SCIENTIFIC APPARATUS AND LABORATORY METHODS

A ZIPPER TUBE FOR HOLDING SMALL LIVE ANIMALS

THE development of this apparatus resulted from an effort to find a satisfactory method of holding and quieting ground squirrels while marking and measuring their incisor teeth. Such work has sometimes been done with the use of an anesthetic, but it was thought preferable to avoid this factor since it might affect the results. After some preliminary experimentation, the senior author sketched out the following device, which was made by the junior author, and it has been used with much success in handling and weighing both ground squirrels and rats.

The cone-shaped or projectile-shaped tube of strong soft cloth (Fig. 1) should be at least twice the length,

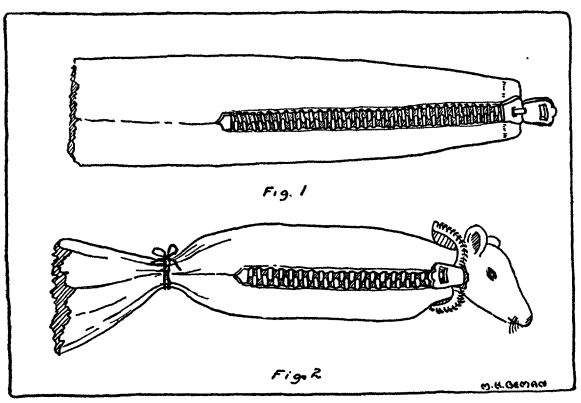

FIG. 1. The closed zipper tube somewhat shortened, with the zipper lock open at top.

FIG. 2. Animal in position in the tube ready for experiment. The zipper lock is closed.

and a third larger in diameter than the largest animal it is to hold. The basal end of the tube is left open and may be kept permanently open by reenforcing it with a ring or a hoop of the necessary size, sewed into a hem around the base. The basal third of the tube is fastened together along the side seam, and a zipper fastener with a patent lock completes the closure of the tube wall to the apex.

The animal can be caught and placed in the closed zipper tube or, by holding the open basal end of the device over the opening of the nest box, the animal may be driven directly into it. The head should be at the apex of the tube, and a reversal of this position may be prevented by tying a string around the tube directly behind the animal (Fig. 2).

To expose the head, the zipper is unlocked, pulled down as far as desired and locked. The apex of the tube wall is then folded back around the neck of the animal like a collar, thus, securely holding the individual and preventing scratching and struggling. One operator can hold the animal while the other proceeds with the marking and measuring of the teeth.

The weekly weighing of the animal is very easily and quickly done while the animal is in the tube. It can be laid on a common balance, where it remains motionless until weighed.

By variations in the kinds of cloth used, the shape and size of the tube, and other modifications, it is possible to adapt this simple device to several uses. Although we have not yet attempted to use the idea for larger animals we believe that it can be made to work satisfactorily.

It is quite advisable to use the more expensive type of zipper, for it has a locking structure that is quite useful. The zippers are attached to a heavy cloth tape and by this means they are easily sewed to the cloth of the tube.

The authors wish to express to the artist, Miss Mary K. Beman, their appreciation and thanks for the very excellent illustration of the device.

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A METHOD FOR IMBEDDING PLANT TISSUES WITHOUT DEHYDRATION

EXPERIENCE has shown that many methods of dehydrating plant tissues make them so brittle that it is difficult to cut satisfactory microtome sections. Mademoiselle Larbaud and Professor Zirkle introduced an improvement when they showed that isobutyl alcohol can be used in place of absolute ethyl alcohol. Recently, Dr. L. Genevois, of the University of Bordeaux, directed my attention to the properties of methylal, $CH_2(OCH_3)_2$. Since methylal is soluble in water and lipoids, it is a good intermediate between water and oils.

The technique of passing plant tissues from the killing fluid to paraffin may be greatly simplified by the use of this solvent. The plant tissue should be washed in water, as usual, to remove the excess killing fluid. It should then be transferred through the following media into paraffin, holding it for an hour in each reagent.

(1) Methylal-water mixture 1: 1.

(2) Methylal.

(3) Methylal which has been dehydrated and neutralized by contact with anhydrous sodium carbonate.

(4) Methylal-paraffin oil mixture 1: 1.

