HYDRODIST

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The Hydrodist (*) is an electronic measuring device for use in plotting a vessel's position whilst employed on surveying, minesweeping, dredging or similar operations where the ship remains within the area covered by the range of the equipment.

The Hydrodist is an adaptation of the Tellurometer which makes use of two well-known principles :

(i) The received signal lags in phase behind a transmitted signal to an extent dependent on the physical separation of the transmitter and receiver;

(ii) In heterodyne frequency conversion systems phase changes in the heterodyne signals are preserved in the converted signals.

In order that the measurement of phase lag can be made at the transmitting station, the signal received at the receiver of slave station is retransmitted and received by the master transmitting station.

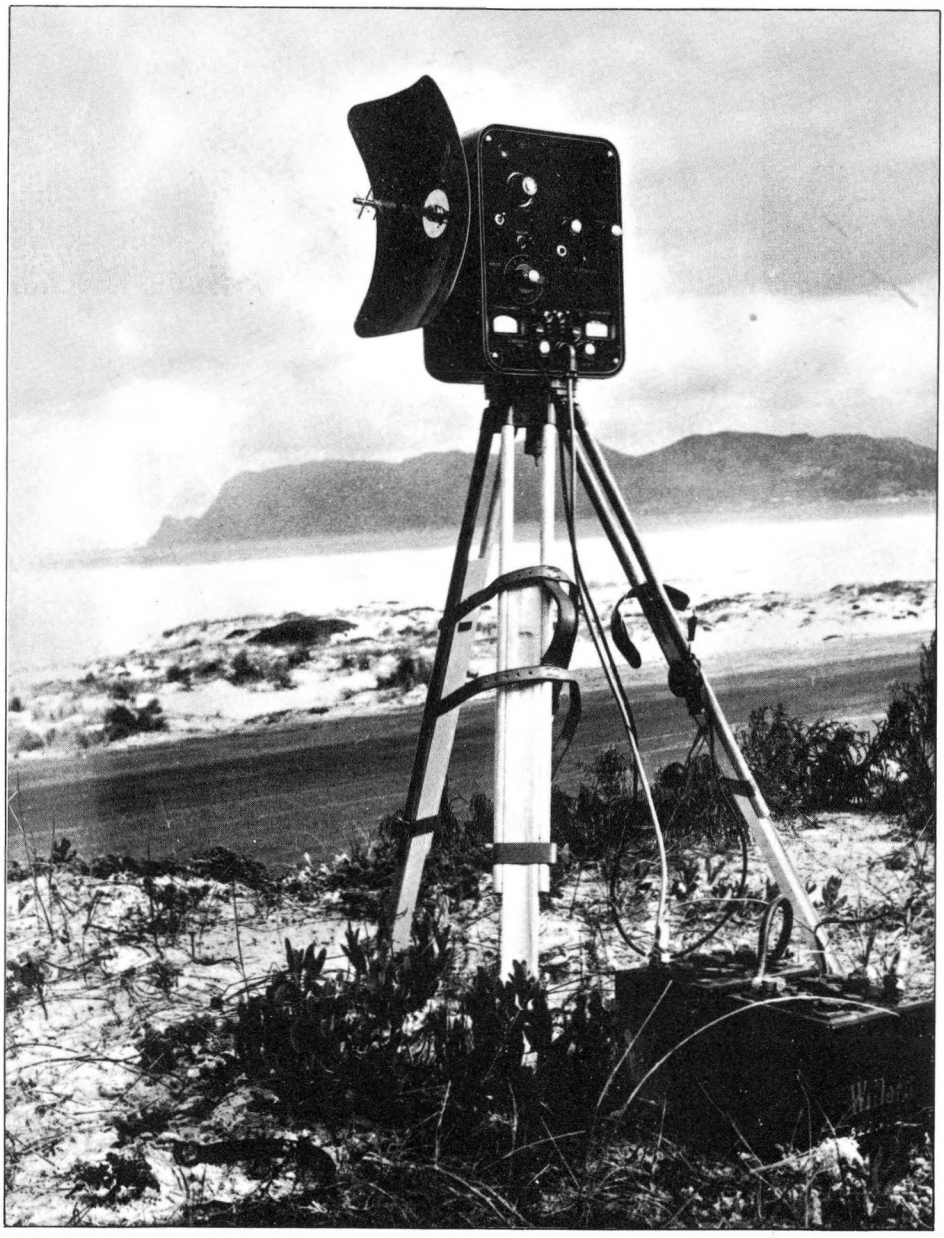
The Tellurometer, however, was designed as a precise distance measurer for use in geodetic surveying. The method employed in obtaining the reading could only be used if both master and slave stations were stationary. However, it was apparent from the outset that if the equipment could be adapted for use in measuring distances between a moving ship and a fixed station, the position of the latter being accurately known, then if two such sets of equipment were to be used, giving two ranges between the moving ship and two suitably spaced fixed stations, the position of the vessel could be plotted relative to the fixed stations.

