INFORMATION ON VARIOUS INSTRUMENTS DISPLAYED DURING THE COURSE OF THE SIXTH INTERNATIONAL HYDROGRAPHIC CONFERENCE MONACO, APRIL-MAY 1952, OR FORMING THE SUBJECT OF DESCRIPTIVE BROCHURES DISTRIBUTED

Information is given below regarding the instruments listed in Appendix I of the *Report of the Proceedings* of the Sixth International Hydrographic Conference (page 295).

1. — REVERSING THERMOMETER

of the Watanabe Keiki Manufacturing Co. Ltd., 114 Higashikata-Machi, Bunkyo-Ku, Tokyo, Japan

Under the name of the Watanabe Deep-Sea Reversing Thermometer, the above Company produces reversing thermometers of considerably high quality. These thermometers were already being manufactured in Japan before 1940, but, under war control, it was impossible for them to be exported. This Company now produces more than 1,000 instruments per year and they are used by large numbers of scientific institutions, as much in America as in Japan itself.

The following are the characteristics of the two models in which this thermometer is produced :

Protected Reversing Thermometer :

Measuring range : —2° C to 30° C.
Subdivision : 0.1° C.

Unprotected Reversing Thermometer :

Measuring range : —2° C to 30° C.
Subdivision : 0.1° C.

The measuring range can be determined according to requirements.
All other information will be supplied on request.

2. — PHOTOGRAMMETRIC INSTRUMENTS

Constructed by the Japan Photogrammetric Instruments Co., Tokyo

Phototheodolite Model Pt1 :

Stereoscopic taking instrument for mapping or studying of moving phenomena. Distortion free special lens. Aperture ratio : F/4.5 Focal length : 19 cm. Size of picture : 4 3/4 × 6 1/2 in (12 × 16.5 cm).

Stereocomparator Model Sc1 :

Precision stereoscopic measuring instrument. Maximum size of picture : 13 × 18 cm.

Fine Contourgraph Model A1 :

Precision mapping instrument for terrestrial photogrammetry with various taking axes. Maximum size of picture : 13 × 18 cm.

Fine Stereograph Model M1 :

Universal precision mapping instrument for aerial and terrestrial photogrammetry. Triple projectors for wide angle cameras. Maximum size of pictures : 9 × 9 inches (23 × 23 cm).

Fine Stereograph Model P1 and P2 :

Mapping instrument for aerial photogrammetry. Large double projectors with wide angle lenses. Size of pictures : 9 × 9 in (23 × 23 cm). Focal length : 6 in (15 cm). Model P2 is a precision-type instrument.

Stereograph Model P3 :

Small scale mapping instrument for aerial photogrammetry. Triple projectors with wide angle lenses.

Stereograph Model S3a and S3c :

Orthogonal stereoscopic mapping instrument for use mounted on a table.
Focal length : model S3a 6 in (15 cm).
model S3c 10 in (30 cm).

Stereometer Model S4 :

Stereoscope with special parallaxmeter and parallel moving rails. Maximum size of pictures : 30 × 30 cm.

Stereometer Model S5 :

Stereoscope with special parallaxmeter. Maximum size of pictures : 30 × 30 cm

Stereoscope Model S2 :

Light stereoscope for field. Maximum size of pictures : 30 × 30 cm.

Reproductor Model Rd1 :

Sketching instrument for tracing on the map sheet from aerial photographs. Maximum size of picture : 6 × 6 in (23 × 23 cm).

Range Finder Model Rf1 and Rf2 :

Short base range finder	Range	Base	Magnification
Model Rf1	10 — 300 m	11 cm	11 times
Model Rf2	5 — 175 m	max. 35 cm	6 times

These instruments have been designed and constructed by the Japan Photogrammetric Instruments Co. No. 94 Shinsakamoto-machi Daito-ku, Tokyo, Japan.

The manufacturers have long experience in designing fine optical instruments and can be applied to for further information.

---

3. — THE DECCA NAVIGATOR COMPANY LIMITED

1-3, *Brixton Road, London, S. W.* 9

At the Sixth International Hydrographic Conference, the Decca Navigator Company exhibited a circular publicity panel, describing the principles of the Decca Navigation System, and various pamphlets from which the most recent information has been extracted and is set out below.

The Decca network covers the entire North Sea area, the southern Baltic, the approches of the Channel, the British Isles, France and Germany. It is estimated that the range of each of the principal stations is about 240 nautical miles. As at the present time, more than a thousand vessels of various nationalities use the Decca system. The Mark V Installation only requires a power supply of 300 watts. The overall dimensions of the apparatus are as follows :

Indicator Unit :	15" × 17" 1/2 × 14"	(38 × 44 × 35 cm);
Receivers :	34" × 19" × 10"	(86 × 48 × 25 cm);
Converter :	19" 1/2 × 14" × 13"	(49 × 35 × 33 cm).

The Receiver and the Indicator can be mounted separately on a bulkhead in any convenient position. It is a wise precaution to place the indicator set not closer than 2 feet (65 cm) to a compass. The shipboard aerial consists of a certain

length of plain insulated wire and the mounting of the equipment never takes more than two or three days. One hour of instruction is sufficient to familiarize the operator with the working of the apparatus, which is very simple. The Decca Navigator Company hires out the apparatus for minimum periods of one year, which include visits of inspection and up-keep in the principal European ports.

