HYDROGRAPHIC BIBLIOGRAPHY

I. — EXTRACTS & REVIEWS

THE " CADASTRO "

Apparatus fitted with an extra rapid between lens shutter for use in aerial photography with plates.

Constructed by the ETABLISSEMENTS GALLUS, 77, Boulevard de la Mission-Marchand, Courbevoie (Seine) France

(*Extract from the* "REVUE D'OPTIQUE", *Paris, October* 1927).

The present requirements of very accurate aerial photography (topographical surveys, government surveys) necessitate the use of instruments specially constructed with a view to the invariableness of the internal orientation of the photographs, to rapidity so that the greatest possible number of photographs may be taken in one flight, and to obtaining the maximum efficiency that is possible from a lens and a photographic plate.

This last condition should be effected with a lens covering the greatest possible area, that is to say, the aperture of which is small.

To make up for this, the shutter should be of very high efficiency, to permit the impression on the plate of a series of very rapid instantaneous photographs.

To satisfy all these requirements, the firm of Gallus has just produced the apparatus which we are about to describe:

MAGAZINE : Particular attention has been given to the magazine for taking vertical views; it can, however, be used satisfactorily up to an inclination of 45°. It is manufactured in all sizes. It holds 100 plates; is entirely automatic; and can be worked by an electric motor or by hand, by the rotation of a crank handle.

Each complete revolution of the magazine corresponds to the taking of one view. The reglets against which the plates are supported carry indices which are reproduced on the photograph and serve to determine its principal point. A view-counter also registers a figure near the plate, which is reproduced on the photograph.

SHUTTER : The shutter is formed by two discs, pierced at the circumference and turning in opposite directions.

Their common axis of rotation is parallel to the optical axis of the lens. The distance apart of these two axes is such that the lens is masked by the discs and is exposed when the apertures pass before it.

The two discs have different speeds so that the superposition of the pierced sections is produced consecutively on the apex of a starred polygon of $a + b$ sides, a and b being prime numbers expressing the relative speed of rotation of the discs; the axis of the lens therefore passes through one of these apices.

The size of the pierced sections is determined so that a very high efficiency is assured to the shutter; this efficiency exceeds 80 %.

The discs are connected by pinions, keyed so that the opening commences at the centre — and the closing finishes also at the centre, of the lens. The lens is thus uncovered each a revolution of one of the discs or — which is the same thing — each b revolution of the other.

One only of these exposures is used, and at the exact moment the operator wishes it.

This apparatus has been tried by the official departments of Aeronautics and, in taking more than 500 negatives, has always worked perfectly. Unfavourable weather prevented 1/400sec being exceeded. At this speed, however, the lens, open to 5.7, has still given sufficiently exposed photographs, owing to the high efficiency of the shutter.

The total weight of the apparatus, ready for use, with shutter and electric motor, is 20 kg.

A MICROMETER MICROSCOPE EQUIPPED WITH AN ILLUMINATED SCALE

by

D. L. PARKHURST, *Chief, Instrument Division,* U. S. Coast & Geodetic Survey

(*Extract from* "JOURNAL OF THE FRANKLIN INSTITUTE", Philadelphia, September 1927)

An interesting development in filar micrometer microscopes has been made by the U.S. Coast and Geodetic Survey in providing these instruments with an illumination device for reading at night or under poor lighting conditions. The Survey uses such microscopes for reading to one second of arc the circles of its first order theodolites, the angle measuring instruments used in triangulation surveying.

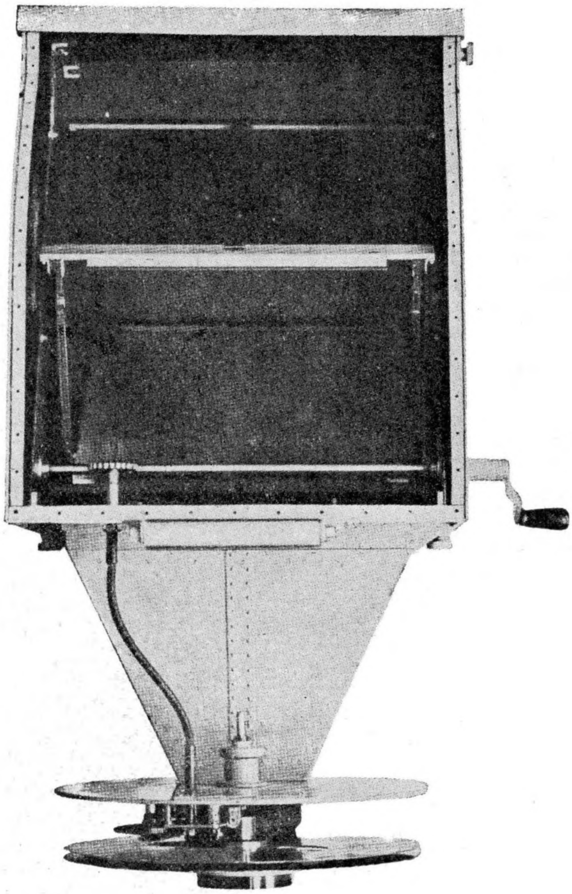
In the past the graduated microscope drums were either made of white celluloid or of silvered metal. As celluloid has a tendency to warp, errors may have been introduced into the readings due to this cause.

As triangulation observations are made at night in order to minimise the effects of atmospheric refraction and as they must be made in nearly total darkness due to the faintness of the signal light upon which the theodolite is pointed, it has been necessary to use a flashlight in reading the micrometer drum. This necessitated carrying the flashlight in the pocket when manipulating the instrument, then, when a reading was made, reaching for it and turning it upon the drum. This light is, of course, very much more brillant than that of the signal light even as seen through the telescope and has a very objectionable blinding effect upon the observer. Where silvered metal drums are used the graduations have an annoying tendency to disappear in the rays of the flashlight.

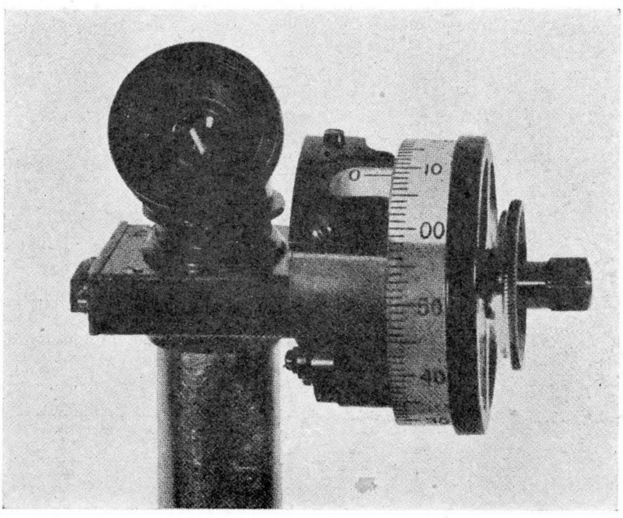
In attempting to perfect a more suitable device it was decided to make the graduated part of the microscope drum in the form of a glass ring frosted on the interior and having a small electric bulb inside, the light from which causes the graduations to stand out very distinctly, and yet, because of the frosting, creates no objectionable glare. The intensity of the light from this bulb may be readily controlled by means of a rheostat so that when properly adjusted there is little tendency for the iris of the observer's eye to change and cause blinding.

