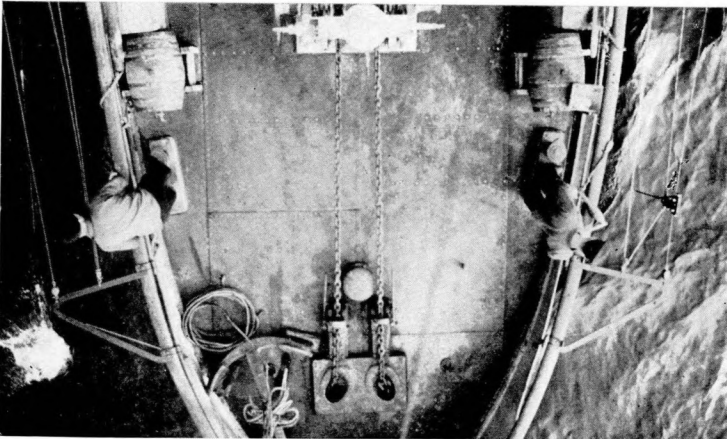


Fig. 1.





## SOUNDING IN SHALLOW WATER FROM A VESSEL UNDER WAY

By Captain G. REINIUS, Hydrographer of Sweden,  
and Commander G. BOUVING R. S. N.

---

**S**OUNDING under way by the method used in Sweden can be carried out from small vessels, when the depth does not exceed 35 meters (19 fathoms). Notwithstanding this considerable restriction the method has proved very convenient and has several advantages. It allows close and speedy sounding to be carried out, greatly facilitates the work in waters where there is a current, and saves a certain amount of coal.

The method therefore is very useful for surveying banks lying off-shore, when these have to be plotted on a large scale, but where sea, swell and considerable distances from the "points" makes the work in small boats difficult or even impossible.

The soundings are taken alternately from the starboard and port sides, and the depths are called by leadsmen (recorders), standing on platforms right aft. The line is hove in again by a winch, placed aft on deck between the two platforms, and the lead is hove forward to the fore-castle by endless rounding-lines of wire, where the leadsmen (the heavers) are placed. The fixing of the position is carried out by two surveyors, who simultaneously measure one horizontal angle each.

### **Materiel.**

The jackstays (*see* Fig. 1) by which the leads are carried from the recorder to the leadsmen on the fore-castle, consist of two wires, 4-5 millimetres in diameter (about half inch wire) which are stretched between spurs forward (which can be folded in) to booms aft, rigged out and topped at an oblique angle. At the end of these booms there is a swivel snatch-block with ball-bearings (*see* Figs. 2 and 3), through which the leadline

passes. Each of these two longitudinal wire jackstays carries a runner (*see* Fig. 4) with a hook on its under-side on which to hang the lead.

The runner, whose wheels are fitted with roller bearings, is hauled forward or aft by means of a small line passing through blocks placed forward and aft.

The lead weighs 10 kilos (22 lbs.). In order to diminish its size it is of lead cast on an iron-core. A strong loop of steel-wire is cast into the lead by means of which to hang it on the runner.

The lead-line is made of steel-wire, 3 millimetres diameter (about 3/8" wire) and is marked with bunting at every whole and half meter. The wire consists of six strands laid round a cotton heart. Each strand of 12 wires also had a cotton heart. Close to the lead, and also at every five meters, a swivel is inserted into the line and this swivel is so constructed (*see* Fig. 5), that it passes through the blocks on the boom-ends and fits into the track on the wooden sheave of the winch. As wire, in spite of this arrangement, is more difficult to manage than a hemp line the working part of the line only (*i. e.* 35 metres) is made of wire. The rest is made of common cable-laid rope. After several experiments with Swedish, American and German lead-lines the Swedish Hydrographic Service has adopted this type, to which the water offers so little resistance that, after some time of training, a speed of about 5.5 knots can be maintained while sounding.

The use of wire, however, involves the use of gloves of a special type by the leadsmen.

On one drum of the winch (*see* Fig. 6) a wooden sheave is provided in the periphery of which a V-shaped track is cut for the lead-line.