Decca Navigator System for Surveying

As the accuracy of the Decca Navigator in position-fixing is very high — i.e., an area of about 10,000 square miles can be covered with a Standard Error of 100 feet, or even of about 30 feet when the angle of intersection of the position lines approaches 90° — it can be used with advantage during hydrographic surveys or during aerial photographic operations for position-fixing or for tracking.

For surveying purposes, the Company has developed chains consisting of three transmitters easily dismantled and transported. The component parts are always less than ten tons in weight and the light-weight chain allows for ranges of 50 miles off-shore, even in areas where atmospheric conditions are bad ; in areas without atmospherics, the range can be extended to 250 miles. Each station weighs about 1,600 lbs. (730 kg.), excluding the generator. The aerial system has been simplified and the mobile station can be mounted in place in three hours by a team of three men.

The Decca apparatus which is used for position-fixing is in the form of a radio receiver divided into sections, each of which is tuned to the three transmitters. All tuning and radio circuit adjustments are fixed at the time of manufacture, the only controls provided being those for setting up the Decometers, which compensate for the effects of temperature changes and which check that the transmissions are being correctly received. The three receiving channels feed phase-comparison circuits which, in their turn, drive the Decometers and show the phase difference, at a common frequency, between signals derived from the Master and the respective Slave stations. This phase difference is displayed in terms of « Lanes », a Lane being the space bounded by two in-phase hyperbolic position lines.

The receiver for surveys appears in two forms, one of which is suitable for marine, and the other for aerial operations. It comes in battery-portable form which allows for its being used in topographical reconnaissance work and for exploration. A device can be embodied in the portable set which compensates for the fix-error which occurs when the receiving aerial is close to large trees, thus allowing full advantage of the system to be realized in geohysical reconnaissance surveys in the jungle.

The number of receivers is not limited and it is therefore possible to operate a very large number with one and the same Decca chain.

The receivers weigh from 40 to 110 pounds, according to type, and use from 50 to 100 watts.

It was in 1947 that the first Decca chain was successfully used for surveys by the Royal Danish Navy for speeding up the plotting of soundings off the west coast of Greenland and for allowing for the continuation of survey work under bad weather conditions and beyond the visibility range of hydrographic shore beacons.

In 1948, the Swedish Hydrographic Service used a Decca chain for re-soundings in the Baltic south of Stockholm. The Bahrein Petroleum Company used a Decca chain in the Persian Gulf for submarine investigations and the corresponding hydrographic surveys. The Central Photographic Establishment, Royal Air Force, also used the Decca system to cut down on flights for the taking of photographs in connection with new surveys of the United Kingdom, and extensive economies were effected through the excellent route accuracy obtained with the Decca apparatus which allowed for flights without deviation on parallel lines about 200 yards apart.

The employment of the Decca apparatus in aerial navigation has allowed for the carrying out of a whole programme of airborne geo-magnetic research.

The Decca Navigator Company, Limited, undertakes to submit, on request, detailed studies for the preparation of programmes of technical survey operations.

4. — HASTINGS INSTRUMENT CO., INC.

Designers and Manufacturers of Electronic, Electrical and Mechanical Instruments
Hampton, Virginia, U.S.A.

During the course of the Sixth International Hydrographic Conference, this Company gave a stereoscopic show of views of Raydist equipment in the field.

Amongst the pamphlets distributed at that time, reference will be made to « Raydist for Shallow-Water Hydrography », by Harold H. Waterfield and Cecil Hilliard, Engineers, which was reproduced in the International Hydrographic Review for November, 1952.

It should be noted that the Raydist radio location system can be applied to all sorts of problems because the position of the receivers and transmitters can be modified and their number varied.

Whatever type of position information is required, there is always a particular Raydist system that can provide it. The apparatus is used for marine geophysical surveying, for nautical cartography, for ship speed-trials, for general navigation, for hydrographic soundings, for topography operations from the ground, for aerial photographic cartography, for aerial tracking, for aerial traffic control, for landing instructions, for rescue operations, etc.

The original continuous-wave radio location system was designed by Charles Hastings in 1940 as an accurate means of measuring the true ground speed of aircraft.

A Raydist survey of portions of the Bahamas Islands was satisfactorily completed under contract with the United States Air Force in connection with the Long Range Proving Ground Missile Test Station in Cocoa, Florida. This was one of the largest electronic surveys ever undertaken.

The Newport News Shipbuilding and Dry Dock Company used Raydist for ship speed determinations. The Bethlehem Steel Corporation, at its Quincy Yard, used Raydist for similar speed tests off Cape Cod, Massachusetts.

Six major oil companies are presently using the services of nine Raydist survey crews in the Gulf of Mexico. These survey parties, working through Offshore Rayist, are operating day and night, supplying vital geophysical survey data.

The Hydrographic Bureau of the Portuguese Navy purchased a second Raydist system for use in the Portuguese possession of Guinea on the west coast of Africa. This second system was the result of more than a year's satisfactory operation of a Raydist system purchased earlier by the Portuguese government for use in Mozambique, Portuguese East Africa.

The Hastings Instrument Company also produces air velocity indicators and recorders, electronic manometers and flow meters, vacuum gauges, precise electronic cells and medical appliances for measuring blood flow and temperature.

The Raydist Navigation Corporation at Hampton, Virginia, supplies, on request, any information that is called for regarding specifications.

