ON A BOTTLE OF SIMPLE CONSTRUCTION FOR OCEANOGRAPHIC RESEARCH (1)

by

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The instruments which are most essential for oceanographic research, such as water bottles, have reached such high prices that many hesitate to procure them. For some time past I have sought a practical solution of this problem. Our expert mechanic, M. CALLERI. has completed a suitable model based on my ideas, which may easily be constructed by any experienced workman. It was only necessary to alter slightly an older model to adapt it to modern improvements.

A cylinder *T* is compressed between two square plates *P* by means of 4 shafts fitted with screw-nuts. The water-tightness is obtained by means of a rubber gasket placed between the end of the cylinder and the corresponding plate. The plates have a hole bored through them of somewhat smaller diameter than the cylinder. The hinged valves *S* (2) are fitted with the upper valve, square, externally and the lower rounded valve, internally. They are connected on their sides opposite the hinge by a small chain *c*. Thus both valves open or close at the same time. A cord *f* secured to the upper valve ends in a loop which allows it to be engaged to one of the well-known systems of detachment, secured to the immersion cable at such a height that the combined valves leave the cylinder the maximum opening. When the apparatus has been lowered to the required depth the messenger is released which frees the cord. The two valves *S S'* drop back into their seats and close the bottle, which is then ready to be hoisted. Their lower faces (or seats) are lined with rubber. The small chain *c* is given a slight amount of slack in order that the lower valve may rest freely on its seat. (I owe the design to M. COMET).

The cylinder may either be of metal, glass or bakelite etc. In the trade glass cylinders which are very suitable are found. The cylinder may be replaced by a tube of square or rectangular section. In such case, the valves, square or rectangular, provide a more serviceable aperture for a greater circulation of water.

The model constructed consists of a glass cylinder 20 cm. long, with an external diameter of 4.7 cm. a thickness of 4 mm. with ground edges and containing 350 cm3.

The perforated plates are 4 mm. thick. They are of brass, like the threaded shaft and the small chain which connects the two valves. Bronze may be substituted for the brass, or stainless steel and varnish may be used.

To empty the bottle the upper valve is raised after placing under the lower valve a flask containing a funnel. One may also provide each valve or the lower extremity of each cylinder with a small pet-cock, when it is desired to collect the water protected from the air in order to analyse the dissolved gases. The valves are also weighted, (by a metal of

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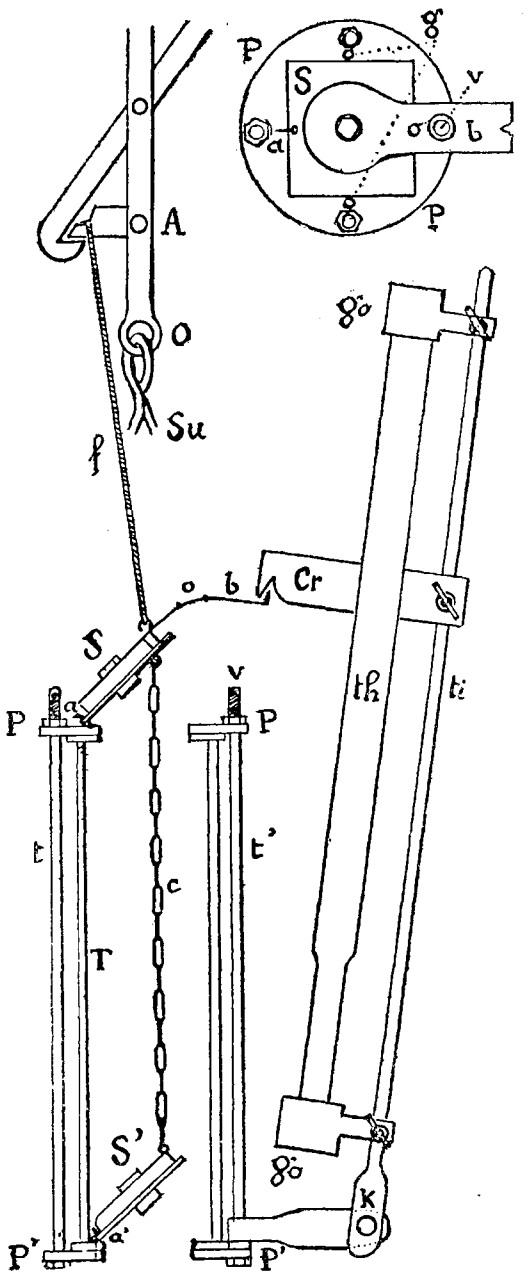
(1) *See also the report of the Académie des Sciences,* sess. 21 Oct. 1940.

(2) *The upper hinge is formed by a small stem a curving towards the exterior and screwed to the edge of the plate; this small stem passes freely into a small aperture opened in the plate on the corresponding side. The lower hinge does not differ from the other except in so far as the small stem* a' *is slightly longer and more inclined towards the outside.*

the same kind) in order that they may not open as a result of the lurching of the vessel while they are being hoisted aboard. This is especially necessary for the upper valve. Sea-water, being practically incompressible, the lower valve cannot lift unless the upper valve lifts. Further it is easy and is also recommended to secure to the cord which joins the upper valve to the detaching system a lead weight which almost touches the upper edge of the valve. This weight falls on the valve when the valve itself seats. This flattened weight, provided with two holes, may slide along the two guides *g* of the valve. One might also secure externally a chain and pendent of lead, of oblong shape, to the center of the lower valve; but the former arrangement seems to me to be better and more satisfactory.



The principle of this bottle with two connected valves was already used by SCORESBY in 1810. But in his model, as in the improved model of Cavendish-Scoresby (1811), one

counted on the bottle closing by the sole fact of its being hoisted up. Unfortunately, this raising movement might be brought about by the lurching of the vessel at any depth whatever. The use of the messenger, on the contrary, assures the certain functioning at the desired depth.

Thanks to the presence of the threaded shaft it is easy to secure to one or the other the articulated frame of the reversing thermometer, *th.* This frame is held in position during the descent by the catch *cr* which engages the prolongation *b* of the upper valve. When this drops the catch disengages and the thermometer reverses.

The bottle may be suspended from the end of the cable or along the cable; several may be attached one above the other, at various distances. The threaded shafts render it easy to attach the bottles to the cable by means of moveable tongs which grip both the cable and the shaft simultaneously. Thus a number of bottles may be used in series to obtain samples of water at different depths, whether it is a question of deep water, or, with the idea of studying the floating deposits at various depths in certain estuaries (the Gironde, for instance). In that case each bottle is fitted with a messenger ready to slide along the cable when the cord attaching it to the thermometer is released by the reversing of the latter. The messenger then closes the bottle situated below and liberates in turn the following messenger etc.

This model may be built to any scale whatever. An apparatus of this kind with a capacity of 10 litres served to collect the nanoplancton at great depths in the research carried out by M.F. BERNARD off Monaco.