Owing to the form of this track it is quite sufficient to wind the line only one half turn round the sheave when heaving in, thus avoiding unnecessary deterioration of the bunting-marks, which would be the case were an ordinary windlass-drum to be used.

## Personnel.

The personnel on deck is the following :

One Surveyor, in charge,

" Assistant-Surveyor,

" helmsman,

" winchman,

Two leadsmen aft, recorders,

" " forward, heavers.

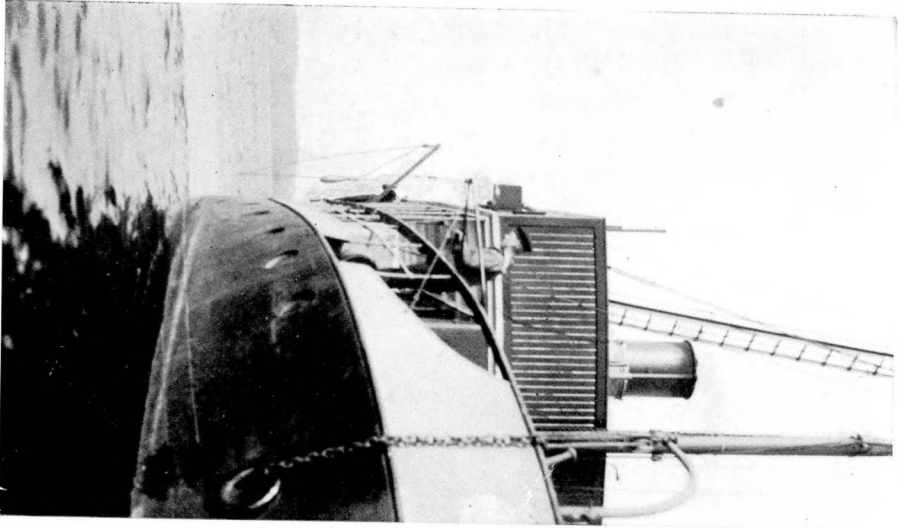


Fig. 2.

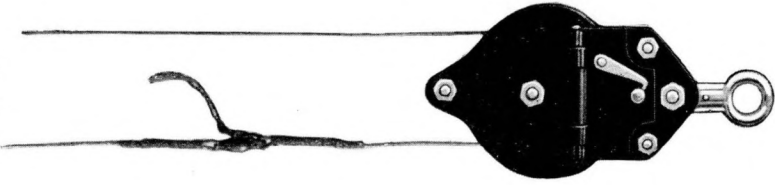


Fig. 3.

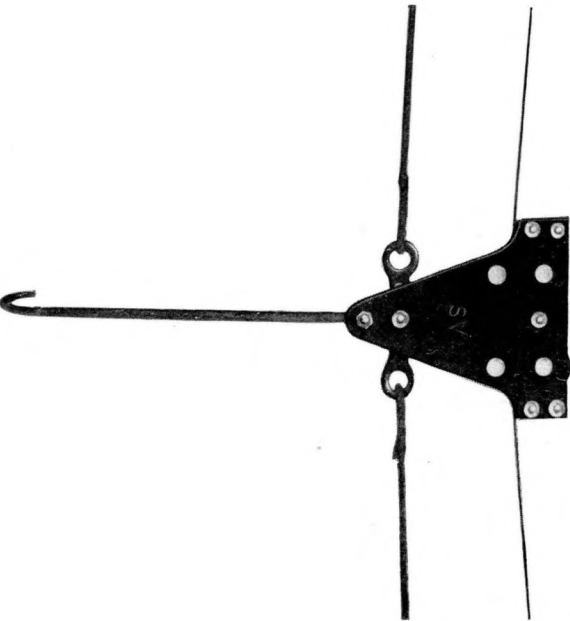


Fig. 4.