---

5. — SOCIETE DE CONDENSATION ET D'APPLICATIONS MECANIQUES S.C.A.M.

37, *rue du Rocher, Paris* (8e)

The « Société de Condensation et d'Applications Mécaniques » established, more than twenty-five years ago, a department specializing in the study of ultra-sonic radiations. Inaudible ultra-sonic waves of a frequency greater than 20,000 per second are capable of being directed in a beam similar to light. Thus, by means of suitable equipment, beams of ultra-sonic frequencies can be projected in the same way as light beams are projected by motor-car headlights.

These properties of the ultra-sonic waves have been known since the laboratory experiments carried out by Galton and Ramsay in about 1880 in which the use in the atmosphere of overshrill whistles and sensitive flames revealed the properties of guided transmission, reflection, refraction and their rapid absorption by atmosphere.

In the course of World War I, Chilowsky designed (in 1915) an electromagnetic vibrator similar to a large telephone receiver with a laminated iron armature for producing ultra-sounds electro-magnetically. In the same year, Professor Langevin suggested using the electrostatic attraction phenomenon by means of « singing condensers », and he produced, at the Paris « Ecole de Physique et Chimie », the first laboratory apparatus transmitting ultra-sounds in water. In February, 1916, he carried out a successful signal transmission of about 100 meters in the Seine. In 1918, he set up the first piezo-electric, steel-quartz-steel sandwich and produced the prototype of the ultra-sound submarine detector.

It was in October, 1920, that the first sounding-line by means of ultra-sounds was made.

In April, 1922, the despatch-boat, « Ville d'Ys », carried out the first continuous sounding-line between Iceland and Norway and at the same time the French hydrographic engineer, Marti, created the first recorder allowing for the continuous recording of soundings on a strip of smoke-blackened paper.

In 1924, S.C.A.M. became the holder of the Langevin-Chilowsky-Florisson patents and, in 1929, produced the first S.C.A.M. echometer comprising, in one unit, the analyser, the transmitter and the receiver registering echoes by means of a mirror oscillograph.

In 1928, S.C.A.M. also produced the TOULY indicator which revealed echoes by means of a neon tube.

In 1933, S.C.A.M. produced the echoscope, which is a portable sounder with oscillograph. In the same year, the recorder with lamp black or ink was superseded by an electrolytic paper recorder.

S.C.A.M. hydrographic sounders have, at specific times, been described in different volumes of the International Hydrographic Review.

The Langevin-Florisson echoscope sounder is of a small size and allows for accurate soundings in shallow water. It is portable and can be set up in any kind of hydrographic craft. The soundings are readable from about 1.20 meters under the transmitting surface of the projector with an accuracy of 10 cm. The total weight of the sounder is 113 kg. ; that of the echoscope proper is 39 kg. ; current 7 A.

The different types of Langevin-Florisson sounders differ only in their chronographic apparatus.

So as to be independent of the ship's mains (except for the charge), all S.C.A.M. sounders work on storage batteries (12 V, 75-100 AH, except for the echoscope which is fitted with a 6 V battery).

S.C.A.M. 418 Sounder

In the case of the S.C.A.M. 418 Sounder, the indicator with neon tube works with a clockwork and has a dial graduated from 0-400 m (and from 0-219 fathoms) with 112 soundings per minute. The total weight of the 418 Sounder is 164 kg. ; the weight of the indicator is 17 kg. ; current 6 A.

S.C.A.M. 420 Sounder

The 420 indicator with neon tube works with an electric motor and is supplied with two scales :

0-60 m (or 0-32 fathoms) giving 375 soundings per minute.

0-600 m (or 0-325 fathoms) giving 75 soundings per minute.

It is possible to switch instantaneously from one system to the other.

The total weight of the apparatus is 170 kg. ; the weight of the indicator alone is 23 kg. ; current 7.5 A.

S.C.A.M. 419 Sounder

This model supplies, in a single recorder-indicator, a neon tube indicator and an electrolytic paper recorder. It is possible to switch from one to the other instantaneously.

The apparatus has four scales :

0 — 230 m
200 — 430 m
400 — 630 m
600 — 800 m.

The recording stylus travels in a straight line so that the recording shows the exact contour of the sea bed. The total weight of the 419 Sounder is 184 kg. ; the weight of the recorder-indicator is 37 kg. ; current 7.5 A.

---

6. — CHASSELON

Geodetic and Topographic Precision Instruments

Cachan (Seine)

The firm of Chasselon manufactures, on request, high precision and special purpose geodetic instruments of which the following have been standardized in two categories:

Vernier Instruments (C.V. 1 — T.V. 2 — T.V. 3)

These instruments are designed for current topometric work.

The average quadratic azimuthal error of these instruments is 0.7 centigrade (with repetition). Their common component parts (i.e., triangle, azimuthal limb, alidade mounting, telescope, verniers, case, locking and control device) are identical, and this standardization allows, in the event of a breakdown, for the necessary replacement to be effected with the least delay.

Microscope Instrument (T.M. 1)

This instrument is designed for high-precision traverse operations, complementary geodetic operations and accurate astronomic orientation operations (Sun « hour angle process ») in which accuracy to the rate of 2 to 3 milligrades is required.

Because of micrometric drum miscroscopes which allow for readings to 1/2 milligrade and for estimations to the centesimal second, the average quadratic azimuthal error of this instrument is 3 centesimal seconds (with 2 series of repetitions).