The light inside the ring is controlled by a small key placed in a convenient position upon the body of the theodolite so that the observer may with the same hand illuminate both circle and micrometer drum. He will first illuminate the circle and make a setting of the wires, then, pressing the key which lights the micrometer, he may, with only a slight sideways motion of the head, read the drum.

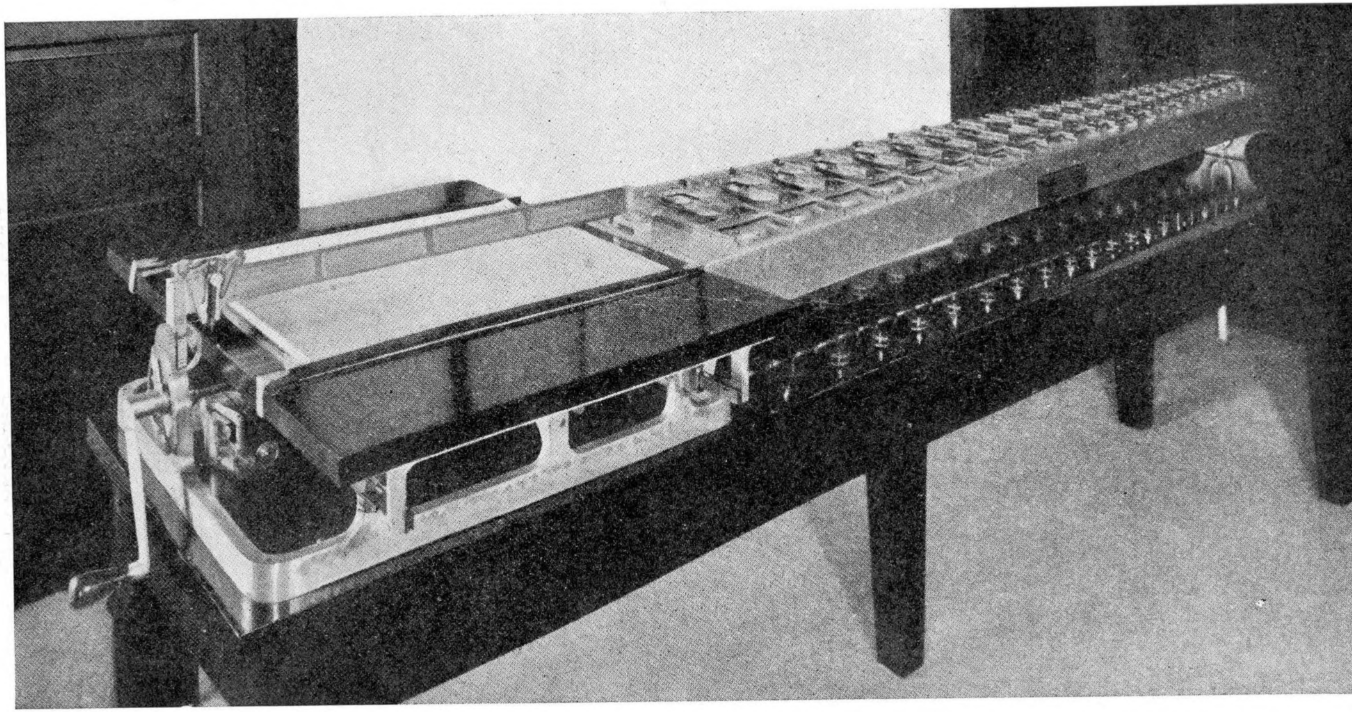
The advantages of the new style of instrument are that there will be a saving of time and also less fatigue for the observer's eye, which will not be subjected to great changes in brilliancy nor in focus. The micrometers should be more accurate than those used previously as there will be no tendency of the glass to warp due to ageing or changes in temperature.



"Cadastro"



Microscope à Micromètre — Micrometer Microscope



MECHANICAL SYNTHESIZER INTÉGRATEUR MÉCANIQUE

A MECHANICAL SYNTHESIZER.

The " *Journal of the Franklin Institute* ", contains an article by Frederick W. KRANZ which gives the description of and the method of using a synthesizer for registering the analysis of curves. It is constructed by Mr. B. E. EISENHOUR of the Riverbank Laboratories of Geneva (Illinois).

These laboratories already possess, for the analysis of sound, a 40 element analyzer of the Henricy spherical integrator type, made by CORADI of Zurich (See *Journal of the Franklin Institute* 1916, N° 181, pages 51-81 and N° 182, pages 285-322).

The synthesizer has been constructed to register the results of analysis by the mechanical reconstitution of the primitive curve. The apparatus is based on the same general principles as the tide-predicting machine of Lord KELVIN.

The simple harmonic motion of each pulley is produced by the rotation of a circular plate with a projecting pin working in the slot of a sliding element which is constrained by parallel guides to move back and forth along one line. Each moving element has a different period which is controlled by the period of the corresponding rotating plate. Helical gears are used to connect these circular plates with a main drive shaft, to rotate the plates at appropriate speeds. The use of helical gears offers a very considerable advantage in economy of space. Also because of the fact that each tooth slides for some distance along the surface of the tooth which it engages, remaining in substantially uniform contact during this time, and several teeth are thus in contact at any one time, the effect is essentially that of the use of an inclined plane, making the transmission of power smoother and more uniform than is practically possible with the use of spur or bevel gears in which the changes of tooth meshings are necessarily more abrupt than is the case with helical gears.

The synthesizer is about 9 ½ feet in length, over all. The table carrying the paper is 25×36 inches, while the main body of the instrument tapers from a width of 2 feet at one end to 9 inches at the other. The height is a little less that 9 inches except for the pen carriage above the table, where the height is about 11 ½ inches. The main framework is of cast aluminium, the gears are of steel, while the circular plates are of Sterlite, a hard stainless compositon metal which machines well and takes a high polish. Other and small parts are of these three metals and brass.

The driving gears are all attached to a main shaft which is rotated by means of a crank at one end, and the driven gears are on the shafts of rotation of the various circular plates.

The gears were lapped in with a light abrasive after their final mounting to eliminate any possible small inaccuracies in the cutting. The axles on which the driven gears were mounted were placed in slightly excentric bearings so as to allow the closeness of meshing to be perfectly regulated. The main shaft is in four sections which are connected by couplings. This allows the use of the table moving mechanism alone, or of the first twelve elements of the synthesizer, or of the first twenty-eight elements, in case the whole capacity of the instrument is not required. Also the effect of the higher elements may be stopped off at any point by the use of a clamp on the chain.

