of America. The Lagoa Santa type is admittedly an ancient one, and it seems much more probable that it represents a very early migration into America of a non-Mongoloid stock, and probably before the Mongoloids arrived. Again, the dolicho-mesaticephals of the woodlands and plains of North America seem to indicate a different racial movement from that of the western and southern American brachycephals. He also adheres without comment to the popular view that all the culture of Central America and of Peru was rigidly indigenous; but this is not the place to discuss this thorny subject. "British Colombia" is evidently a printer's error which has crept in on p. 10.

After this little grumble I can return to the book itself. A map on page 379 gives the distribution of the tribes described and one sees at a glance how representative they are. An appendix gives a brief account of the distribution of each tribe, and very useful bibliographies. By Mr. C. Grant Lafarge (whose name strangely enough appears only on the title-page, the Editor and Introducer might profitably have alluded to him or his plates), the book is embellished with six colored plates and 19 uncolored, which are explained by the "Illustrator's notes" at the end of the volume. They are mostly of a decorative character, but the artist has evidently been at pains to be accurate in detail and color.

Writing as a teacher of, alas! now long experience, I have no hesitation in stating that this should be the first book to be placed in the hands of a beginner in the study of North and Central American ethnology. When he has read this, he will be able to read textbooks and original treatises with much more profit and comprehension, as he will be equipped with a sympathetic human background which will illumine the more systematic works which he will have to study. There is no better survey of Indian custom and belief for interesting the general reader in the vanished life of the earlier inhabitants of his country. It is to be hoped that the large size and expense of the book will not seriously diminish its sale, for it certainly deserves a wide circulation.

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# SPECIAL ARTICLES

## AN IMPROVEMENT IN MUSCLE CONTRACTION APPARATUS

ONE of the difficulties encountered in recording a series of muscle contractions is due to the fact that the relaxation phases very seldom happen to stop on the base line; hence the curves are not exactly comparable and it is difficult to make comparisons. It is thus often desirable to be able to adjust the writing point of a lever to the base line on a revolving kymograph and at the same time not otherwise interfere with the experiment. The apparatus described in this paper enables one to do this easily, quickly and accurately. It has been used with satisfactory results on smooth muscles such as the esophagus, stomach, intestine and oviduct of the frog; regions of the esophagus and stomach of the turtle, and the circular muscles of the body wall and intestinal tract of the earthworm.

The principle involved is that of raising or lowering the fulcrum of the writing lever by means of a micrometer screw. This adjustment is of special advantage when stimuli are being made at regular intervals of time and when the stretch of the muscle is considerable or the relaxation phase is slow or long drawn out. By use of this apparatus one is able to make these corrections at will by raising or lowering the writing point to the base line while the kymograph is running.

The main support of the apparatus is the iron bar indicated by letter *A* in figure 1, which may be clamped on to a ring stand. At right angles to *A* are two parallel bars, *B* and *R*. The former and shorter one is rigid and firmly

