

**SPECIFICATION OF INSTRUMENTS EXHIBITED
AT THE SEAT
OF THE INTERNATIONAL HYDROGRAPHIC BUREAU
DURING THE
Vth INTERNATIONAL HYDROGRAPHIC CONFERENCE
Monaco, April 1947**

**SERVICE HYDROGRAPHIQUE DE LA MARINE
Paris**

1. **Lecoq-Lejard Star Globe.**— This star-globe has been welcomed by mariners on account of the simplicity and stability of its setting which is operated according to sidereal time by causing the two hemispheres to slide jointly around the equatorial plane, according to latitude, and the celestial sphere to pivot around two equatorial trunnions placed at the poles of the local meridian.

2. — Various Destroyer watches, chronometers, siderometers, etc. :

a) **The Jaeger Destroyer Watch.**— High-grade watch for astronomical observations at sea. The watch forms one with its case, this being the standard form in the French Navy. The winding-up mechanism is to be noted: the milled head of the system slides along its axis immediately the winding-up action is completed.

b) **The Jaeger non-magnetic Watch for Submarines.**— High-grade watch fitted with soft-iron screen which protects the mechanism from the influence of magnetic fields. These are the standard watches for submarines. The case is of the standard type.

c) **Longines ship-borne chronometer with electric stop.**— The central seconds-hand drives a duplicating hand which rests immobile against the dial when stops are made. The instrument includes a balance-blocking system and a dial fitted with a movable outer ring. It must be frequently set to the hour so as to have an approximately zero correction at the time of observation.

d) **Délépine Tropometer, divided in 400 grades.**— Several instruments of this type were manufactured some half-a-century ago for the purpose of simplifying nautical-astronomical calculations by the systematic use of the same decimal unity: the grade, i.e. 1/400th part of the circumference, in the measurement of time and angles.

This simplification, nevertheless real, was not well received by mariners, being quite contrary to their long-established customs.

The accuracy of these instruments is the same as that of the usual marine watch; every tenth grade is shown on a first dial, tenths of grades are shown on a second dial, the thousandths of grade on a third. One-thousandth of a grade is equal to 0.216 second in time.

e) **Longines Siderometer with electric stop and single and double duplicating hand.** This instrument shows sidereal time expressed in sexagesimal degrees. The central hand for tenths of minute of arc drives two duplicating hands permitting two successive phenomena to be marked one after the other. The instrument includes a balance-blocking system and a dial with movable outer ring.

f) **The Bréguet Siderometer with indicator and push-button stopping device.**— This instrument shows sidereal time expressed in sexagesimal degrees. The central hand pointing the quarters of minute of arc (second of time) drives a unique duplicating hand. Reading of degrees is facilitated by the indicator system which forms an individual feature of the Bréguet siderometer.

CHASSELON**3 et 5, rue Amédée-Picard, Cachan (Seine)**

1. **Chasselon Theodolite for Topography.**— A vernier topographic instrument fitted with high-grade optics; gives the accuracy of a half-minute, sexagesimal, by easy readings.

ETABLISSEMENTS ALBERT LEPETIT et C^o**(formerly : Etablissements Lorieux, Ponthus et Therode)****20, rue Marie-Debos, Montrouge (Seine)**

1. **The A. Lepetit T. 111 model Sitometer.**— This small sextant, fitted with toothed sector, tangent screw and reading drum, is convenient for carrying out summary aerological soundings at sea. The accuracy of the readings is slightly above 1/10th degree.

2. **Hydrographic Circle - Ricard-Lepetit 180° model.**— This instrument has been developed for the purpose of greatly facilitating the observation of angles in the vicinity of 180° which are frequently met with in the practice of hydrography.

The luminous power of the instrument is as good in the case of large-angle observations as that of the standard hydrographic circle for small and average angles. The instrument is adjusted as rapidly as the standard circle or as the sextant.

3. **The Lepetit Toothed-racket Sextant.**— The remarkable facility of the reading has won the favour of mariners for this instrument. The inconveniences of the older-type sextants (clamping device and small motion screw), have been happily suppressed on this type although the latter retains the same possibilities of use. The Lepetit toothed-racket sextant is also remarkable for its robustness and ease of handling.