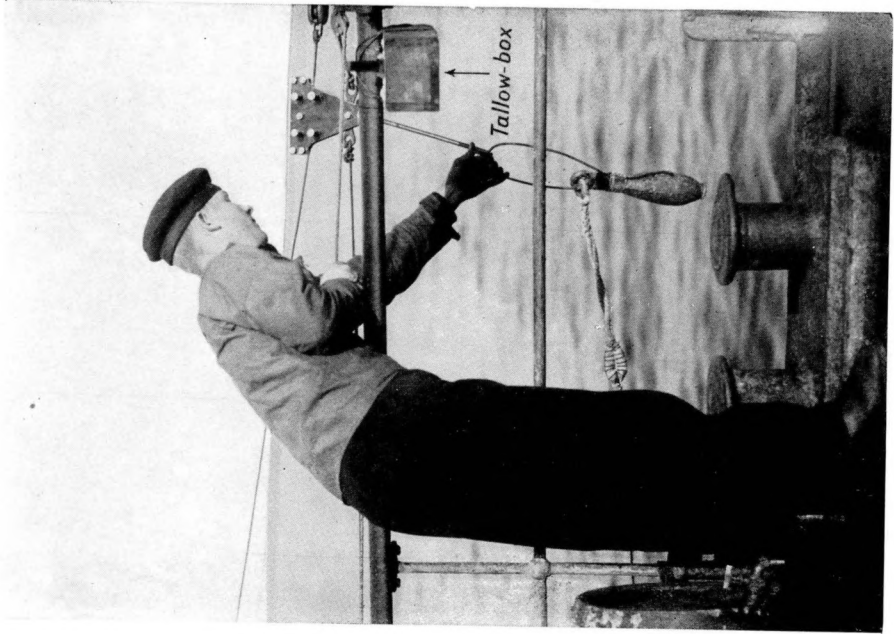


Fig. 7.

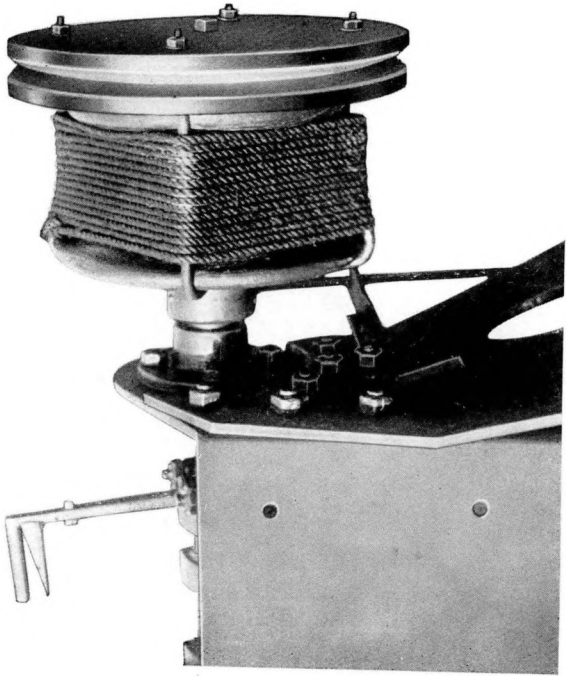


Fig. 6.



Fig. 8.

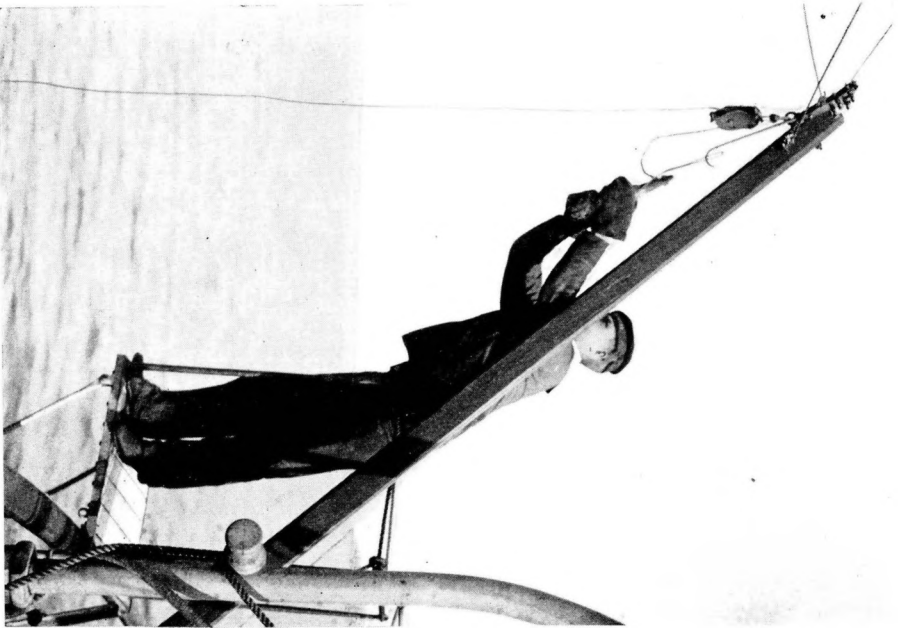


Fig. 9.