Each element is capable of adjustment as to amplitude and phase. The available amplitudes vary from 110 mm. to 40 mm. for the various single elements.

There are, however, provided on the instrument two extra rotating elements complete except for any gear connections with the main shaft. These are to make possible the use of ratios of frequency other than the harmonics, or to provide additional amplitude for one or two of the regular series.

The phase of the curve at the beginning of the motion is made adjustable by an arrangement which allows the spindle axis of the circular plate to be rotated with respect to the gear which is attached to it, while a scale of degrees on the periphery of the circular plate indicates the phase by reference to a line on the main framework of the machine.

The table which carries the paper at right angles to the pen motion is driven from the same main shaft as drives the gears, for the proper relation of the motion of the table to that of the rotating elements is essential. The actual wave-length of the curve produced is determined by the relation of table motion to the speed of rotation of the circular plates, although the relative wave-lengths of the curve components to each other are determined by the gears alone.

The chain is a chronometer fusee chain. A picture of the synthesizer is given in Fig. I. A mirror beneath the instrument allows the gears to be seen.

The instrument makes possible the easy, rapid and accurate summation of a series of forty simple sinusoidal curves of any initial phase and with a considerable range of possible amplitudes. Some twenty possible sources of error in the construction of the instrument have been investigated and found to be of negligible importance.

ATMOSPHERIC REFRACTION IN THE GULF OF NAPLES.

Doctor ESTER MAJO, in an article published in the "*Rivista Marittima*" (Rome, June 1927) gives an account of a series of daily observations of the sea horizon taken from the balcony of the laboratory of the Institute of Terrestrial Physics of the University of Naples.

Measurements were taken every day at 15 hours during 334 days in 1926.

By means of a micrometer telescope, fixed to a support, the relative angle of depression α of the horizon, distant about 25 kilometers from the summit of the church San Pietro Martire, which is about 300 meters from the place of observation, was twice measured.

If the depression of the cross in relation to the observer is denoted by β the angle of the refracted depression is obtained from the formula:

$$d_r = \alpha + \beta$$

If h denotes the altitude of the observer, which causes a geometrical depression d, the refraction of the horizon will be given by the formula:

$$r = d - d_r$$

If R denotes the radius of regional terrestrial curvature for the observed azimuth, then

$$d'' = \sqrt{\frac{2\,h}{R\,sin^2\,1''}}$$

which in this case gives $d = 12'84$.

The cœfficient of marine geodesic refraction has been deduced from the formula

$$n = \frac{r}{\frac{d}{2}} = \frac{1}{6{,}42}\,r$$

Tables giving for each month the mean refraction of the month, the maximum and minimum refractions, and the values corresponding to the cœfficient have been drawn up.

0,1277 has been calculated as the mean annual value of the coefficient, the extreme values being 0,3271 on the 8th March and 0,0436 on the 5th February and the 15th March.

The maximum in summer and the minimum in autumn have been ascertained.

It has also been found that variations of refraction corresponded to variations of the thermometric gradient.

Lastly, it has been ascertained that the days of maximum and minimum refraction corresponded to values of the atmospheric pressure taken at 15 hours, which were above the monthly mean.

The maximum refractions also generally correspond to values of humidity below the monthly average—and the maximum to values above.

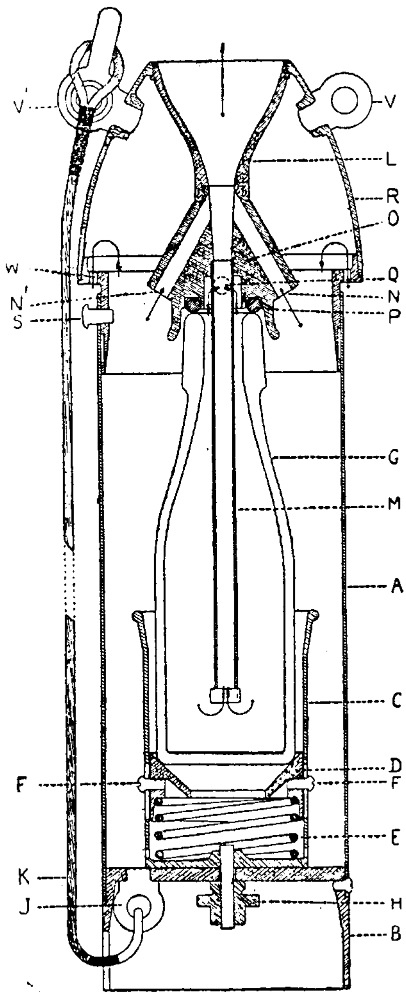
THE SURFACE SAMPLER.

AN APPARATUS FOR THE COLLECTION OF SAMPLES FROM THE SEA SURFACE BY SHIPS UNDER WAY

by J. R. LUMBY, *Fisheries Laboratory, Lowestoft.*

(*Extract from* "JOURNAL DU CONSEIL PERMANENT INTERNATIONAL POUR L'EXPLORATION DE LA MER" Copenhagen, December 1927.

This apparatus was designed to facilitate the collection of surface water samples from ships in motion, the samples being obtained to provide material for salinity and temperature determination. The need for some such apparatus sprang from the realisation that the use of an ordinary iron bucket was not always a simple task.



It is considered that the use of the surface sampler would materially improve the collection of samples for salinity determination and that, so far as observation of temperature is concerned, given ordinarily advantageous conditions, with due precaution readings may be obtained with a fair degree of accuracy.

The sample bottle *G* (capacity about 150 cc.) is supported on the plate *D*, and when the apparatus is assembled maintains the spiral spring *E* in compression.

The outer shell *R* of the head carries at its upper end a funnel piece *L* which is continued in the tube *M*, passing well down into the sample bottle. A casting *O*, between the funnel piece *L* and the tube *M*, carries two side tubes *NN'*, which assist in promoting the circulation of water within the cavity of the body.

Towing bridles are shackled to the two eyebolts *VV'*, screwed into the head of the apparatus.

When the apparatus is towed, water enters the apparatus through the funnel piece *L*; part of the water is diverted through the side tubes *NN'* into the body cavity, and part flows through the tube *M* into the sample bottle where it passes through the outlets *Q* into the body cavity of the apparatus. The water leaves the apparatus through a series of ports *W* on the under side of the head.

The weight of the apparatus assembled and filled but excluding bridles and towing line is about 7 kilos.

One of these samplers has now been in use for more than a year in s. s. "*Dieppe*" Southern Railway and French State Railway C[os] and, so far as its operation is concerned, has proved satisfactory.

SOME NEW OCEANOGRAPHIC INSTRUMENTS

Special Publication N° 77 of the Permanent International Council of Copenhagen for the Exploration of the Sea, is devoted to the description of several new instruments, among which must be mentioned:

1) A waterbottle for taking sea water, insulated from the influence of temperature for a period of 7 to 12 mins.