(5) The tissues are warmed on a water bath and transferred to melted paraffin, which has a low melting point.

(6) Within an hour the plant tissues should be transferred to the grade of paraffin required for embedding.

The whole process may be carried out within three hours from the first transfer from water to methylal.

Experience has shown that the structures of the cell are remarkably well preserved. The finer details, such as mitochondria and cytoplasmic fibrillae, are not destroyed. Lignified tissues retain a soft, waxy texture and may be readily sectioned.

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AUTOMATIC FLOW-METER FOR DRIP SOLUTIONS IN PLANT NUTRITIONAL STUDIES

VARIOUS means have been utilized for providing a constant nutrient flow to plants growing in pot cultures. It has been realized that definite conclusions from such studies need to be based on several pots in each series. The drip-nutrient method, when used for several large series, necessitates a system which is simple in construction and requiring a minimum of time for refilling the nutrient reservoirs. Bearing these facts in mind, an apparatus embodying an apparently new principle of construction was devised where twelve eight-inch pot cultures were used in a single series. As a matter of fact, a larger number of pots may be used.

Fig. 1 illustrates the salient points of the system.

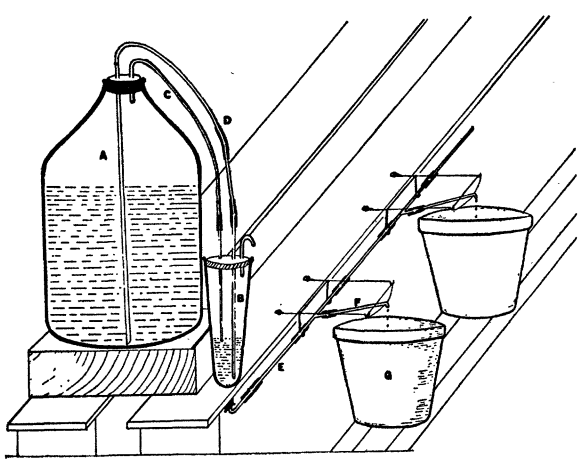

FIG. 1

The nutrient chamber (A) is a five-gallon bottle calibrated and wrapped in paper to exclude light. A narrow slit in the paper exposes the liter calibration marks. A siphon tube (D) of 12 mm bore is for delivery of the fluid into chamber B. The flow-meter (B) was constructed in order to provide a constant flow from chamber A regardless of the height of the liquid in it. Chamber B is a soil percolater of 300 cc capacity. It is provided with a 12 mm bore tube for connection with the siphon tube (D), a 4 mm bore tube for connection with the air line (C) and a small curved glass tube for the entrance of air. Experimentation showed that glass tubing of these sizes provide the most efficient operation. The air tube (C) may be of either glass or rubber tubing.

As a flow-meter, chamber B operates automatically to control the rate of flow from chamber A to the feed line (E). Explanation of the automatic action of the chamber is as follows: as the level of the liquid rises in chamber B, the flow ceases from A when the tip of the air tube (C) becomes submerged. The escape of the solution into the main feed line (E), also of 4 mm bore, permits air to enter chamber A through tube C and flow is resumed until again automatically stopped. The nutrient solution reaches the pots through capillary tube F. This tube is of 5 mm bore and is slightly bent at the tip, where it is suspended by a wire support.

The rate of drip into the pot (G) may be twice controlled, namely, by changing the elevation of the tip of tube F, and by raising or lowering the air tube (C) in the flow-meter (B). The latter controls the "head" of the fluid held in this chamber, thus directly regulating the pressure on the feed line (E). In this conjunction, as the nutrient requirements of the plants increase with growth, one may by simply raising the height of tube C in flow-meter B permit a faster drip into the cultures.

Two points of construction to be borne in mind are that the base of the flow-meter (B) should be at least four inches lower than that of chamber A, and all connections in the rubber stopper in A be airtight. A cork stopper may be used in chamber B.

This system in comparison with other drip-culture apparatus has the following advantages: no shifting of adjustments is encountered while refilling the nutrient supply chamber; it provides a uniform flow of the nutrient solution; it permits the use of double-deck benches, thus saving greenhouse space; it reduces the labor of maintenance to a minimum; it is easy to clean, and it is cheap in construction.

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