AN IMPROVED RADIO CURRENT METER

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Radio current meters of a type bearing the name of the author have been used extensively in the United States in recent years.

The principal characteristic of a radio current meter is that it can be operated at an unattended station, using a buoy or other method of placement. From such point, the meter, through a radio transmitter, emits signals which can be recorded at a distant point, at any desired time, and interpreted to reveal direction and velocity of current. The advantages include economy, because a small working party can operate numerous meter installations simultaneously, and safety, because it is unecessary to maintain a manned station boat in dangerous waters. The certainty of the work is improved by continuous monitoring of the observations at all stations. The method of central-station recording of all results means that in event of an instrument failure, all records prior to the moment of failure are saved.

These advantages are sufficient to make the method desirable in spite of some well-known past disadvantages, resulting from the delicacy of the earlier type of instrument and the difficulty of maintaining it in correct working order. The delicacy has been a result of the requirement for sensing the orientation of a magnetic compass within the instrument — a difficulty which was originally met by use of a rotating mechanism that made contact with the compas element without great disturbance of its position. An extremely delicate mechanism had to be employed (« International Hydrographic Review », Vol. XXIV p. 210).

The principal feature of the present improvement lies in the employment of a photo-electric sensing mechanism to replace the former electro-mechanical system. A result of the use of a light beam in place of a physical contacting mechanism is that a cheap, light pivot-type compass can be employed instead of the former heavy, delicate, and expensive gimbal-mounted compass, and that its operation, furthermore, occasions no compass disturbance. As designed, the photo-electric system requires no fine adjustment and cannot easily become deranged.

The successful adaptation of photo-electric cells has become possible through the recent development of photo-transistors of germanium, cadmium sulphide, and other materials. These cells now combine small size with great sensitivity and output. They operate at very moderate voltage, so that it is now possible to place such a system within the radio current meter itself. The operating essentials are the transistor, a one-cell miniature lamp of the prefocussed type, 45 volts in miniature dry cells, and a slotted compass, all in the meter. The batteries for the miniature lamp are installed in the buoy, or other mounting structure. The lighting circuit and the output circuit of the photo-transistor, therefore, go through the buoy-meter connecting cable. Both transmit low voltage.

Figure 1 shows a section of the Roberts Radio Current Meter with the sensing mechanism omitted. Figure 2 shows a conventionalized diagrammetric section of the new photo-electric sensing system, and Figure 3 is a simple circuit diagram showing how the transistor output is utilized for control of a relay, which keys the transmitter.

The operating principle of the new mechanism may be stated as follows: The mirror system (Figure 2) is rotated about a vertical central axis by steady rotation of the base gear, driven by the external impeller. Thus the offset light beam passes through a slot in the card, producing a signal by operation of the photo-transistor.

At a fixed time in each cycle, a reference signal is produced by a mechanical contact operated by a lug on the base gear. The timing of these two kinds of signals indicates the relative orientation of the meter and the compass, hence the current direction is deduced. The velocity is, of course, a function of the signal frequency. In order to avoid ambiguity as to the identity of the signals and hence the current direction, it is improved by the design that a fixed and unmistakable difference in signal duration is produced for identification purposes.

ROBERTS RADIO CURRENT METER BODY
(contacting mechanism omitted)

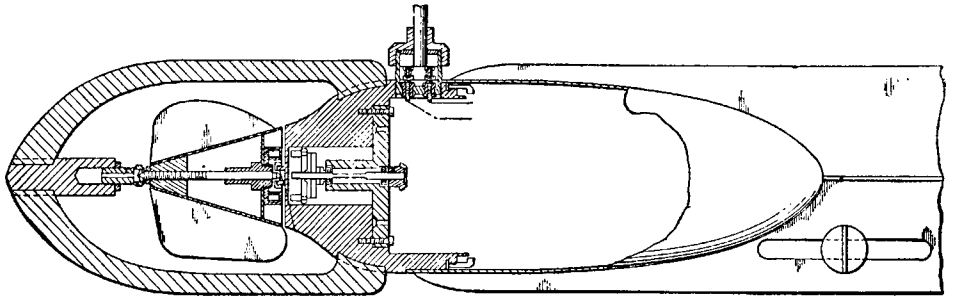

Fig. 1.
Roberts Radio Current Meter body
(contacting mechanism omitted).