As with the vernier instruments, the standardization of this category has been developed to the point at which all the component parts common to other instruments are identical.

Microscope Theodolite (T.M. 1)

This instrument consists of :

— Collimation level.
— Level for vertical setting.
— Axial focussing eyepiece.
— Focus control.
— Lighting speculum.
— Vertical and horizontal circle protective case.
— Micrometric drum.
— Drum reading lens.
— Vertical circle reading lens.
— Microscope eyepiece.
— Inclination movement adjusting screw.
— Collimation level adjusting screw.
— Horizontal movement adjusting screw.
— Alidade locking screw.

— Dust-proof plate.
— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Adjusting screw counter spring.
— Control knob.
— Levelling screw.
— Silver-engraved circles ..... 400 gr.
— Diameter of horizontal divided circle ..... 104 mm.
— Space of divisions ..... 10 cgr.
— Space of divisions of micrometric drum ..... 1/2 mgr.
— Diameter of vertical divided circle ..... 100 mm.
— Space of divisions ..... 20 cgr.
— Vernier providing for ..... 1 cgr.
— Aperture of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x.
— Horizontal and vertical stadia 1/100
— Sensitivity of collimation spirit level ..... 25"
— Sensitivity of vertical setting spirit level ..... 25"
— Weight of instrument ..... 6 kg. 200
— Weight of sheath-case ..... 3 kg.
— Dimensions of sheath-case ..... 200 × 220 × 370 mm.
— Weight of No. 110 Tripod ..... 4 kg. 300
— Sun shield — Plumb-line — Control key.
— Electric lighting.

Vernier Theodolite (T.V. 2)

This instrument consists of :
— Collimation level.
— Level for vertical setting.
— Axial focussing eyepiece.
— Focus control.
— Vertical limb protective case.
— Horizontal limb protective case.
— Inclination movement locking screw.
— Inclination movement adjusting screw.
— Vertical limb reading lens.
— Collimation level adjusting screw.
— Alidade locking screw.
— Horizontal limb reading lens.
— Horizontal movement adjusting screw.
— Adjusting screw counter spring.
— Horizontal circle locking screw (Repetition).
— Horizontal circle adjusting screw.
— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Levelling screw.
— Control nut.
— Silver-engraved circles ..... 400 gr.
— Diameter of horizontal divided circle ..... 108 mm.
— Diameter of vertical divided circle ..... 100 mm.

— Space of divisions ..... 50 cgr.
— Vernier providing for ..... 1 cgr.
— Apertune of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x
— Stadia 1/100
— Sensitivity of vertical setting level ..... 30"
— Sensitivity of collimation level ..... 30"
— Weight of instrument ..... 4 kg. 200
— Weight of sheath-case ..... 3 kg.
— Dimensions of sheath-case ..... 200 × 200 × 300 mm.
— Weight of No. 101 Tripod ..... 4 kg.
— Sun shield.
— Plumb-line.
— Control key.

VERNIER TACHEOMETER (T.V. 3)

This instrument consists of :

— Collimation level.
— Level for vertical setting.
— Axial focussing eyepiece.
— Focus control.
— Vertical limb protective case.
— Horizontal limb protective case.
— Inclination movement locking screw.
— Inclination movement adjusting screw.
— Vertical limb reading lens.
— Collimation level adjusting screw.
— Alidade locking screw.
— Horizontal limb reading lens.
— Horizontal movement adjusting screw.
— Adjusting screw counter spring.
— Horizontal circle locking screw (Repetition).
— Horizontal circle adjusting screw.
— Goulier-type tubular compass needle.
— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Levelling screw.
— Control nut.
— Silver-engraved circle ..... 400 gr.
— Diameter of horizontal divided circle ..... 108 mm.
— Diameter of vertical divided circle ..... 100 mm.
— Space of divisions ..... 50 cgr.
— Vernier providing for ..... 1 cgr.
— Aperture of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x
— Stadia 1/100
— Sensitivity of vertical setting level ..... 30"
— Sensitivity of collimation level ..... 30"
— Weight of instrument ..... 4 kg. 700
— Weight of sheath-case ..... 3 kg.

— Dimensions of sheath-case ..... 200 × 200 × 300 mm.
— Weight of No. 101 Tripod ..... 4 kg.
— Sun shield.
— Plumb-line.
— Control key.

Vernier Alignement Circle (C.V. 1)

This instrument consists of :

— Sighting vane.
— Axial focussing eyepiece.
— Horizontal circle reading lens.
— Focus control.
— Level for vertical setting.
— Level control screw.
— Alidade locking screw.
— Horizontal circle locking screw (Repetition).
— Horizontal movement adjusting screw.
— Adjusting screw counter spring.
— General movement adjusting screw.
— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Levelling screw.
— Control nut.
— Silver-engraved circle ..... 400 gr.
— Diameter of horizontal divided circle ..... 108 mm.
— Space of divisions ..... 50 cgr.
— Vernier providing for ..... 1 cgr.
— Aperture of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x
— Sensitivity of vertical setting level ..... 30"
— Weight of instrument ..... 3 kg. 400
— Weight of sheath-case ..... 3 kg. 900
— Dimensions of sheath-case ..... 200 × 200 × 270 mm.
— Weight of No. 101 Tripod ..... 4 kg.
— Sun shield.
— Plumb-line.
— Control key.

