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FIFTY YEARS AGO...

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1. An *International Geographic Conference* was held in Cairo in April 1925 under the auspices of the Union Géographique Internationale. The organisation was carried out by a special Committee of members of the Royal Geographical Society of Egypt, the meetings being held in the very fine building housing this Society.

"The President of the Directing Committee attended the Congress as the representative of this Bureau, and was associated primarily with the Section of Physical Geography, which included Hydrography and Oceanography; it was realised that a considerable number of those attending the Congress would probably not understand clearly the relationship between Hydrography and Geography, and Admiral PARRY therefore prepared a short pamphlet on the subject, with a brief description of the formation and the work of the Bureau; there is no doubt that this fulfilled its purpose and directed the attention of the delegates to its activities; an extract is represented below :

"The word "Hydrography" is composed of two Greek words meaning "water" and "to draw" or "to write", that is, the science dealing with the measurement, delineation and description of the waters of the globe; the definitions of the word given in various dictionaries are generally in agreement and may be briefly summarised as follows :

"The description of the physical features and conditions of the waters; the preparation of charts and maps, showing the delineation of the coasts; the positions of lakes, rivers, seas and oceans, together with the configuration of their bottoms; the determination of the position and extent of all shoals, rocks, reefs and islands; the positions of lighthouses, beacons and buoys; the investigation of tidal phenomena; the nature and velocity of currents; and the investigation of the alterations which are continually taking place on the coast and in the depths of harbours, rivers, seas and oceans generally.

"On the occasion of the funeral of the celebrated French Hydrographer

Monsieur BEAUTEMPS-BEAUPRÉ in 1854, the following allusion to hydrography was made by Admiral BAUDIN, the distinguished Explorer :

"Hydrography, which has for its object the determination of the true configuration of the coasts, and also the depth of those seas in their vicinity, is one of the sciences most eminently useful to men. In presenting to mariners the means of navigation, by day and night, through labyrinths of rocks or shoals, they are relieved from anxiety, difficulties and delays; hydrography is also an auxiliary to the naval forces of a country, and preserves many lives from wrecks; finally, it facilitates maritime commerce, that great source of national prosperity. For all these reasons no science has greater right to our solicitude, gratitude and respect".

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2. On page 53, experiments with a *Radio Acoustic Method of Position Finding for Hydrographic Surveys* by the United States Coast and Geodetic Survey were described starting :

"INTRODUCTION

"On the Pacific Coast of the United States during the winter frequent gales prevent work, and often the surveying vessel would be held in port during the favourable weather following a gale by the heavy swells breaking on the bars which are characteristic of all the harbours. In the summer time fog and haze are prevalent.

"In consequence the United States Coast and Geodetic Survey has been led to consider the application of the method of sound ranging for hydrographic work, the study of which has improved during the war, with a view to determining the position of the ship.

"The experiments have been performed on board the "*Guide*" from October 1923 till March 1924 by the personnel of the Coast and Geodetic Survey and by the physicists of the Bureau of Standards. The following information relating to the description and operation of the apparatus is extracted from Special Publication No. 107 recently issued by the Coast and Geodetic Survey.

"APPARATUS AND METHOD OF OPERATION

"The non visual determination of the off shore position of a vessel with reference to fixed shore points may be accomplished in a variety of ways. Direction measurements can be made on either sound or radio signals. The intersection of two lines of direction through the ends of a shore base line gives the desired position. Other methods involve the measurements of time intervals. In one such method the intervals between the arrival time of a single signal at three or more different shore points are observed. The position of the source is derivable from these intervals and the speed of sound. In another method a sound and a radio signal are started simultaneously at one point, and the interval of their arrival times is observed at another point. The magnitude of the interval depends on the difference between the speeds of the two signals and on the distance between the two points. The speed with which radio signals progress through space is so great, compared to sound speeds, that the time in which the radio signal

passes from the transmitter to the receiver may be ignored, and the arrival time of the radio signal may be considered identical with the departure time of the sound signal. If the two signals are transmitted simultaneously from a ship, the observed interval at a shore station is practically the time in which the sound signal travels from the ship to the shore station. Under-water sound signals are preferably used. The observed time multiplied by the speed of sound in the sea water gives the distance from the ship to the sound receiver of the shore station. Two such distances from two shore stations at the ends of a shore base line completely determine the position of the ship.

