HYDROGRAPHIC BIBLIOGRAPHY.

I. — EXTRACTS AND REVIEWS.

RECENT DEVELOPMENTS IN ACOUSTICAL DEPTH-FINDING APPARATUS.

by HARVEY C. HAYES.

EXTRACT FROM THE "*Bulletin of the National Research Council*", WASHINGTON, D. C. NOVEMBER, 1926, PAGES 112 TO 116.

Various methods and means for determining ocean depths by sound waves have been developed during the past few years, most of which have certain specific merits, but no one of which operates entirely satisfactorily over the whole depth range. Depths less than about one hundred fathoms are measured with considerable accuracy by any of three types of apparatus developed respectively by Dr. Alexander BEHM of GERMANY, Dr. M. LANGEVIN of FRANCE, and by the SUBMARINE SIGNAL CORPORATION of BOSTON, U. S. A. All three types register the depths in terms of the time of sound transit to the sea bottom and return by flashing or deflecting a spot of light on a scale.

During the past year the Navy has developed two distinct types of depth-registering devices which, in addition, are able to sound an alarm when the ship passes over any predetermined depth to which the apparatus is set. But all of these registering and recording devices fail at the greater depths because the intensity of the echo then becomes so weak, compared with that of the local disturbing noises produced by machinery, propellers and slapping of waves, that sufficient amplification to operate the relay or other deflecting parts of the apparatus cannot be secured by amplifiers without, at the same time, amplifying certain components of the intense local sounds to the point where they also operate the recorder. Thus far no depth registering or recording apparatus has been perfected that will operate reliably in depths much greater than one hundred fathoms.

The intensive research in submarine acoustics which the Navy has carried on during the past nine years has demonstrated that, on shipboard at least, the ear is greatly to be preferred to any mechanically registering or recording device because of its comparative high sensitivity and because it can take into account only such of the numerous received sounds as apply to the purpose at hand. The ear can detect the faint echo of a sound signal of definite known pitch in the midst of numerous intense local noises when other receivers would fail to register anything but these intense local sounds. It is for this reason that practically all the sound-detecting and direction-finding devices, as acoustical range-finding devices, developed by the Navy have been designed primarily as aids to the ear. And until some sound-registering or recording device having far greater sensitivity and selectivity is perfected, we believe the most promising line of development of depth measuring, or other apparatus depending upon the reception on shipboard of submarine sound signals, will make use of the ears for receiving the sounds. Under such conditions the depth must be determined by apparatus that can be adjusted to give to the sound signals some particular characteristic or condition that is affected by the depth and that is recognizable by the ears.

Our researches have shown that the simultaneous arrival of two like sounds, one at each ear, can be judged to within one one-hundredth thousandth of a second and that for two unlike sounds of approximately the same intensity such judgment can be relied upon for an accuracy to within a hundredth of a second. The great gain in accuracy given by the use of like sounds is due to the fact that the binaural sense then operates to give the listener a sense of direction. This sense is entirely lacking when the two sounds are unlike. The Sonic Depth-Finder was designed to give a sounding in terms of the adjustment of apparatus required to make two like sounds arrive simultaneously at the two ears because the accuracy of such a binaural adjustment even when roughly made, would be sufficient to give the depth with a very high degree of accuracy. In practice, however, it proved that change in depth during the signal interval and variation in the speed of the transmitting cam wheel are sufficient to prevent the operator from adjusting the two signals sufficiently near to simultaneity to bring the binaural sense into play except under very favorable operating conditions such as are given by smooth sea surface and practically level sea bottom. In general, the accuracy of adjustment to simultaneity of the two sets of signals was found to be even less than that given for two dissimilar sounds, because, in the process of adjustment, as soon as the two sets of signals begin to overlap they tend to coalesce so that their ends become blurred and it is impossible to judge with great accuracy when the signals are superimposed length for length. It proved that an experienced operator can make a depth determination accurate to within about plus or minus five fathoms.

An error of five fathoms is not a serious matter for depths greater than about a hundred fathoms—the range over which the sonic depth finder is capable of operating—but for depths under one hundred fathoms it becomes necessary to obtain greater accuracy. Somewhat over a year ago the Naval Research Laboratory undertook the problem of developing an acoustical depth finder that would cover the whole range of ocean of depths and give a higher degree of accuracy than the original device, which originally was developed for a range-finder and not a depth finder. This problem has been fairly well solved; and its solution represents the only progress made in acoustical depth finding apparatus during the past year that has come to our attention.

The new device employs the same procedure on the part of the operator as does the sonic depth-finding, which consists of adjusting the apparatus so as to cause two systems of equally spaced signals to arrive simultaneously at the two ears. Except for this one similarity, the principle of operation of the new device differs radically from that of the old one. The old device employs the same pitch for both sets of signals and brings then to coincidence at the ears by adjusting the period between signals, so that the time of sound transit to the sea bottom and return shall be a whole multiple of this period. The new device employs a decidedly different pitch for the two sets of signals. It does not vary the periodicity of the signals, but instead provides means for generating the comparison signals at any desired instant after the generation of the submarine sound signals. By this means the comparison signals can be delayed behind the sound transmitter signals so that they will energize one phone of a double telephone head set at the same instant that the echo of the submarine sound signal is picked up by a submarine sound receiver and heard in the other phone. The time of sound transit to the sea bottom and back is then equal to the known time the comparison signals are delayed behind the sound signals. Such an arrangement permits the adjustment to simultaneity to be made for any depth independent of the length of the sound signals, but the original device only permits such adjustment for depths beyond which the time of sound transit is greater than the duration of the signals, thereby rendering it useless for depths of less than about twenty fathoms.

