NOTES ON THE HYDROGRAPHIC DRAG. M-1931.

by

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(Reproduced from *Annales Hydrographiques* - Paris 1935-36, page 109).

(Translated from the French).

In this note we shall attempt to describe a method of wire dragging which was conceived and tried out in 1931 by a hydrographic party off Morlaix.

The drag employed, which we have designated the "M drag (Morlaix) 1931", is suitable for dragging in narrow channels, in the search for isolated rocks and for the dragging of those areas where the submarine relief is rather broken or where it is necessary to drag close to the bottom.

I. *PRINCIPLE OF THE DRAG* M-1931. (1)

Two motor boats A and B (fig. 2) tow at slow speed, keeping opposite each other, two fish-leads *a* and *b*, supported by graduated uprights of steel wire. The leads are immersed

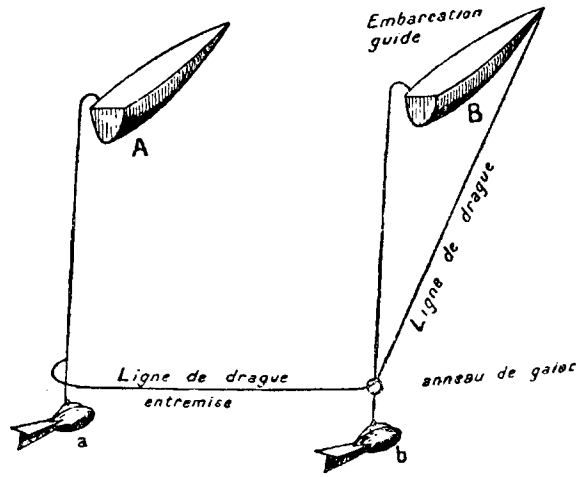

FIG. 2

(1) M. COURTIER, *Ingénieur hydrographe en chef, tried out during a hydrographic expedition to Saint-Malo, a wire drag which was constructed according to the following principle* (fig. 1°).

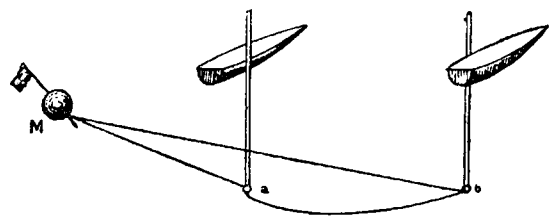

FIG. 1.

On two launches were rigged vertical bars adjustable as to height and having rings at their ends; a *and* b *(thimbles).*

Through each of these thimbles was rove a fine wire line having a buoy attached to its end which was towed by the system.

When the two launches proceeded the tension on the wires a *and* b *was determined by the resistance of the buoy to its movement through the water.*

This drag gave good results; its drawbacks were due to the difficulty of attaching the upright bars to the gunwales of the launches.

to the depth at which it is proposed to drag. A bottom-wire of fine hemp is secured at one of its ends to mooring shackle of the upright of the lead *a*.

This bottom wire, which reeves through the lignum vitae ring interposed between the other lead *b* and its suspension, is held taut by a sailor stationed near the bow of the boat B (guide boat).

The drag line is chosen such that its weight in water will be slight. The two extremities of the bottom wire, which, for the rest are suitably taut, are towed at the same depth. It follows that the entire bottom wire is maintained throughout the dragging operations in the horizontal plane swept by the straight line joining its extremities.

In order that the central portion of the bottom-wire should not dip below this horizontal plane it is necessary that there should be adequate tension on the line. It is apparent that this stiffening will give the fish lead upright a slight tilt in the vertical plane perpendicular to the course followed by the guide-boat.

The line employed for the bottom wire not being buoyant there should not be any lifting of this line except that due to the leads. If the speed is low (1 knot) and if the tension on the drag line is not exaggerated, the graduated uprights will be practically vertical and the lifting of the leads negligible.

II. *CHARACTERISTICS OF THE* M-1931 *DRAG.*

The M-1931 drag, not being a drifting drag such as the RENAUD wire drag, may be employed in waters without current or even where there is a slight cross current. Naturally it should be towed as far as possible in the direction of the current.

The uncertainty with regard to the width of the zone swept arising from the length of the tow does not exist; (this uncertainty in the American drag necessitates extensive overlapping of adjacent zones covered by the operation). The drag sweeps exactly the same zone passed over by the towing vessels.

While in the American drag the depth insured is a function of the proper holding of the course by the towing boats, in the M-1931 drag the variations from the course have no influence on the depth of immersion of the bottom-wire since, if the towing boats get off their course it is only necessary to pay out or haul in on the drag as may be necessary. Therefore it is not essential that the two boats should be compelled to steer parallel courses at all times.

The changes in the length of the graduated uprights can be made aboard the towing boats, a fact which allows them to follow readily the variations in the height of the tide and the changes in depth.

III. *EXPERIMENTAL DRAG.*

The M-1931 drag which was tried out in the Bay of Morlaix, was constructed of material available on board and gave results which were entirely satisfactory.

The greatest length of drag employed was 160 metres. We have used for towing two motor launches of the Brestois type (fitted with a Kitchen rudder) in which the fittings and equipment were almost the same as those provided for boat soundings. During the first trials a third boat checked the depth of immersion of the bottom-wire with the aid of a test bar as employed with the American drag to check the depth of immersion. This third boat was done away with after it was found that the lifting of the wire was impossible except as a result of an error in the immersion of the leads or an exaggerated inclination of the graduated uprights.

For a bottom-wire we have used a hempen mooring line having a static breaking strain of about 100 kilograms.

The leads employed were fish-leads of 50 kilograms weight, ordinarily used for soundings from the tender. The davits holding the graduated uprights overside were secured to the stern of the motor launch (1). For lowering and hoisting the gear and the leads we used the Warluzel sounding winch.