"The requirements of the service suggested as the preferred method one in which a sound signal is started from the vessel, and in which the arrival of the sound signal at the shore station sound receiver automatically results in the transmission of a radio signal which in turn is received and recorded aboard the vessel. The time interval between the initiation of the sound signal and the reception of the radio signal is measured by suitable chronographic apparatus. This multiplied by the proper value of the speed of sound in the sea water gives the distance of the vessel from the corresponding shore station. All the apparatus is here assumed to function instantaneously. The question of lags will be discussed later. Two distances from the two shore stations are sufficient for a position determination. A third shore station provides a check".

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3. One of the major papers was a "*Summary of the Proposals, Discussions and Conclusions of the various International Conferences on Uniformity in Buoyage and Buoy Lighting, with data of existing systems*", which was copiously illustrated with coloured diagrams. The Summary was compiled by Rear Admiral A.P. NIBLACK U.S.N. (Retd), a Member of the Directing Committee. Admiral NIBLACK describes the efforts to bring about a uniform system of buoyage which began at the International Marine Conference in Washington in 1889, was further discussed at the International Maritime Conference at St. Petersburg in 1912, and was passed on to the newly-formed I.H. Bureau as unfinished business by the International Hydrographic Conference held in London in 1919.

A League of Nations Technical Committee for Buoyage and Lighting of Coasts was to meet in the Bureau at Monaco in November 1925 (shortly after the publication of this *Review*), and accordingly part VI of Admiral NIBLACK's paper sets out "Proposed International Systems of Buoyage and Buoy Lighting as drawn up by the IHB" which it was intended to lay before this Committee. It read as follows :

"The Directing Committee believes that confusion has arisen, and will continue to arise, in adhering for buoyage purposes to the idea of the route as that "entering from seaward" or "in the direction of the main stream of the flood tide" instead of adopting, as here proposed, the conception of the route as that of "leaving a port" or "the direction of the *ebb* stream", in which latter conception the assignment of colours by the Washington

Conference would have satisfied the St. Petersburg Conference, and presumably Mr. DE ROUVILLE (*). All the larger cities of the world, with very rare exception, are located upon navigable bodies or streams of water. The location of any city on a navigable stream, or on tide-water, can be traced by the debris which floats down on the ebb tide, which ebb tide tends to carry everything to the open sea. The flood stream, on the other hand, when assisted by the wind, tends merely to beach floating debris, and also to arrest the silt carried down by the ebb stream, forming bars or obstructions to navigation at the entrance to rivers or estuaries. The ebb tide is the major tide, the scouring tide, and is always assisted by the current of navigable streams. For this reason the ebb stream, throughout the world, prevails for more hours than the flood stream. Theoretically, at least as many vessels proceed to a port to load cargo as to unload it, and the conception of "leaving a port" with deep draught is quite as reasonable as that of "entering from seaward" with deep draught, but much more so when taken in conjunction with the conception of the ebb stream as always struggling to reach the sea, and only being prevented, to some degree, by the less dominant flood stream. Thus the direction of the ebb stream can never be mistaken and it is the sanitary and dredging stream, whereas the flood stream is the unsanitary and shoal-building stream.

"The first proposal, therefore, of the Directing Committee is to revise the definition of the Washington Conference as follows :

" I. The navigational marks which a ship should find on its port side or left hand when leaving a port to proceed to sea or in the direction of the ebb stream in any channel, should be coloured RED, and those on the starboard side or right hand, should be coloured BLACK. In detached navigable channels open at both ends, the port hand or port side should be considered to be that on which the mainland lies.

"It will be noted that even in channels with various branches and in estuaries where the tidal currents turn at half-tide, this really does not give rise to any ambiguity, because, in every part of the channel, its outward direction (or seaward mouth) can be determined. Proceeding in this direction, by whatever channel, a ship, going to sea, should always have RED channel buoys on the port hand and BLACK channel buoys on the starboard hand, until she has passed the outer buoy.

