in diameter hung by means of two silk fibers in an F frame after the manner of Darwin. The frame is of brass mounted on a cast-iron platform with leveling screws. The mirror hangs in the frame as shown and its motion is traced on a photographic film, which is attached to a rotating drum in the usual manner.

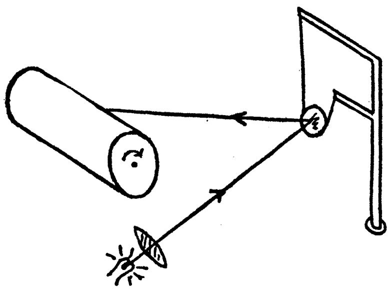

FIG. 1

This drum was made in the laboratory and is driven by a synchronous motor which was bought from one of the numerous radio-wrecking concerns.

The mirror on its support was mounted on a large brick column which was not in contact with the floor of the room. The estimated mass of this column is something like ten tons.

The apparatus has been used thus far in the study of earth tremors and disturbances of a minor nature. It detects with ease the footsteps of a person 100 yards from the building. It records the passing of a street car or an automobile half a mile away and it records (with what a physician says is fair accuracy) the heart beats of a person lying on the heavy column.

Although the apparatus is in a large empty room, remote from the walls, in a large building, it is in continual motion throughout the day. Records made when any part of the building is in use show that the ground under it is in a state of almost steady vibration.

It seems to the writer that this apparatus is particularly well adapted to the study of tremors which do not penetrate the earth very deeply. It is light, simple, inexpensive and easily portable; and it can be set up with a minimum of adjustment.

Results obtained thus far seem to justify the further use of this apparatus in the work for which it was designed.

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APPARATUS FOR TAKING WATER SAMPLES FROM DIFFERENT LEVELS

MANY of the apparatus designed to take water samples from different levels are difficult to manipulate and, in many instances, are not accurate. This is especially true with makeshift apparatus constructed from ordinary laboratory materials. The apparatus described in this paper was used by the author in bacteriological work which required the taking, accurately, of bottom samples. Larger models of the apparatus have since been constructed and used in protozoological work with excellent results. It is easily put together with materials found in every laboratory.

The apparatus as used in bacteriology consists of a glass test-tube with the bottom cut off. This tube is fitted with two rubber stoppers which are drilled to take a piece of glass tubing an inch and a half longer than the rubber stopper. Small wire loops are fastened near each end of the test-tube and are bound in place with thread which is then shellaced or varnished. A piece of short gum rubber tubing about two inches long is slipped over each glass tube which protrudes from the rubber stopper. Other straight pieces of glass tubing with their ends bulged are pushed into

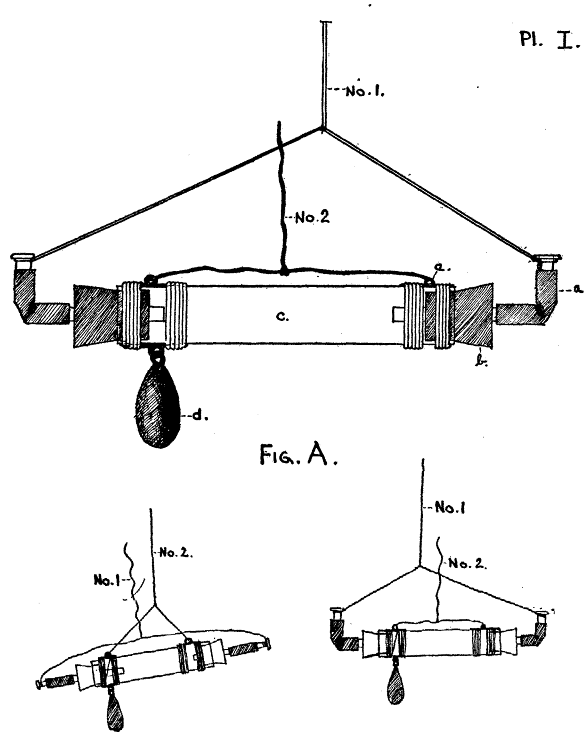

FIG. B. FIG. C

FIG. A. Detail construction: a, rubber connection acting as a valve; b, rubber stopper; c, glass body of instrument; d, lead weight; e, wire loop; No. 1, hand cord for operating the instrument valves; No. 2, hand cord for raising and lowering the apparatus. FIG. B. Apparatus with valves open and weight suspended by cord No. 2. FIG. C. Apparatus with valves closed and weight suspended by cord No. 1.

the rubber tubing, making a simple rubber joint. It is best to daub rubber cement or shellac on the glass tubing before making the connection.