Compact Level (N. 1)

This instrument consists of :

— Axial focussing eyepiece.
— Focus control.
— Setting-up level.
— Spirit level control screw.
— Reflector.
— Speculum for observation of spirit level.
— Horizontal movement locking screw.
— Horizontal movement adjusting screw.
— Fine-adjustment inclination screw.

— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Levelling screw.
— Nut for pump fixture.
— Aperture of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x
— Lenght of telescope ..... 175 mm.
— Stadia 1/100
— Field of view of telescope ..... 1°40'
— Minimum working range ..... 2 m. 25
— Sensitivity of spirit level for 2 mm. motion of bubble .. 15"
— Accuracy of 1 km. length leveller ..... ± 4 mm.
— Weight of instrument ..... 2 kg. 200
— Weight of sheath-case ..... 2 kg.
— Dimensions of sheath-case ..... 210 × 140 × 170 mm.
— Weight of No. 101 Tripod ..... 4 kg.

Fittings :
— Control pin.

COMPACT LEVEL WITH HORIZONTAL CIRCLE (N.C. 1)

This instrument consists of :
— Axial focussing eyepiece.
— Focus control.
— Setting-up level.
— Spirit level control screw.
— Reflector.
— Speculum for observation of spirit level.
— Circle reading lens.
— Horizontal movement adjusting screw.
— Fine-adjustment inclination screw.
— Plate for horizontal shifting.
— Spring for horizontal shifting.
— Levelling screw.
— Levelling screw control.
— Aperture of object-lens ..... 35 mm.
— Magnifying power of internal collecting lens telescope .. 24 x
— Length of telescope ..... 175 mm.
— Stadia 1/100
— Field of view of telescope ..... 1°40'
— Minimum working range ..... 2 m. 25
— Sensitivity of spirit level for 2 mm. motion of bubble .. 15"
— Accuracy of a 1 km. length leveller ..... ± 4 mm.
— Diameter of divided circle ..... 65 mm.
— Space of divisions ..... 50 cgr.
— Vernier providing for ..... 5 cgr.
— Weight of instrument ..... 2 kg. 200
— Weight of sheath-case ..... 2 kg.
— Dimensions of sheath-case ..... 210 × 140 × 170 mm.
— Weight of No. 101 Tripod ..... 4 kg.

Fittings :
— Control pin.

ECLIMETER ALIDADE

This instrument consists of :

— Sun shield.
— Focussing eyepiece.
— Telescope control screw.
— Porro limb.
— Level.
— Adjusting screw.
— Adjusting screw counter spring.
— Raised bracket attaching alidade to ruler.
— Spherical spirit level control.

— Division of Porro limb every	5 gr.
— Accuracy of division to	2 cgr.
— Inclination measurement	— 50 gr. + 50 gr.
— Limb divided every	10 gr.
— Aperture of object-lens	12 mm.
— Magnifying power of telescope	7.5 x
— Length of bevelled alidade blade without divisions	50 cm.
— Weight of instrument	1 kg. 500
— Weight of sheath	1 kg.

— Scale from 0 to 5 grades by 1/10ths.
— Scale from 24 metres to infinity.

COLOURED GLASS PRISM FOR ZENITHAL SIGHTING

The coloured glass prism for zenithal sighting includes two glasses of different shades to allow for the adjustment of the eye to intensities of light.

This prism can be adapted to the C. V. 1, T. V. 2, T. V. 3 and T. M. 1 instruments.

Because of the axial focussing eyepiece, it remains in its sighting position.

HIGH-PRECISION OPTICAL SQUARE

The Optical Square allows for the simultaneous sighting of two points situated in perpendicular directions.

TRIPODS

Double tripod : This tripod, which has perfect stability, is suitable for all precise triangulations.

Constructed with head and joints in bronze, the legs (which are of the highest quality ash) are joined and fitted with bolts and all the armatures reinforced with metallic rings.

The weight of this tripod is 7 kg. 800.

Its great ease of transport allows for its adaptation to the T. M. 1 instrument.

Tripod No. 101 *with shifting device :* This tripod has six legs and two struts.

The length of the legs is 1 m. 35.

Bracket for shifting movement with clamping piston. Head in grooved aluminium which allows for the setting-up of instruments with a levelling screw of 50 mm. to 70 mm. radius. Wrought-iron leg tips. Weight, 4 kg. Tripod can be fitted to the C. V. 1, T. V. 2, T. V. 3, N. 1 and N. C. 1 instruments.

Tripod No. 110 *with shifting device :* This tripod has the same characteristics as No. 101 Tripod and allows for the setting-up of instruments with a levelling screw of 45 mm. to 90 mm. radius. Weight, 4 kg. 300. Tripod can be fitted to the T. M. 1 instrument.

7. — MECABOLIER INSTRUMENTS

Address : 21, rue Alice, Villeneuve-le-Roi (Seine-et-Oise), France

Models of this firm's instruments for oceanographic research were exhibited at the 1952 International Hydrographic Conference.

Reversing Bottle, Mecabolier patented type, No. 1006

For taking deep sea water samples and obtaining temperatures by means of reversing thermometers operating independently of bottle. Outstanding advantages of this improved model of standard bottle are its light weight and simplicity of operation.

