An Apparatus for Keeping Marine Organisms Under Circulation in Narrow Observational Tanks.

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With 1 Figure in the Text.

THIS apparatus was elaborated during some preliminary observations on the biology of the polychæte worm *Melinna adriatica*, and in view of its possibilities for facilitating observations on other small marine organisms, an account of it seems desirable.

Tanks sufficiently narrow to enable the worms in their long slender tubes to remain in position near to the sides in order that the organism might be observed with a hand lens or binocular microscope, were made from two sheets of glass separated by a piece of rubber tubing bent into an arc, and the whole clipped tightly together by means of six spring washing pegs. By the use of tubing of different thicknesses, tanks of different widths can be made according to the material used and type of observation desired. A simple support for the tank was made from a block of wood in which were bored two holes to hold the lower clips. In practice, such tanks were found to be practically water-tight, but to protect the bench it was found convenient to place the block in a shallow tray.

Such tanks enabled the worms to be kept under close observation, but owing to their narrowness the quantity of water contained in them was small, and for extended observational work it was desirable that a circulation of freshly aerated water should be established. This was effected by a modification of the circulating system for aquaria previously described (Cannon and Grove, 1927), and the arrangement is seen in Figure 1.

The tank A is connected by siphons to a jar B on one side, and a shallow vessel C on the other. The ends of the siphons dipping into the tank have to be drawn out because of the narrowness of the tank. One should dip lower into the tank than the other. Jar B* is connected by a wide siphon with the circulating jar in which is suspended the air-blast tube, the drawn-out, turned-up end of which enters the circulating tube which passes

* Jar B is not absolutely essential. The siphon from the tank could pass directly into the circulating jar, but the insertion of the jar between the tank and the circulating jar was found convenient during manipulation, and, as mentioned later, if other tanks are inserted in the circulation.

