

## PRECISE ECHO SOUNDER FOR SHALLOW WATER

Hydrographic Office, Tokyo

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The following description of the above-named instrument was given to the International Hydrographic Bureau by the Japanese Delegation to the VIth International Hydrographic Conference held in Monaco in April-May 1952.

This instrument was invented by the Japanese Hydrographic Office in cooperation with Professor Juniti Saneyosi of Tokyo Technical University, Professor Yosimitu Kikuti of Tohoku University, the Nippon Electric Company, and the Japan Radio Company.

In the summer of 1951 remarkable effects were obtained using this machine in harbour surveying at Mike, Taketoyo, Sakai and Aomori.

This apparatus is highly recommended whenever extreme accuracy is demanded for very shallow water soundings, as it is useful in the following connections:

1. For accurate surveys of harbours, rivers, estuaries and channels, for the taking of precise data of the bottom for drawing up navigational and bathymetric charts, for the inspection of dredging work, etc.;

2. For measuring the depths and volume of water in reservoirs and lakes and for detecting the bottom character and topography;

3. For use as a nautical apparatus for shallow water;

4. For use in the detection of the fish schools, for gathering data necessary for the investigation of fishing grounds, and as research apparatus for all kinds of fish ecology.

This depth recorder has been specially designed to satisfy the requirements of the Hydrographer.

The characteristics proper of this instrument are as follows:

1. The heaviest unit of the apparatus is about 50 kg., so that it is portable and can be installed in any motor boat of small tonnage.

2. The accuracy of sounding is very precise and the error at depths of about 20 m. is less than  $\pm 10$  cm., because it has sharp directivity, by using supersonic waves.

3. The least measurable depth of fish from the transducer is 30 cm., independent of amplifier gain.

4. By using the ultrasonic wave of about 50 - 70 kc. produced by means of the magnetostriction of nickel sheets, the character of resolving figures is very superior; because the transmitting pulse and receiving pulse are very short, hence the detection error is small.

5. Owing to the use of recording paper of the dry type painted with a thin layer of the white powder,  $TiO_2$ , upon carbon paper, the width of the paper remains constant for a long time.

6. As the synchronous motor of the recording unit is connected with the oscillator, which is driven by tuning fork, made of « Elinvar », the speed of the rotating stylus can be kept nearly constant, irrespective of all normal supply voltage fluctuations.

Any outsider can easily operate this machine by merely flicking the switch, after suitably distributing each unit and connecting the flexible rubber cables to the numbered socket corresponding respectively to each numbered plug.

### SPECIFICATIONS

Range .....	0 — 20 meters (shallow). 0 — 60 meters (deep). 15 — 35 meters (shallow). 45 — 105 meters (deep).
Soundings per minute .....	High speed 375. Low speed 125.
Paper feed rate .....	Double stage of 2 cm. or 6 cm.
Time mark .....	About 20 m.
Length of paper roll .....	Every 1/3 minute.
Frequency .....	50 - 70 kc.
Voltage .....	D.C. 24 V.
Power consumption .....	Approximately 350 watts.
Total weight .....	100 kg.

