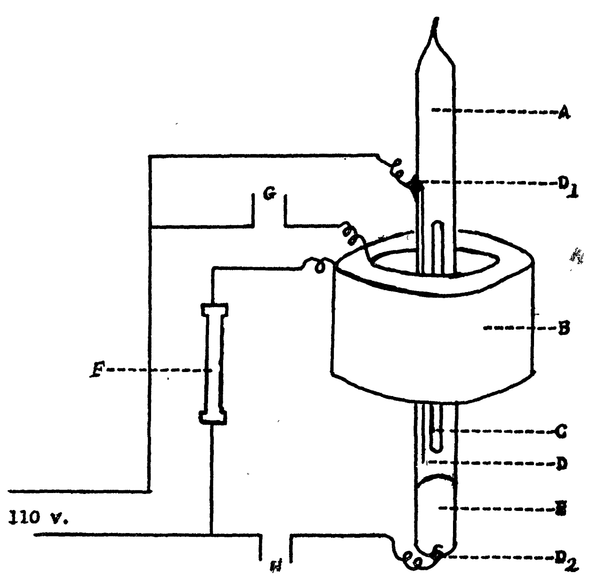

FIG. 1

A —Pyrex tube
B —Secondary of Ford coil
C —2 mm × 4 cm iron nail
D —Platinum wire, 22 ga.
D_1—Platinum contact
D_2—Platinum contact
E —Mercury
F —1000 ohm resistor
G —Leads to regulator
H —Leads to heating unit

[1] Peter T. Black, SCIENCE, 79: 322, 1934.

The pyrex tube *A* (see diagram) has a 7 mm bore, and is 10–12 cm long. At D_1 and D_2, 22 gauge platinum wire is sealed directly into the glass. Wire *D* is long enough to reach within 7–8 mm of the mercury *E* when the plunger *C* is raised. The plunger is a number 6 finishing nail and is inserted with the head down. When the plunger is lowered into the mercury, the level of the mercury is raised and contact with wire *D* is made. *B* is a secondary coil from a Ford model T induction coil. When operated from a 110 v. A.C. or D.C. line with a 1,000 ohm resistor *F*, there are 35–40 milliamperes of current flowing through the thermoregulator. If resistance of 1,500 ohms is used the current can be reduced to 30 milliamperes. (A resistor of the type used in radio work is satisfactory.) This is sufficient current to operate the magnetic coil.

When contact is made in the thermoregulator at *G*, current flows through the coil *B* and creates a magnetic field which lifts the plunger out of the mercury, and contact between the point *D* and the mercury is broken. Conversely, when the contact is broken in the thermoregulator, the magnetic field disappears and the plunger drops by gravity into the mercury, and contact between point *D* and the mercury is made, thereby completing the heater circuit. It is important that the wire *D* does not touch the side wall of the glass tube as the lower portion of the tube becomes plated with mercury and contact between *D* and *E* is made through the plating. Instead of placing points in an atmosphere of hydrogen as described by Black to prevent oxidation, we obtained, with 550 watts, very satisfactory results by merely evacuating the tube before sealing. By protecting contact points D_1 and D_2 with a condenser of suitable capacity for the current required, sparking is eliminated.

This relay was used daily for a period of 4 months at the end of which time no noticeable signs of deterioration were observed. This can be adapted for use wherever a sensitive mercury relay is required. The total cost of this relay is less than two dollars.

We wish to thank Dr. B. R. Stephenson of the Buffalo City Hospital for his valuable suggestions and comments.

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HOLLOW-GROUND SLIDES FOR WHOLE MOUNTS MADE WITH THE DENTAL ENGINE

THE customary method of making slide mounts of whole specimens requires supporting the cover glass to prevent crushing the specimen, and results at best in a thick preparation which hardens slowly and is easily damaged. Commercial hollow-ground slides are satisfactory in some cases, but their concavities are too large for many specimens and their costliness puts them out of the question for routine use. A simple solution of the difficulty is afforded by the use of a motor-driven flexible shaft and grinding tools, such as the well-known dental engine. Slides with depressions to fit any specimen may be easily and rapidly made as required. These mounts permit the cover glass to rest directly upon the surface of the slide, require a minimum of mounting medium and facilitate the orientation of the specimen. Where a number of specimens are to be mounted under one cover glass, as for example the successive stages of an insect, their arrangement in any desired position is made possible by grinding a depression for each specimen.

The essential apparatus for turning out these laboratory-made slides is an electric motor (that of an electric fan will serve), a flexible shaft provided with a chuck or "handpiece" into which may be fitted any of the dentist's arsenal of burrs, drills and abrasive devices. Of these the most generally satisfactory for grinding glass are the abrasive wheels, which consist of small disks of carborundum or other material mounted on a mandrel, and which are available in a variety of diameters, thicknesses and degrees of abrasiveness. Abrasive "points," *i.e.*, small carborundum spheres, cones and cylinders, may also be used, but are much less rapid than the abrasive wheels on account of their small diameter and hence low velocity of grinding surface.

The process of grinding a depression consists merely of placing a drop of water on the slide and applying the abrasive instrument. Very little spattering occurs. The most rapidly ground depression is the slot made by the edge of the carborundum wheel. A cavity of this shape is desirable for elongate specimens. By moving the wheel while grinding, a depression of almost any size and shape may be made, and rotating the slide on a turn-table produces a circular concavity similar to that of the ordinary hollow-ground slide. Where any considerable quantity of glass is to be removed the wheel is the most efficient instrument, though the small carborundum spheres which grind circular depressions with relatively steep sides give the neatest and most uniform results. An inspection of the grinding devices at a dental supply house or in a dentist's office will doubtless suggest at once the instrument appropriate for a given purpose.

These slides may be ground with a speed which permits their routine use for large series of class slides. For example, a slot-like depression suitable for a mature flea larva may be ground in ten to fifteen seconds, one for a mosquito larva in about thirty seconds, while the broader and deeper depression necessary to accommodate a bedbug may be ground in about a minute. The ground surface may be polished in a little more than the original grinding time, though polishing is usually unnecessary since the ground surface is nearly invisible when covered with the mounting medium.

Once a flexible shaft and its accessories are installed in the laboratory it will be found to serve any number of useful purposes besides grinding slides. Among these may be mentioned etching glass or metal, making the opening in egg-shells for the purpose of inoculating chick embryos, and grinding and shaping dissecting needles and other instruments under the dissecting binocular.

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