

seconds. This is the rate of speed of the slow axis of the kymograph of Burdon-Sanderson which I have in use and of others. The apparatus can be used with equal facility in experiments illustrating rapidity of nervous influence. Suppose we wish the recording surface to travel with the same rapidity as the swiftest axis of Sanderson's kymograph, that is, forty revolutions in a minute, equal to twenty inches in a second and a half. First, approximate the plate A A to the stand B, so that it will be three or four inches from the end of the iron bar along which it travels. Now place beneath the weight W a box containing a few layers of cotton wool. Have it elevated so as to permit the weight to rest on the wool. Push recording plate to its proper position for commencing tracing. Place on shaft of engine a wheel ten inches in circumference. Increase the speed to 120 revolutions per minute. Let the wheel R be one-half former size, and place cord *b* around larger circumference of iron cylinder, which is three times the size of smaller one. You have then increase of speed represented by $3\frac{1}{2} \times 2 \times 2 \times 3 =$ forty times as fast as previously; or, simpler still, let the fly-wheel, as in my engine, have three different speed grooves—one, thirty inches in circumference. Connect this with the wheel R; do not remove the cord *b* from the smaller circumference of cylinder L, but increase speed of engine to 240 per minute, that is to say, four times speed first mentioned. You then have 10×4 , equal forty times previous speed. It can be arranged a number of other ways that will readily suggest themselves to the experimenter when at work. Numbers of revolutions of wheel over 120 or so, which cannot be readily counted with watch, can be ascertained and fixed at any number with the greatest ease by use of the speed indicator, a small instrument used by machinists.

The recording surface can readily be placed in position any number of times without interfering with the motion of the wheel R, simply by depressing the handle K and thus removing the clutch from the cylinder L, and then with the hand pushing the plate back towards the pulley *g*; while doing so, slightly tilt the stand holding recording pens so that they do not write on plate.

To take tracings, the apparatus must be placed between the window and the observers,

when the tracings come out boldly through the white glass. Or, as the duties of private practice compel me to do most of my laboratory work at night time, it can be illuminated by gas, as I have it; three jets fixed on a brass tube which is connected by rubber with the gas in my laboratory, and so attached to the frame A A that it can readily be dismantled and connected with another similar recording plate.

The manometer is clamped to a T shaped brass rod, one end of which fits into the opening N of the support M (Plate I., Fig. 3), which can be clamped at any height to an ordinary retort stand. Repeated tracings can be taken by altering the height of clamp M and pushing back plate A A, tilting slightly the stand holding recording pens while doing so, as previously stated.

Other recording pens, such as electro-magnetic marking key, Marey's tambour, &c., can readily be attached to supports similar to M, having a small rod fixed permanently in N.

The cord *a a*, passing through the cam H, although here represented above the table, would be better placed out of the way running beneath the table, the lever Z being prolonged so as to project an inch or so beyond its under surface; the cord made to pass over pulley wheels through an opening in the table close to F.

As most of the more important experiments are performed while the animal is under the influence of curare, artificial respiration apparatus is necessary, and for that purpose nothing is simpler or easier than Grehan's apparatus, arranged as figured in "*Cyon's Methodik der Physiologischen Experimente und Vivisectionen*," Plate IX., Figure 1, which can be worked easily by a small water engine such as I have in use. Both water engine and respiration apparatus can be arranged in any convenient place out of the way. In my laboratory the engine is placed on a shelf over the sink, and power transmitted overhead by small shafting and belting to Grehan's apparatus, which is on an elevated shelf, air being conveyed from it by rubber tubing. Power is also transmitted over head to wheel R of kymograph.

The engine and respiration apparatus could with equal facility be arranged on a small stand beneath the operating table, or, as I had it at a recent meeting of the Medico-Chirurgical Society