2) A reversing water bottle — permitting the simultaneous use of a reversing thermometer.

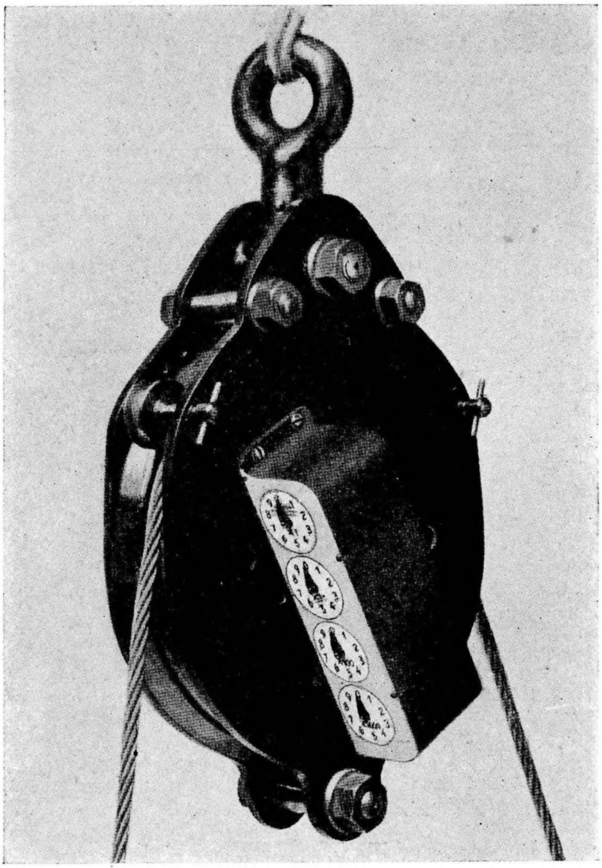
3) Reversing frames for thermometers — which do not lose the sample of sea water. Their reversing is effected by a propeller or by releasing weights.

4) Meter Wheel — for any use, with an indicator which is very easy to read and specially constructed for use at sea in phosphor bronze.

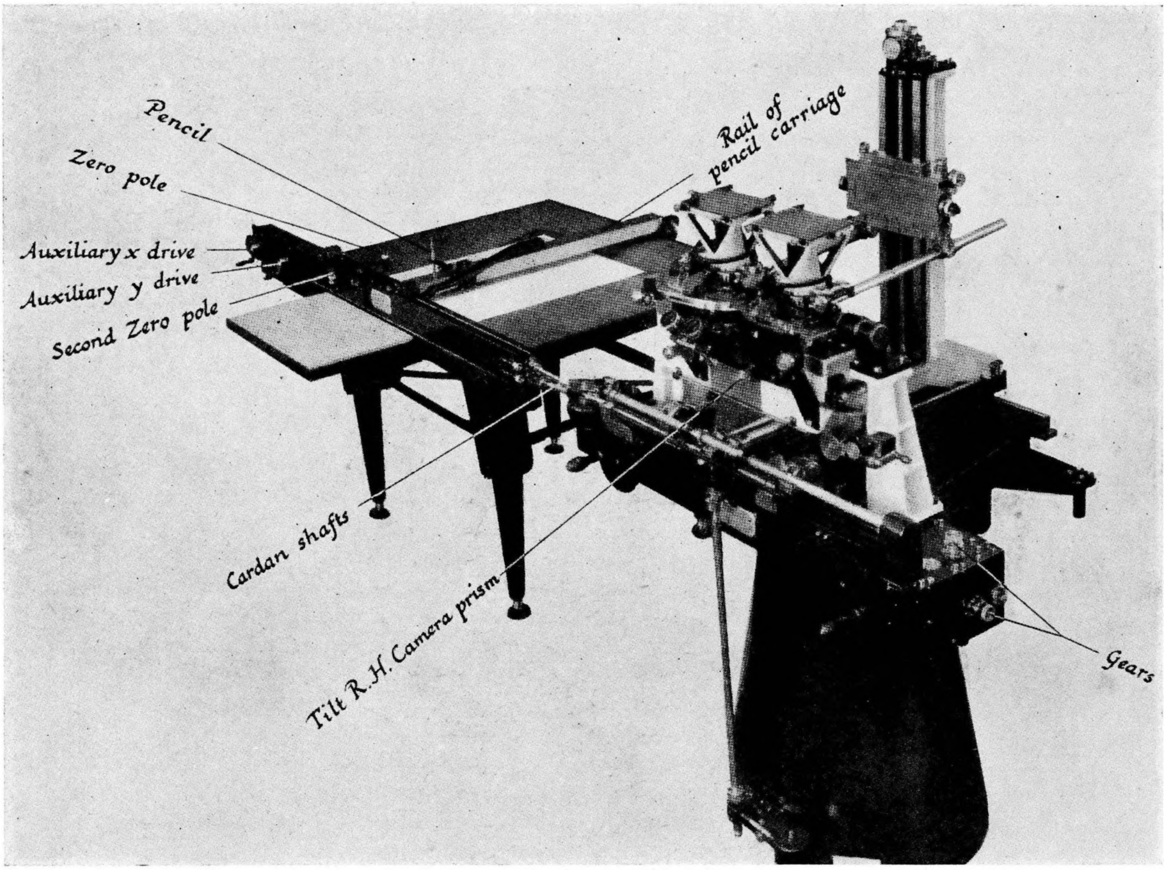
It is strongly built and designed for a line of 3 to 6 m/m diameter. The circumference of the wheel is 50 c/m the total weight 5 kg. and the breaking strain about 400 kg. The dial shows single metres up to 1,000 m. A similar but stronger one, for lines up to 15 m/m thick tested for a tension of 6,000 kg., has also been constructed. This apparatus shows depths in metre units up to 10,000 metres. The circumference of the wheel is 75 c/m, the total weight 28 kg.

5) The author, M. Martin KNUDSEN ends by relating some experiments he has made concerning the speeds of descent in water of controlling weights of various shapes.

With the adoption of an ogival shape, a gain according to its type of 25 % to 30 % in the time of descent can be obtained — which is appreciable when measures taken at great depths are concerned.



METER WHEEL — POULIE A COMPTEUR MÉTRIQUE



GENERAL VIEW OF AUTOGRAPH AND DRAWING TABLE.

VUE GÉNÉRALE DE L'AUTOGRAPHE et de la TABLE DE DESSIN

Pencil	Crayon
Zero pole	Repère du Zéro
Auxiliary x drive	Commande auxiliaire des x
Auxiliary y drive	Commande auxiliaire des y
Second zero pole	2me Repère du Zéro
Cardan shafts	Arbres à cardans
Tilt R. H. Camera prism	Réglage d'inclinaison du prisme de de support de plaque de droite
Gears	Engrenages
Rail of Pencil carriage	Glissière du support de crayon

THE "WILD" STEREO-PLOTTING MACHINE — THE AUTOGRAPH

Mr. Arthur R. HINKS, Secretary of the Royal Geographical Society of London, gives, in the *Geographical Journal* of October 1927, pages 358 to 371, the theory and the description and views of WILD's Autograph, which is designed to effect the Stereoscope restitution of photographs with a view to obtaining a chart.

