

The vertical distribution of temperature and salinity was determined from actual measurements at each oceanographic station (i.e. about every second day) down to the greatest depths which were usually 2,000 to 4,000 metres.

The various oceanographic stations were then grouped together where the distribution of temperature and salinity was sufficiently similar, and these groupings served to compute the velocity of propagation of sound for various areas, of which the accompanying sketch shows the distribution.

The cruise of the *Carnegie* having several times intersected the boundaries of the areas indicated in British Admiralty publication *H. D. 282: Tables of the Velocity of Sound in pure water and sea water for use in echo-sounding and sound-ranging*, attempts were made to check the characteristics of the boundaries corresponding to these frontiers.

There are seasonal temperature and salinity variations in the upper layers of the ocean; these variations attain 10° C. in the temperate regions and even more in the regions adjoining the Japan Current. It may be assumed that annual variations in temperature occur down to about 500 metres. Under such conditions the computed values in sounding velocity would be in error by about 0.2 per cent at a depth of 2,500 metres, and the error at 4,000 metres would be about 2 metres per second.

It is very desirable that much more information regarding the seasonal variations in subsurface temperatures in the open ocean should be collected in the near future.

ANNAES HYDROGRAPHICOS.

TOMO II.

Rio de Janeiro, 1934

The second volume of these *Annaes* has just reached the Bureau. A summary of the contents of the first number was given in *The Hydrographic Review*, Volume XI, No. 1, May 1934, page 134.

This second volume opens with a report on the *Courses in Hydrography* and mentions that the first "term", consisting of 5 Officers, has completed the course and two of them have been sent abroad (1 to the U. S. of America and 1 to Great Britain) to complete their instruction. In addition to these, two other Officers who have acted as instructors are considered to have qualified in hydrography.

The "term" now undergoing the course consists of 6 Officers; as practical instruction they have carried out the triangulation of Bahia das Tijucas and made surveys of the Ganchos Inlets.

The next article gives a brief history and description of the Surveying Vessel *Rio Branco*. This vessel was built in England in 1914 and is of the following dimensions:

	metres	feet	inches
Length.....	55.6	181	5
Beam.....	9.8	32	2
Draught.....	4.2	13	9
Tonnage.....	756 tons.		
Maximum speed.....	14 knots (approx.).		

The succeeding chapter, which is entitled *On the Accuracy of Air Photography in Hydrographic Surveys*, opens with the following statement:—

"The application of aerial photogrammetry in the hydrographic surveys undertaken by the Directoria de Navegação shows indisputably the two great advantages over all other methods that it can be carried out very rapidly and that it gives an absolutely faithful representation of those outlines which are of interest to the surveyor:"

and continues with a study of the errors which may creep into the work and of how to avoid them.

This is followed by a chapter entitled *Photocarta* (Photographic Charts) which contains descriptions of the camera and other instruments employed in making such charts.

The next two articles are reports on the *Surveys of the Ganchos Inlets* and of *Sepetiba Bay*. The latter report contains a list of the charts (with their limits) which are to be published as a result of the survey.

Thereafter are chapters which deal with :

Notes on the Tides on the Brazilian Coast, containing the harmonic constants for 23 ports, mostly based on one year's observations.

Shipping Disasters in Brazil ; including even those of the XVI century, with an examination of their causes. The author, Rear-Admiral D. Paes LEME DE CASTRO, sums up with the words :-

"The above cases show that most disasters are due to the blind stubbornness of fatal and irresistible causes, but many others result from an incorrect interpretation of prevailing meteorological conditions and from imperfect knowledge of local lighting and buoyage or, again, are the result of lamentable errors only possible to those seamen who are grossly ignorant of the hydrography of the place in which they are manœuvring."

Erection of the Itapagé Lighthouse. The new light, which was inaugurated on 1st January 1933, takes the place of the old one extinguished during the night of 30th-31st July 1929 and lies some 1733 metres to the N.W. thereof.

Notes on Aids to Air and Surface Navigation. A short history of the evolution of these aids in Brazilian waters with brief notes on the programme of improvement and development.

It is to be regretted that neither this nor the previous volume contains an index or, even, a list of contents.

G. S. S.

MAPPING THE OCEAN FLOOR

by

CAPTAIN GILBERT T. RUDE, U. S. Coast and Geodetic Survey.

(Extract from the *United States Naval Institute Proceedings*, Annapolis, April, 1934.)

In this article, Captain Gilbert T. RUDE, Chief of Division of Hydrography and Topography, U. S. Coast and Geodetic Survey, gives a summary of modern hydrographic methods. After having recalled in a brief historical account the earlier conceptions which led to the drawing-up of hydrographic charts, since the epoch of the great discoveries, he outlines the general development of the methods of precise cartography, based on systematic surveys, a procedure which has gradually evolved from the less precise practices of the art of navigation, until it has reached its present precision, based on the developments and the principles of modern science. The recent years, and principally those which followed the World War, have seen a revolutionary advance in the technique employed in hydrographic surveying, with a corresponding increase in the volume and accuracy of this work.

In our time hydrography resorts to laboratory science, in order to bring into play new physical methods. Piano wire, after half a century's use for the measurement of the greatest depths, gives place, to-day, to a series of instruments borrowed from the arsenal of the radio engineer. The hydrographic surveyor, therefore, is actually a combination of navigator and engineer, with a clear understanding of the requirements of the mariner and with engineering ability to carry on, not only hydrographic work of a high order, but also all the related field operations necessary to the construction of the chart. It is necessary not only to determine the exact depth of the sea, but, above all, to ascertain the accurate location of these depths; it is actually in this dual operation that modern echo-sounding and sound-ranging methods complement the one the other now-a-days. At present, still more is demanded from the marine chart than was