6. This circle was invented and constructed in 1889 and is still used by the French Hydrographic Service.

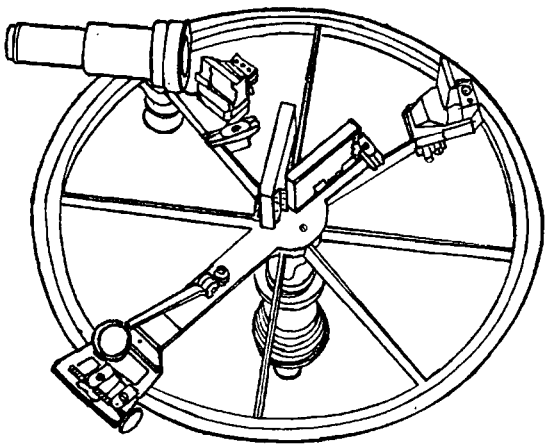

Fig. 4

THE RANGE OR DIRECTION INDICATOR

by

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(Extract from *The Nautical Magazine*, Glasgow, April 1934, pages 300 to 303).

The object of the indicator, so called for the want of a better name, is to enable the observer to determine when he is exactly on the line joining two points when he is between the points, and thus use these points as a «range» for his course with the same confidence as though both of the observed objects were ahead or astern, or to show when the angle between the objects measured at the position of the observer is 180°.

A and *B* are two sextant index mirrors secured firmly to and perpendicular to the wood or metal base *C*, so that the angle between their faces is 90° and their centres about 4 inches apart, just far enough so that a ray of light from the rear object will clear the observer's head and strike the mirror *B*. The mirror *A* should be secured permanently in place as shown in Fig. 1 at an angle of 45° with the line of sight, both *A* and *B* should be mounted on wood or metal supports; the one carrying *B* should have a central pin fitted with a thread and thumb and lock nuts on its lower end and pass with a neat fit through holes in brass plates secured to the upper and lower sides of the base *C*. Fit a short wooden handle to the under side of *C*. A sextant telescope may be fitted at *T* if desired.

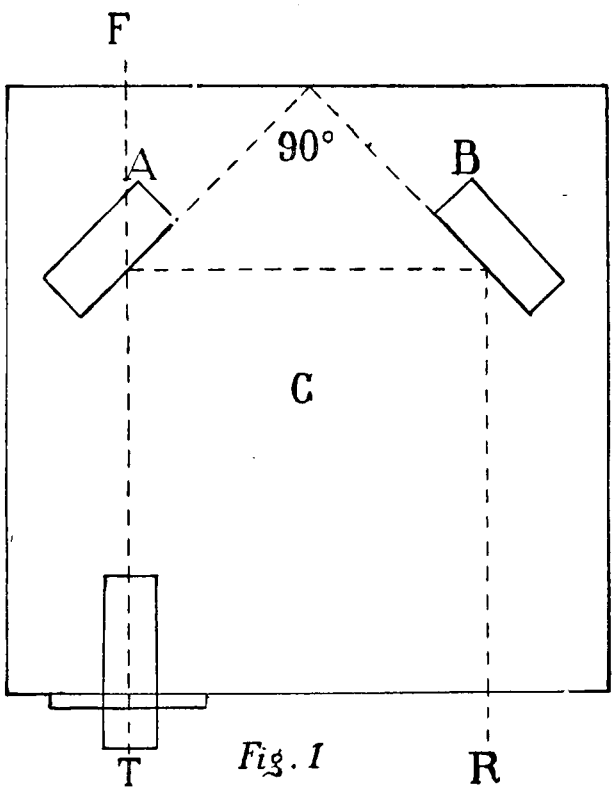

Fig. 1

To set the Mirrors at 90°.

Suppose the ship at a dock or lying quietly at anchor. Direct the sight vanes of the pelorus towards some distinct and distant object and clamp plate, then go to the opposite side of the pelorus and note what object comes in line with the sight vanes. Now, standing at the pelorus, take the instrument in the left hand and with the right eye look along the line *T A* at the front object *F*; with the right hand turn the mirror *B* until the image of the rear object *R* is seen in the mirror *A* beneath the front object *F*. Face about, direct the line of sight to *R*, and if the image of *F* is seen in the mirror *A* below *R* the adjustment is correct; clamp the thumb nut and again verify the adjustment and set up carefully on the lock nut.