"Proposal No. 1 does away with the necessity for the Compass System of Buoyage in navigable channels, and relegates its use to outlying shoals or dangers.

"The Directing Committee recognises the shortcomings of any definition in bodies of water in which there are no clearly indicated tidal currents or where currents are not directly connected with the rise and fall of the water. In these cases a direction must be assigned to represent a *conventional ebb stream*, as Germany and Denmark have done in the case of the Baltic, otherwise the Cardinal System must be applied, but the systems followed should be clearly stated wherever this is necessary. Hence the following proposal :

" II. The direction of the ebb stream, as defined in Proposal I, shall be indicated by an arrow and if necessary by the legend "Direction of the ebb stream", or its

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equivalent in the language of the chart, on every new chart and on every new edition of an old chart. In channels where there is no tidal current the same arrow and words, or some other appropriate symbol, shall be used as a guide to the system of buoyage in force.

"The third proposal is :

" III. That the recommendations of the Washington Conference (1889), as amended and supplemented by the St. Petersburg Conference (1912), be adopted as the International Buoyage System, but that the reversing of the colours (and forms) of the buoys, as recommended by the St. Petersburg Conference, be cancelled.

"This embraces three subsidiary proposals as follows :

(a) That where it be necessary to use the Cardinal (or Compass) System, the direction hitherto referred to as North shall be referred to as "from N.W. to N.E."; East as "from N.E. to S.E."; South as "from S.E. to S.W"; and West as "from S.W. to N.W.".

(b) That the buoys of the Compass system should carry such double top-marks as may be agreed upon hereafter.

(c) That the character of a buoy marking a wreck should be indicated, not by the word "Wreck" in the national language, but by painting thereon, in white, the symbol accepted for wrecks on hydrographic charts.

"The fourth proposal is :

" IV. That at the next International Conference an attempt be made to come to an international agreement on uniform distinguishing colours for such miscellaneous buoys as those marking the location of :

Moorings,
Quarantine,
Submarine Pipe Lines (such as those carrying oil, water, etc.),
Areas under hydrographic survey,
Extension of harbour works (obstructing free navigation),
Dumping ground for spoil, dredging, and so forth,
Target practice or Experimental grounds,
Fishing grounds,
Compass adjustment.

"The fifth proposal is :

" V. That at the next International Conference the question of the use of top-marks to indicate forms and characters of buoys be definitely settled, having in view the difficulty of maintaining top-marks on certain buoys due to bad weather, ice or other destructive agencies.

"The sixth proposal is :

" VI. That, on buoys, the colour GREEN, both by day and night, be reserved exclusively for indicating wrecks or submarine telephone, telegraph or other electric cables, as now more or less generally accepted.

"The seventh proposal is :

" VII. That in defining the characteristics of the lights displayed by lighthouses or lighted buoys, as may be agreed upon hereafter, due consideration be given to the provision of vertical lighting with similar or other characteristics to meet the growing needs of aviation at night.

"The eighth proposal is :

" VIII. That for buoy lighting at night, except as in Proposal VI, the colours RED and WHITE be used, with such characteristic flashes or occultations as will clearly indicate the exact character of the buoy making such display.

"With reference to the proposal of Mr. DE ROUVILLE, the Directing Committee is of the opinion :

(a) That the so-called "*Principal direction of arrival*" and the "*Direction limit*" are unnecessary complications arising from the idea of "*entering*" instead of that of "*leaving*" a port, and

(b) That the Tabulation of Buoyage, prepared in this Bureau to accompany the present *Summary of Data on Uniformity in Buoyage and Buoy Lighting,* shows that over half of the thirty systems of buoyage conform to the recommendations both of the Washington Conference (1889), and of the St. Petersburg Conference (1912) (except in its reversal of colours (and/or form) of channel buoys), and that the reason given by the Technical Committee for its acceptance of Mr. DE ROUVILLE's proposals does not seem to be entirely convincing, *viz* :

"Having the choice between three solutions :

" That of Washington (black on the port side, red on the starboard side),
" That of St. Petersburg (red on the port side, black on the starboard side), which obviates the contradictory meaning of red by day and night respectively,
" And that suggested to it by one of its members in order to complete the symmetry initiated in 1912 (red on the port side; green, or green and white squares, on the starboard side; black being confined to buoys marking wrecks);

" And considering that it is inadvisable to go back on the decisions taken at St. Petersburg, where three nations assumed definite obligations and a remedy was found for the most serious of the above anomalies; ... ".