4. **The Lepetit Aviation Bubble Sextant. Type 107.**— This instrument is the modern form of the Favé Bubble Sextant established by Lepetit, which was the prototype of the majority of bubble sextants throughout the world. On the right-hand side, the instrument is fitted with an observation recording system operating on paraffined-paper tape the movement of which is proportional to time. The altitudes which are marked in succession are plotted on the graph in terms of time, and the selection of the mean of the observation is easily made, corresponding to a clearly-defined time.

This system of reduction of recorded observations the correctness of which may be checked, is in many respects more satisfactory than the reduction by means of mechanical analyses.

5. **Time-recording Theodolite for aerological Soundings - Model Lepetit.**— This instrument is very convenient in use. Azimuth angles and altitude angles are plotted against each other and very easily read.

SOCIETE D'OPTIQUE**ET DE MECANIQUE DE HAUTE PRECISION (S.O.M.)****(Formerly: Etablissements Lacour-Berthiot)****125-133, boulevard Davout, Paris (20^{me})**

1. **The Claude and Driencourt 60° Prismatic Astrolabe.** (Geodetic model).— This instrument for geographical astronomy allows the very convenient application of the equal altitudes method. The transit time of the celestial body at the 60° altitude circle, is observed. At that moment the direct image of the celestial body coincides with the reflected image on the mercurial trough. In this instrument the different settings and adjustments have been simplified as much as possible.

The accuracy of the instrument for latitude determination is to a few tenths of the sexagesimal second of arc and for time determination, to a few hundredths of second of time, when the personal equation error has been eliminated.

**SOCIETE ANONYME
DES ANCIENS ETABLISSEMENTS BARBIER, BENARD ET TURENNE
82, rue Curial, Paris (19^{me})**

1. **B.B.T. Magneto-striction Sounder.**—The Husun B.B.T. ultra-sonic Sounder is of the M.S. III model.

The rotating arm is driven at two revolution-velocities.

For the higher velocity the range of depths is from 0-125 m., and, by phasing of the zero, from 125-225 m.

For the lesser speed, the range of depths is from 0-625 m. and, by phasing of the zero, from 625-1125 m.

For small depths the transmission impulses are provided by means of a 500-volt generator situated in the recorder-box.

For great depths, a 1000-volt generator and a relay in a separate container must be used.

2. **The Idrac Speed and Direction Recorder for Submarine Currents.**—This instrument is described in *Hydrographic Review*, Vol. V, No. 2, page 155 and Vol. XII, No. 1, page 158.

**SOCIETE FRANÇAISE RADIO-ELECTRIQUE (S.F.R.)
79, boulevard Haussmann, Paris (8^{me})
et ETABLISSEMENTS CARPENTIER
3, rue Lord-Byron, Paris (8^{me})**

1. **S.F.R. Carpentier Sounder - Magneto-striction Recorder.**—This instrument is suitable for carrying out deep-sea soundings, whether by navigation in general or in surveying operations.

The stylus has only one speed of movement.

The different depth ranges are obtained by phasing of the transmission; they are as follows :—

0-250 m. ; 200-450 m. ; 400-650 m. ; 600-850 m.

Records are marked on red paraffined paper.

2. **S.F.R. Transmitter-Receiver Nautophone.**—Radiotelephonic transmitter-receiver post easy to use and very suitable for the "joining-up" which it is convenient to be able to establish between the vessels of one hydrographic party or between these vessels and a chart-room installed ashore.

MARINE INSTRUMENTS Ltd.

(Kelvin, Bottomley and Baird Ltd., Henry Hughes and Son Ltd. Assoc.)

107, Fenchurch Street, London, E.C.3.

1. **Hughes M.S. 21 Recording Echo Sounder type "A".**—This Shallow Survey Echo Sounding Equipment is an entirely new instrument specially developed for hydrographic survey. The complete equipment comprises four main units, viz. (1) Recorder-amplifier ; (2) A.C. Convertor and Transmission unit ; (3) Transmitting Oscillator ; (4) Receiving Oscillator.