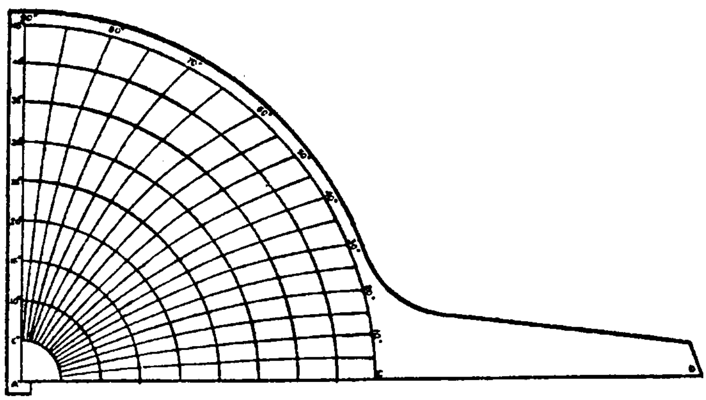
This memorandum, written out after a visit paid by the author to the workshops of Mr. WILD at Heerbrugg, describes the type of Autograph which has been used in concurrence with WILD's Photo-theodolite for the stereographic Survey of Shaksgam (Survey of India).

A general view of the Autograph is here reproduced and the reader is referred to the *Geographical Journal* for its description.

PROTRACTOR FOR USE WITH GNOMONIC CHARTS FOR POSITION FINDING BY WIRELESS BEARINGS.

In the *Nautical Magazine* for October 1927, Mr. T. J. RICHMOND, B. Sc., of the British Admiralty Hydrographic Department, gives a description of his invention—a transparent celluloid protractor—whereby bearings can be accurately plotted at any point of a gnomonic chart. Its manipulation is extremely simple.

The theory and the method of using the instrument are described with figures on pages 331-336.



NOMOGRAM FOR ALTITUDES.

An article by Von E. HAMAUKE on the subject of a Nomogram giving points in line for calculating altitudes is published in the *Annalen der Hydrographie und Maritimen Meteorologie*, Part IX of 1927.

The formula $\sin h = \sin \varphi \sin \delta + \cos \varphi \cos \delta \cos t$, which becomes

$$\cos z \sec \varphi = \cos z_0 \sec \varphi = z \cos \delta \text{ sem } t \ (*).$$

is of the form $A = A_0 - B$

(*) $\text{sem } t = \sin^2 \frac{t}{2}$

$$\text{with} \begin{cases} A = \cos z \sec \varphi \\ B = z \cos \delta \operatorname{cem} t \end{cases} \quad i.\ e. \quad \begin{cases} \log \cos z + \log \sec \varphi - \log A = 0 \\ \log \cos \delta + \log \operatorname{sem} t - \log \dfrac{B}{2} = 0 \end{cases}$$

which are of the form $f_1 + f_2 + f_3 = 0$

A first abacus with points in a line, a function of A, z, φ and a second abacus, a function of B, δ, t, which resolve the problem, can be constructed from these formulae.

Two annexed plates give a part of the nomogram (pages 293 to 301 and plates 30 and 31· Annalen IX, 1927).

It is interesting to recall a " Note on some applications of Nomography to Nautical Astronomy " published in the *Annales Hydrographiques* of 1904, Paris, by Lieutenant PERRET. This author has applied nomography to the principal nautical tables, and in particular to the special case of calculating the equation of equal altitudes of the sun. (See *Revue Maritime* of April 1905, Paris, Librairie Chapelot).

NUEVA NAVEGACION FISICA

In various numbers of the *Revista General de Marina*, Madrid, August 1927, etc., Mr. José RICAET Y GIRALT describes under the name of: " *New Physical Navigation* ", all the latest improvements applicable to navigation introduced by the use of apparatus based on the submarine transmission of sound waves: acoustic sounding apparatus, hydrophones, ultra-sounds, etc. combined or not with the use of W. T. and radiogoniometric or gyro-compass bearing.

TRABAJOS DE CAMPO QUE SE EFECTUAN EN LA COMISIÓN HIDROGRAFICA PARA EL LEVANTAMIENTO DE LAS CARTAS Y PLANOS

(Field Work carried out by the Hydrographic expedition for surveying for Charts and Plans)

Under this heading Commander Joaquin GERVERA publishes in the *Revista General de Marina*, Madrid, August - November 1927, a series of lectures which he has given at the Naval Aeronautical School on the various operations carried out by a hydrographic expedition :—tidal observations, various means of sounding, including echo-sounding, coastal topography, magnetic observations, azimuths, lists of details destined for the compilation of Sailing Directions, measurement of bases by the Brunner or the Porro apparatus, or by wire, etc. In particular, the author gives a short history of the geodetic junctions between SPAIN, ALGERIA and the SPANISH PROTECTORATE IN MOROCCO and of the geodetic survey of the CANARY ISLANDS by heliotropes and searchlights of high power.

TABLES OF THE VELOCITY OF SOUND IN PURE WATER AND SEA WATER FOR USE IN ECHO SOUNDING AND SOUND RANGING — N° HD 282.

In 8vo— 29 pages— 1 chart

Published for the Hydrographic Department, Admiralty, by H. M. Stationery Office, London, 1927

NET PRICE : 1 shilling.

These very comprehensive tables just published by the British Admiralty have been calculated and prepared by Mr. D. J. MATTHEWS in co-operation with the Hydrographer of the Navy and the Director of Scientific Research; they are based on the indirect method from other properties which can be investigated under laboratory conditions from the formula:

$$V = \sqrt{\frac{dp}{d\rho}}$$

where V = velocity.
p = pressure.
ρ = density.

Before the numerical value of these quantities can be found it is necessary to know with regard to the water :

(1) The temperature.
(2) The salinity, or alternatively the density at 0°/4° C.
(3) The pressure, which depends upon the depth, the density of the overlying water, and the acceleration of gravity, and therefore upon the latitude.

The salinity and density are taken out from *Knudsen's Hydrographical Tables,* 1901.

The true compressibility has been determined from V. W. EKMANN (*Publications de Circonstance* N° 43 and N° 49).

These tables differ somewhat from those of Dr. MAURER, Dr. SCHUMACHER (*Annalen der Hydrog.* 1924) and from those of the Coast and Geodetic Survey (*Special Publication* N° 108, Washington 1924) which are based on Bjerknes' tables.

The 3rd part of the pamphlet gives details of the methods used in preparing the tables of velocity and the comparison of observed and calculated velocities as well as the numerical data on which the accuracy of the tables is based.