The Hydrodist is the name given to that adapted version of the Tellurometer and can be used to determine the position of a vessel.

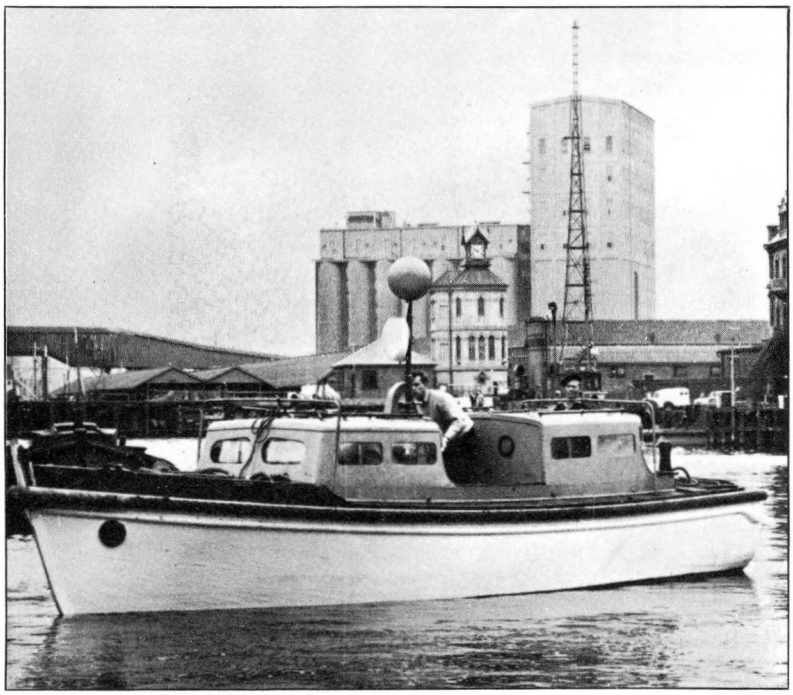
The plotting of the vessel's position is simple, for the ranges in metres from the two fixed stations can be graphically portrayed by concentric circles around each slave station, and the position of the vessel is at the point at which the relative range circles cross each other.

The equipment is compact and easily handled. Aboard the vessel are

(*) A detailed study of this system will appear in the Supplementary Papers to S P 39.



Pl. 1. — Hydrodist Equipment



PI. 2 et 3. — Hydrodist Equipment

two master-station consols, both approximately 18″ × 12″ × 9″ in dimension, each having their 12-volt battery supply, and either an 18-inch dish-shaped dipole aerial attached to the back of the consol, or a similar aerial mounted on a mast which can be stepped in some suitable position clear of other obstructions. These aerials must be capable of being directed at the slave station in order to receive maximum signal strength, thus assuring maximum range. Therefore if the aerial is attached to the consol the whole equipment must be mounted on a pedestal so that the aerial may be pointed in the required direction, i.e. the position of the slave station ashore. If the aerial is mounted on the roof of the boat's cabin or some other suitable position it must be free to revolve. The actual movement of the aerial is made manually by means of a handle mounted at the base of the mast. The master stations can then be suitably sited inside the cabin.

The slave stations ashore are to all intents and purposes identical to the master stations and here again the aerials can be attached to the housing of the set or on a mast which can be easily secured to a tripod, sited over the coordinated position of the land. These aerials must also be capable of orientation to face the master station on board the ship.

A two-way radio telephone is built into each set so that the operator at the master station may converse with the slave station and thus pass instructions for training the aerial, solving ambiguities in the range, etc.

The operation of the equipment is simple. On a cathode-ray tube is a circle of light broken by a small gap which revolves round the screen as the range alters. One revolution equals 100 metres. A cursor is attached to the cathode-ray display which is manually rotated to follow the gap. The cursor is connected to a counter which, having been set to the initial range ambiguity, then automatically records the range in metres.

The ambiguities have first to be resolved by a pattern-switching device to determine the range in thousands and hundreds of metres, after which the counter takes over the recording of the range, dependent on the position of the gap and the number of revolutions made.

The aerials must be kept orientated to face the direction of the slave station. Althougth the aerial is so constructed as to give a 20° beam width, the best results are naturally obtained with the aerial trained on the slave station, especially at maximum range, which is the line of visible sight, and is therefore dependent on the elevation of the slave station.

The most convenient arrangement for the aerials is to have them attached to a mast one above the other, each independent of one another and revolved manually by two hand wheels at the base of the mast. The maximum separation allowance between the master station and the aerial is 10 feet, therefore the height of the aerials is considerably limited. The two master stations are suitable positioned in the cabin of the boat or a deckhouse on the bridge of the ship.

Two operators are required, one for each instrument and, in addition to following the gap with the cursor, they have to keep their respective aerials trained onto their respective slave stations. A volume meter on the instrument panel enables the operator to determine the line-up of the aerial.

The plotting of the vessel's position is carried out by a plotting officer using a specially prepared board on which have been plotted the positions of the two slave stations. See fig. 1.

