

SEXTANTS AND MIRRORS.

PART II.

by COMMANDER P.S.E. MAXWELL, R.N.

In the *Hydrographic Review*, Vol. XI No 2, of November 1934, page 135, a description was given of a new method of ensuring watertightness in the horizon and index mirrors of any sextant, whether of the hydrographic or of the ordinary navigating or observing type.

In order to accomplish this it will be remembered that the mirrors, circular in shape, were, after the silvering process, enclosed in a completely watertight frame before placing on the sextant. It was obvious that with this particular type of case a wholly silvered horizon glass became a convenience of manufacture and, in many people's opinion, it was considered that it was just as good for observing purposes as the older form, and, that anyhow the advantages of the watertight and almost imperishable mirror would go a long way towards overcoming any prejudice.

In spite of this it has been found that this prejudice does exist amongst certain navigators and so work was commenced experimentally on a watertight half silvered type of sextant mirror. These efforts have now been successful, and a hermetically sealed, completely air and water tight mirror with a half silvered portion has not only been devised but patented and placed on the market. As in the case of the wholly silvered watertight mirrors, also invented by the same member of the British Hydrographic Department, the manufacturing and selling rights were handed over to Messrs. Henry HUGHES of 59 Fenchurch Street, London, from whom they can now be obtained.

THE HALF SILVERED WATERTIGHT MIRROR.

Obviously the method employed with the fully silvered mirror would be of no use in this case, although it was clear that a suitable form of transparent backing would go a long way towards solving the problem, and thus trials were begun with two parallel glass plates cemented together with the half silvered portion in the middle.

To obtain the accuracy required for a sextant mirror it was necessary to ensure the parallelism of the outer faces of each glass after cementing. A definite layer of cement between the glasses was necessary and it needed but a few experiments to show that their parallelism was liable to break down when subjected to pressure, or even when used under tropical conditions. When this occurred the image viewed through the unsilvered part of the double mirror was seen to have a "ghost": in other words, the image had been distorted.

To avoid this, the following method was tried and has proved successful:—

Owing to the circular shape of the mirrors the "best position" of the two glasses, one to the other, is easily found by rotating one on the other and examined by an interferometer until a position free from distortion is reached.

This "best position" is then marked on the edge of the glasses after which the silvering process is proceeded with in the ordinary way. After cutting away the top half of the silvering, the two mirrors are cemented together, bedding on to four thin metal separators. These are formed of tiny strips of metal foil .005" in thickness and provide a solid link between the half silvered glass and the plano-parallel glass backing, preventing any movement of either glass.

To supplant the watertightness already obtained by the cementing, the mirror is fitted and clamped in a mount similar in character to that of the object glass of a telescope, and finally fitted with a suitable arrangement for the correction of index and side errors, etc.

By fitting a deep flange at the base of this mount, an unobstructed view is obtained through the unsilvered part of the mirror and as all adjustments affect the mount only, the mirror cannot be strained in any way.

This type of mirror has now found considerable favour, and appears to fulfil all requirements admirably.

The attached photograph shows:

- A. The half silvered type of horizon mirror.
- B. The wholly silvered type of index mirror.