# NOTE ON AN AIR-PRESSURE SOUNDING MACHINE

The method which consists of balancing the pressure of the water on the bottom of the sea by an equivalent pressure of air in a reservoir in the ship or boat, in order to determine therefrom the depth, is by no means a novel one. Instruments have already been established on this principle with a view to obtaining a continuous record of soundings.

Several types of this kind of apparatus have already been mentioned in the *Hydrographic Review*, in particular a bathygraph of American conception, described in *Hydrographic Review*, Vol. III., N° 1, November, 1925, pp. 190-191, and the sentry sounding machine designed by Commander MENSING and improved by Mr Fred. H. C. NEYN and Dr H. C. KRUGER, Chief Surveying Instructor of the Navy at Wilhelmshaven in 1909. (See *Hydrographic Review*, Vol. IV, N° 2, November, 1927, pp. 161-167).

It is frequently rather difficult in this sort of apparatus to control the escape of air at the lower end of the hose, for the air bubbles produced at sea-bottom are scarcely discernible from the surface so that the operator may be led to produce, in the compressed-air reservoir, a pressure exceeding that which exactly suffices to balance the weight of the water-column corresponding to the precise depth. With this idea in mind the author, towards the end of 1923, drew up a device for the accurate control of the issue of the bubbles through the lower end of the tube. By means of this device also, the operator may confirm whether the escape of air is in reality taking place at the lower end of the hose and not through a leak in the side of the hose due to deterioration, which would naturally falsify the indication of depth.

For this purpose, the lower end of the hose would be constituted by a nozzle-shaped metal delivery-tube (Fig. I (1)); a flexible highly-insulated electric cable is contained within the hose (Fig. I (2)) without, however, impeding the passage of the air. It is terminated near the nozzle by a denuded copper rod (Fig. I (3)) connected concentrically to the nozzle by means of porcelain insulators.

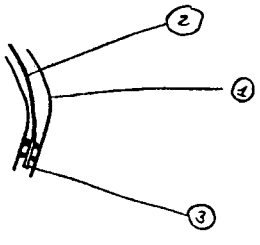


Fig. I

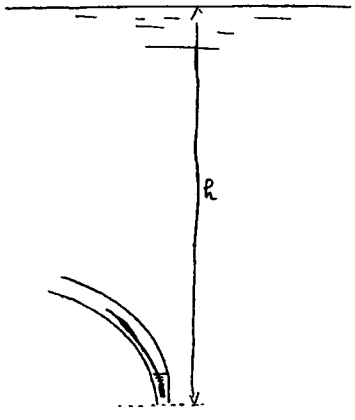


Fig. II

When the air-pressure within the tube is not sufficient to counter-balance the pressure of the water-column *h* which corresponds to the sounding, sea water more or less penetrates into the tube as shown in Fig. II. This sea water short-circuits the electric current provided on the inner cable by wetting the rod (Fig. I (3)). On the contrary when the compression pump is operated, either by hand or by turning the compressed-air expansion valve, and when the air-blast apparatus yields exactly the pressure corresponding to *h*, the sea water is expulsed from the nozzle, there is produced one single air-bubble which escapes from the nozzle and the contact on the rod is interrupted (Fig. I (3)).

The making and breaking of this contact may therefore be employed to ascertain the exact moment at which the pressure supplied is "statically" equal to *h*. For this

purpose, the breaking and making of contact may be made to act on the circuit closed by the sea of a 4-volt battery terminating in a small control lamp. The blinking of this control lamp corresponds to the escape of the successive air-bubbles by the lower end of the nozzle. The pressure is regulated so as to obtain an evenly-spaced "blinking" of the lamp.

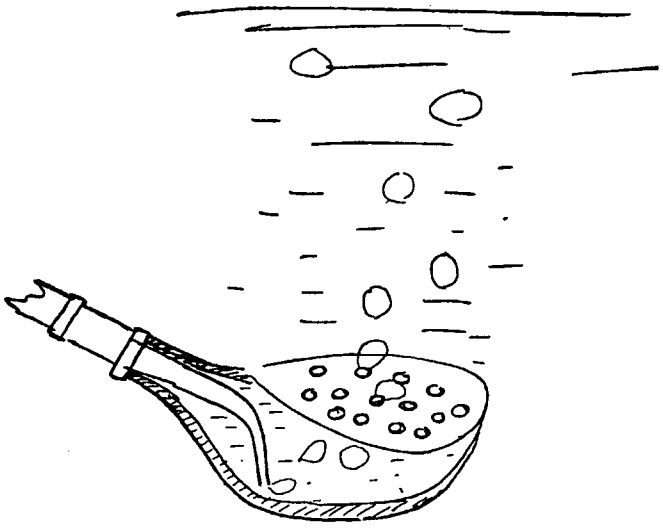

Fig. III

To keep the delivery-tube in the desired position at sea-bottom, and to protect it against the introduction of sand, mud or sea-weed, it may be enclosed in a sort of *sabot* or wooden shoe such as that shown on Figure III. The sieve placed over the upper part of this sabot allows the air-bubbles to escape while the lower part protects the end of the hose. The most suitable shape for this sabot is a tapering one widening out towards the back part and weighted at the lower part so that the apparatus may trail along sea-bottom without turning over, at the usual speeds of sounding from a boat.

Although instruments trailing along sea-bottom are useful only in smooth sea-beds composed of sand, broken shell or small stones, which prevents them from being in general to any great extent serviceable to Hydrographic Surveyors except in quite exceptional circumstances, yet it is possible that certain surveyors, having to sound in areas where the sea-bed is flat or only slightly uneven, may usefully employ such methods; and it is for this reason that a convenient device for controlling the working of air-pressure sounding machines is here noted.

H. B.