The main power supply is taken from three large-capacity accumulator batteries (36 volts); an A.C. convertor supplies power for the amplifier, internal illumination, and marking devices and also for the high voltage transmission unit. The amplifier is now built into the recorder case, resulting in a much neater installation, yet with no sacrifice of accessibility for the entire unit is arranged to slide out from the side of the recorder case for inspection or adjustment.

The recorder consists of a motor-driven stylus wheel and arm rotating at 533 1/3 r.p.m. on scale 45 feet and 266 2/3 on scale 90 feet. The recorder mechanism contains a 2-speed gear box, enabling a choice of two ranges to be selected by the operator. The fixed 5 inch scale is calibrated 0-45 feet and 0-90 feet. soundings on the highest speed being taken at the

rate of 533 $\frac{1}{3}$ per minute. Using the principle of continuous automatic phasing, the scale can be extended by eight equal increments of 30/60 feet to a maximum of 270/540 feet.

The total scale length being 30 inches, phasing is achieved by advancing the position of the transmitting contacts. There is an illuminated indicator which shows at a glance which of the two feet ranges is in use and also the phase, i.e. the number of feet to be added to the scale reading.

Recording is effected by the passage of the stylus current from the stylus through chemically-treated paper to the tank lid beneath the paper. Associated with the stylus wheel and arm is the mechanism operating the transmission contacts, etc. Power for pulsing the oscillators is obtained from a power unit. The transmission unit supplying the high voltage impulse to the transmitting oscillator is entirely electronic. In place of the electro-mechanical tuned contactor previously used is an inertia-less thermionic gas-discharge relay, the flashing of which can be checked through a glass window in the cover of the unit. Included in this unit is a non-synchronous vibrator-type convertor with its associated transformer and all necessary rectifiers and smoothing equipment for supplying A. C. and D. C. power at both high and low tension for transmitting, amplifying and marking circuits.

Part of the transformer employed has a winding which is connected to a metal rectifier. The rectified output is fed to a condenser which is discharged through the transmitting oscillator by a gas-discharge valve triggered by the contacts in the recorder. The received signal is fed via the receiving oscillator to a valve amplifier having a gain of 10^6 where, after amplification, it is rectified and fed to the stylus of the recorder.

The equipment is completed by a pair of 30 kc. magneto-striction oscillators, which are approximately half the size of the kilocycle pattern formerly used and also give greatly improved definition. They may be fitted either in separate inboard water-filled tanks or alternatively in a single light streamlined outboard "fish" designed to be outriggered from the side of the launch.

The actual housing of the oscillators and their reflectors depends on the type of ship from which the gear is being operated. Steel tanks are used in steel ships, copper tanks for fitting in wooden ships, and an outboard "fish" type unit when a portable arrangement is required.

2. Hughes M.S. 10 Surveying Echo Sounder.— This instrument comprises a recorder, amplifier, and transmitting and receiving oscillators. The oscillators are magneto-striction pattern housed in reflectors located in water-filled tanks. The actual housing of the oscillators and their reflectors depends on the type of ship from which the gear is being operated. Steel tanks are used in steel ships, copper tanks for fitting in wooden ships, and an outboard "fish" type unit when a portable arrangement is required.

The recorder consists of a motor-driven stylus wheel, rotating at 300 r.p.m. Associated with the wheel is the mechanism operating the transmission contacts, etc. Power for pulsing the oscillators is obtained from a rotary convertor continuously charging a condenser. The discharge of this condenser provides sufficient energy to the transmitting oscillator for transmitting satisfactorily in depth to approximately 500 feet. The received signal is fed via the receiving oscillator to a 2-valve amplifier having a gain of 1,000,000. The received signal is rectified after amplification and fed to the stylus of the recorder. Recording is effected by the passage of the rectified current from the stylus through the recording paper to the lid of the tank holding a roll of the paper which has been chemically treated.