"The reasoning that, because Italy, Spain and Portugal changed the red buoys from port to starboard, and the black buoys from starboard to port, therefore all the other countries in the world should do the same thing and a great deal more, is not sound. It is true that the whole question is one of merely repainting buoys and shifting their location from one side of a channel to the other, but the number of hydrographic marks used by these three countries is but a small percentage of that used by the other countries which would be involved in this unnecessary upsetting of existing conditions. The question is one to be settled by an International Conference at which, naturally, financial considerations involved in such changes would be given due weight".

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4. Although Echo-sounding was now gathering momentum, room is found (page 190) for a brief description of *An Air-pressure Sounding Machine* ... giving a continuous record which depends on the well known method of balancing the pressure of the water at the sea-bottom by an equal pressure of air.

"Though the principle is well known its application in this machine is novel and ingenious, but no information has been received as to durability of that portion of the apparatus which is dragged along the sea-bottom. This portion is an armoured sounding cable containing a flexible rubber tube. The tube is encased in steel ferrules and spiral springs and over these is an 18 strand steel cable with a tensile strength of about 35 tons. To take the chafe on the lower end of this cable it is provided with a jointed

armoured covering, at intervals in which heavy springs are inserted, which permits a considerable amount of bend.

"The sounding cable is wound on a drum, passes down a tube and out of the ship through the fore part of the hull below water over a group of three sheaves so arranged that not too sharp a bend is imposed on the cable.

"The inboard end is secured by an airtight joint to the hollow axle of the winding drum which is situated, with its winding engine, the air pump and the compressed air reservoir, on the main deck of the vessel, and thus is under shelter from wind and sea. An air-pressure pipe connects the hollow axle of the drum, and therefore the tube of the sounding cable, with a pressure gauge on the bridge and with the compressed air reservoir.

"The recording devices consist of three dials and a bathygraph. The depth at which the lower end of the sounding cable happens to be, at any moment, can be read off one of the dials. The index of this dial may be made to close an electric circuit at any desired depth and thus actuate a signal (Sonic or visual). This obviates the necessity of watching the dial continuously, for the signal will give warning on entry into a predetermined minimum of water.

"... The various dials of the recording apparatus were situated on the bridge and consisted of a continuously recording bathygraph; a dial showing by means of the index, the depth at the moment (the shallow water alarm is actuated by this dial); and two dials showing the amount of sounding cable out and the air pressure in the reservoir respectively. ...

"It is obvious that the air in the reservoir must be maintained at a pressure at least as high as that of the water at the depth at which the end of the cable lies, for if this were not done the water would enter the tube of the sounding cable and the depth recorded would be too small. In practice the pressure would be kept slightly higher than any water pressure expected, and such excess pressure is reduced by the escape of air from the bottom end of the sounding cable until the water pressure is balanced. Thus the pressure recorded is that corresponding to the depth of water. It should be noted that, on the record of the bathygraph, the scale is more open in shallow water than in deep water; an obvious advantage".

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5. Among the 245 *bibliographic references* given at the end of the volume the following examples may be of interest :

502. — SUR LE GULF-STREAM (On the Gulf Stream). S.A.S. le Prince de Monaco. In-8vo, 2 pl. Gauthier-Villars & Co, Paris, 1886, 5 francs.

503. — THE WATER MOVEMENTS OF THE SOUTHERN NORTH SEA. Part I : The surface drift. By J.N. Carruthers. In-4to, 119 pp., diagr. H.M. Stationery Office, London, 1925. Price 14 s.

583. — SURVEY WORK IN SIAMESE WATERS FROM ITS BEGINNING UNTIL THE ERECTION OF THE HYDROGRAPHIC DEPARTMENT IN THE YEAR 1922. Published in Siamese and English. 5 pp., 25 pl. Bangkok, 1925.