The Surveyor directs the survey, measures one of the horizontal angles and does the plotting.

The Assistant-Surveyor measures the other horizontal angle, checks the sounding and keeps the sounding-book. In addition to the depths and the nature of the bottom, all the angles of the fixes are entered in this book, so as to render possible the construction of a new chart by aid of the sounding-book alone. This might prove necessary if, for instance, the district were found to be so dotted with shoals that a chart on a larger scale, of part or of the whole survey, is required.

Sounding is carried out as follows :

The Surveyor takes the ship to the starting point for the sounding ; meanwhile by means of the revolution-telegraph, he gives orders to the engine-room as to the number of revolutions to be run between casts, and tells the leadsmen on which side to begin sounding.

When the starting point is reached the order " Commence sounding " is given whereupon a short signal is given from the engine-room, where an automatic counter is put instantly on to the number of revolutions ordered.

On hearing the signal the recorder who has to begin the sounding gives the order " Heave " whereupon the leadsmen (forward) heaves the armed lead. Immediately thereafter he hauls the runner aft to the recorder. The box containing the tallow should be conveniently placed (*see* Fig. 7) in order to facilitate speedy work. It is convenient to apply the tallow by means of a small trowel. By having a special leadsmen to heave the lead two advantages are gained over the system of slipping the lead automatically. On the one hand the nature of the bottom can be recorded for every cast and on the other existing currents can be taken in consideration when heaving the lead as it can be hove at an oblique angle inwards or outwards, according to whether the leadsmen is standing up current or down, so that the lead-line shall be as vertical as possible when the depth is recorded.

The surveyors make ready to measure the angles.

From the moment when the recorder feels that the lead has reached bottom he keeps the line taut, and when it is vertical he reads the depth (*see* Fig. 8) and calls out " Now ", when the surveyors measure the angles. The depth is then called by the recorder.

As soon as the depth is read, the recorder brings the line to the winch which, by this time, should be moving and hauls the line up hand over hand, but not completely. He must be trained to go onto the platform at the suitable moment during the hauling in, taking care to keep the line taut on the winch so that the hauling in continues. This movement

should be so timed that the lead is up just at the moment when he steps onto the platform. If this be done the lead can be hooked on to the hook of the runner at once, thus saving time (*see* Fig. 9).

The platforms, if possible, should be on the same level as the deck in order to admit of speedy and convenient communication between them and the winch.

The recorder examines the tallow and calls the nature of the bottom. As a guide for this a collection of samples of different classes of bottom, *e. g.* gravel and sand in different sizes, stones, shells, *etc.*, should be placed near to the platform.

When the leadsman sees that the examination of the tallow is finished, he hauls the runner forward and again prepares himself to heave the lead on receipt of the order from the recorder.

When the ship has run the number of revolutions ordered the automatic counter in the engine-room gives a signal which is clearly distinguishable on deck, and a sounding is taken from the other side of the ship.

The position is fixed at every fifth or seventh cast. Before every fix the Surveyor calls out "Angle" which signifies to the recorder, that he has to call out "Now" when the depth is about to be read.

As has been the endeavour to indicate, this method is very simple and has given good results even onboard short vessels (25 meters = 82 ft.). In endeavouring to be able to take soundings very closely even when moving at a comparatively high speed (about 5 knots) it has been found necessary to use as fine a lead-line as possible and also to arrange that the passage forward of the lead is easy and rapid. Experience has shown that, when the men are well trained, sounding by this method on a scale of 1 : 20,000 can be carried out at least as closely as from a motor-boat of small size.

