at low cost and is also hermetically sealed against dust and moisture. Being of the plug-in type, it can be easily replaced if necessary. In an early model, a variable resistor ("volume control") was used in place of R_1–R_2, but this was found unnecessary, since the present unit will operate if any resistance between 0 and 20 megohms connects the electrodes. The 0.1 megohm resistor, R_3, is introduced to lower the available current to a safe level in case the electrodes are contacted personally. The parts are mounted in a 2″ × 4″ × 4″ case. The unit will operate up to 15 cycles/sec without skipping, but we were only able to make about 7 drops/sec. This limit of 420 drops/min is in good agreement with the elegant photoelectric device of Josten (*3*). Three of these units have been in use during the past two years with no adjustments or repairs being necessary. The cost, exclusive of labor, is less than one-fourth that of commercial units.

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Electrically Heated Wax Pencil for Sealing Inoculated Eggs

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An electrically heated wax pencil devised in our laboratory for sealing inoculated eggs has been found to be an extremely convenient and time-saving device, especially when a large number of eggs is handled. The apparatus works directly on 110 AC or DC, and basically consists of an element wound around a copper tube with a suitable tip and release valve. The construction of the apparatus is very simple, and the materials required are readily available.

With the following on hand the apparatus could be easily constructed in any laboratory: (1) Spencer immersion oil dropper (Catalogue #470, Spencer Lens Company); (2) brass or copper tube, with an internal diameter of 3/16″ and 4″ or 5″ in length; (3) 20′ of nichrome wire, gage 32, with a resistance of 10 ohms/ft; (4) asbestos paper; (5) a piece of steel or brass rod, 1/16″ in diameter and 7″ long.

The cap of the immersion oil dropper is removed, and one end of the copper tube is fitted in its place. The joint so formed is soldered to make it leakproof. Next, one layer of asbestos paper, which has been moistened to prevent it from cracking, is wrapped tightly over the tube and part of the dropper (a, Fig. 1), leaving approximately 1″ of the tip of the dropper and ½″ or so of the free end of the tube exposed. While the asbestos paper is still wet, approximately 20′ of nichrome wire is closely wound around the insulated portion of the apparatus, starting 1″ from the upper end of the tube (b), leaving 1″ of the wire free, and winding down to the end of the insulation (c), where 4″ or 5″ is left free. In winding the element, care must be taken not to overlap the loops of the wire.

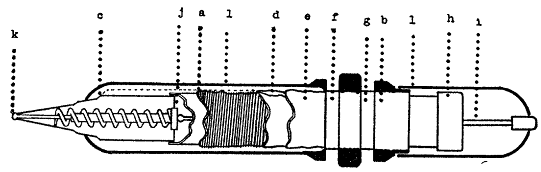

Fig. 1

The element is then insulated with another layer of wet asbestos paper (d), and the free end of the wire (c) is brought over it to the upper part of the apparatus. The element is further insulated with two or three layers of asbestos (e), and the free ends of the wire (b and c) are brought through the insulation.

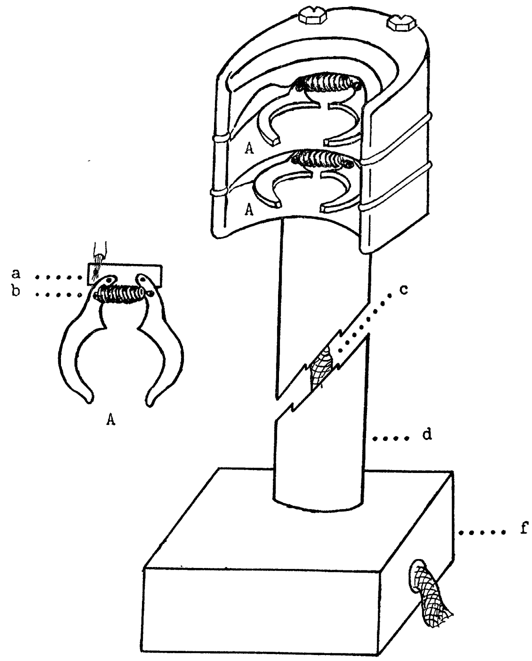

Fig. 2

The free end of the wire (c) is soldered to a narrow (3/16″ wide) copper strip, and the latter is tightly wound around the insulation, having the soldered wire on the inside, and soldered to form a band (f). The second free end of the wire is soldered to another similar copper strip, and in the same manner the second contact band (g) is made. The bands are spaced about ½″ apart.