Recording System: The electrolytic action of a small current passing through the recording paper, which is chemically impregnated, from the metal stylus point to the polished surface of the paper container, causes a sepia mark to appear at a point corresponding to the depth. There is no time-lag whatsoever between the moment of receiving the Echo and its recording on the graph—it is the actual returning sound impulse, electrically amplified, which marks the record instantaneously.

The basic scale of the M.S. 10 is 0-40 feet (0-12 m.) and this may be increased by phasing to record depths to the same scale ratio to 480 feet (or 150 m.). Phasing is achieved by advancing the position of the transmitting contacts, i.e. 15 extra phases of 30 feet.

Fix marking is provided by a push button which is an auxiliary circuit so arranged that a continuous current from a small internal battery in the recorder passes to the stylus and thus through the paper. The electric pencil is similarly arranged for making notes on the recorder paper.

Power Supplies: Suitable for operation from D.C. Mains of 110 or 220 volts, or from power batteries of at least 24 volts, preferably 36. In the case of the latter, a charging board can be supplied on request. Power consumption approximately 250-300 watts. In certain cases separate dry and wet batteries may be necessary for amplifier operation, but in the standard installation the amplifier will be powered by the main source of supply.

The driving motor is a 1/8 h.p. D.C. Shunt Motor incorporating high-precision electro-mechanical governor: runs at constant speed, plus-or-minus 1%, irrespective of wide variations in supply voltage. Speed adjustable from outside of recorder case.

Time and Speed Indicator: Mechanically driven one-minute clock calibrated at 15 seconds intervals. Useful for checking speed of recorder mechanism and for making fixes at regular intervals.

Weight: Recorder 1 cwt. 3 qtrs.; Amplifier 23 lb.; Charging Board and resistance 8 lb. (220 volts, 14 lb.); Power Batteries 53 lb. per 12-volt battery.

Streamlined Outboard "Fish": When working in motor-boats with inboard oscillators, after reaching a certain speed there is often a tendency for the soundings to be blanketed by "aeration"—formation of air bubbles in the path of the sound waves. In such cases it has been proved that the outboard oscillators eliminate this effect and allow much higher speeds to be reached.

The outboard fish consists of a matched pair of M.S. oscillators, mounted in reflectors and housed in a D-section streamlined form divided into five compartments. The ends and middle contain air, and between them lie the two oscillator compartments, which are filled with fresh water. Thus there is an air space between the oscillators which acts as an insulator to any interference which might otherwise occur with so small a separation between them, and also gives a considerable degree of buoyancy to the whole unit, making it only slightly non-buoyant when submerged. As the axes of the two oscillators lie very close together, the triangulation error in measuring shallow depths is, for average soundings, negligible.

3. British Admiralty Transmitting Magnetic Compass. Type II.—Binnacle with one repeater, A.T.M.C., type II. Is described in this volume of the *International Hydrographic Review*.

4. Roberts Radio Current Meter.—Is described in this volume of the *International Hydrographic Review*.

5. The Challenger Survey Sextant. Mark II. (With one-minute micrometer).—Manufactured in light alloy. Divided from minus 5° to 140°, in white-filled marks on black arc, with a radius of 6" reading to one minute with parallel worm micrometer. Index mirror and circular horizon mirror in silex fully protected and hermetically sealed. Telescope has a magnification of 5, with a field of view of 3 1/2° with focussing scale. The sextant is fitted with a spring-loaded handle which can be adjusted to the vertical during the taking of either vertical or horizontal angles. If fitted with pentagonal prism the angular readings are increased by 90°. The instrument is anodically treated and stained, no paint or lacquer being used. Weight: 2 lbs. 8 ozs. Three legs are fitted on the upper side of the limb for greater convenience in handling.

6. The Micrometer double Sextant. (With one-minute micrometer).—Utilises corrosion-resistant light alloys, thus reducing weight to a minimum. Has a circular limb of 6 3/4" reading to one minute, is fitted with four Class A mirrors: two horizon and two index, the latter two being fully protected. The telescope is of magnification 2 1/2 with central field of view 6°. The weight of the instrument is 3 lbs. The sextant is anodically treated and stained, no paint or lacquer being used.

