

without the interference of changes of the circulation or of the volume of the heart.

4019

A Device for Determining Refractory Period of the Mammalian Heart During Normal Sinus Rhythm.

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(Introduced by Edward P. Carter.)

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In previous determinations of the refractory period of the mammalian heart an artificial rhythm has been established by means of a series of break induction shocks at a rate necessarily more rapid than that of the normal sinus rhythm. This rhythm has then been interrupted by break shocks timed by some mechanical device to fall at various points in diastole. Such measurements have, therefore, yielded the refractory period of an artificially induced excitation.

The authors have devised an apparatus utilizing the action current after amplification with which it is possible to interrupt the *sinus* rhythm at any interval following a normal excitation. The amplifier is designed to be connected to the terminals of the galvanometer string without affecting the performance of the latter. The electric impulse to be amplified is on the order of 1 millivolt for 1/50 second, and the current supplied to the amplifier must be negligible as compared with about 1 microampere, the galvanometer current. A 5-stage, resistance-coupled amplifier is used, with 4 UX-240 tubes and 1 UX-112A. The string terminals are connected directly in the first grid circuit. The 4 coupling condensers are large, so as to give the entire amplifier a discharging time constant of 1/6 second. The first 2 plate circuits have condensers in parallel, so as to obtain a charging time constant of 1/50 second. In this way, the amplifier is rendered free from impulses of much longer or shorter duration. A 10,000-ohm magnet carries the plate current of the last tube, normally less than 1/2 milliampere because of a large negative grid voltage. An impulse of 1/2 millivolt for 1/50 second, applied to the amplifier, is amplified to over 20 volts for 1/10 second at the magnet terminals, about 200,000 times the applied impulse.

The only adjustments in operating the amplifier are: a parallel resistance to adjust the applied impulse to about 1 millivolt, and a reversing switch to secure the correct polarity. A switch in parallel with the magnet, when closed, allows any adjustments while observing the deflections of a milliammeter in series—without actuating the magnet. On the second impulse after opening this switch, the magnet, through an escapement, releases a falling arm which, in turn, opens a trip-switch, breaking the primary circuit of an induction coil. Operation on the second impulse eliminates errors which might otherwise enter if the switch is opened during the first impulse. The trip-switch is opened after a delay of $1/20$ to $1/2$ second, depending upon the position of adjustable weights on the falling arm.

4020

Effects of Chicory on the Isolated Intestine.

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Although chicory is widely used as a beverage ingredient, very little information as to its action is available in the literature. The popular belief, perhaps founded on statements by those commercially interested, that it serves as a mild laxative, suggested testing its effects on isolated intestine. It has been shown that coffee infusions increase the activity of isolated intestinal segments¹ to a greater extent than could be explained by their caffeine content.² Kymographic tracings were made from segments of rabbit duodenum in the usual fashion. The preparation tested was a fresh 10% infusion of ground and roasted chicory, made in Tyrode's solution. In numerous experiments we have observed no indication of stimulation of either tone or amplitude of contraction, but with concentrations greater than would be present in the gastro-intestinal tract of individuals drinking chicory-coffee infusions there was uniformly a more or less marked depressant effect.

¹ Bickel, A., and von Eweyk, C., *Z. f. d. Ges. Exp. Med.*, 1927, liv, 75.

² Plant, O. H., and Reynolds, C., *J. Pharm. and Exp. Ther.*, 1922, xix, 256.