STATION POINTER WITH STATION HOLDERS FOR HYDROGRAPHIC SURVEYING DURING PROTRACTED USE OF THE SAME TERRESTRIAL LANDMARKS.

by

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The Station Pointer is so universally known in the domain of nautical hydrography that it is not necessary to go into every detail of its construction here. The instrument serves to plot on the chart, by the graphical method of inverse intersection, the horizontal angles measured by sextant or quintant between three stations on the coast. The position of the ship at the moment of observation is found at the point of intersection of the three legs, *i.e.* at the centre of the instrument; it is marked on the chart by exerting a slight pressure on the movable centre pricker. By joining the positions of the ship found in this way, we get the line of soundings run by the ship or boat.

The assumption of the accuracy of the ship's position depends on : —

(*a*) The two horizontal angles measured being correctly set on the instrument, and

(*b*) The three legs (straight edges) being accurately and uniformly placed on the objects used for measuring the angles (churches, towers, beacons, signals, etc.).

It follows that the time taken in operating the instrument is divided between two quite distinct phases, to wit : —

First, the time required to set on the instrument the two angles called to the plotter, and

Secondly, the further time required to place the three legs accurately and uniformly over the stations in use.

As a result of this there is often delay owing to the inevitable moving of the instrument from one place to another on the chart, and these delays, as every professional surveyor knows, are particularly tiresome when the objects in use lie far from the centre so that it becomes necessary to use very long legs. Besides, the circle and the lay-out of the central part of the instrument mask an important part of the chart lying under them; so that the plotter must move the instrument after each fix to enable him to keep track of the line of soundings. When the next fix is plotted, the same process recommences, and after each move the legs must first be replaced exactly on the objects. If we reflect that during intensive chart-work one may well be plotting hundreds of positions a day, we are bound to admit that this work must be extremely fatiguing for those who have to carry it out.

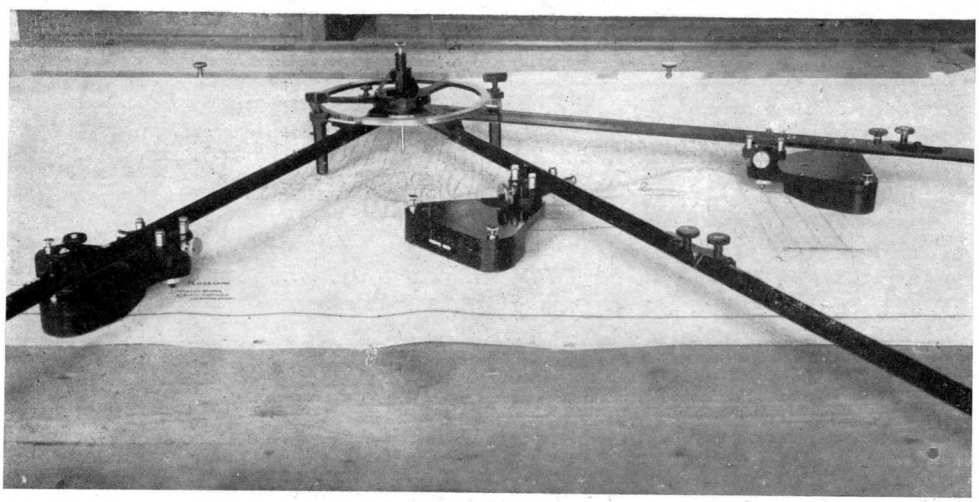
To remedy this state of affairs the *Nautische Abteilung* has produced station holders, whose object is, as their name implies, to replace the legs accurately and uniformly each time on the stations, or rather to *hold them there.* After various not very satisfactory attempts, we have now succeeded in producing a workable model which has proved most satisfactory in practice. The use of these station holders in itself completely eliminates the phase mentioned in the *"secondly"* of the method of use. The act of setting the measured angles on the station pointer by means of the verniers automatically places the centre of the instrument on the position sought for, and nothing remains but to mark the latter on the chart with the pricker. This automatic plotting of the position results from the forced guiding of the legs through the slides of the retaining pieces. The construction of the instrument thus ensures that the lines of bearing of the legs pass exactly through the objects in use.

As will be seen from the attached Plate, which shows the instrument in use, the station pointer does not rest, as in previous types, with its legs on the chart, but is supported about 2 1/4 inches (6 $^{c}/_{m}$) above it. There is consequently an almost unobstructed view of the part of the chart under it, which constitutes a valuable advantage. The Plate shows also that the station pointer itself has been retained in its classic form. To compensate for its being raised by the station holders, the instrument has had to be provided with two feet at its centre and a longer centre pricker. These feet, which screw on to supports in the instrument box, are mounted at their lower end on balls, so as to slide over the chart with as little friction as possible. During use, the feet are screwed home into threads tapped under the verniers. The three legs and their extension pieces are of a cross section designed to avoid any bending. The extension pieces for the legs are fixed by means of special bridles and locking screws which ensure rigid joining.