The use of a distinctly different pitch for the two sets of signals not only removes most of the coalescing and blurring troubles experienced when like signals are used but, strange to say, permits the use of the binaural sense in making the adjustment for simultaneity so that this adjustment can be made with a high degree of accuracy. The explanation of this unlooked for result appears to be simple and is as follows: two pure sounds of slightly different pitch are near enough alike to cause the binaural sense to operate and give a sense of direction. This is readily proved by holding two tuning forks of slightly different pitch at the two ears respectively. If the higher pitched fork is held at, say the right ear, the sound appears to the listener to come from his left and to move across to his right and these excursions continue periodically, the period being equal to the beat period given by the two forks. These excursions become more rapid as the pitch difference between the forks becomes greater and appear to vanish when their frequency becomes something like fifteen or twenty per second, or in other

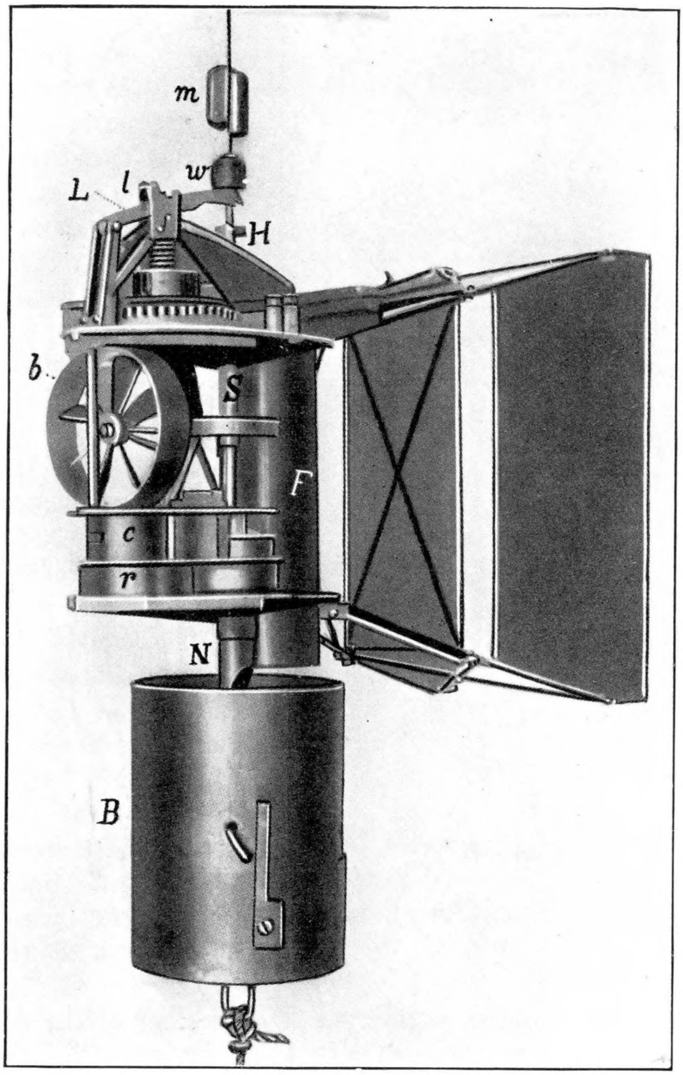


Fig. 1

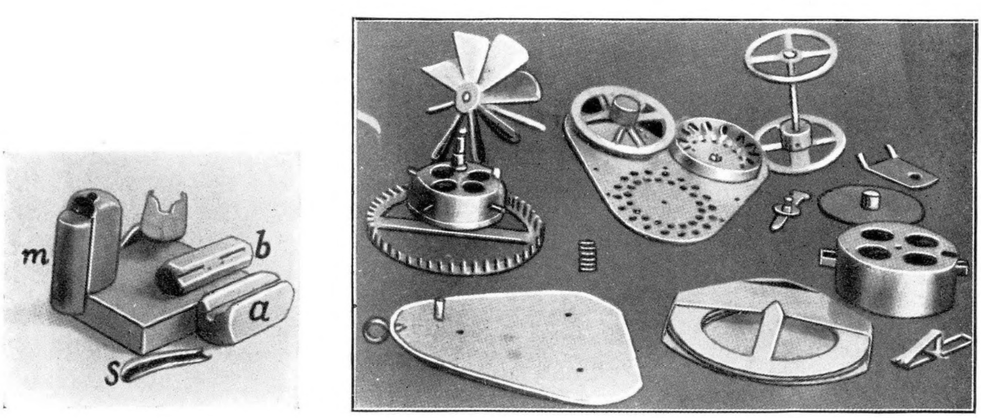


Fig. 2

words, when the period between beats is of the same order as the time interval of vision persistence. When the beats occur so rapidly that the mind cannot comprehend each separate excursion of the sound image, the sense of direction vanishes and the two distinct pitches are heard, one at each ear. And since under such conditions there is no unwilled effort to determine the direction of the sound, the operator is as free to listen for sound from any definite direction as he would be when the forks are silenced. If the two fork sounds of different pitch are now broken up into short dash-like signals and the listener focuses his attention for a sound, say straight ahead, he will hear a sound in that direction if the signals reach the two ears in such a way that their first exposure together is made when the sound waves are in phase. This does not mean that the front end of the two signals reach the two ears simultaneously, but that when the latter one reaches its respective ear it will be in phase with that part of the earlier signal that is already stimulating the other ear. The first binaural exposure will then be the same as that given by a sound source dead ahead and if the listener's attention is focused for a sound from that direction he will have a distinct impression that a sound is actually coming from that direction.

If the foregoing explanation is correct then, when the two signals of different pitch are adjusted for a binaural center, the greatest difference in time of arrival at the two ears will equal one second divided by the difference in the pitch of the two sounds. The average difference will be half of this value. Laboratory tests employing 1060 for the pitch of the sound signal and 1325 for that of the comparison signal have shown an actual average error from the adjustment to perfect simultaneity of the order predicted and in terms of depth soundings represents an average error of 0.8 fathoms and a maximum error of about 1.6 fathoms.

This type of depth-finder has been tested on one ship, the U. S. S. HANNIBAL, with favorable but not wholly satisfactory results, because the relative location of the submarine sound transmitter and receiver on the HANNIBAL is such that the direct sound from the transmitter energizes the receiver so strongly that it responds to this sound, which it is not desired to hear, more intensely than it does to the echoes of the signals. As a result, only soundings in shoal water, where the echoes are very intense, could be taken. However, the tests demonstrated the ability of the device to take accurate soundings to depths as shoal as six fathoms and there is all reason to believe that it will work at the greater depths when installed on a ship carrying a submarine sound receiver well shielded from the direct sound of the transmitter.

NAVAL RESEARCH LABORATORY,
BELLEVUE, ANACOSTIA, D. C.

ON A NEW REPEATING CURRENT METER.

EXTRACT FROM THE "*Journal du Conseil International pour l'Exploration de la Mer*" VOL. II, Nº 1, COPEHNAGEN, MARCH 1927.

