International Hydrographic Review, Monaco, LV (1), January 1978.

FIFTY YEARS AGO...

Much of the *Hydrographic Review* of May 1928 (No. 9 of the series) was devoted to echo-sounding methods, following the publication by the Bureau of SPs 1, 3, 4 & 14 between Dec. 1923 and Aug. 1926. Ships of about half the 23 Member States were by this time fitted with echo-sounders of French, German, British or American manufacture, and some of these sounders are described in detail in articles by the manufacturers. As a contrast to the approach cited in most articles, which had the ships transmitting an acoustic pulse, we reproduce from pages 159-160 the description of the ingenious but expendable sound source, the " Atlas Dropping Lead " :

"As complementary information to that already given in Special Publication N° 3, on a device for taking soundings in which an explosive is used, the following description of the "*Atlas Freilot*" (Atlas Dropping Lead) is given. This description has been communicated by the "*Atlas Werke Aktiengesellschaft*" of Bremen, the constructors, and deals more particularly with the safety assured in the manipulation of the instrument.

The "*Atlas Dropping Lead*" made on this principle consists of a drop-shaped body of 6 inches length and weighing not quite 4 ounces. The velocity of fall is exactly 2 metres per second. At the upper end the body is provided with two tailshaped fins which ensure a uniform speed of fall in the water, and in the manufacture serve for accurately adjusting the velocity of fall.

At the lower end is attached a movable, semispherical cap which, on touching the sea bottom, releases a mechanism similar to the trigger of a gun, which in turn releases a pin and explodes a cartridge. In the design of the "*Atlas Dropping Lead*" particular importance has been attached to protection against premature explosion, by the arrangement of a number of safety devices. As main security against explosion during transport, a locking pin is fitted which is only removed when preparing the lead for use. Two safety fuses of blotting paper still give full security after the removal of the above pin, and they allow the striker to pass only when under influence of water. Finally, the Dropping Lead is cast into the water with the help of a sheet-steel throwing tube, and the main locking device is not withdrawn until the lead has been inserted in the tube. Everything has therefore been done to prevent any possibility of danger while handling the apparatus.

MANIPULATION OF THE ATLAS DROPPING LEAD.

The lead is extracted from the moisture-proof packing, is inserted in the throwing tube and the locking pin withdrawn. The lead is now ready for casting. It is cast into the water from the bridge, on the lee side, and the stop watch is started the moment the lead plunges into the water. As said before, the lead sinks to the bottom with a uniform velocity of 2 metres per second. In the interval, the operator goes to the submarine signal receiving apparatus, holds

the receiver to his ear, and awaits the detonation which indicates that the lead has struck against the sea bottom. The watch is stopped immediately the explosion is heard and the depth is ascertained by multiplying the number of seconds shown by the watch, by 2. If desired, the *Atlas Werke* can supply stop watches gauged direct in depth metres, or in fathoms. In the dark and in misty weather, when it is impossible to see the lead drop into the water, the watch can be started when casting off. In this case the measurements taken must be corrected, as the time of fall for the space between the bridge and the level of the sea must be added. Correction tables are included in the directions for use.

This device is used in the German Navy and on board numerous merchant ships".

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Apart from a number of technical papers, notably on chart printing methods in use in many Member States, and photographs and descriptions of some Survey Ships of the epoch, there are articles on several Hydrographic Services, notably :

The Hydrographic Office of the United States Navy, with an interesting map showing the extent of activities worldwide;

The Hydrographic Service of the Spanish Navy, describing its reorganisation by a recent Royal Decree of King Alfonso;

The Hydrographic Office in Leningrad, with extracts from a booklet written by the Director Mr V. AKHMATOV and published in connection with the 100th anniversary;

The Hydrographic Office of the Estonian Republic, in Tallin; of interest is an account of the meeting of Baltic coastal states in 1924 to agree on a common geodetic triangulation system;

The Hydrographic Department of the Navy of the Kingdom of the Serbs, Croats and Slovenes, at Dubrovnik, established by Ministerial decision in 1921.

An outstanding paper in this issue is "The physiographic interpretation of the nautical chart" by Raymond Stanton PATTON (U.S.A.), parts of which, containing sage words as true today as they were then, follow :

"In a number of instances recently the writer has been asked for his opinion, as an engineer experienced in the technique of nautical chart production, with regard to the probable accuracy of data carried on the charts of this and other nations and to the validity of certain physiographic deductions which resulted from studies of such data.

The recent prevalence of seismic disturbances having their centers in ocean areas, has resulted in efforts to determine the relation, if any, between the disturbance and the slopes of the area in which it originated. Likewise, the recent application to hydrographic surveying of certain methods developed during the war for the location of submarines, has greatly expanded the field which it is feasible for the hydrographer to occupy in a reasonable time, resulting in a sudden accumulation of data in considerable volume applicable to hitherto unexplored areas of the ocean floors. These accumulations have been seized upon eagerly by physiographers, and have been productive of numerous requests for assistance in correlating them with pre-existing data for the same or adjacent areas.