The 1st part (Sounding Tables) gives in fathoms per second and in metres per second the velocities to be used according to the various depths in 23 different zones :

(1) Red Sea ;
(2) Mediterranean ;
(3) Sargasso Sea ;
(4) Arabian Sea ;
(5) N. W. African Region ;
(6) Gulf Stream ;
(7) N. E. Atlantic Drift ;
(8) Central Indian Ocean ;
(9) Fiji Is. Region ;
(10) Equatorial Atlantic Ocean ;
(11) Central South Atlantic Ocean ;
(12) Indian Ocean Counter Current ;
(13) Pacific Ocean ;
(14) Southern Indian Ocean ;
(15) Marshall and Caroline Is. Region ;
(16) Pacific Ocean ;
(17) N. American Cold Water ;
(18) Pacific Ocean ;
(19) Pacific Ocean ;
(20) Southern Easterly Drift ;
(21) Bering Sea ;
(22) Norwegian Sea ;
(23) Antarctic Ocean.

These zones are shown on a chartlet at the beginning of the book.

The 2nd part gives, in the metric system, various tables for calculating the velocity of sound in sea water and correcting the soundings.

MANUALE DI IDROGRAFIA PER LA COSTRUZIONE DELLE CARTE MARINE.

(HYDROGRAPHIC MANUAL FOR PLOTTING NAUTICAL CHARTS)

BY COMMANDER G. ROMAGNA MANOIA

in-8°. XI — 543 pages — 280 figures and tables.
Typolithography of the Naval Academy at Leghorn — 1927

This very complete manual has been drafted for naval officers who are called upon to make hydrographic surveys; it replaces the Treatise on Hydrography by Admiral CATTOLICA, which is at present out of print.

The manual is divided into 5 parts :

1 – *Geodetic Elements ;*
2 – *Instruments ;*
3 – *Operations on land ;*
4 – *Operations at sea ;*
5 – *Drawing and publication of the Chart.*

In the first part, after recalling the various definitions concerning the geoid, formulae and methods are given for calculating the transformation of coordinates, the various systems of projections used for marine charts and the drawing of their meridian and parallels network. The principles of the compensation of errors for triangulation chains are set forth. The first part ends by recalling a few optical notions applied to telescopes.

The second part deals firstly with levels, then with the rectification of micrometers and then with the theodolite and its adjustment. One chapter is devoted to instrumental errors — another to measuring horizontal or vertical angles and to the reduction at the centre of the station. The tacheometer and its stadimetric use, the topographical plâne table — (also called pretorian table), the prismatic circle Amici-Magnaghi, the surveying level of Zeiss, and then various floating or pressure automatic tide-gauges are successively described. One chapter deals with the erection of signals, their method of registering, with heliostats, with collimating lamps for optical signals and with the signalling apparatus of General Faini.

The third part deals with the choice of triangulation summits, the measurement of the base by the invar wire and with the orientation by the measurement of an azimuth. Samples of calculations are given with auxiliary tables to accelerate calculations in observation of circumpolar stars; then follow questions relating to topography proper, the graphic determination of points of detail (use of nonius alidade and of the plane table) or their numerical calculation and to the compensation of the traverse.

A special chapter is devoted to photogrammetry, stereophotogrammetry and to aerophotogrammetry — this latter section is fully explained and the various methods and apparatus which are used in Italy and abroad for the restitution of photographs (Hugershoff, Nistri, Santoni, Brock), are described.

The fourth part gives firstly the description and the use of various sounding apparatus: Magnaghi's small sounding machine and its revolution indicator; table of corrections for the inclination of the wire, Lucas's sounder, Kelvin's sounder, Warbuzel's sounding machine, the submarine sentry, the fish-lead (aquilone-scandaglio). The method of boat sounding is then dealt with and a model of a sounding book is given, then soundings taken from a ship under way with the deep-sea lead or with a roller weighing 200 kilogs dragged over the bottom. Instructions are given how to buoy the zones which it is desired to cover with parallel sounding lines and how to examine shallows and find rocks. The device for sweeping with two submarine sentries, with a rigid sweep towed by or fixed to the ship, or with wire called "*Wire-drag*" is described. The means of extending the triangulation out to sea with the aid of large beacons and the special cases of surveying anchorages, roadsteads and rivers, are dealt with.

One chapter is devoted to new acoustical sounding methods and to ultra sounds obtained either by means of the bomb of the Signal Gesellshaft of Kiel, or by Langevin's piezo-electrical projectors or by transmitters of Fessenden type of the Sonic Depth Finder.

The last part enumerates the various documents which having been placed at the disposal of the "*Istituto Idrografico*" make it possible to draw the definite draft of the chart according to the rules adopted by this Service. It gives ideas about the representation of the ground, chart drawing to various scales, how to use Jordan's diagram for reducing distances to the horizontal plane, on the use of the stigmograph (*Staziografo*), pantograph and of the camera lucida, notably Fiechter's.

The last chapter indicates the methods adopted by the Hydrographic Institute for producing charts; engraving of charts, photogalvanic engraving by the galvanoplastic method with bichromated gelatine (Gliamas's system by methyl-violet and rinsing in aqua fortis); then the lithographic methods are reviewed; photolithography, photozincography and the rapid autographic method.

The work ends with the list of conventional signs which are used on Italian charts and with tables for calculating coordinates giving for the latitudes of Italy and her Colonies the logarithms to 6 decimals of the fractions

$$\frac{I}{2RN \ sin \ I''}, \quad \frac{I}{R \ sin \ I''}, \quad \frac{I}{N \ sin \ I''}, \quad \text{and} \ \frac{N}{2R} \ sin \ I''.$$

H. B.

HANDBUCH FÜR KÜSTENVERMESSUNGEN

(in 8 vo VIII, 475 pages, 129 figures, 7 plates, and 6 tables.)
Drawn up by the *Marineleitung of the Reichswehrministerium.*
edited by E. S. MITTLER & SOHN, (Kochstrasse 68-71, Berlin, S. W., 68, 1927)

The International Hydrographic Bureau has recently received the new *Hydrographic Manual,* edited by the German Hydrographic Office, of which the following is a brief summary:

The work is divided into 17 chapters and we will review them in succession.

1. INTRODUCTION: The introduction contains some historial particulars, extracted from the "Handbuch der Vermessungskunde" by JORDAN, and some generalities concerning various surveying operations.

2. INSTRUMENTS AND ACCESSORIES: A list of material supplied to surveying ships is given; then a description of the instruments:—Sprenger's small universal theodolite, theodolite with microscope and central telescope or excentric telescope, with a description of the micrometers.

The following magnetic instruments should be noted:

1°— A declination needle with horizontal telescope for measuring the variation of the compass needle.

2°— A field magnetic theodolite for measuring the variation of the compass needle, the horizontal intensity and the magnetic dip.

3°— A double compass (Luyken N° 5 model) (Doppel Kompass) for measuring the horizontal intensity.

Also an electrical contact watch (mean or sidereal) and a chronograph recording the Morse system on a paper band.