Specifications :

Water content : 1.000 cm3 and over if desired.
Weight : 3.5 kg.
Maximum length of thermometers used : 330 mm.
Maximum diameter of thermometers used : 22 mm.
Maximum diameter of suspension cable : 6 mm.
Materials used : Marine bronze and stainless steel.
Delivered without thermometer.

Reversing Bottle, Standard Knudsen Type No. 1000

For taking deep sea water samples and obtaining temperatures by means of reversing thermometers operating independently of bottle.

Specifications :

Water content : 1 050 cm3.
Weight : 5.5 kg.
Maximum length of thermometers used : 330 mm.
Maximum diameter of thermometers used : 22 mm.
Maximum diameter of suspension cable : 6 mm.
Materials used : Marine bronze and stainless steel.
Delivered without thermometer.

Reversing Thermometer Frames

For one thermometer : No. 1008
For two thermometers : No 1008A

For obtaining temperatures in deep water.
The same equipment is used in this instrument as for reversing bottles.
It is designed for obtaining water temperatures at desired depths.

Specifications :

Released by messenger.
One- or two-thermometer models.
Maximum length of thermometers used : 330 mm.
Maximum diameter of thermometers used : 22 mm.
Maximum diameter of suspension cable : 6 mm.
Materials used : Marine bronze and stainless steel.

Messenger No. 1002

For reversing bottles, reversing thermometer frames, samplers, etc.

Specifications :

Weight : 0.5 kg.
Diameter : 38 mm.
Length : 60 mm.
For cable having maximum diameter of 6 mm.
Materials used : Bronze and stainless steel.

Underway Bottom Sampler, Mecabolier patented type

For rapid collection from aboard ships underway of loose top layers of bottom sediment.

Collects bottom samples from aboard ships moving at any speed.
Materials used : Bronze, malleable cast iron, steel.

Specifications :

No. 1007, Type I : Sediment content : 32 cm3. Weight : 3.5 kg.
No. 1007A, Type II : » » 100 cm3.
No. 1007B, Type III : » » 200 cm3.

Bottom Sampler No. 1003A, Claw-Type

For sampling loose bottom sediment and pebbles from aboard stationary vessel.
Must be operated with winch.

Specifications :

Area covered : 0.1 × 0.1 m.
Materials used : Bronze or soldered sheet iron.

Bottom Sampler No. 1003, Improved Leger Type

For collecting bottom sediment from aboard stationary vessel.
Must be operated with winch.

Specifications :

Shutters for water circulation.
Fins for lateral stability.
Counterweight in mouthpiece.
Area covered : 0.35 × 0.25 m.
Weight of instrument : 13 kg.

Dredge No. 1004, Charcot Type

For collecting bottom samples by tearing from aboard a ship underway.

Specifications :

Weight of instrument : 27 kg.
Dredged area : 0.6 × 0.2 m.
Material used : Steel.
Delivered without net equipped with apron guard.

Corer No. 1009

Core : Diameter : 45 mm. ; length : 900 mm.
All corers of standard type or other type are manufactured to requested specifications.

Metering Blocks, Mecabolier Type, No. 1013

Oceanographic Winches, Mecabolier Type

Three types are being developed :
Type 1010 : For 3 mm - cable 1 500 m long.
Type 1010A : For 4.5 mm - cable 5 000 m long.
Type 1010B : For 6 mm - cable 9 000 m long.

Specifications :

Totally enclosed waterproof electric motor and equipment.
Two running speeds : (1) hoisting speed of 2 metres per second ; (2) initial pulling speed just under tensile strength of cable.
Drum-brake. Safety-catch.
Declutchable motor.
Hand-operated emergency control.
Automatic guide for cable winding.
Steel or stainless steel cable.
Delivered with or without cable.

SOLID YIELD SAMPLER, MECABOLIER PATENTED TYPE No. 1014

Designed for collecting a certain amount of water with its contents in suspension. Does not disturb current at time of sampling.

Specifications :

Release by messenger.
Water content : 1 000 cm3.
Weight of instrument : 8 kg.
Maximum diameter of suspension cable : 6 mm.
Materials used : Bronze and stainless steel.

---

8. — J. AURICOSTE *Clock-Maker*
10, *rue de la Boetie, Paris, VIII*

Deck Watch : standard French Navy model ; diameter, 70 mm. ; fitted in padded mahogany or walnut case.

Aviation deck watch : specially mounted for aerial navigation.

Bulkhead clock : hermetically sealed case; horizontal lever escapement; 8-day running time; large centre split-second hand ; diameter 165 mm. ; diameter of case, 180 mm. ; enamel varnished brass case ; varnished optic rim.

Steering indicator watch : without split-second hand; diameter 100 mm. ; double Alpax protective case.

Radio cabin watch : luminous; centre split-second hand; additional hour hand in red for G.M.T. ; three Standard zones marked ; radio security watch ; radiophonic security watch ; automatic alarm signal ; luminous dial and hands ; flanged bulkhead case, 125 mm. or 180 mm. diameter.

Astronomic Observatory clock : with concentric seconds' hand; diameter of case, 165 mm.; Graham escapement; mercury compensation pendulum or Invar rod beating the seconds ; mahogany cabinet ; height 1.40 m. ; width, 0.40 m.

Electric Laboratory Clock : Féry System ; diameter of case, 160 mm. ; compensation balance-wheel; battery for four years' running; mahogany or walnut cabinet; height, 0.45 m.; width, 0.23 m.