7. Micrometer Station Pointer.—The Micrometer Station Pointer is designed to facilitate the plotting work of Hydrographic Surveyors.

Fitted with well-known Hughes Micrometers on the moving arms, which provide a more rapid and convenient setting than verniers. The approximate setting is made instantaneously by slight pressure on the clamps and the fine reading is legibly shown on the micrometer head. Divided on silver. Reading to one minute with micrometers and lengthening arms.

Circle	6 in.	Arms extend to	27 in.
—	8 in.	—	36 in.
—	10 in.	—	48 in.
—	12 in.	—	60 in.

8. Marine Super Integrating Bubble Sextant.—The instrument consists of a sextant, the mechanism of which is totally enclosed, with the usual fixed horizon mirror and adjustable index mirror. The mechanism is arranged to give arbitrary increments of altitudes of 10° , together with a slow motion covering about $14^\circ 50'$ so arranged as to cover all angles between -10° and 90° . Attached to the main body of the sextant by two screws is the bubble complete with eyepiece through which the observer sees the bubble and the object observed. A single instantaneous observation is made by setting the next lowest whole tens of degrees and then using the slow motion to obtain coincidence between the centre of the bubble and the object, reading the altitudes on the tens of degrees scale and the degrees and minutes scale (instantaneous reading).

An averaging observation is made by maintaining the coincidence as nearly as possible during the one-minute period of observation between starting the clock drive and the automatic raising of the cut-off shutter, the altitude being read on the tens of degrees scale and the degrees and minutes scales (averaging).

A second bubble unit is provided, interchangeable with that on the instrument. This unit is exactly the same as the first, except that it carries a $2 \times$ Galilean telescope mounted in the unit itself, which, when sea conditions permit, gives brighter star images than would otherwise be obtained.

Two dry batteries and two spare lamps are supplied.

9. Mate Sextant with 10-Sec. Micrometer.—Divided on silver from -5° to 125° . Radius 6 in. Reading to 10 seconds. Index and horizon mirrors—full sized Class "B". Shades—Neutral. Telescopes—One Achromatic Erect Star, magnification 2.5, field 7° , aperture 1.22 in. Shade head—Neutral. Electric Lighting on index arm, adjusting pin, oil bottle, chamois leather. Finish—crystalline black. Weight—as illustrated : 4 lb. 0 oz.

10. Hand-Bearing Compass.—With 2" dia. 'Dead-Beat' Card in $3\frac{1}{2}$ " dia. liquid Bowl, with transparent base, large prism with luminous sight vane affixed to verge ring. Moulded plastic handle containing battery for illuminating the card from below.

11. The Hughes Hydrographic Bearing Compass provides facilities for accurately determining the magnetic bearing of distant objects.

The instrument consists of a 4-in. liquid bowl into which is mounted a specially prepared $2\frac{1}{2}$ in. photographic card clearly graduated in degrees. The construction of the compass is such as to provide complete steadiness of the card in actual use, which is an important feature in obtaining an accurate bearing. The compass bezel is provided with a sight in the design of which special consideration has been given to the requirements of Hydrographic Survey. A prismatic reflector, magnifying and transposing the card's image in a vertical plane in conjunction with a finely-set vane, allows the observer to obtain a bearing to one half of a degree.

The whole instrument is mounted on a robustly constructed tripod, the latter being adjustable for varying heights and quickly transported and remounted from one position to another.

COOK, TROUGHTON and SIMMS

(subsidiary Company of Vickers Ltd.)

15 and 17 Broadway, Westminster, S.W. 1
and Buckingham Works, York (England)

1. **45° Prismatic Astrolabe and Stand.**—(For description see: *Hydrographic Review*, Vol. IX. No. 1, page 218 and Vol. XII, No. 2, page 116.)

2. **Star programme finder for 45° Astrolabe.**—(For description see: *Hydrographic Review*, Vol. XIII, No. 2, page 147.)