In our early experiments we had thought of using round stems or tubes instead of flattened legs, to obtain easier movement through the slides. This idea was not carried out, and we have retained the flat ruler shape of the legs. Thus the station pointer can also be placed directly on the chart, without the station holders, in which case it can be used in the ordinary way.

The station holders can easily be distinguished in the Plate. They are made of lead and brass, of triangular shape, rounded at the corners. Each slide is mounted on the upper end of a rotating axle fitted with ball bearings; the lower end of the axle is tapered to a point, the station pricker. The slide carries three guiding rollers, two on one side and the third on the opposite side. The third roller is pressed firmly towards the other two by a pressure spring with a head. By the use of an actuating screw it is also possible to raise the third roller, to introduce the legs. To prevent the station holders from shifting on the chart, they are provided at two of their corners with pins which can be raised.

To use the instrument, the station holders, with their points lifted, are placed on the chart in such a way that each station pricker is exactly over the object in use. The thick part of the station holders must be placed, when in use, in such a way that no part of the sea area is covered, i.e. this thick part must be turned towards the land. When the station holders are correct-



Station pointer
with station holders

Rapporteur double
avec fixe-points

The Jacobsen Current Meter

Appareil Jacobsen pour la mesure des courants

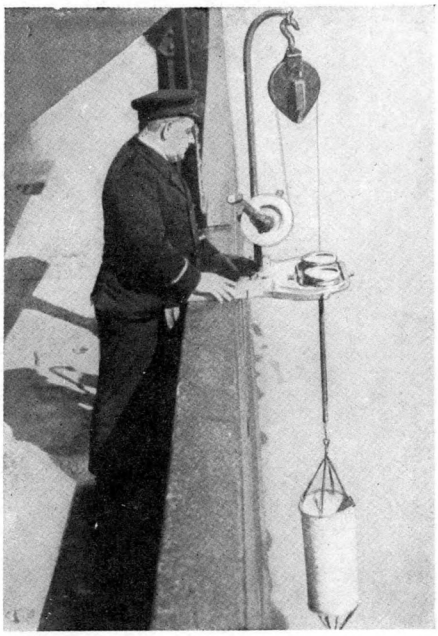


FIG. 1

ly placed, the anchoring pins are lightly pressed in. The actuating screws of the movable guide-rollers (the third rollers) must then be screwed up to their limit stops. The two feet are screwed on to the station pointer, the clamping screws of the verniers are eased off, and the three legs are placed between the rollers in the slides. In carrying out this procedure care must be taken that the working edge (*i.e.* the bevelled edge) of each leg bears against the two fixed rollers. The actuating screw is then eased off again, so that the third movable roller presses the leg against the two fixed rollers. After inserting the long centre pricker, the instrument is ready for use.

N.B. — When the two clamping screws of the verniers are unscrewed, the station pointer can be moved with the greatest ease in any direction required, both by turning to right or left and by displacement forward or back. This extreme mobility is obtained by the introduction of ball and roller races in all the bearings.

The remainder of the procedure for using the instrument is of the simplest.

(*a*) First, the *larger* of the two angles measured is set, and the clamping screw of the corresponding vernier lightly screwed down.

(*b*) Then the *smaller* of the two angles is set. This action, together with the forced guidance due to the larger angle being already fixed on the instrument, automatically brings the centre of the latter over the position sought for. It is not necessary in practice to touch the clamping screw of the second vernier.

(*c*) The position of the ship is marked on the chart by a light pressure on the centre pricker, then the clamping screw of the set vernier is eased back. The instrument is immediately ready for the setting of the next pair of angles.

It should further be noted that the use of the station holders is especially advantageous when angles for determining the position are being measured, over a long period, between the same set of objects.

When, on the other hand, for special reasons the objects have to be frequently changed, the use of the station holders is not to be recommended, for after all the moving of them must take a certain time.

Advantages.

(1) We have been able to prove by experiment that an experienced man, using the station holders, is capable of plotting three times as many angles in the same space of time as with the old method.

(2) The personal equation is eliminated by the above operation.

(3) The view of the plotting sheet is almost unobstructed.

The construction of these station pointers with station holders has been entrusted to the firm of Ed. SPRENGER, Manufacturer of Mathematical and Optical Precision Instruments, Alte Jakob Strasse 6, Berlin, S.W. 68.

Further information will gladly be given by this firm on request. The price of the instrument depends on the size required, the diameter of the circle, the graduation of the verniers and the length of the legs.