112 plates, photographic in large part, leaves little to be desired. One may study these reproductions with a lens or reading glass with great profit. The descriptions of the plates are printed opposite the pictures, and they are given in full in each case—a praiseworthy feature.

Neurologists, especially those dealing with the brain and cranial nerves of fishes, will profit greatly by examining the author's discussion of the brain and adnexa of *Cephalaspis*. Stensiö tells us that he took two months to dissect the endocranial parts shown on plates 49 and 50. He finds the brain to be that of a cyclostome and on this basis as well as others, he says that the creatures we call Ostracoderms are cyclostomes. The differentiation of marginal electric fields will be a surprise, but while he has not defined the electroplaxes, yet it seems reasonable to agree that this neuro-muscular specialization may have taken place as early as the Silurian (Downtonian).

It has taken a long time to extricate the Ostracoderms from the eurypterids, from the arachnoids, from the annelids, but we feel that Stensiö has opened the way for us to believe, with him, that these early Paleozoic fishes are cyclostomes. The importance of this is very great, and if generally accepted will lead to still greater correlations. Our author says:

> It is clear now that the Ostracodermi, though very lowly organized, are true craniate vertebrates which have nothing whatever to do either with the Arthropoda or with the Annelida.
>
> The investigations carried out in this work have thus thrown light not only on the organization of the *Cephalaspidae*, but also on the Ostracodermi as a whole: and we have even been able to establish that the Ostracoderms still persist in the recent *Petromyzontia* and *Myxinoidea*, though they play a much less important part than during the early palaeozoic time.

Those who think the field of vertebrate paleontology is largely exhausted will receive a new stimulus in examining this work of Stensiö. It stirs our ambition to do further work to advance our knowledge of the vertebrates of ancient times. No more worthy scientific piece of work has appeared for decades and Stensiö is to be congratulated on the appearance of this, the most monumental study he has yet made.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A UNIVERSAL MUSCLE LEVER

The problem of providing a universal muscle lever for the use of students taking their first course in experimental physiology led to the construction of the apparatus here described. The requirements to be filled are not met, to the writer's knowledge, by any instrument on the market—a lever with well insulated "head," so arranged as to allow free adjustment in the horizontal plane, a strong after-loading screw, and, above all, an instrument constructed so sturdily as to withstand rough usage.

A number of attempts were made to modify other muscle levers to suit our requirements but without satisfactory results. Finally, with the assistance of a pattern-maker, a model somewhat like the one sketched in Figure 2 was constructed from soft pine and a few brass castings made. When finished and assembled, the instruments were found to be quite satsifactory.

This instrument consists of a handle, a lever holder or head, and a lever. The handle is made from a 6-inch length of 3/8 inch round bakelite rod which is slipped into the tubular end of a switchboard lug having an opening of that diameter. A hole is then drilled through the lug and the bakelite rod and the rod riveted into place. The flattened portion of the lug is centered and drilled to allow the passage of a number six machine screw.