3. **"Tavistock" Transit double-reading Theodolite and tripod.**—(This instrument is described in *Hydrographic Review*, Vol. XIV, No. 1, page 115.)

4. **Surveying Level S-300.**—(This instrument is described in *Hydrographic Review*, Vol. XIV, No. 1, page 116.)

Messrs SHORT and MASON Ltd.
Aneroid Works, Walthamstow, London, E-17.

1. **Pocket altitude aneroid** for measuring altitudes.
2. **Surveying aneroid** with vernier scale reading to single feet.
3. **Barometer cylindrical case aneroid.**
4. **Micro-barograph** (recording barometer) similar to type used by the Meteorological Office.
5. **Stormograph.**
6. **Thermograph** (recording thermometer).
7. **Hair hydrograph.**
8. **Electric cup anemometer**, type of Meteorological Office.

Messrs NEGRETTI and ZAMBRA
38, Holborn Viaduct, London, E.C.

1. **Reversing deep-sea thermometer.**
2. **New unprotected type deep-sea thermometer.**
3. **Thermometer** for use with Nansen-Peterson water-bottle.
4. **"Marine Biological" reversing deep-sea thermometer frame**, improved design.
5. **Sea surface temperature recorder.**

THE MARCONI
INTERNATIONAL MARINE COMMUNICATION COMPANY Ltd.
Marconi Offices, Electra House, Victoria Embankment, London, W.C.2.

1. **Marconi Wireless Marine Direction Finder**, type 579 ;
 Radiogoniometer type 579 ;
 D.F. Receiver type 579 ;
 D.F. Aerial type 354 N. with Stand.
2. **Marconi Echometer Sounding Device**, type 430 (Langevin-Chilowsky system) for Surveying and Shallow Water Soundings (0-30 fathoms). (See: *Hydrographic Review*, Vol. XIV, No. 2, page 227 and Vol. XV, No. 2, page 26.)
3. **Marconi Echometer Sounding Device** Electrolytic Recorder, type 429 (Langevin-Touly). (See: *Hydrographic Review*, Vol. XIV, No. 2, page 227 and Vol. XV, No. 2, page 26.)

U. S. HYDROGRAPHIC OFFICE
Washington, D.C.

Phamphlets illustrating newly developed instruments and cartographic procedures.

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
8806 Van Wyck, Jamaica I, New-York

Photo-theodolite Fairchild.

PHILIP B. KAIL ASSOCIATES
2535 Elm Street, Denver 7, Colorado, U.S.A.

The Stereoscopic Plotter K.E.K. (King, Elliott, Kail).

DAVID WHITE Co
Milwaukee 12, Wisconsin (U.S.A.)

Pendulum Astrolabe.

SOCIETE DE CONDENSATION ET D'APPLICATIONS MECANIQUES
37, rue du Rocher, Paris (8^{me})

1. **Langevin-Florisson ultra-sonic Sounder**, type 420. With S. 24 Transmitter.

Feeding: 1 accumulator set—12 volts. (Charge by ship's mains with protection by mains box.)

The equipment consists of: 1 S. 24 transmitter; 1 mains box; 1 H.T. box; 1 transmitter-receiver 0-15; 1 indicator-420.

Principal characteristics: Electric motor; 2 sounding scales 0-60 and 0-600 metres; instantaneous change from one scale to the other.—Shallow depths: Dial 0-60, 375 soundings per minute. Larger depths: Dial 0-600 metres, 75 soundings per minute. Indirect lighting of the dials during the night. Easy access to all parts.

2. — View of **S.C.A.M. Recorder-Indicator**, type 419 (new series).

The Recorder-Indicator type 419 replaces in the equipment of the ultra-sonic sounding machine the Indicator 420. Four scales: 0-200 m.; 200-400 m.; 400-600 m.; 600-800 m. Instantaneous change from one scale to the other; luminous indicator with neon bulb (same scales); instantaneous change from indicator to recorder; stylus with *rectilinear* and uniform movement; recording on electrolytic strip of paper delivered in watertight boxes, ready for use, width 152 mm. in rolls of 27.40 metres' length, providing for (approximately) 45 sounding hours.