To Prof. V. ECKMAN belongs undoubtedly the merit of having furnished oceanography with some of its most efficient instruments. His earlier current meter has proved very efficient and useful within the limits given for an instrument designed for single observations of short duration, and it is probably the most widely used current meter. Although quite a number of instruments exist for measuring currents in the upper water layers, there still remains the problem of measuring the generally slow currents of the deep sea. There is, of course, the indirect method by calculating from the distribution of densities, but it is something of an open question whether the general application of this method is quite justified when regard is paid to the nature of the material available from the deep ocean, unsatisfactory both in point of quantity and comparability. The method would, in any case, profit immensely by being tested against actual measurements of a trustworthy nature.

The author reviews the different methods considered or tried, to measure currents in deep water and concludes his survey by assuming that no method hitherto devised is likely to give trustworthy and undebatable results. Accordingly he set out to construct the new instrument which is described in the paper under review. The new instrument presents a number of novel and ingenious features, making a study of the description very interesting : the messengers which divide into three pieces and fall into a receptacle when their "mission" is fulfilled, and thus give room for the next one, the registration of propeller revolutions performed by two numbered balls falling into two chambered receptables which are moved at a rate of 10: 11 relatively to each other, the well thought-out contrivances for recording the results.

The possibilities of the instrument are to permit up to 47 consecutive observations at any depth a ship can be anchored in, at any intervals desired (down to a few seconds), and with current velocities down to 2 or 3 c/m per second, possibly even only 1 c/m per second (= 0,02 miles per hour). The record is in the form of the number of revolutions during the interval between the release of any two messengers. (In depths less than 3 or 4 hundred metres the acutal hitting of the messengers may be recorded, although this is not of great importance as the running speed of the messengers has been found to be very constant, lying between 53.8 and 55 secs. per 200 m. thus creating an uncertainty as to the length of periods in 1000 metres of only about 10 or 12 secs.).

The most serious limitation of the instrument lies in the fact that the speed is recorded as a sum of revolutions covering the whole interval, while the record of direction applies only to the last moment of the interval, *i.e.*, the moment when the messenger hits the arm releasing the spring-wheel, but this limitation is, of course, less important the shorter the intervals are made.

The instrument has been used during two summers (1923, 1924) in the Faroe-Shetland channel, at various points in the northern North Sea and along the edge of the continental shelf from the latitude of Shetland to that of Cape Stat, on board the "Armauer Hansen", the "Johan Hjort" being employed at the same time in making oceanographical observations in such a manner as to provide material for a comparison of the currents calculated and those actually observed. During this work the reviewer had often an opportunity to observe the working of the current meter and satisfied himself as to the reliability of its functioning and the apparent consistency of the records. Some of the measurements were made when anchored in up to 1,600 meters depth, the movements of the vessel being as far as possible recorded by taking the magnetic bearing and the inclination of the anchoring wire every minute. As the results of this work are not yet published, it is too early to form a judgment of its success, but there is every reason to believe that they will prove valuable and interesting, being the first seemingly successful attempt to measure slow currents in very deep water.

TWO NEW RECORDING CURRENT METERS

(TWO OCEANOGRAPHIC CURRENT-RECORDERS DESIGNED AND USED ON THE "MAUD" EXPEDITION. *Journal of the Optical Society of America and Review of Scientific Instruments.*, VOL. 12, Nº 5, MAY 1925).

It is a feat worthy of admiration that the scientist in charge of the observations during the "Maud" expedition, with the assistance of one of his fellows, designed, constructed and kept in operation for long periods a new current meter (made in two types), which seems to solve the greater number of difficulties attending this kind of observations. When one considers the absolute isolation of the workshop of the "Maud" and the success attained, there is every reason to congratulate Prof. SVERDRUP and Mr. DAHL on their achievement.

The two types of current meters differ in the way the direction is got, one model being hung on a bifilar frame, for moderate depths, the direction of the frame being recorded independently, the other model being provided with a compass needle. Otherwise the construction is very much the same.

These current meters contain two ingenious and, as far as known, novel features : (1) the registering of direction by inserting an ampere meter in an electrical circuit (one branch being insulated, the other provided by the suspension cable), which is closed every time a certain number of revolutions are completed by the propeller, and (2) the use of a "diving bell" to provide a dry space for the magnet needle and the electrical contacts. The air in this chamber is protected against absorption by the water under pressure by a small quantity of petroleum let into the bell before immersion.

In the bifilar type the direction is registered by a key being brought into contact with one of 18 segments (each of 20°) constituting a resistance ring. In the compass type the compass needle itself is used as " key ", being slowly let down on the resistance ring by an eccentric wheel acting on the lower end of the pin every time the propeller has turned 80 times, and the circuit remains closed during 20 turns.

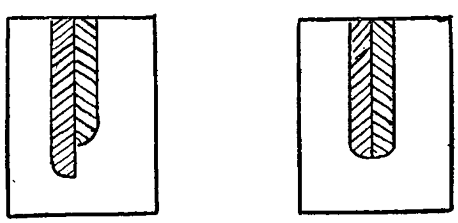
The constants of the instruments were obtained by direct experiment and by comparison with EKMAN's (single observation) current meter. The lower limit of velocities reliably recorded was 4-5 cm.-sec. on the case of the bifilar type as against ca. 3 cm.-sec. by the EKMAN instrument, but Prof. SVERDRUP maintains that this limit may be reduced when his instrument is made of better materials than those available to him. The compass type was found to be reliable down to between 5 and 6 cm.-sec., but this also it should be found possible to reduce.

In both instruments the cable used was 1.5 square millimetre okonite cable. The bifilar instrument was kept in operation for 14 months, suspended through a hole in the ice using 24 hour record paper. The other was not used for any long periods, but was always found to work very satisfactorily during numerous experiments. Prof. SVERDRUP believes that it will work at any depth, even thousands of metres, especially if a cable be used which contains both the suspension element and the insulated wire. Both instruments seem to be comparatively cheap to construct. A very important advantage of the SVERDRUP current meter is that the working of the instrument can be watched at pleasure, the recording mechanism being placed safe and dry in a ship's saloon, or in a hut on the ice, as the case may be.

From the *Journal du Conseil International pour l'Exploration de la Mer*, Vol. II, N° 1, Copenhagen, March 1927, pp. 79-80.