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# SCHEMATIC DIAGRAM

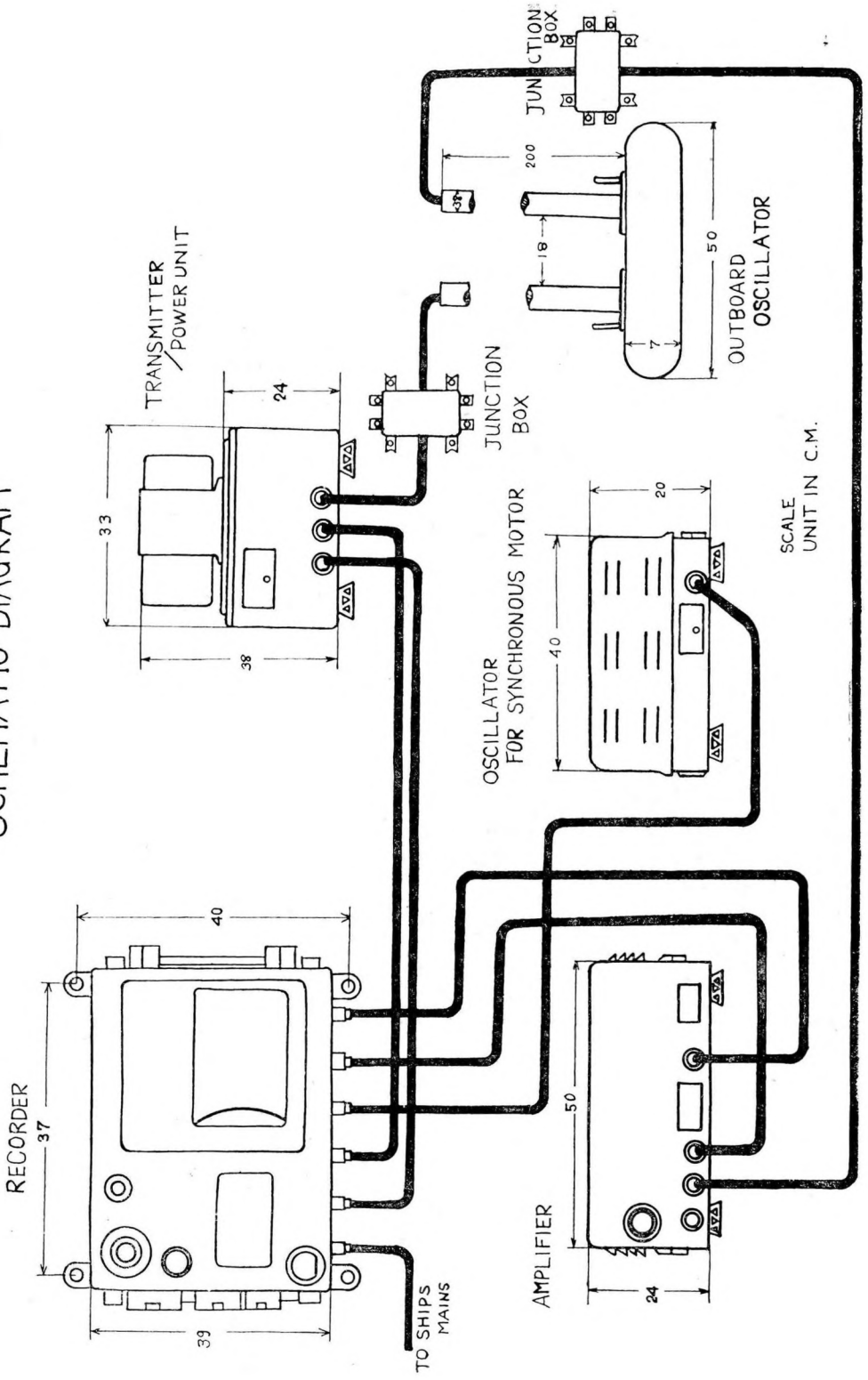


Fig. 1. — Schematic diagram.