3. — View of **New Echoscope S.C.A.M.**

Feeding: By 6-volt accumulator set.

The equipment consists of: 1 type S.32 transmitter; 1 echoscope; 1 battery, 6 volts; 1 H.T. box.

Soundings every 10/11 of second; *Reading* of (approximately) 10 cm.; *Soundings* from 1.20 metres under the face of the transmitter up to 60 m.

Recent improvements: S. 32 transmitter more powerful than former S. 23 transmitter; high tension cells replaced by a small converting group in box with filter; new 3-penthode amplifier; instantaneous replacement of the Spot Bulb; external control of the initial frequency adjustment, of the speed adjustment and of the phasing of the transmission; additional winding-up indicator; stuffing-box for all external controls and improved watertightness; use of drying arrangement in the apparatus. The Echoscope is also constructed for the 30 metres type.

(See description in the present volume of the *International Hydrographic Review*).

4. **Tabulation of the various types of S.C.A.M. Transmitters.**

Type	Useful Diameter	Proper Frequency	Average Range	Use
S.23	100 mm.	65,200 p.s.	1.50 m. to 150 m.	Hydrography: Coasts, Estuaries, Roadsteads, etc.
S.32	140 mm.	53,200 p.s.	2 m. to 300 m.	Hydrography: Small coasting vessels, small trawlers.
S.24	220 mm.	37,500 p.s.	2 m. to 800 m.	Hydrography: General Navigation (ships-iron hull, trawlers).
S.30	220 mm.	37,500 p.s.	2 m. to 800 m.	Hydrography: (wooden ships, submarines).
S.34	310 mm.	29,150 p.s.	3 m. to 2000 m.	Deep-sea hydrography, Cable ships.

Any fragility of the transmitters has been eliminated by a new system of assembling inner constituents.

5. **Ultra-sonic Transmitter S.32 (S.C.A.M.).**

6. **Langevin-Florisson ultra-sonic Sounding Machine**, type 418. For fishing-boats.

Feeding: 1 accumulator set—12 volts. (Charge by ship's mains with protection by mains box).

The equipment consists of: 1 S. 24 or S. 30 transmitter ; 1 mains box ; 1 H.T. box ; 1 transmitter-receiver 0-15 ; 1 indicator 418.

Principal characteristics: Clockwork with centrifugal regulator ; sounding scale 0-400 m. ; 112.5 soundings per minute ; indirect lighting of the dials during the night.

ETABLISSEMENTS TAFFE

34, rue Gimaldi et avenue de Fontvieille, Monaco

1. Current Meter. Thoulet model.
2. Secchi disc.
3. Richard Water-Bottle, small model : 0.400 litres.
4. Buchanan Water-Tube, large model : 1 litre.
5. Ballbearing Swivel.
6. Biological cup and special Richard-Portier Water-Tube.
7. *Leger* Catcher for bottom sampling.

ETABLISSEMENTS JULES RICHARD

25, rue Mélingue, Paris

1. Curvilinear Level Register.
2. B.C.M. Recorder Thermometer.
3. B.C.M. Recorder Barometer.
4. B.C.M. Recorder Hydrometer.
5. Recorder Hygrometer, medium size.

HYDROGRAPHIC DEPARTMENT

(British Admiralty), London

1. Chronograph with Battery Leads and Chronometer.
2. Various Decca charts and Decca book.
3. Manual of the Decca Navigator (Marine model MK-III. The Decca Navigator Company Ltd., 1-3, Brixton Road, London, S.W.9).
4. Model of Lowry Beacon with mast and radar reflector.

Messrs J. HALDEN and Co Ltd.

Trafalgar House, 9, Great Newport Street, London, W.C.2.

Barnes Transilluminated Tracing Table.

DIRETORIA DE HIDROGRAFIA E NAVEGACAO

Rio de Janeiro (Brazil)

Star Identifier (A. de Azeredo Rodrigues). Tables for Tidal Harmonic Constants (Cap. teniente A.S. Franco and A.P.F. Serpa).