THE HENRI WILD TELESCOPIC LEVEL

The new accurate level perfected by the firm of Henri WILD of Heerbrugg (Switzerland), has the advantage of a very much reduced size. The telescope carries a focussing apparatus by means of internal diverging lens, the displacement of which is governed by the rotation of a milled ring. For a given magnifying power, the length of the telescope is thus reduced and



besides, apart from the quality of being water-tight, this device allows an invariable direction of sight to be obtained whatever may be the focus.

The collimating level which governs the horizontality of the axis of sight of the telescope is on the "ZEISS & WILD" principle, *i.e.* that above the spirit level is a set of prisms arranged to give the two halves of the image of the bubble, separated by a fine line. (*See Figure*). The old method, which consisted of placing the bubble between two lines of the scale, is here replaced by causing these two parts of the image to coincide; when the bubble moves, the two portions of the image move along the line of separation by the same amount as the bubble, but in opposite directions so that, for the same curvature of the spirit level, the precision is double that of the usual arrangement. Part of this gain in accuracy has been used to increase the curvature of the spirit level, which considerably reduces the damping period of the oscillations of the bubble. Also, the examination of the two images of the bubble is made directly on the side of the telescope, without moving, thanks to the reflecting prism; a slight sideways movement of the head is enough. The estimation of their coincidence constitutes a bringing into line like a coincidence range-finder, and is able still further to increase the accuracy of the level.

The same apparatus is also constructed with a circle for azimuths for measuring horizontal angles.

A detailed description of this level will be found in N° 7 of the "*Revue d'Optique Théorique et Instrumentale*", published by the Institut d'Optique, Paris, July 1927 (pages 287-296).

THE HENRI WILD UNIVERSAL THEODOLITE.

In the "*Revue d'Optique Théorique et Instrumentale*", Paris, N° 5, June 1927, pages 193 to 241, Captain OLLIVIER gives a description and a very complete theory of the Universal Theodolite, invented by Mr Henri WILD of the Swiss Geodetic Service and manufactured by the firm of Henri WILD at Heerbrugg (Switzerland). A certain number of ingenious devices render this instrument original.

(1) The readings are made in a single microscope situated parallel to and at the side of the telescope. The operator, without moving can read the diametrically opposite graduations on both circles (azimuth and altitude) thanks to an optical arrangement which gives images superimposed and separated by a very fine line.

(2) For reading, the classical translation of the double-line reticule has been replaced by a rotation of the images of the diametrically opposite graduations which brings these graduations into coincidence; thus the great accuracy of the bringing into line as in the coincidence range-finder, is also taken advantage of. Moreover, this coincidence micrometer gives directly the mean of the diametrically opposite readings of the circle under consideration, *i.e.* if the graduations are correct, the exact azimuth without error of excentricity.

(3) The focussing of the telescope is carried out by means of an internal diverging lens which allows a finer focussing to be made than by the rack system and gives the telescope an invariable length and perfect water-tight quality.

(4) A teleobjective provides great magnifying power with a short telescope (175 m/m for a magnification of 25).

(5) Both circles have been engraved on glass with many precautions to avoid variations of temperature and vibrations during the short time the apparatus remains on the dividing machine. The graduation lines are chemically engraved by "grinding" while the polished surface of the glass is silvered so that it becomes brilliant and refulgent; the chemically engraved lines thus appear very fine and in black, and they are free from the blotches which usually appear by direct engraving on silver;

(6) The horizontal circle is provided with a releasing and stop screw so that it may be turned in its plane and allows reiteration of measurements.

(7) The spirit level is on the ZEISS-WILD system of coincidence of the two half-images of the bubble.

(8) An additional device, consisting of a stadimetric double prism and double Helmholtz parallel glasses acting as "optical micrometer", is used to transform the theodolite into a tacheometer. The whole, used with a special horizontal stadia on a tripod, allows a greater precision to be obtained than with the ordinary Porro stadimetric devices.

(9) The mechnical construction, which involves cylindrical steel axes, has been particularly carefully prepared and tested. The protection of the graduated surfaces of the optical part and of the moveable mechanical arrangements, has been very carefully assured.

(10) For field work, the theodolite is kept in a very light and water-tight metal case.

The total weight is reduced to 5 kilogrammes.

In the afore-mentioned article of the "*Revue d'Optique*" very complete information will be found on the leading principles which led to the conception of this apparatus, on the theory of its construction, of its device for reading, and on its different parts. It will be specially observed how the anallatic condition of the tacheometric device has been, in practice, obtained within the limits of the use of the stadia. A chapter is devoted to the accuracy of the measurements.

A sketch of the optical system for reading and of the tahcheometric device A is given below.