The apparatus is then embedded in acrylic (l) or wrapped into one or two thin layers of cork, leaving the contact bands exposed.

The free end of the copper tube is covered with a tightly fitting cap (h) with a central hole. The cap can be made easily from a piece of copper, with the aid of a soldering iron. A plunger (i) approximately $\frac{1}{16}''$ in diameter, which is inserted through the cap hole, should be of such a length that one end of it rests on the release valve (j) and the other protrudes above the cap (h).

For simplicity of construction, an electric cord could be attached permanently to the bands (f and g), the apparatus being plugged into an electric outlet as needed. We found a permanently attached cord inconvenient, however, because of the interference of the cord during operation.

The apparatus in use in our laboratory plugs into a stand made of acrylic (see Fig. 2) in which are embedded two pairs of contact brackets (A) made of thick brass plate and shaped to fit snugly around the bands (f and g, Fig. 1). Each bracket consists of two halves. One end of each half is attached on a pivot to a small plate (a) which is stationary, and both halves are connected by a small spring (b) a short distance from the plate. The spring ensures a better contact between the brackets and the bands and also keeps the apparatus in place when it is plugged in. The bracket plates are connected to an electric cord. The cord (c) passes through a metal tube (d), which serves as the stem of the stand, and through the back of the base (f) and is connected to an electric plug. The base is made of plaster of Paris.

The brackets could be embedded between layers of Bakelite or some other insulating material, instead of acrylic.

The pencil is filled with melted paraffin through the free end of the copper tube after removing the cap (h). The capacity of the pencil of these dimensions is about 20 cc.

Before using, the pencil is plugged in for 2 or 3 min, which time is sufficient to melt the paraffin inside. Then, by pressing with the finger on the plunger, a drop is released through the opening (k, Fig. 1). The paraffin remains liquid for approximately 10 min, thus enabling an operator to seal a considerable number of inoculated eggs with a single heating.

Book Reviews

Comparative physiology. Bradley T. Scheer. New York: John Wiley; London: Chapman & Hall, 1948. Pp. x + 563. (Illustrated.) $6.00.

While this useful textbook may be considered as a variation of the general physiology type, it was written from a somewhat different approach. The title emphasizes the fact that the objective is comparative physiology, and the treatment is more on a phylogenetic basis. In order to fulfill the difficult task of distinguishing analogy of function from homology of function, the author considered it necessary "to compare functions in organisms which are reasonably closely related." The chapters in the book, therefore, are divided not according to organ or functional systems but according to phyla. In the treatment of each major phylum as a unit, an attempt is made to trace evolution of function in that unit. In each chapter there is also a concluding summary which discusses the relations of the phylum considered with other phyla. It may be added that the vertebrates receive a good third of the total space devoted to all the major phyla.

Since the comparative method is emphasized throughout the book, the author utilizes the first chapter (56 pp.) for a general statement. This should be particularly helpful to the student. In this chapter are summarized the general physiological processes common to most animals. A good portion of the chapter is devoted to metabolism and nutrition, particularly carbohydrate metabolism. The succeeding chapters are "concerned with the deviations from the picture—and with the elaboration of new processes to meet particular circumstances."

A good deal of the material and fairly extensive references have been brought up to date. An increase in the number of illustrations and an author index would add to the usefulness of the book to the student. In addition to a subject index there is one of species mentioned in the text and an appendix of classification of animals.

This is not a handbook of comparative physiology but a textbook of moderate size. The objective and method of this type of comparative physiology, as the author states, are analogous to the fundamental methods of comparative anatomy. The book should thus be useful for students in zoology and general physiology.

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Astronomy: a textbook for colleges. William Lee Kennon. Boston: Ginn, 1948. Pp. vii + 737. (Illustrated.) $5.50.

With the appearance of this volume, another member has been added to the group of elementary college astronomy textbooks. The author has been professor of physics and astronomy at the University of Mississippi since 1911, and this is the outgrowth of his long teaching experience. The book is characterized mainly by the simple and explicit style in which it is written. It is also extensively illustrated with pictures, astronomical photographs, and drawings. The author emphasizes that he has tried to "preserve the sequence of observation, application, and interpretation." This produces a somewhat disjointed result, because the same subject matter is treated in