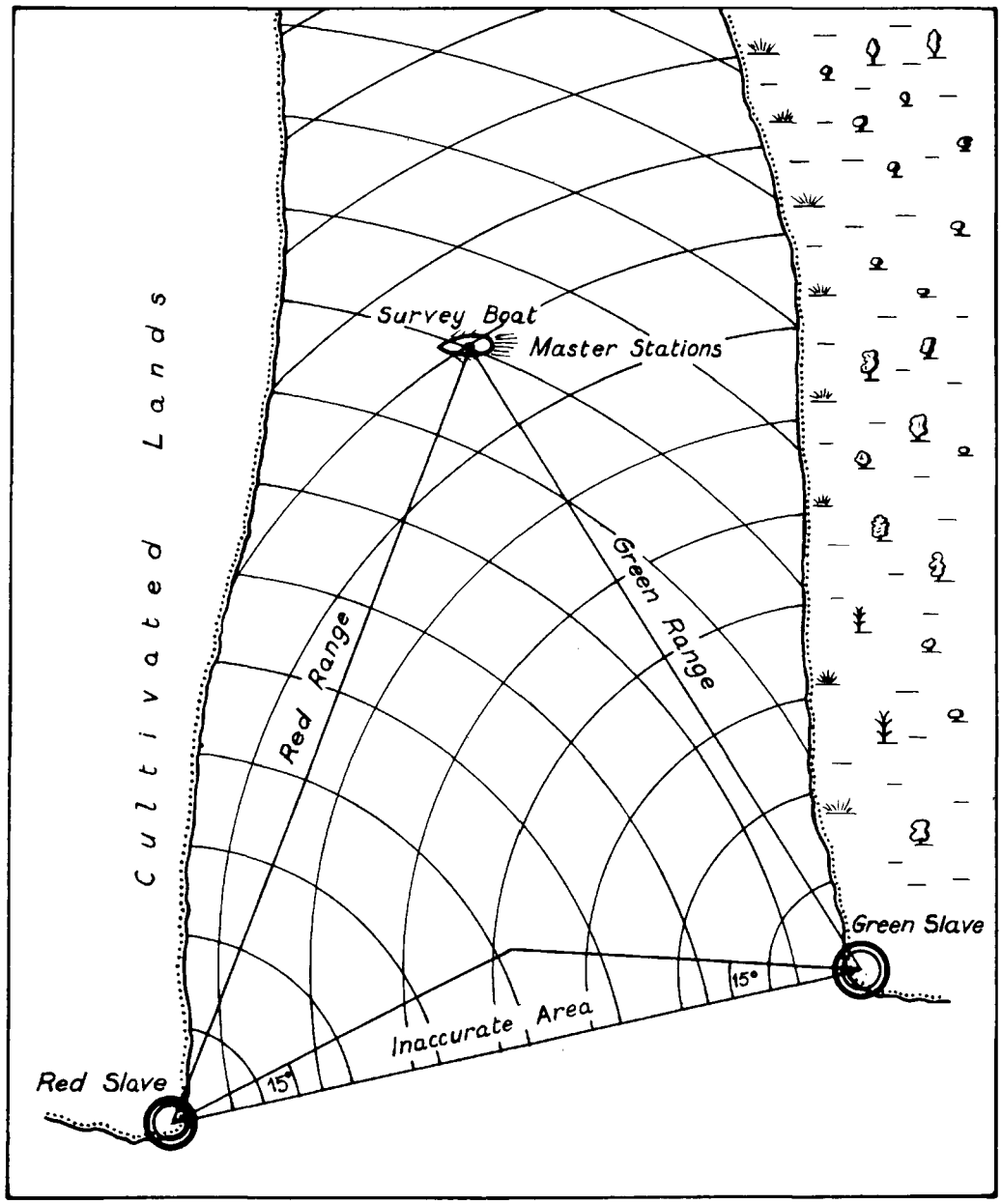


FIG. 1. — Diagrammatic Drawing Showing the Method of Plotting by Hydrodist

The ranges read out by the operators are set on a two-range plotter, the ends of the arms being pivoted about their respective positions of the stations on the board, and the position of the vessel is thereby plotted at the intersection of the two arms.

The two slave stations each manned by one attendent are positioned at previously coordinated sites. The positions of these stations will be dependent on the scale and also the nature of the survey or the operation.

The slave station attendant's duty is to keep the aerial trained on the

vessel. In poor visibility this can be done by means of the volume meter on the instrument panel, traversing the aerial till maximum signal strength is obtained.

The accuracy achieved by the Hydrodist is in the order of 3 metres at 20 miles, which is far in excess of the plottable error on the scale used at that range, i.e. on a scale of 1/25 000 : 3 m = 0.01 mm.

With the aid of Hydrodist surveying, minesweeping and dredging operations can be carried out in conditions of poor visibility, and being easily transported and simple to operate, the equipment should have a very great future, especially in enclosed or confined waters such as river estuaries, large bays, gulfs, etc.