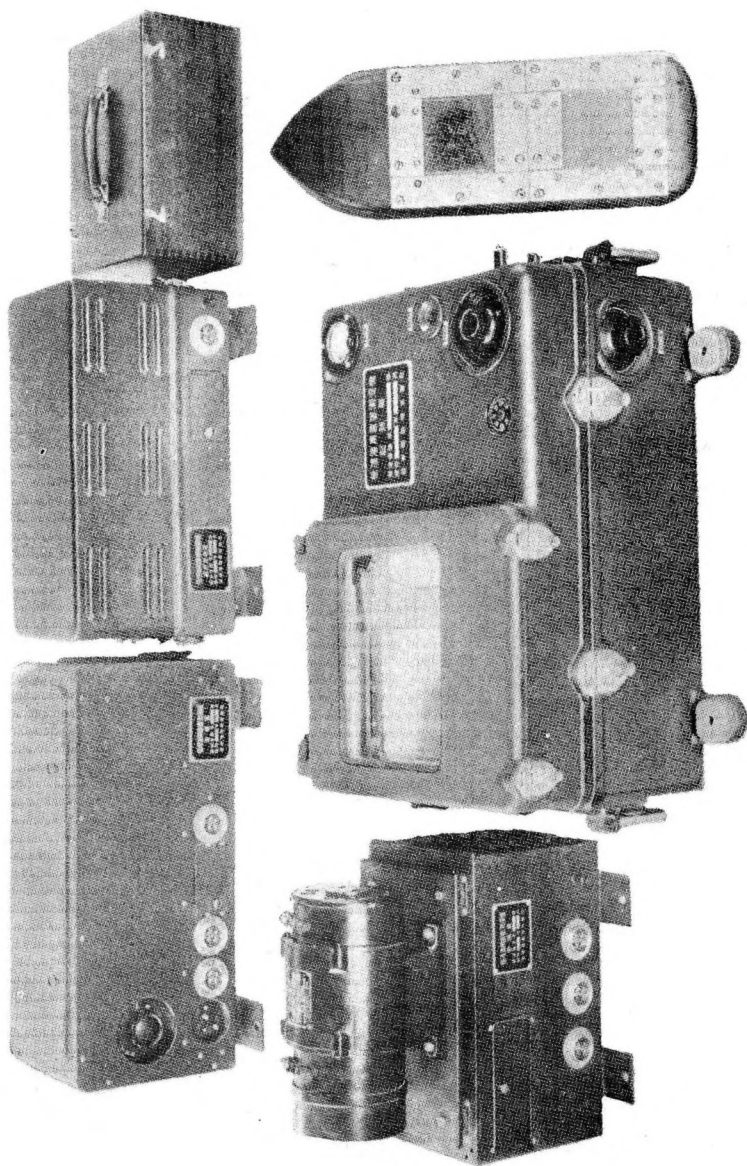


Fig. 2. --- Outside views of each unit.

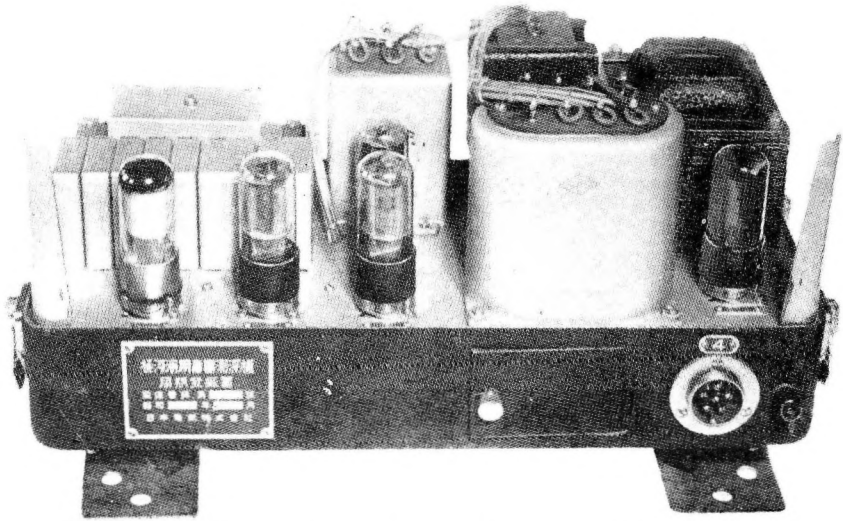


Fig. 5. — Oscillator for synchronous motor.