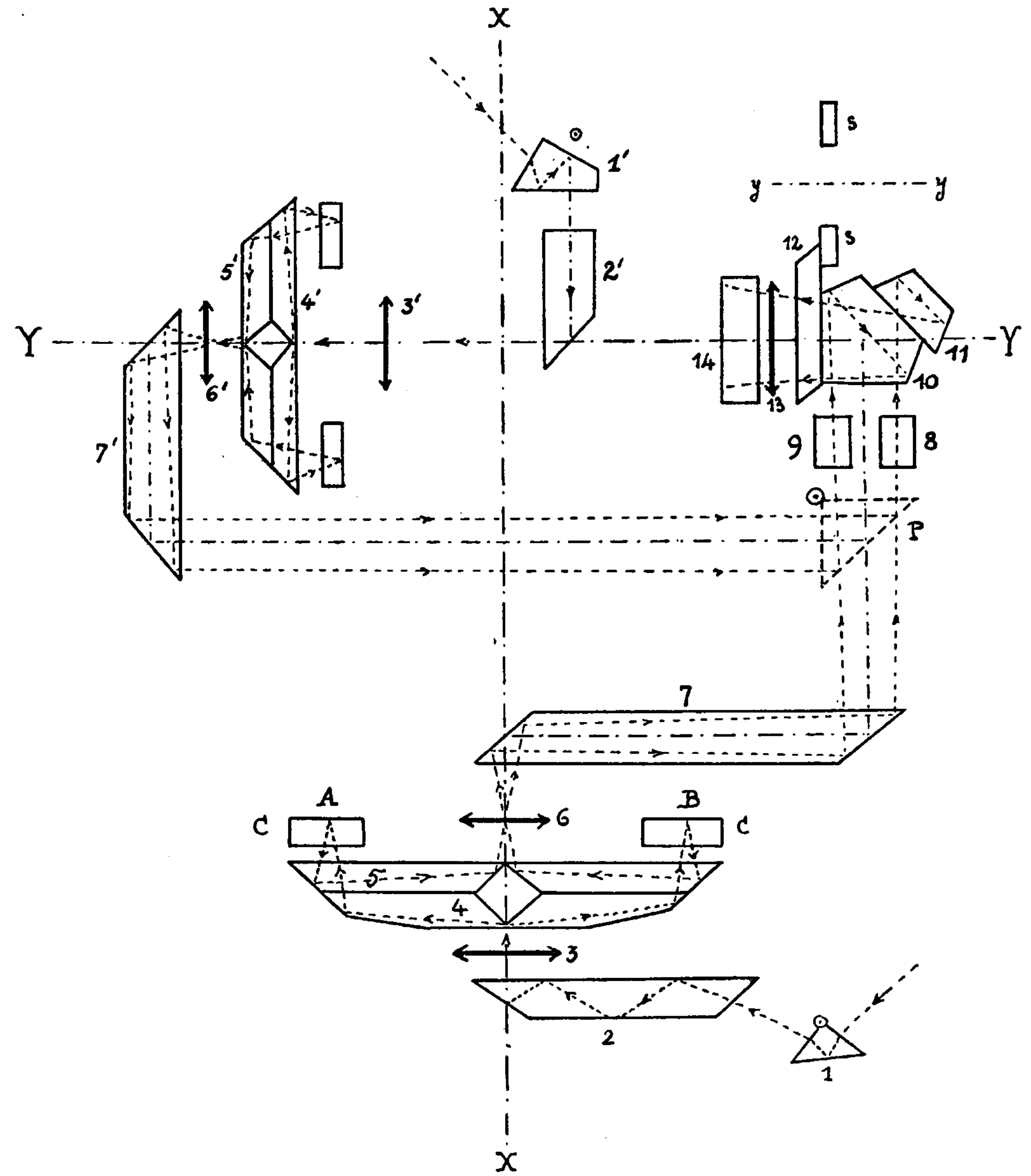


FIGURE 1.— The *Wild* Theodolite. Optical system of reading ;

XX Vertical axis of the theodolite ;
YY Axis of the trunnions ;
1 - 1'
2 - 2' Prisms
3 - 3' Reflectors and lens for lighting
4 - 4'
CC - C'C' Glass crowns on which the graduations are engraved,
A,B - A'B' Graduations ;
5 - 5' Reflecting Prisms ;
6 - 6' Objectives of the microscope ;
7 - 7' Reflecting Prisms ;

P Rocking prism (for reading vertical circles);
8, 9 Parallel glasses turning in opposite directions and acting as optical micrometer;
10, 11 Separating Prism;
12 Index-carrying prism;
S S Crown for seconds coupled to the optical micrometer 8 - 9;
13 Collecting lens;
14 Prism reflecting towards the eye-piece of the reading microscope;

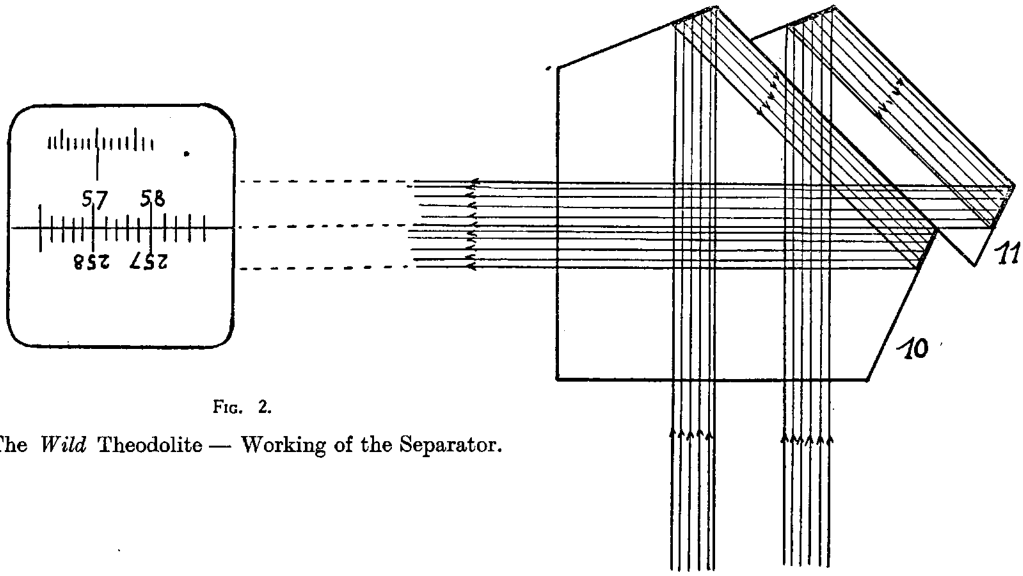


FIG. 2.

The *Wild* Theodolite — Working of the Separator.