These and other similar inquiries incident to the consideration of problems having to do with the configuration of our continental shelves emphasize the need for a statement of the limitations to which the charts are subject, and of the cautions which should be exercised by the scientist who uses them in his geophysical studies.

The critical evaluation of a chart demands an intimate and detailed knowledge of all the factors involved in its production. Therefore, the present discussion will be limited in its application to the charts produced by the Coast and Geodetic Survey, since it is only with regard to those charts that

the writer can speak with the necessary measure of authority. It is believed, however, that the standards of accuracy of the Coast and Geodetic Survey have always been the equal of the best contemporaneous practice of the charting agencies of other nations and, in consequence, that the following statement may be accepted as indicating, in a general way, the limitations to which all charts are subject.

The Coast and Geodetic Survey would be the first to assert that such limitations exist. We frequently observe a tendency, manifested by the presumably critical scientist or engineer scarcely less than by the layman, to accept the publications of the Survey as "gospel truth", worthy of unquestioning acceptance for even the most precise purpose. Such a manifestation is as embarrassing as it is flattering. The Survey has always adhered scrupulously to a high ideal of accuracy; in fact the most serious criticism which it has ever been called upon to meet was that its work is done too thoroughly and therefore at too great cost. Accuracy, however, is a relative matter, and that which was ample to ensure the safety of the shallow draft sailing vessel of the clipper ship era, may well be inadequate to meet the exacting *requirements of some special physiographic problem.*

There is a group of fundamental facts which must form the basis for any just appraisal of the chart. They afford alike the explanation and the justification for both its merits and its deficiencies.

The purpose of the chart is primarily utilitarian. It is the product of the obligation incumbent upon each maritime nation, to furnish its shipping the information necessary to guide it safely through the waters it must traverse. All nations subordinate every other purpose to this one. For example, in the field, surveys must be made first of the shoal areas which may contain dangerous obstructions, rather than of the deeps whose exploration admittedly would produce information of great scientific value, but which are of minor interest to the mariner. Similarly, in the drafting room, the mercator projection is used as the framework for the chart because that projection is particularly adapted to the mariner's needs, and in spite of the fact that for general purposes it is less suitable than others available.

The task of surveying the waters of the earth is such a stupendous one that the combined effort of all participating nations has scarcely made a beginning of its accomplishment. This being the case, it follows as a necessary consequence of the purpose of the chart, that such surveys as have been made have as a rule been confined to the proximity of the land, and that as we proceed seaward from any shore, the survey becomes progressively more open, the soundings more widely spaced, and the whole product more of an approximation. Important harbors and channels whose depths are but little in excess of the drafts of the vessels using them are sounded with a thoroughness which reveals even minor irregularities in the configuration of the bottom. Coast-wise areas of moderate depths are examined less minutely, yet in sufficient detail to insure that no considerable difference in depth will pass undetected, and to permit of drawing generalized depth curves accurate as to position and general trend, but in which minor irregularities are omitted. With a greater departure from the shore and deepening of the water, the sounding lines become progressively more widely spaced and, when beyond sight of land, subject to uncertainties which will be discussed in detail later, so that by the time the outer limit of the surveys has been reached the data frequently have become approximations to an extent which must be taken into account when utilizing them for any precise purpose..... ".

"The standards of accuracy prevailing to-day were impossible of attainment a century ago when the Survey began its task. The art of hydrographic surveying has developed just as have other arts and sciences during that period. In the matter of equipment alone the total progress is ample to justify the differences in accuracy which will be found to exist. The sailing ship has given place to the steamer, the hand-manipulated hempen sounding line to the steel piano-wire carried on a motor driven reel, and both to the super-sensitiveness of radio-acoustics. The radio time signal is now broadcasted daily, insuring the accuracy of our chronometers to a small fraction of a second, and thus making it possible to fix our astronomic positions with a certainty previously undreamed of. To evade a frank acknowledgement that these and many other improved facilities have increased the accuracy of certain kinds of hydrographic surveying, simply because such an acknowledgment means an admission that the corresponding work of earlier periods was more or less inaccurate as measured by present standards, would be a stupidity of which the Survey has never been guilty.".

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January 1978 sees the Golden Jubilee of two of the Bureau's periodical publications, since in January 1928 the first *Yearbook* of the IHB appeared, similar in format to the latest 1978 IHO *Yearbook*, and also the first number of the *Hydrographic Bulletin*, published monthly thereafter : "In order to reduce postage in mailing numerous Circular Letters, the Directing Committee has decided to group all urgent and temporary information in a periodic Bulletin..." (Annual Report, 1927). It is hoped that these two publications are still fulfilling a useful and worthwhile purpose.