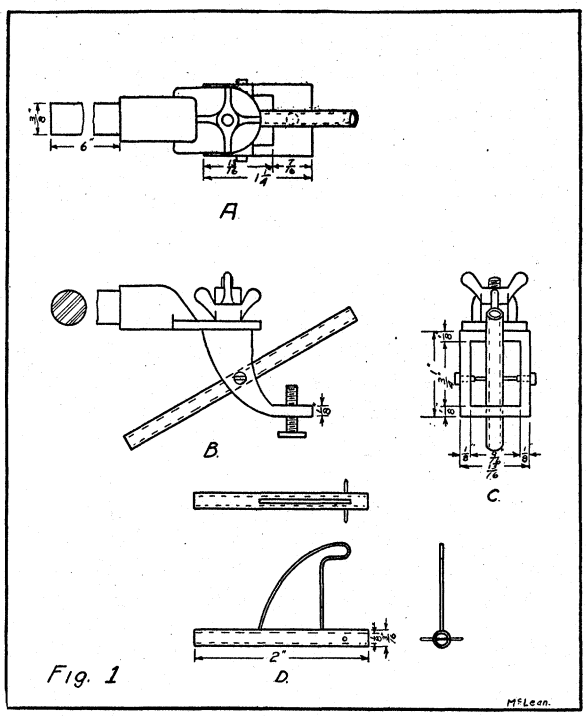

Fig. 1

The holder, the distinctive part of the apparatus, is made according to the dimensions given in Figure 1, A, B, C, showing top, side, and end views, respectively. This holder or head consists of a table, with dimensions as shown in the figure, from two parallel sides of which project downward and parallel to each other, two crescent shaped arms. Across the distal end of these arms is a bar, parallel to the table and 1/8 inch thick in order to support a 6/32 knurled head, brass, machine screw, the after-loading screw. Through the middle portion of the parallel crescents are drilled holes to receive 2-56 cup-pointed machine screws. These cups receive the pointed ends of the lever axle. The lever is made from a 3-inch length of 5/32 inch, outside diameter, brass tubing, which is drilled transversely at its middle point and a small brad soldered in place. Both ends of the brad are then sharpened to make an axle of sufficient length to fit the adjustment limits of the cup-pointed screws. The writing lever is made from a six to eight-inch length of split bamboo rod, about one eighth inch in diameter, and tipped with a small piece of thin brass shim.

The holder is firmly attached to the handle by means of a 6/32 brass machine screw which passes through the center of the table of the holder and whose head is countersunk in and soldered to the lower surface of the table. When assembled, this screw is passed through the hole in the handle and two wing nuts are placed thereon. It has been found that two wing nuts may thus be nested if the overlapping margins of the wings are slightly filed. These wing nuts then serve as check nuts and also as a means of attachment for a copper wire from one pole of the secondary coil of the inductorium. This method of attachment of the head to the handle allows swinging of the holder in a complete circle and greatly facilitates the adjustment of the writing lever to the kymograph drum.

If one desires to perfuse the circulation of the frog with drugs or sugar solutions and secure a record of the contractile powers of the muscle, the kick-up lever, Figure 1, D, shown in three views may be placed in the holder, the frog pinned in dorsal position for perfusion, and the graph made upon a slowly revolving drum.

Nickel- or preferably chromium-plating is useful to protect the brass from the action of sodium chloride and greatly improves the appearance of the apparatus.

Casting of the holders: Reference has been made to the casting of these holders or heads. In Figure 2, A and B, are shown the top and side views, respectively, of the pattern used for casting three holders. It is much more convenient to cast eight or ten holders at a time and partially finish them upon a shaper or milling machine than to cast a lesser number. After partially finishing the castings, they are sawed apart with a machine hack-saw and finished by hand. In all probability jigs could be made which would facilitate this work; but for the number of holders finished, the trouble involved in making jigs was not considered necessary.

In September, 1926, about eighteen of these muscle

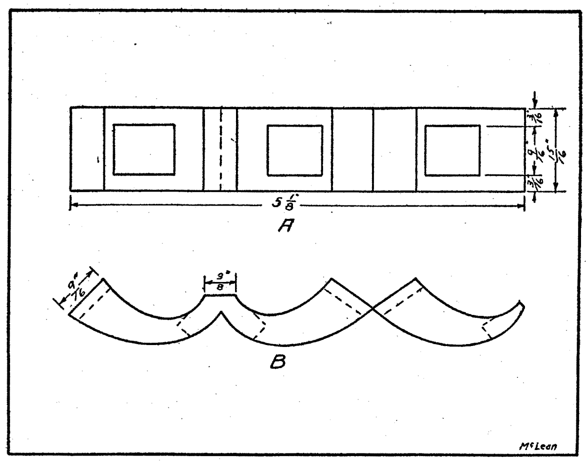

Fig. 2

levers were made and since that time, they have been used by over 600 students working in groups. These levers have been used for recording a simple muscle twitch, for demonstrating the maximum lifting power of a muscle, as well as numerous other experiments, and have given no trouble whatever.

Although this lever is as yet a relatively crude product, finished by hand, it has the following advantages:

1. An insulating handle or support rod;
2. An adjustable head with after-loading screw;
3. It may be used to record the responses of muscles reacting in either the vertical or horizontal plane;
4. It is sufficiently rugged that it will withstand the rough usage of college sophomores who are more accustomed to the manipulation of five-year-old Fords than to the delicate equipment of a physiological laboratory.

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METHOD FOR GROWING SMALL-SEEDED PLANTS UNDER STERILE CONDITIONS

The accompanying figure diagrammatically shows the principal details of a method now being used at the Massachusetts Agricultural Experiment Station for growing tobacco plants under sterile conditions.

In the middle opening of a 3-neck Wolff bottle is placed a plug (H) of absorbent cotton which serves both as a substratum for the plantlet and a wick for the nutrient solution (I). Before seeding, the entire apparatus as shown, with the exception of the layer of nutrient agar (G) and the celluloid cover (D), is set up and sterilized under steam pressure. Then, under aseptic conditions, the thin layer of nutrient