Use of the Instrument in Navigation.

When circumstances permit, the observer should stand with his back to the nearer object; this not only makes the reflected image more distinct, but the range is also rendered more sensitive. In using the instrument for steering on a range, if the line of sight falls to the right of the object in front of the observer when he sees the reflected image of the rear object in the mirror *A*, then he is to the right of the line between the objects or to the right of the range and *vice versa*.

1. To avoid a rock or shoal by keeping on a range between two objects when no ordinary range is available.

A strong tide renders the channel between the rocks dangerous, no range lights can be placed in the ordinary way at *A* and *B* as the land is too high, but by placing a second light or beacon at *B* a vessel may be safely steered between the rocks by day or night, at any stage of the tide, as with ordinary range lights (Fig. 2).

2. When passing between two objects laid down on the chart the ship's position may be fixed with a single sextant angle or compass bearing, as at *C* (Fig. 2).

3. To find the deviation of the compass.

Station an assistant by the standard compass, and when the indicator shows that the compass is on the line between the two objects selected on the chart, «mark» and note the bearing of either landmark, the magnetic bearing of the line being taken from the chart and the deviation obtained.

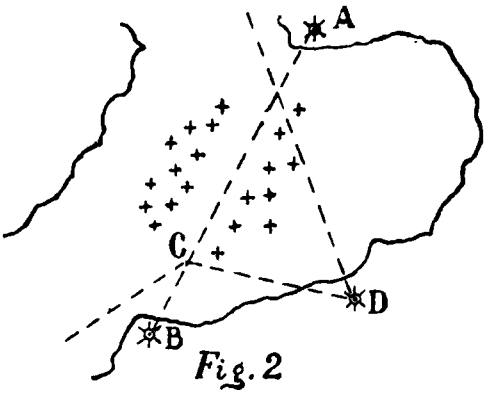

Fig. 2

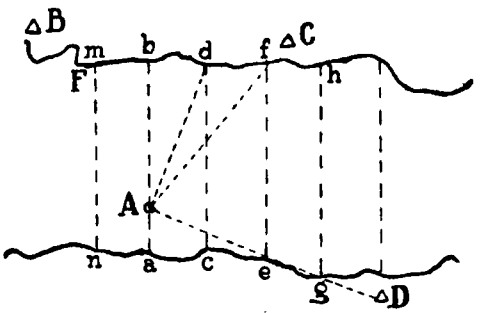

Fig. 3

Use in Hydrographic Surveying.

This instrument will be found very useful in running lines of soundings in rivers and harbours where the currents are strong and conditions are such that ordinary ranges cannot be established. Under these conditions straight lines of soundings greatly facilitate the plotting of the work and add to the accuracy of the chart.

Fig. 3 represents a boat sheet, *ab, cd,* etc., sounding lines, *B, C,* and *D,* surveying signals. The boat is located on the line *ab,* at *A,* by sextant angles. If the current be strong it may be necessary to drop the anchor under foot at *A.* The angle *bAC* is taken from the sheet, placed on a sextant and the image of *C* fixes the point *b* on the opposite shore, one point of the range, and *a* is established with the instrument by looking at *b* and noting the rear object in the mirror, but under some circumstances it is better to have two flags on poles one on each side of the river or bay, which may be used as rear objects. These can be shifted by the tender of the sounding launch from time to time when necessary. Experience will show that time will be saved by being careful to establish a good range which will save the necessity of patching up broken lines, etc.

Before getting under way from *A* it is well to mark the beginning of the next line at *d* by placing the angle *dAD* on the sextant and noting where the image of *D* falls, then having sounded along the line *ab,* pick up the flag at *F,* used as a rear mark in running the line *mn,* and have it transferred to *d,* and then establish the point *c* on the opposite shore.

When the shore lines have been already accurately located on the boat sheets, as should always be the case, the angles *dAD* etc. will locate the ends of the lines exactly.

When the lines are so short or the water shoal or rocky so as to require the use of pulling boats or canoes, a sheet of newspaper placed on the beach or bushes will make a good rear mark.