Double-hand stop watch : 1/10- or 1/5-second; cases suitable for different purposes.

Continuous double-hand timekeeper.
1/5-*second Chronographs.*
1/10-*second Double-hand chronograph.*
Double-hand minute timekeeper : 1/100-second.
1/5-*second Stop Watch* with ink recording device.

Precision timekeeper : for industry and science; anchor lever escapement; Nivaros flat balance-spring with optional stop and return to zero ; composite all-purpose 1/60- and 1/100-minute dial; tachometer dial for speed determination; pulsometer dial for registering pulsations.

Special fast-working or totalizing timekeepers : long running ; 1/20-, 1/30- or 1/100-second ; hand performing 15-second, 10-second and 3-second revolutions respectively.

---

9. — ULYSSE NARDIN S.A.,
Le Locle, Switzerland

Large-size Marine Chronometer (2-day running) :

This Company displayed a large-size marine chronometer : Admiralty type ; dial and action, 100 mm. diameter ; seconds' dial, 39 mm. ; running period, 2 days; winding spring indicator, 0 to 56 hours ; fusee action; Guillaume balance-wheel; sidereal or Standard time; half-second spring escapement; dial suspension in padded chest, 19 × 19 × 19 cm.

This chronometer can be fitted with an electric seconds'-recording mechanism with or without suppression of the 60th tick for marking each minute ; current up to 50 milliamperes ; tension up to 12 V.

Large-size marine chronometer (8-day running) :

This model requires winding once a week ; precision is constant throughout the seven days ; the eighth day is kept in reserve.

Small-size marine chronometer :

Dial, 72 mm. diameter; seconds' dial, 29 mm.; running period, 2 days; winding spring indicator, 0 to 56 hours ; fusee-regulated mechanism and Guillaume balance-wheel; Standard or sideral time; 1/2- or 4/10-second spring escapement or 1/5-second anchor lever escapement ; dimensions of chest, 15 × 15 × 15 cm. ; can can be fitted with electric recorder.

Deck Watch :

Diameter of action, 50 or 54 mm. ; stainless steel case with small, split-second hand, 19 mm. diameter, or large centre seconds' hand with winding spring indicator, 0 to 36 hours; antimagnetic protection; nickel-steel or brass-steel Guillaume balance-wheel ; 1/5-second anchor lever escapement or half-second or 4/10-second spring escapement ; padded case for transport, 11 × 14 cm. ; can be fitted with seconds' electric recorder.

High-precision chronograph :

Diameter 54 mm. with or without forward re-setting mechanism; 30- or 60-minute meter; 1/5- or 1/10 second lever escapement; anti-magnetic nickel-steel or brass-steel Guillaume balance-wheel; fitted with 1/5- or 1/10-second electric recorder; in the case of the latter, with or without the suppression of the 10th contact for showing the seconds; carries in addition an electro-magnetic release for long-distance control of chronometer push-button and forward re-setting mechanism.

Magnetic Favag. chronograph recorder :

This instrument records and measures very short time-periods with a precision greater than 1/100-second ; the time recorder works dry on a strip of paper covered with a very thin layer of wax ; the action ensures that the paper unwinds at a constant speed ; the styluses are actuated by electromagnets ; number of styluses, 2, 4 or 6 ; speed at which strip unwinds, 2 or 4 cm. per second ; running period, 6 or 12 minutes.

---

10. — S. MARTI *Clock-Maker*

22, *rue Général-Leclerc, Montbéliard, Doubs*

MARINE CLOCK

Details of construction :

— Eight-day running; mounting, 90 mm. square.
Actual running time, 13 days.
All pinions tempered and polished ; all wheels true.
Coated white and varnished.

— Circular anchor lever escapement ; high precision Swiss manufacture.
Invar screw balance-wheel ; Bréguet Elinvar spring ; 6 rubies in shaft.
Two sapphire counter-pivots ; sapphire levels and ellipses.

— The case is very strong and made entirely of brass.
Water- and dust-tight fastenning; length 200 mm.; height, 100 mm.; weight 3 kg. 700.
Enamel dial ; polished brass hands (except for the seconds' hand, which is black).
Bevelled glass ; case coated white and varnished.

— A rate of less than 10 seconds a week can easily be attained if a final regulation is made by the user.

---

11. — RENO-LEPAUTE VIBROGRAF

79, *avenue des Champs-Elysées, Paris,* 8e

and RENO S.A.

165, *rue Numa-Droz, La Chaux-de-Fonds*

The Vibrograf is an electronic apparatus designed for the observation and regulation of clockwork movements.

Recent progress in the manufacture of microphones, electronic amplifiers and time standards based on the steadiness of quartz or tuning-fork vibrations have allowed the firm of Lepaute to improve stroboscopic comparators, oscillometers and the Lepaute Vibrograf.

Description of the Apparatus

The escapement beat of the watch or clock under observation is transmitted by a piezo-electric microphone to an electronic amplifier which transforms these impulses into currents under high tension applied between a fixed electrode and a disc with points mounted on the axis of a synchronous motor fed by a tuning-fork or quartz generator.

A strip of paper, the unwinding of which is effected by a constant-speed motor, passes between the fixed electrode and the disc.

On each escapement impulse (tic-tac), a spark flashes and burns a dot on the paper. These dots in sequence trace a very clear diagram.