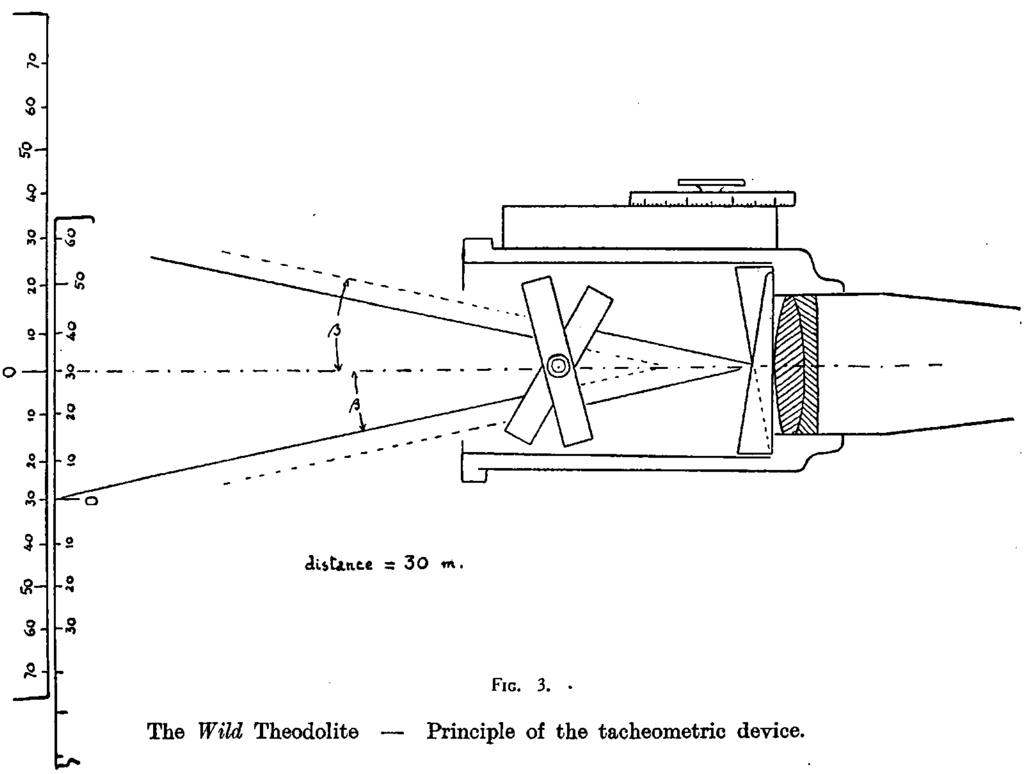


FIG. 3.

The *Wild* Theodolite — Principle of the tacheometric device.

SOUNDING BY FISH-LEAD

by Mr. P. Marti, *Hydroprapʜic Engineer*

Publication N° 1895 — Service Hydrographique — Annales Hydrographiques, 1925-26 — Paris, 1926

In this booklet, containing 24 pages and 17 drawings, the author gives an historical résumé and a description of a sounding lead of particular shape which has been employed by the French Hydrographic Expeditions since 1921, together with the conditions of its use.

The "lead", of oblong shape horizontaly, is provided at the rear with a tail which guides it in the direction of the ship's route. It is suspended astern by a fine steel cable which maintains it in the neighbourhood of the vertical passing through the centre of gravity of the lead.

While the ship is under way, the lead thus remains nearly perpendicular from the point of suspension at all speeds of this point along the surface of the water.

This device therefore allows soundings to be taken while the ship is under way without it being necessary to bring it to the surface between each sounding. Also, the soundings may follow each other at closer intervals, there being thus obtained more detailed profiles of the sea-bottom, and, in this way acting as a submarine sentry, the device simplifies and accelerates the exploration of shoals.

The handling of this sort of "submarine kite" for hydrographic work is nevertheless rather delicate; and hence the author, in the latter part of his interesting booklet, dwells with some insistence upon the conditions which must be fulfilled in order that the use of this apparatus may be satisfactory.

OUR CHARTS - A SHORT GUIDANCE FOR ESTIMATING THE RELIABILITY OF SWEDISH CHARTS.

Under this title the Swedish Hydrographic Office has recently issued a publication which contains a summary in the English language and thirteen explanatory plates.

The object aimed at is to put before the seaman such information as will make it possible for him to appreciate the more or less high degree of confidence which he can have in the chart which he uses and thus be enabled to draw the necessary conclusions as to the action to be taken to ensure safe navigation.

The introduction enumerates the factors which affect the accuracy of a chart, of which the principal are :—

the method and material used in the survey,
the topographical character of the area,
the quality of the surveying personnel.

As the Swedish charts are based on surveys some of which date from 1813 obviously they are of varying value and this must be taken into consideration.

Chapter I reviews the different methods used in surveying in use since the first decades of the 19th century and these are criticized. Then the eras which may be distinguished in the history of Swedish surveying are enumerated; the deficiencies of the surveys of each such era are noted, as also are the resulting consequences in their use for navigation.

Chapter II contains remarks on the use of charts for coastal and inshore navigation; the principal subjects are the information provided by particular charts, landfalls and the rules for navigating channels.

Chapter III deals with the reliance to be placed on charts and the homogeneity of the surveys on which they are based. The first depends on the second, which varies very much. Some charts are based entirely on old and not very reliable surveys ; where the submarine topography is not very accidented this may partly compensate the inferiority of these charts which the navigator should use with caution. In other cases the value of the basic surveys is not uniform and it is difficult to determine to what point and over which areas the chart may be taken as correct. The object of the publication is precisely to do away with this uncertainty.

Chapter IV gives further information with reference to Swedish charts ; variations in sea-level, continental uprise, magnetic variation, distortion of paper in printing, correction of charts, areas with sparse soundings, such are the heads under which brief information is given.

Finally at the end of the book there are thirteen coloured plates of which the first three represent the chart divided into 3 parts showing the progress of hydrography in Sweden which will be found at the end of this number of the *Hydrographic Review.* Plate 4 shows three sounding-sheets of a single area made in 1840, 1875 and 1913 respectively .Plate 5 shows the scheme of lines of these three surveys. Plates 6, 7 & 8, are reproductions of sounding-sheets of eight different periods and the last figure gives a comparison of the density of the soundings taken during surveys on differing-scales. Plates 9 & 10 show the amount of correction which a new survey entails in an old chart: Plate 11 superimposes the coastline from a new survey on that given by the older chart. Plate 12 is a reproduction of Plates 1, 2 & 3 (and of the plate at the end of this number) on which have been inserted the limits and numbers of the charts issued by the Hydrographic Office as is done on an Index Chart. Thus this Plate gives, at a glance, the means of appreciating the values of various parts of any chart. Lastly, Plate 13 shows the influence of the scale on the legibility and the practical value of a chart.

It is impossible to praise too highly the critical spirit, true index of the scientific mind, shown in this publication or the care with which Commodore Reinius and his collaborators O. Janke and P. Collinder, have done their utmost to set before the non-specialist seaman the difficulties of the task with which their Office is charged, the extent to which they can trust its publications and the precautions which the inevitable imperfections of an incomplete work render necessary, which work is made particularly complicated by the topography of the Swedish coasts.

LAVORI GEODETICI COMPIUTI IN ITALIA E COLONIE DAL 1922 AL 1926 DALL'ISTITUTO IDROGRAFIO DELLA REGIA MARINA

4° - 27 pages

Tipografia dell'Istituto Idrografico della Regia Marina, Genova, 1927.

This report, presented at the third General Meeting of the Geodetic Section of the International Geodetic and Geophysic Union which was held at Prague from the 31st August to the 10th September 1927, gives a summary of the principal Astronimcal operations for Positions carried out by the Italian Hydrographic Office in the course of the last few years, particularly in the Italian Colonies.

The report includes :—

Determinations of differences of longitude by W/T between Genoa, Milan, Padoa and Naples — carried out in 1922.

Determinations of geographical positions at Cape Guardafui, at Ras Hafun and at Assab — 1923 - 1924.