The principle of Bertram's heliotrope is described.

Next is given the theory of errors and the process of adjusting theodolites and the level.

3. Chapter 3 is devoted to the preparation of the hydrographic expedition and to the material and documents to be taken with it.

4. RECONNAISSANCE OF THE POSITION—CHOICE OF THE TRIANGULATION APICES: In this chapter comment is passed on: choice of landing-places, choice of sites for the measurement of the base, for the installation of a tide pole, method of erecting marks and naming of the points.

5. ASTRONOMICAL DETERMINATION: This chapter deals with the method of determining

local time and latitude by equal altitude, the use of the Talcott level is indicated, and the azimuth of a terrestrial object is determined by the observation of a heavenly body or the pole star.

6. MEASUREMENT OF THE BASE: This chapter deals with different known methods of measuring bases, the mean error of the measurements and their accuracy.

7. TRIANGULATION: In this chapter are examined, with suitable examples, various methods of triangulation and calculations of coordinates; reduction to the centre, calculation of points by bearings (V. E. Vorwärts-Einschnitt), by subtended angles (R. E. Ruckwärtseinschnitt) and by reciprocal measurements (G. M. Gegenseitige Messung)— the method by which the ship is made to serve for the 4th point is also indicated.

8. LEVELLING: A description is given in this chapter of trigonometrical and barometrical levelling.

9. TOPOGRAPHY: Different methods are indicated of carrying out the polygonal topographic traverse, taking successive bearings either by sextant or by landing compass for coastal operations, and the measurement of distances and elevations. The method of calculating positions and the distribution of the closing error is also given.

10. Chapter 10 is devoted to TIDES: a number of definitions relating to tides and currents are recalled. Some generalities on the propagation of the tidal wave and an example of the cotidal distribution in the North Sea are given.

Then the methods of observing the sea level and those for the reduction of observations taken near land or off-shore are described—and in particular the accuracy of the calculated level.

At the end of the chapter some remarks are made on the observations of currents with the various Ekmann-Merz appliances, with that of Dr. RAUSCHELBACH and of KRUGER-SCHULZ, and on the manner of classifying and reducing these observations.

11. DETERMINATION OF DEPTHS— TIDE POLES— LINES OF SOUNDINGS: The necessary apparatus are enumerated:— Lucas's small sounding machine, deepsea lead, hand lead, tide pole and echo-sounding machine (Echolot), preliminary operations, material necessary for the boat, and the duties devolving on each member of the party. Different methods are given for determining the position of the boat when sounding, by 2 subtended angles, by transit and angle, by bearings of land-marks, by bearing and distance, by estimation of the distance run, etc.

The method of determining the level of reduction from soundings and the chart datum is given; the levels of reduction used by various countries are indicated.

12. DEEP-SEA SOUNDING: In this chapter the construction of buoys for carrying out the triangulation in the open sea is shown, and some examples for calculating their position are given.

13. RUNNING SURVEYS: This chapter concerns rapid operations, such as reconnoitring an anchorage, a bay or a port; surveys taken by a ship underway along a coast, by bearings and distances.

14. Chapter 14 entitled PREPARATION OF THE SHEET, begins with the enumeration of graphical instruments necessary in drawing: protractors, pantographs, metallic rulers, etc. Then the method of drawing the Mercator net and the calculation of the points are described. For this purpose tables are inserted at the end of the volume giving the lengths of minutes of latitude for different latitudes and their value in millimeters for different scales from 1/5000 to 1/10000. The method of finding the points by cords is given and also some examples of figure and letter writing.

15. MAGNETIC MEASUREMENTS ON LAND AND SEA: This chapter is very comprehensive: the detail of the operations is given, examples for calculating the variation of the compass needle, dip, and horizontal intensity, and the use of the apparatus already mentioned.

16. Chapter 16 shows the method of compiling Sailing Directions, of giving the description of coasts and ports: also remarks on the orthography to be adopted for geographical names and the method of taking photographs of the coast.

17. This chapter shows the method of making out the monthly reports, which are sent to the central department by the ships concerned.

The work terminates with Tables showing various methods used for calculating geographical coordinates, tables of reduction to the centre of the station, tables for reducing barometric heights and tables of Minutes of latitude for drawing up a Mercator's projection.

HANDLENING i SJÖMATNING

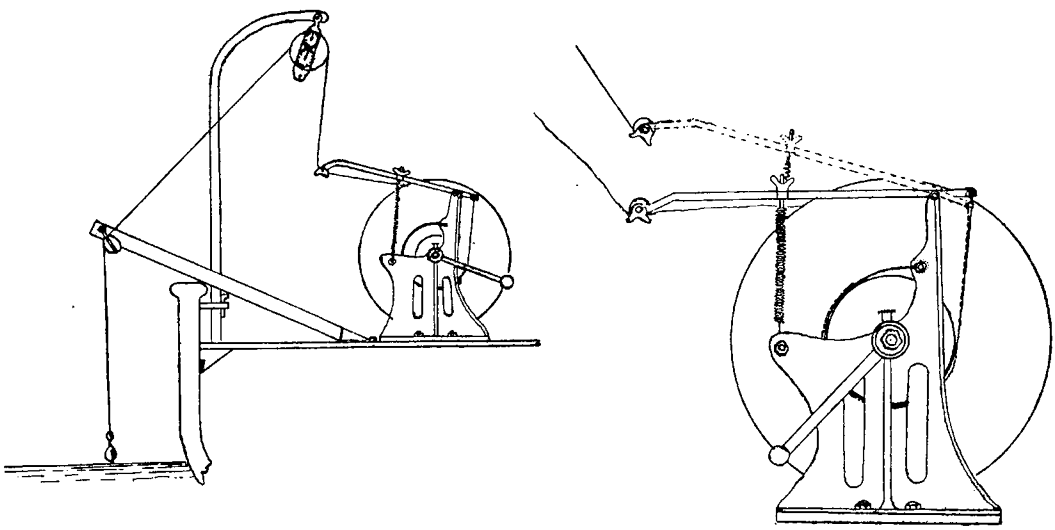
(in-8vo — VIII + 255 + 14 + 15 + 23 pages — 130 illustrations, plates and appendices)

Issued by the KUNGL. SJÖKARTEVERKET — Stockholm, 1923 — Supplements 1924-1926.

This manual deals in a very comprehensive way with all the operations which must be carried out in the course of a hydrographic survey.

The duties of the Chief of the Hydrographic Expedition, of the Commander of the Surveying Ship and of the Director of Work, are described from the beginning.

In the chapter dealing with instruments and material, explanations are given concerning :— the theodolite, the heliotrope, the plane table, the alidade M/24, the telemetric sights, the quintant, (a special model of which is that constructed by the firm of Plotts at Hamburg and the vernier of which is replaced by a graduated drum) ; various models of stigmographs, in particular the M/24, large and medium models and their adjustment, and the Zeiss level.