The hemp drag line which was used was marked every five metres by a piece of bunting and had to be checked both before and after each of the dragging operations. At

(1) *This method of securing the drag to the stern of the launches was not entirely satisfactory since the launches were difficult to handle when the line was rather taut.*

each station and every time the length of the uprights was changed the sailor who tautened the line read off the length paid out to the nearest metre. From this it was easy to deduce the distance between the two leads and this enabled us to plot on the field sheet the position of the drag with the aid of a celluloid rule.

The reserve length of line was wound upon a reel located near the bow of the guide launch. For a drag having a length of 160 metres experience has shown that about 240 metres of line is necessary. In order that the boats might manoeuvre at the start to get on their course, it was found advisable to slack off the line somewhat to facilitate the movements of the boats.

The lignum vitae rings through which the drag line is rove is interposed between the fish-lead *b* and the upright through the intermediary of a swivel-hook.

The uprights were graduated starting from the lignum vitae rings for the lead *b* and starting from the manila securing line in the case of the lead *a*.

The communications from one launch to the other were effected by means of a large blackboard on which were noted in white chalk the changes in the depth of immersion and any other indications, in accordance with a simple code; such as

T. End of dragging; *CR.* Drag hooked; *CA.* drag broken; etc.

IV. *PUTTING THE DRAG OVER. DRAGGING OPERATIONS.*

The boat A maintains station at the point of departure either by anchoring or else holding position on easily seen landmarks, the lead *a* is brought just awash. From the guide launch B a line is thrown to the boat A the other end of which has first been passed through the lignum vitae thimble. The guide-boat then starts at slow speed to take position for the start while the line of the drag is paid out. The boats then manoeuvre on suitable headings, the leads are immersed to the desired depth, the line is drawn taut and the dragging begins. It is essential that while the drag line is being paid out the lead of the guide boat should not be immersed, since the manœuvres of that boat might cause the drag line to take a turn and foul the lignum vitae ring. The lead of the guide boat should not be put over until it is clear and ready for dragging.

The immersion of the leads is equal to the dragging depth increased by the height of the tide and by as great a margin of safety as may be considered necessary. The positions of the boats are determined every three minutes by means of the subtended angles. The stations are made on signal from the leader who is in the guide boat. It is preferable but not essential that the guide-boat A should regulate its speed to keep the guide bearing 90°. At each station and at every change in the length of the uprights the sailor stationed in the bow reads the length of drag paid out to the nearest metre and this is entered in the note-book. The changes in the lengths of the uprights are made as nearly as possible on the even minute. When this condition cannot be fulfilled the time noted in the note-book for the change in the uprights is that which shall give the greatest security for the dragging. If the uprights are shortened the minute which precedes the first operation of shortening is the time to be noted; if the uprights are lengthened the minute following the final operation is the time to be noted.

When the drag encounters an obstacle the leads are suddenly dragged astern. The sailor tending the drag line is then obliged to pay out the line.

The two boats then hoist their leads and manœuvre so as to reach a point directly over the place where the drag has caught. Thereupon the boats draw close together and a few casts of the sounding lead will generally suffice to locate the head of the rock.

With this method of procedure it might be feared that the bottom wire might slide over the head of the rock while the boats are manoeuvring to reach a spot directly above the point the drag has caught. This risk may be avoided by operating as follows :— when the drag has caught the two boats do not change the depth of immersion of the leads; the second boat keeps clear and maintains station as closely as possible. The guide boat then heads towards the second boat and reels in the drag line as may be necessary. The graduated upright of the guide boat will tend towards the obstacle and the guide boat then changes course to head towards the obstacle which its lead necessarily encounters as it is guided by the drag line.

In order to disengage the drag, the second boat raises its lead and slacks the end of its line which is then reeled in on the guide boat.

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VI. *IMPROVEMENTS TO BE MADE TO THE* M-1931 *DRAG.*

The experimental drag constructed of material available aboard, although imperfect, gave results which were very satisfactory. The efficiency and safety of the drag may be increased by the following alterations;—

1°. *Point of suspension of the fish-leads.* In order that the tension on the lines should not interfere with the manoeuvring qualities of the boats, it is essential that the graduated uprights should be secured to the midship section of the boat.

2. The windlass for lowering and hoisting the fish-leads should be constructed so as to permit rapid immersion and hoisting (about one metre per second) of a one hundred kilogram lead.

3°. *Leads.* The fish leads for the experimental drag weighed 40 kilograms each. It is probable that this weight will have to be increased.

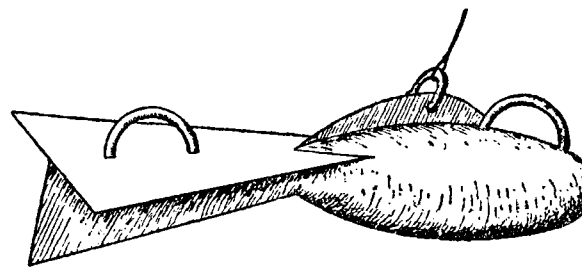

FIG. 3

It is possible however that in order to have leads which can be conveniently handled in the boats, the weight of 100 kilograms should not be exceeded. (fig. 3).

4°. *Bottom-Wire.* This should be firm, thin and have a density not much greater than sea-water and should stretch but a very slight amount when a pull of approximately 10 kilograms is exerted on it. Its breaking strain should be about 150 kilograms at the least. In order to obtain a line which shall not weigh much in the water it may be composed of strands of ordinary hemp mixed with strands of manila. We shall see that the weight of the wire of the hydrographic drag is very important if there is not to be a very noticeable bow in a drag 200 metres long.