Determinations of co-ordinates in the Dodecanese at Rhodes, Leros and Kos — 1924.

Determinations in Libya — 1925 - 1926 at Tripoli, Bengazi, Zuetina, Carcura and Tobruck with the following results :—

Tripoli (New Lighthouse)	φ = 32°54'13", 25 N. λ = 13°10'42", 96 = 0h52m42s,864 E. of Gr. (Observer: Commander Romagna MANOIA).
Bengazi (Lighthouse)	φ = 32°07'30", 1 N. λ = 20°03'36", 5 = 1h20m14s,44 E. of Gr. (Observer: Commander Romagna MANOIA).
Tobruck (Semaphore)	φ = 32°05'17", 8 N. λ = 23°59'24", 0 = 1h35m37s,60 E. of Gr. (Observer: Commander RUBARTELLI).

Instruments and methods employed: — for latitude, Troughton & Horebow Talcott method

Simm's zenithal telescope, for longitude, Bamberg's meridian telescope, rhythmic signals from Paris.

At Port Bardia, Zuetina and Carcura, Claude & Friencourt's (Jubin type) astrolabe was used and rhythmic signals from Paris.

Port Bardia (Axis of Lighthouse)	φ = 31°45'26", 1 N. λ = 25°06'21",7 = 1h40m25s, 45 E. of Gr. (Observer: Commander RUBARTELLI).
Zuetina (Astronomical Pillar)	φ = 30°57'03", 1 = 0",12 N. λ = 20°07'16", 5 = 1h20m29s'10 ± 0s, 02 F. of Gr. (Observer: Lieutenant SCOTTO DE MARCO).
Carcura (Astronomical Pillar) of Fort Morra)	φ = 31°28'51", 0 = 0", 49 N. λ = 20°00'04",1 = 1h20m00s29 ± 0s,02 E. of Gr. (Observer: Lieutenant SCOTTO DE MARCO).

New determination of Graham's Bank in the Sicilian Channel — 1925.

Determination of the geographical position of Giarabub (Jarabub) Oasis (astrolabe with prism, and rhythmic signals).

φ = 29°44'39" N.
λ = 24°31'08" E. of Gr.

Participation in the international operations of longitude measurement at Genoa and at Mogadiscio - 1926 – in accordance with the isntructions of the International Longitudes Committee presided over by General FERRIÉ.

Measurements of the force of gravity and magnetic determinations in the Red Sea and in Libya — 1923 - 1924.
principally :—

	Declination	*Horizontal Component*	*Inclination*
At Giarabub.	2°11'	0,2964 GGS	41°13'
At Tobruck.	2°26'	0,2867	44°42'
At Port Bardia.	2°19'	0,2888	44°07'

Lastly, determinations of harmonic constants of the tide which complete in a very satisfactory manner the data concerning the closed area of the Aegian and Mediterranean Seas and the shores of the Indian Ocean.

TIDAL HARMONIC CONSTANTS.

(H in cm : ϰ in degrees referred to local time)

LIEU		M2	S2	K2	K1	O1	P1	DURÉE DES OBSERVATIONS
INDIAN OCÉAN								
Obbia	H	42.7	37.2	7.2	32.8	11.2	10.9	5th November — 19th November 1911
	ϰ	118°	162°	165°	51°	41°	50°	
Mogadiscio	H	62.4	30.7	7.7	17.6	9.5	5.8	2nd Feb. — 2nd March 1927
	ϰ	118°	159°	159°	44°	37°	44°	
Chisimaio	H	72.2	40.6	10.9	18.7	11.3	6.2	8th June - 6th July and 7th Sept. - 5th Oct. 1926
	ϰ	110°	152°	152°	40°	23°	40°	
AEGIAN SEA								
Simi	H	4.2	1.6	0.4	1.2	1.2	0.4	4th - 18th Sept. 1926
	ϰ	307°	309°	309°	350°	288°	350°	
Stampalia	H	3.0	1.6	0.4	1.7	0.6	0.8	30th June — 29 th July 1926
	ϰ	322°	250°	350°	350°	302°	350°	
LIBYAN COAST								
Porto Bardia	H	2.9	2.9	0.8	1.2	0.8	0.4	11th-25th August 1925
	ϰ	286°	322°	322°	332°	285°	332°	
Tripoli	H	11.1	5.4	1.7	2.0	0.6	0.6	13th May — 12 th June 1924
	ϰ	86°	101°	101°	26°	134°	26°	
SOUTHERN COAST OF SICILY								
Porto Empedocle	H	6.1	3.6	1.1	2.3	1.8	0.8	2nd - 15th May 1925
	ϰ	99°	76°	76°	97°	71°	97°	
Marsala	H	6.8	2.0	0.6	3.6	1.8	1.2	2nd May — 2nd June 1925
	ϰ	231°	241°	241°	145°	107°	145°	
SARDINIA								
Carloforte	H	6.5	2.6	0,8	3.2 F	1.9	1.1	26th April — 25th May 1925
	ϰ	248°	271°	271°	186°	103°	187°	

There has just been published :

MANUALE DE IDROGRAFIA PER LA COSTRUZIONE DELLE CARTE MARINE

(Libro di testo, della R. Accademia Navale), by Commander G. Romagna MANOIA, 8° - 543 pages, 280 figures — Drawings and Tables. Tipo-Lit. della R. Accademia Navale - Leghorn, 1792. — An analysis of this work will appear in the *Hydrographic Review* of May, 1928.

CATALOGUES OF INSTRUMENTS.

I.— The International Hydrographic Bureau has received the new Catalogue of Optical and Scientific Instruments of W. WATSON & SONS, Ltd., 313 High Holborn, London, W. C. 1, Edition 1926.

This quite voluminous catalogue—which is itself only a part of the complete catalogue— is of interest because it contains, in Chapter II, a repertory dictionary of British Scientific Instruments published by the British Optical Instrument Manufacturing Association.

The dictionary contains 130 pages of text, besides more than 300 illustrations giving over 2700 references.

II.— The Bureau has received also the catalogue of Surveying Instruments published by COOKE, TROUGHTON & SIMMS, Broadway Court, Westminster, London, S. W. 1 (Publication N°600)

This small 8vo volume of 153 pages contains numerous photographs and descriptions of surveying instruments, mainly theodolites, tacheometers and levels.