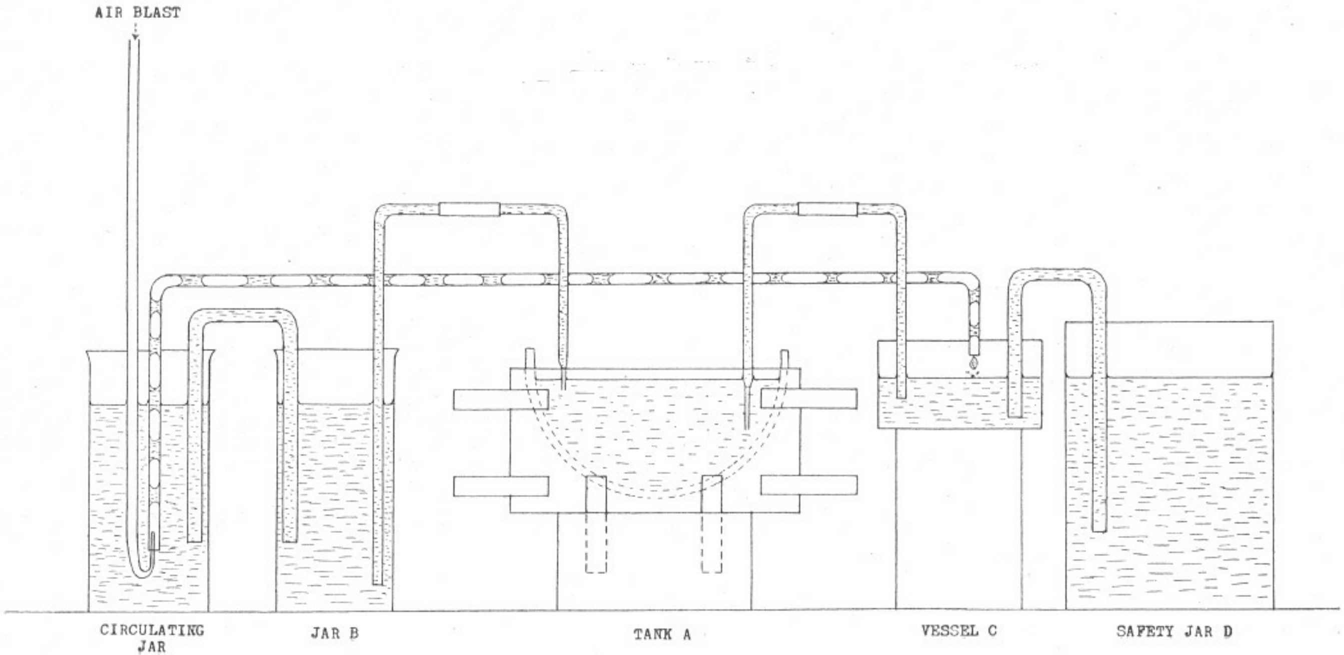

Fig. 1.

thence to vessel C. When the air blast is turned on, a stream of bubbles of air and water pass along from the circulating jar to the vessel C. This tends to lower the level of the water in the circulating jar, to compensate for which water is drawn from jar B through the tank A from vessel C, establishing a circulation. Because, however, of the fineness of the drawn-out ends of the siphons dipping into the tank, the flow of water through the tank to the circulating jar is slower than that from the circulating jar to vessel C by way of the circulating tube. There is therefore a tendency for vessel C to overflow and a big difference of level of water to be established between vessel C and the circulating jar. This difficulty was overcome by connecting vessel C by means of a siphon with a wide jar D. Then, a considerable quantity of water would have to be carried over by the circulating tube before the level in C and D would be raised sufficiently for flooding to occur.

With the apparatus arranged in this way, after the circulation has been running for a short time, an equilibrium is set up so that a difference of level (depending on the rate of flow in the circulating tube and the size of the narrow ends of the tank siphons) is maintained between the vessel C and jar B, giving an indication of the rate of flow of water through the tank.

The following points were found to require attention in order that the apparatus may work efficiently. The drawn-out ends of the tank siphons should be made carefully to fit into the tank, and it is essential that the inflow siphon should be wider than the outflow, otherwise the tank is apt to be emptied to the level of the outflow siphon because water cannot enter from the inflow sufficiently rapidly. In the apparatus used, the inflow siphon was the lower one, because a flow of water along the surface of the mud in the tank without it being stirred up was desired. The reverse arrangement would work equally well. It will be found convenient for manipulation if the tank siphons are made in two pieces joined together by rubber tubing. This is a convenience when placing them in position, for after filling, a siphon can be maintained full of water by pinching the rubber tubing and the two ends are free to be inserted into the tank or jar as the case may be.

The vessel C should be of convenient size (a finger bowl was actually used) so that there is as much surface as possible while the shallowness will ensure that only freshly aerated water passes into the tank. If a deeper jar is used there is some danger of stagnation in the lower part of the jar.

In the first trials the tank was made of ordinary glass, but from various observations it was found that the worms were in all probability negatively phototropic and the simplicity of construction of the tanks enabled a number of tentative experiments to be carried out on the use of coloured lights, for, by using glass of different colours for the sides of the tank, the activities of the animals under these varying conditions could be tested until the most suitable was found.

The figure gives the arrangement for one tank, but if it is so desired (as in parallel phototropic experiments with different coloured glasses), other tanks can be inserted into the circulation. It is essential, of course, that for each tank the inflow siphon should come direct from vessel C, the outflow passing into a convenient jar which is in siphonal connection with B.

The air blast for the circulation was taken in the original experiments from the Laboratory system, but where such is not available, the simply made pump described previously (Cannon and Grove, 1927) can be substituted.

If the observations are to extend over a lengthy period, it may be necessary to change the water in the safety jar D occasionally, for it is obvious that when the apparatus is running continuously and the equilibrium has become established, the water in this jar does not enter into the circulation, and is consequently likely to become foul.

REFERENCE.

Cannon, H. G., and Grove, A. J. (1927). An Aerating and Circulating Apparatus for Aquaria and General Use. Journ. Roy. Micro. Soc., Vol. XLVII, pp. 319–322.