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Among the sounding appliances are described : — the machine worked by a winch (figure annexed) which is very convenient to use, with counter sheave and revolution indicator ; the submarine sentinel and details as to fixing it in position in the sounding vessel ; the submarine wire sweep supported by two floats, rigid sweeps towed or fixed to the surveying ship ; the automatic registering tide-gauge with float.

In the part devoted to geodetic operations are examined the connection of the triangulation necessary for nautical charts to the general net : the construction and establishment of signals and the method of computation of their coordinates and levels.

In the chapter dealing with projections, a study is made of plane charts, of the Mercator projection, Gauss's projection and Lambert's conical projection.

One chapter deals with the operations preparatory to the survey :— Preparation of draft plans, manner of fixing points by the chord method. Information is given concerning the shrinkage of the paper ; installation of the tide-pole and mean level mark, of the sounding-lines ; preparation of mark-buoys for shoal research ; making of floating hydrographic beacons.

The next chapter gives in detail a list of the material which is necessary for each of the surveying operations :— material for the vessel ; material for the erection of marks ; drawing materials; material for coastal topography, for sounding and for searching for rocks. Then the manner of erecting the land marks is described, as well as the method of designating them and the use of the plane table.

The chapter referring to sounding work and to the search for shoals describes :— the method of drawing up a plan to run parallel lines of soundings, of correcting the soundings, of running the lines of soundings, of fixing the position by means of two angles reduced to the horizontal plane, of taking soundings with the apparatus worked by means of a winch. Thereafter are given the various methods of systematic search for shoals by lead sounding and the search for channels; the procedure of sweeping by spar sweep.

For sounding on the high seas, the method of deep sea sounding under way and how to fix the position by means of angles drawn from the beacons, are described; the procedure for determining the limits of uncertainty of light sectors is also given.

The last chapter shows a list of standard signs and types of writing to be employed on the charts, in the drawing up of documents and views of the coasts.

Information is also given concerning the search for anomalies in magnetic variation.

In the supplements are found a note on the approximate method of calculation of a net of triangles distributed around a central point; a note on the adjunction of a pentagonal prism in the line of sight of the sextant and a note on the verification of the stigmograph. At the end of the volume are placed a tabulation of the usual abbreviations found on charts, a table and rules of metrical transformations; the distance of the sea horizon based on the height of eye and some models of original drafts of charts.

An appendix by Mr. HELGE ODELSIO describes 53 mean level marks of the sea along the Swedish coasts and the methods used for the reduction of the level and terrestrial altitudes. Graphs give the variations of mean level for 10 tidal stations on the Swedish coast.

H. B.

ANNALI IDROGRAFICI — Vol. 11.

(IN-8° - 450 Pages - Illustrations - Price: 30 Lires).

The 11th volume of the *Annali Idrografici*, published in 1927 by the Hydrographic Institute of Genoa, is devoted to the first part of the report of the field work of the Surveying Ship "*Ammiraglio Magnaghi*" in the Red Sea during the years 1923-1924.

It includes :—

1° A general report on the work of the Mission; redrafting of the plan of Massaoua; completion of the Survey of the South Canal of Massaoua; triangulation and coastal topography of the Archipelago of the Dahalac; survey of the anchorages to the north and south of the Ras Hafun; and reconnaissance off the coast of Somaliland; oceanographic researches on currents and tides of the Red Sea and on the physical and chimical conditions of that sea;

2° A memorandum by Professor F. VERCELLI, Delegate to the Italian Thalassographic Committee on the distribution of currents and tides in the Red Sea. The tidal observations were made at 11 mareographic stations:— Tor, Koseir, Ashrafi, Shadwan, Ras Gharib, Zafarana, Jeddah, Port-Soudan, Massaoua, Kamaran and Assab, besides particulars already known for Suez, Djibouti and Aden.

This memorandum is followed by marine optical researches in the Red Sea, transparency and colour of sea-water and by a study of meteorological conditions such as atmospheric pressure, temperature, humidity, actinometry, evaporation, etc...

3° The results of determinations of geographical coordinates at Cape Guardafui, Ras Hafun and at Assab, of measures of relative intensity of gravity at Suez, Assab, Asmara, Massaoua and Aden; and magnetic measurements at Koseir, Port-Soudan, Aden, Assab, Asmara, Adjuz, Dahalac, Kebir, Massaoua, Jeddah, Harghada and Suez. The appliances and the methods here used are described by Lt.-Commander M. CUGIA, specially placed in charge of the mission.

EIGHTH ANNUAL REPORT OF THE TIDAL INSTITUTE OF LIVERPOOL (1927)

The eighth annual report of the Tidal Institute of the University of Liverpool indicates a steady growth in the work of tidal analysis and prediction executed by the Institute.

Dr DOODSON has devised a somewhat simpler method of analysis for series of observations extending over only twenty-nine or fifteen days. This method is intended for use with the "*Tables to facilitate prediction*" now published in the "*Admiralty Tide-Tables, Part II.*"

Concerning predicting machines two years' experience of the continued working of the Institute's predicting machine, together with the testing of other machines, showed that certain small changes in design were desirable. They have been carried out by the makers, Messrs Kelvin, Bottomley and Baird, and the mechanical performance of the machine is now exceptionally good.

Very small elastic variations in the length of the tape had been traced to the effects of friction on the pulley-bearings. Ball-bearings were fitted to the new machine which the makers were building for the Brazilian Government, and the new feature proved so satisfactory that new pulleys with ball-bearings have now been fitted in the Institute's machine.

Vibrations produced by the driving motor sometimes caused small changes in the amplitude settings. New heads with spring washers have therefore been fitted to the setting screws.

A time-wheel has been connected to one of the gear-wheels on the main shaft. This proved very convenient for the reading of time with the necessary scales.

Harmonic shallow water corrections have been determined from one year's observations for: Avonmouth, Southampton, London Bridge, Royal Albert Dock, Southend and Tilbury.

Analyses were carried out for Side Saddle (for the Chinese Hydrographic Office) for Sandakan, Jesselton, Kudat, Lahad Datu, Semporna and Tawau (British North Borneo).

Tidal Currents Analyses were carried out for Varne Lightship and Smith's Knoll Lightship (for the International Council for the Exploration of the Sea) for Turn Point and the Strait of Canso (for the Canadian Hydrographic Office).

Predictions of Times and Heights of High and Low Water have been prepared for: Liverpool, (also hourly heights at Liverpool), Avonmouth, Portland, Southampton, London Bridge, Southend, Tilbury, Royal Albert Dock, Punta Delgada, Sandakano.Auckland, Bluff Harbour, Dunedin, Lyttleton, New Plymouth, Wellington and Westport (for the New Zealand Authorities); Portage Island, Victoria and Vancouver, also times of slackwater in the Strait of Canso (for the Canadian Hydrographic Office); Newchwang, for the Liao River Conservancy Board and Side Saddle (for the Chinese Hydrographic Office.)