If the clockwork movement is strictly regulated in accordance with the control generator, the points on the disc will always be in the same position in relation to the axis of the unwinding paper, at the moment of impulse, and consequently of the spark, and the dots will fall parallel to the edge of the strip of paper. On the other hand, any deviations in the rate of the instrument will be shown by an inclination of the diagram in one direction or another according to whether this deviation is positive or negative. A rotating disc with parallel zero lines, of which the median ending in an arrow travels on a divided dial, allows for the diurnal rate to be estimated instantly. Finally, all irregularities in the working of the escapement are shown by a distortion in the recorded line which, instead of being straight, produces successive curves which show these irregularities very distinctly and allow for the cause to be detected.

Figure 1 shows the outline of the apparatus and the arrangement of its principle parts.

The microphone watch-stand can be replaced by a mobile microphone placed at the end of a flexible wire and adaptable to any clock.

A jack allows for the connection of a telephone earpiece for the acoustical sounding of the movement.

This apparatus can be used for detecting mechanical faults in clockwork movements, for studying their performance under different working conditions (such as, for example, under different temperatures), and finally, for regulating quickly their rate.

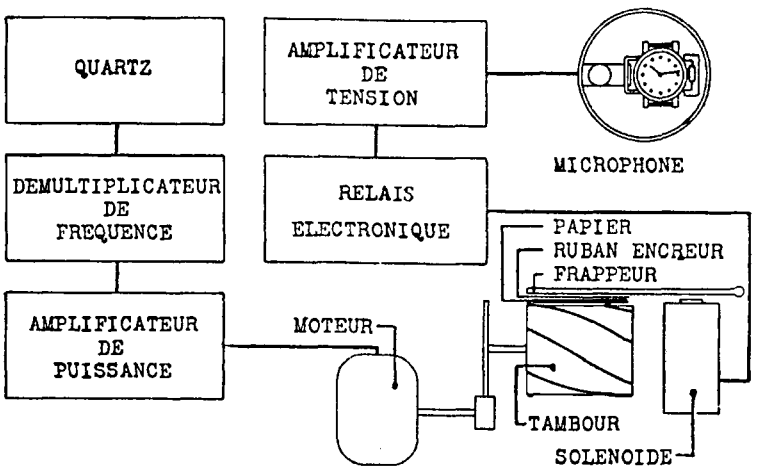

Figure 1 : Outline of the Lepaute Vibrograf.

Model VS 32 Vibrograf

This Vibrograf is equipped with new improvements. It supplies, on a strip of continuous paper, an instantaneous printed record allowing for an immediate reading.

Thanks to a patented printing system, the recording is accurate and clear.

The plexiglass plate which covers the paper on the reading device is concave

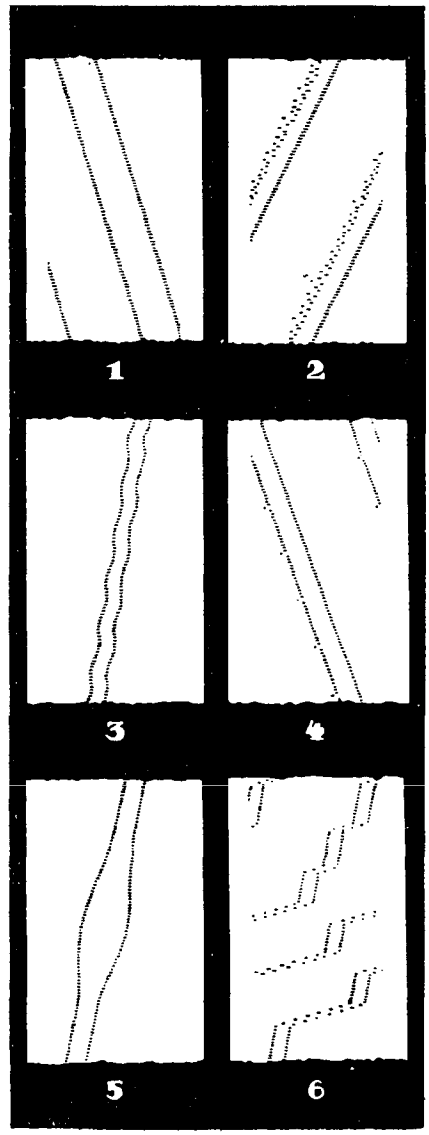

Fig. 2. — Diagrams as printed by Vibrograph :

1. Losing.
2. Gaining.
3. Defective escapement.
4. Teeth of escape wheel slightly damaged.
5. The balance varies in amplitude.
6. The balance is knocking.

and the visibility, which is always clear, is therefore still further improved. It allows, in addition, for the paper to be torn off easily.

A special microphone can be connected to the Vibrograf to allow for quick verifications of watches or large clockwork movements, such as pendulums, time-keepers, marine chronometers, etc., which cannot be observed on ordinary microphones.

The Vibrograf is equipped with an earpiece which amplifies the sounds of the clockwork movement under observation.

Weight : 11.5 kg.

Dimensions : 39 × 27 × 15 cm.

This apparatus supplies two types of information, the first concerning the regulation of, the second allowing for the detection of faults in, clockwork movements.

Regarding the regulation of the movement, details are supplied concerning the following : the daily rate, isochronal discrepancies, and faults in the gearing which affect them.

The manufacturer supplies on request detailed information regarding the use of the Vibrograf.

(To be continued).