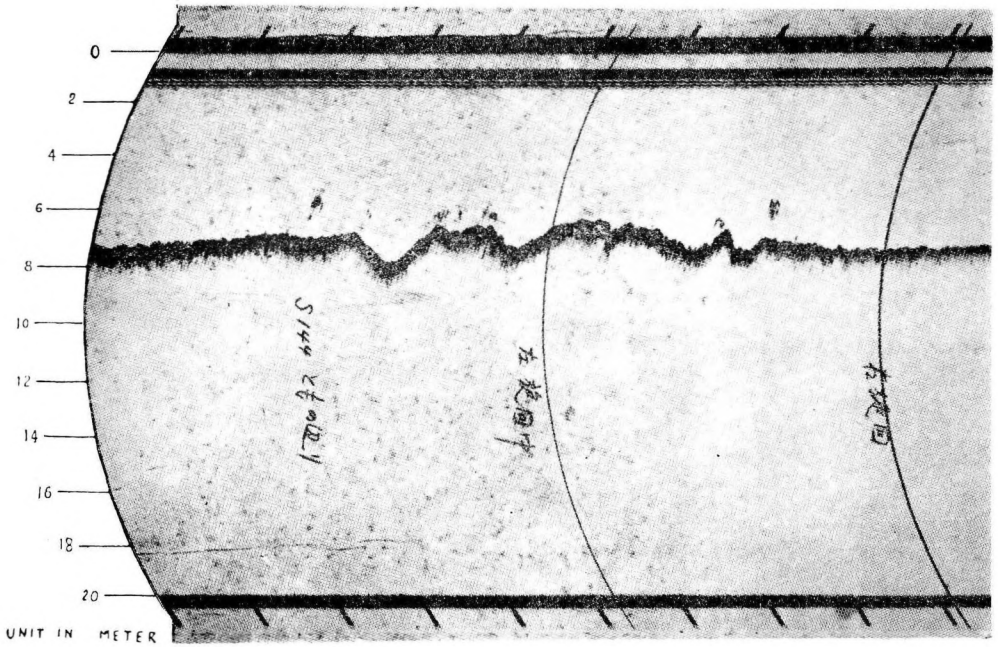
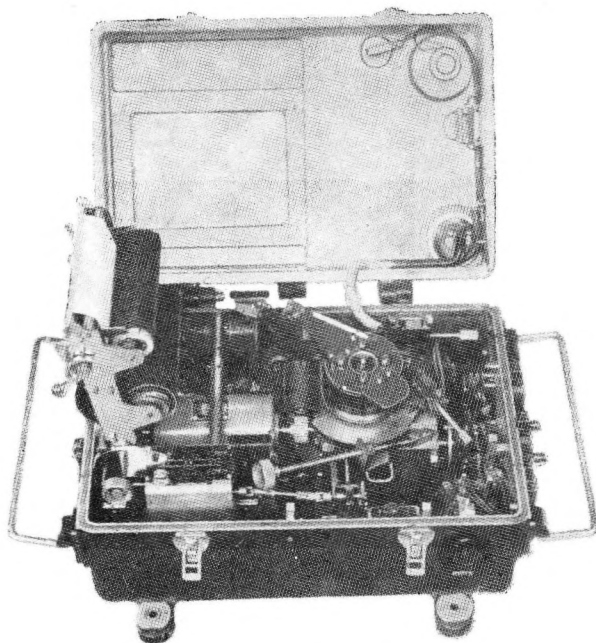
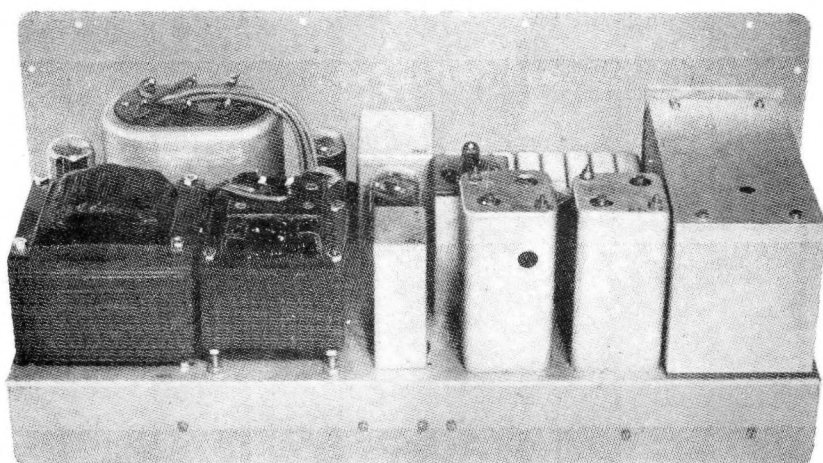


Fig. 6. — A typical record.



*Fig. 3.* — Recorder.



*Fig. 4.* — Amplifier.