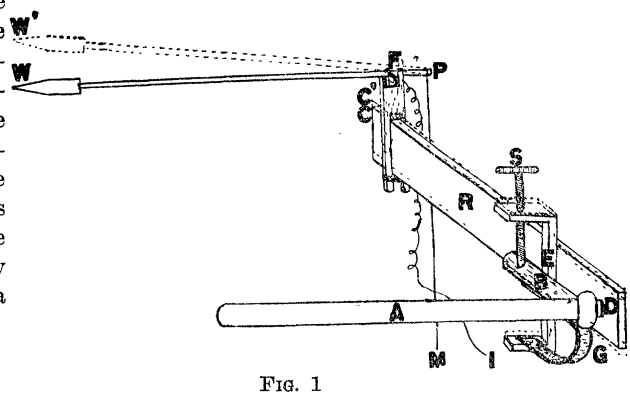


FIG. 1

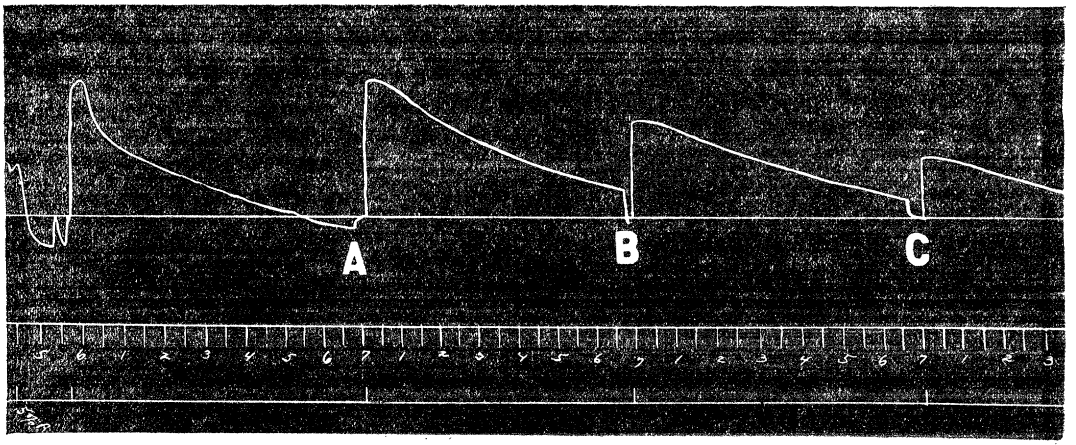


FIG. 2

attached to *A* near its distal end. The latter fits on the distal end of the bar *A* and turns on it as on an axis at *D*. Firmly attached to *R* about one fourth of its length from *D* is a rigid piece *E*, both ends of which are bent at right angles to its main axis. Through its upper end passes a micrometer screw *S*, which is so arranged that when turned clockwise it strikes the bar *B* and thus raises the pieces *E* and *R*. The point *C* is raised to *C'* and hence the fulcrum *F* is also raised. To the lower end of *E* is firmly attached the lower end of a horseshoe shaped steel spring *G*. The upper end of the spring presses against the lower side of the rigid bar *B*. When the screw is turned clockwise, *E* and hence *R* and *F* are raised and the two ends of the spring are forced closer together. When the screw is turned counter clockwise the spring forces the lower end of *E* down, hence *R* and *F* are lowered.

Standardized loops of the muscle to be stimulated were mounted as follows: Two equilateral triangles of about one centimeter on each side of fine copper wire, about No. 24, were made in such a way as to form a sort of safety pin, with a hook-like clasp at one end. By running the free ends of each triangle through the loop of tissue and clasping the triangles, a desirable support for the tissue was made. One of these triangles was then attached at *M* to a copper wire extending to the short arm of the lever at *P*. The other triangle was looped over a small hook extending through the stopper in the bottom of the glass chamber in which the muscle was placed. These supports also served as contact terminals for the electric current, while the short arm of the lever *F P* and the copper wire extending from *F* to *I* completed the circuit.

Figure 2 is a series of curves of a muscle stimulated at regular intervals of seven minutes (by an electrical current of constant strength and duration) showing how the writing point may be adjusted either up or down to the base line, without interfering in any other way with the experiment. In this particular series the muscle consisted of ten segments of the body wall of an earthworm, taken between the sixtieth and seventieth segments back of the clitellum and immediately mounted as described above and immersed in normal sodium chloride solution. Eight minutes after mounting, the normal sodium chloride was removed and 0.5 per cent. ethyl alcohol added; after 1¼ minutes the electrical stimulus was applied and likewise after three successive intervals of seven minutes each. Adjustments of the writing point were made at *A, B* and *C*, immediately preceding the limit of the seven minute time interval between the stimuli. These corrections may be made either up or down with equal ease. By this means the curves are more accurately standardized and more nearly comparable from the fact that each starts from the base line.

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