The catalogue is printed in English but there are also French and Spanish editions, particularly those giving descriptions of theodolites (Publications N^os^ 523, 551, 507 and 547).

Concerning the various instruments in the catalogue, attention may be drawn to (1) devices for focussing telescopes without lengthening, (2) device for direct reading of the stadia through the tacheometer, (3) artificial lighting of cross-wires, (4) special magnifiers for reading verniers at a distance, (5) device for direct reading of the two extremities of the bubble in levels, (6) differential-screw with revolution counter device, allowing the measurement of small subtended angles through the telescope-levels. This enables measurements of distances to be obtained by means of sights on the stadia, (7) a similar ranging device is given by means of an additional fitting consisting of a parallel glass placed before the objective of the theodolite telescope, (8) the alidades with telescope for planetable surveying fitted with parallel rulers.

Amongst the instruments specially relating to hydrography thare are :—

1) The Galton solar dial, fitted with a heliograph
2) *pro memoriam* : the Booth double sextant
3) Several current meters — Eckmann type
4) Registering tide gauges
5) a Chronograph fitted with recording cylinder to be used for wireless longitude determinations.

The catalogue gives a list of agents for 33 countries.

NEW CHARTS.

I.— The Directing Committee of the International Hydrographic Bureau desires to direct attention to the new Chart N° 303 " Kobenhavn-Red og Havn " — " Copenhagen-Road and Harbour " which has recently been published (June 1927) by the Kongelige Sokort-Arkiv of Denmark.

As has already been done by the Hydrographic Office of Sweden on some of its charts, the title and various notes on this Danish chart are given in both Danish and English.

Particular attention is directed to a special inset plan which indicates the directions assumed to be " *coming from seaward* " for buoyage purposes. Arrows are shown in each channel marked on the lateral system to indicate this direction to the seaman.

The chart gives information also as to the shapes, colours and topmarks of the buoys which will be found in these channels.

The Danish Hydrographic Office informs the Bureau that all new charts and new editions of charts issued by DENMARK in the future will have similar insets and translations into English,

It should be noted that this initiative on the part of the Danish Hydrographic Office marks an important step in the direction of the improvement of nautical documents placed at the disposal of seamen, and is in conformity with the wishes expressed recently by International Conferences on Buoyages and Hydrography.

II.— The International Hydrographic Bureau has received the first Latvian chart from the head of the Hydrographic Section (HIDROGRAFISCA DAJA) of the Marine Department of the Finance Ministry of Latvia at Riga.

This chart, entitled LATVIJAS PIEKRASTE (Coast of Latvia) VENTSPILS, KOLKASRAGS, ROJA (Vindau, Domesness, Roigu) is dated 1927 and was compiled from surveys made between 1923 and 1926 by officers of the Latvian Navy.

It is printed by lithography and in colour. The titles are translated into English.

Soundings are given in metres; contour lines appear on the chart. Two inset chartlets give the entrances to VENTSPILS OSTA and ROJA harbours. The area up to 4 metres, depth is coloured blue.

Lighthouses and their sectors are shown by coloured points and the charts give perspective views, of the lighthouses.

Latvian conventional abbreviations are shown in the legend with their English equivalents. The legend also gives, to an accuracy of 1-10 and 1-100 of a second of arc, geographical positions of lights and land-marks.

AERONAUTICAL CHARTS.

The International Hydrographic Bureau has received a few copies of aeronautical charts published by the Hydrographic Office of the UNITED STATES OF AMERICA.

These charts are drawn on the Mercator projection to a mean scale of 1-100,000th. They give a scale in " *Nautical Miles* " and in " *Statute Miles* " and a compass rose graduated in true bearings from 0° to 360°. They are prepared in an oblong form, so that they may be unrolled before the eyes of the aviator. Land is coloured in green, shallow waters near the shore (3 fathoms) are coloured grey-blue. The topographic details comprise only rivers, railways, highroads, tramways and agglomerations of houses. There are a few geographical names on the charts.

Forbidden areas are shown by red shading.

Tracks of aeroplanes and of hydroplanes are given in red or green dotted lines. Lighthouses are surrounded by a large red patch. Light-ships, light-buoys and a few noticeable buoys are left on the chart. The legend gives the special symbols used on the Aviation Charts of the U. S. Navy, such as *W-T* and *D-F* stations, coastguard stations, landing-grounds of various kinds and hydroplane anchorages.

On the margin of the charts are aerial views and the orientation of the principal landing-grounds, also views of remarkable lighthouses.

HYDROGRAPHIC OFFICES.

In the course of researches made by the International Hydrographic Bureau with the object of establishing the nomenclature of the original charts issued by the different nations of the world, the Bureau has been led to seek out and to correspond with the authorities in each country who are charged with the construction or the keeping up-to-date of the charts.

Sufficiently complete information concerning these various departments, their addresses and their attributions, will be grouped together in a small annual which the International Hydrographic Bureau hopes to issue from the year 1928 onwards.

Below are given a few addresses which do not appear in the Annual Report for 1926, and which have been obtained since the issue of the latter :—

POLAND

Kierownictwo Mar. Voj. BIURO HYDROGRAFICZNE
ul. Chalubinskiego 3,
VARSOVIE.

LATVIA

HIDROGRAFISKA DAJA,
Jurniecibas Departaments,
Finansu Ministrija,
RIGA.

ESTHONIA

Colonel Jacob PREY,
Suur Brokusmâgi,
Kindradlstaabi IV Osakonna Ulem,
TALLINNA.

LITHUANIA

Le Chef du Service Topographique de l'Etat-Major Général,
KR. APS. M-JA VYRIAUSIAS STABAS
Topografijos Dalis,
KAUNAS.

ICELAND

THE DIRECTOR,
Lighthouse Department,
REYKJAVIK.

NEWFOUNDLAND

MINISTRY OF MARINE & FISHERIES
ST JOHNS.

ALBANIA

Monsieur
Le MINISTRE DES TRAVAUX PUBLICS,
TIRANA.

YUGO-SLAVIA

Monsieur
LE DIRECTEUR DU SERVICE HYDROGRAPHIQUE
DE LA MARINE ROYALE DES SERBES, CROATES ET SLOVENES
(Hidrografski Ured Mornarice)
DUBROVNIK.

SOUTH AFRICA

MINISTRY OF RAILWAYS AND HARBOURS
PRETORIA.

NEW ZEALAND

The Hon.
MINISTER OF MARINE
WELLINGTON.