A string is now tied to two of the wire loops, and another string is fastened onto the glass tubes protruding from the rubber joint. Both of these connecting strings are tied so that there is plenty of slack in them. A hand cord is attached somewhere along the length of each connecting string. The two hand cords serve to open and close the valves as well as raise and lower the entire instrument. A lead weight is suspended from the third wire loop which is fixed on the opposite side of the tube from the other loops and at one end. This weight serves to sink the apparatus as well as to slant it so that water can come in the lowest side and force the air from the higher end.

The apparatus is used in the following manner. The weight of the instrument is suspended from hand cord No. 1 (Fig. A) which is attached to the ends of the glass tubing. This action kinks the rubber connections and forms a perfectly air and water-tight valve. With the weight of the instrument supported from cord No. 1 the apparatus is lowered into the water. During this phase the No. 2 cord is paid out very loosely. When the selected depth has been reached the weight is shifted to cord No. 2 and cord No. 1 is loosened. This action allows the rubber connections to straighten out and the valve to open. When the body of the apparatus has been filled the weight is again transferred to cord No. 1, which closes the valves. With the valves closed the instrument is pulled to the surface. The rubber connections may be kept permanently closed by tying strings around the connecting pieces.

In bacteriological work a number of such instruments may be made and sterilized in the autoclave, provided the binding of the wire loops has been fixed with waterproof Valspar varnish. To remove the contents of the tube in a sterile manner the rubber valves may be cut close to the glass tubing.

Types of work other than bacteriology may require apparatus with larger openings. Apparatus have been made at this university with openings up to an inch in diameter with but a few minor changes in the shapes of the glass pieces forming the valves and the use of a double system of rubber connections.

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SPECIAL ARTICLES

REGENERATION IN BRYOPHYLLUM

WHILE *Bryophyllum calycinum* has been repeatedly used in physiological investigations of the phenomenon of "regeneration," a developmental and histological study of the foliar organs of this plant gives rise to a grave doubt whether in this instance regeneration really occurs. The worker is dealing with leaves possessing latent meristems in their notches which quickly form both root and shoot systems when the proper stimulus is applied. Even so able an investigator as Jacques Loeb[1] disregards entirely the presence of these foliar meristems or embryos and L. W. Sharp[2] refers to *Bryophyllum* as a case in which dedifferentiation of cells takes place in the formation of plantlets upon the leaves. A study of these problems being carried on by the writer reveals that too little attention has been paid to the anatomy and developmental history of the leaves of *Bryophyllum* and that physiological studies must take account of these facts if they are to interpret correctly the processes involved in so-called "regeneration."

The question immediately arises as to what the phenomenon of regeneration really involves. Are we to consider as regeneration only such phenomena as the reformation of a tail in the case of certain snakes, the replacement of an eye-like structure in the case of *Cambarus*, or the reformation of a growing point on the shoot axis of a plant? Or shall we include within this category the development of latent buds in the willow, of axillary buds (in many plants) which in the normal course of events never develop, and finally the development of the foliar embryos in the leaves of *Bryophyllum*? All these examples have been lumped together under the term "regeneration" by various workers and since the wide differences existing among them are obvious, the situation is a rather unhappy one.

Particularly is this the case when development of plantlets upon the leaves of *Begonia* is termed "regeneration" and the same term applied to plantlet development upon the leaves of *Bryophyllum*. Hartsema[3] has clearly shown that in the case of *Begonia* there is an actual dedifferentiation of certain cells of the epidermis and an assumption by them of meristematic characters which builds up a new plant. Work of the writer shows that in the case of *Bryophyllum* a group of meristem cells is very early segregated in the notch of the leaf even when it is 2 mm

[1] Jacques Loeb, "Regeneration," 1924.
[2] L. W. Sharp, "Introduction to Cytology," 1926.
[3] A. M. Hartsema, Extrait du Recueil des Travaux botaniques néerlandais, Vol. 23, 1926.