FIFTY YEARS AGO...

The May 1925 *Hydrographic Review* (Volume II, No. 2) had as a frontispiece a photograph of the Library in the old Bureau premises in the Avenue du Port, Monaco. The same fine library table is still in use today.

The "Prefatory Notes" recorded the adhesion of Poland and Uruguay to the Bureau and announced that the 2nd International Hydrographic Conference would be held in the autumn of 1926.

National Hydrographic Offices. The *Review* carried a report on the Department of Hydrography and Navigation of Chile (see Centenary paper in January 1975 *Review* and a paper on the Italian Hydrographic Institute by IHB Director J.M. PHAFF (see Centenary papers by Captain Franceso RIBUFFO and Rear Admiral G.S. RITCHIE in the *Review* of July 1973).

Echo Sounding. This new technique was beginning to have its impact on hydrographic surveying and there are a number of papers on the subject followed by a useful bibliography of references, relating to this vital new technique, published throughout the world during the years 1904-1925. Reference is also made to Special Publications Nos. 1, 3 and 4 (still available at 10 Francs each) in which the more important papers on the principles of echo-sounding and details of many of the earlier echo-sounding machines were reprinted.

On page 163 there is a discussion on the advantages and disadvantages of echo-sounding as follows :

"The seaman is conservative when it is a question of means of navigation. He prefers the simple methods inherited from his forefathers, methods which have stood the test of time and practice, and it is not easy to make him adopt all of a sudden something which is quite new and which has nothing in common with the old methods. But none can escape his fate and the seaman is gradually forced to keep pace with developments. Whether this development is tantamount to safer navigation may remain an open question, for it is very likely that navigation becomes more audacious as the means of navigation become more developed. Who, only a few years ago, would have imagined it possible that, by means of a combination of a submerged bell and radio signals from a light-ship, it is feasible to ascertain the distance from them, a problem which also is

based upon the speed of sound waves through water, yet now the appliances for this are installed in the "Graadyb" light-ship and are very much used by Danish steamers running between Esbjerg and British ports.

Seamen have been heard to say that one cannot trust a sounding apparatus which, by giving a reading which is but a fraction of a second wrong, may give wrong depths. In reply to this the question may be asked : 'What is a short and what is a long time ?' — The seamen must get accustomed to the idea that 1/5 of a second (the longest period that the chronomicrometer is able to record) is a long time and he must get used to relying on the chronomicrometer to work with an accuracy of 1/10 000 of a second in the same manner as he gets used to relying on the accuracy of the daily working of the chronometer. [In depth 1/5 of a second corresponds to about 150 m (82 fms.), 1/10 000 of a second to about 0.07 m (2-3/4 ins.)].

There are yet others who think that an instrument which has to work, with such great accuracy, under the influence of a spring is too dependent on the maintenance of constant tension by the spring. But they rely on the chronometer even through its springs have to work for years, whereas the springs of the chronomicrometer are bent only during the few seconds required for the operation of the sounding".

Under 'Use for Aerial Sounding' we can read as follows :

"It is interesting to learn that an apparatus of this type was installed on the Reparation Zeppelin Z.R. 3 during her trial flights over Germany. The instrument was used as a depth-sounder in air instead of in water, that is to say, it indicated the height of the airship above the ground".

A requirement for exploiting echo-sounding was, of course, an accurate value for the velocity of propagation of sound in seawater, and this matter is referred to on page 183 :

"As early as 1827 J.C. COLLADON and J.K.F. STURM measured the speed of the propagation of sound through the waters of the Lake of Geneva over a base 13 kilometres (14 215 yards) in length at a temperature of 8°1 centigrade (46° Fahr.), and found the value of 1435 metres (4708 ft.) with an estimated accuracy of ± 24 metres (78 1/2 ft.), which agrees fairly well with the value deduced from the formula

$$V = \frac{I}{\sqrt{\mu\rho}}$$

in which ρ represents the density of the liquid and μ the coefficient of adiabatic compressibility, i.e. the variation in the unit of volume for a difference of one unit of pressure.

During the last few years much new research and many experiments in direct measurement through open water have been carried out by various nations. They were made in connection with various problems of submarine ranging, in order to determine more exactly the velocity of propagation of sound waves through sea-water.

At Cherbourg in 1919, Ingenieur Hydrographe MARTI, working with a base 900 metres (2953 feet) long has obtained a value for the velocity of propagation of sound through sea-water under definite physical conditions,

and has adopted for normal conditions — i.e. for a temperature of 15° centigrade (58 1/2° Fahr.) and a salinity such that the density at 0° C (32° Fahr.) is $D_4^0 = 1.026$ (which represents according to the tables of LANDOLT and BÖRNSTEIN a salinity of 32.35 per 1000) — the value 1504.15 metres (4934.966 feet) which he estimates to have an accuracy of ± 0.50 metre (1.64 feet).

The velocity of the sound varies with the temperature of the water, its salinity and the pressure, that is to say, with the depth. The theoretical formula

$$V = \frac{I}{\sqrt{\mu\rho}}$$

from which is deduced

$$\frac{dV}{V} = -\frac{I}{2}\left(\frac{d\mu}{\mu} + \frac{d\rho}{\rho}\right)$$

permits the separate influence of each one of the above factors to be analysed (salinity, temperature, depth) both on the density ρ and on the coefficient of compressibility μ.

By introducing the data extracted from the *Recueils des Constantes physiques* into graphs, we can trace the curves showing the relative variations $d\mu/\mu$ and $d\rho/\rho$ in functions of each of the above factors, and half the total gives the corresponding variation of the velocity V.

A detailed analysis of this process will be found in the French *Annales Hydrographiques*, Vol. 705 of 1920, pages 165 to 179".

Auxiliary languages. The 1920s were the heyday of Esperanto, and the Bureau, seeking to serve its international membership, records :

"An invitation for the representation of the Bureau at the Universal Congress of Esperanto at Geneva in August next was received recently, and another invitation from the President of the International Conference for the use of Esperanto in Pure and Applied Sciences, which is to be held in Paris during the month of May, has also been received. The Directing Committee fully appreciates the importance of the adoption of a universal language which could be utilised for abbreviations on all hydrographic documents, but the representation of the Bureau at Conferences dealing with one auxiliary language only is considered undesirable, as it would appear that the only satisfactory means of solving this most important question is the adoption of one of the many auxiliary languages after its acceptance by international opinion; as has been previously remarked in the *Review*, it is extremely doubtful if any existing national language would be acceptable for this purpose by all those concerned, and the only alternative, therefore, is to await the time when an auxiliary language has been sufficiently perfected to be universally adopted as an international medium of expression".