

added the information to be found in Commander FONTOURA DA COSTA'S *A Marinharia dos Descobrimientos*, pages 157 and 192, and in an article by H. WINTER which appeared in the *Annalen der Hydrographie und Maritimen Meteorologie* of 15th September 1935, page 352 et seq.

HOW THE WRECK OF THE "LUSITANIA" WAS FOUND.

(Summary of an article published in *The Nautical Magazine*, Glasgow, January 1936, page 33).

In the course of her search, carried out in June 1935, around the wreck of the *Lusitania*, torpedoed in 1915 off the South West coast of Ireland, near the Old Head of Kinsale, the S. S. *Orphir* developed a method of location of the wreck the success of which is due to the use of a recording echo-sounder. Without this valuable auxiliary the wreck of the *Lusitania* could not have been found so quickly. The *Orphir* was equipped with two echo-sounders: the French Langevin-Chilowsky pattern and the British Admiralty M. S. II model. Both are supersonic in operation. The Admiralty pattern however employs a recording device with an accuracy of inches, while the French pattern registers soundings by flashes on a transparent scale. Some idea of the accuracy of this latter machine may be gathered from the fact that as the anchor cable ran out those on the bridge clearly saw its outline registered on the chart.

On 6th October the *Lusitania* was definitely found. Shortly after 2 p.m. the British Admiralty echo-sounder apparatus charted an enormous wreck at least 600 feet long rising 84 feet above the bottom of the sea. Nine times the *Orphir* was taken over the spot and each time the long bulky outline was recorded, while the sea bottom in the area was recorded as being perfectly flat. A close reading of the chart indicated that the wreck was fairly deeply embedded in sandy clay and was lying at a depth of 309 feet at 11.6 miles 164° from Old Head of Kinsale Lighthouse. During the course of the search, over 2000 miles of the sea-bed was surveyed. A clever system of buoying was adopted and one square mile was surveyed at a time.

The appended photograph shows the trace of the record obtained over the wreck of the *Lusitania*. The soundings on this chart correspond to the second phase of the recorder ranging from 25 to 60 fathoms, with the result that the zero of the chart corresponds to a depth of 25 fathoms. The echo-sounder had been working during a period of 32 days; the machine ran from 12 - 14 hours daily and produced altogether 47 charts of an average length of eight hours. 240 soundings were made each minute, giving a total of over 6,760,000 echo-soundings.

On the chart, above the wreck of the *Lusitania*, one notices two bearings which were scribbled hastily by means of an "electric pencil". The blank space on the record corresponds to a gap in the soundings at the moment when, the ship having gone beyond the wreck, the engines were moved astern, thereby causing air to be mixed with the water below the transmitter.

THE TIDES OF PUERTO PIZARRO

by

LIEUTENANT COMMANDER VICTOR CORTEZ M. OF THE PERUVIAN NAVY.

The *Boletín de la Sociedad Geográfica de Lima*, Tomo LII, 4th Quarter, 1935, page 307, publishes a very comprehensive study of the tides of Puerto Pizarro (3° 31'S. - 80° 23'W.). The tides are influenced at this place by the hydraulic action of Rio Tumbes and its bar. This region has formed the subject of a special study; a series of 240 tide-gauge observations was carried out in the port during September, 1934. The study was continued throughout the lunar month and has enabled tidal curves to be drawn from which the ranges, mean sea level and various intervals have been deduced.