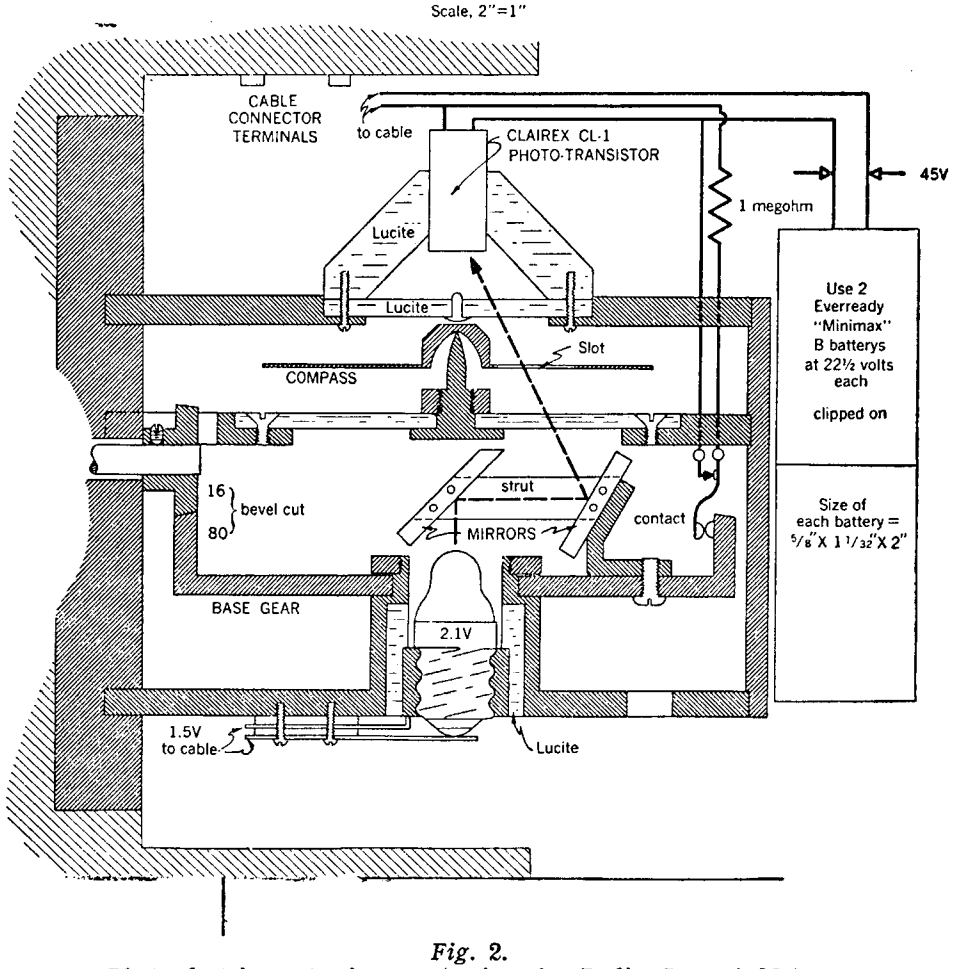

Fig. 2.
Photo-electric contacting mechanism for Radio Current Meter.

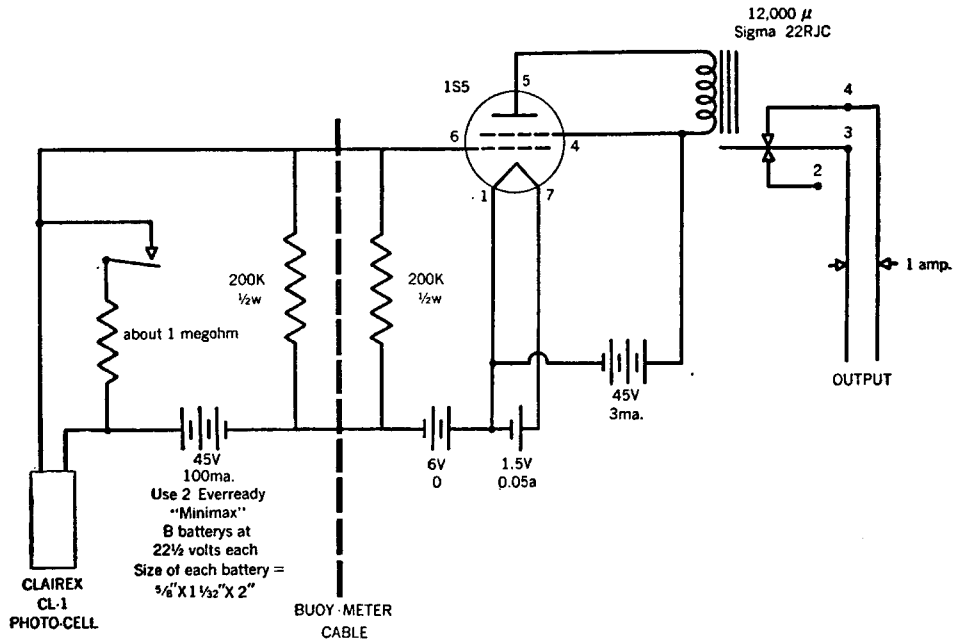

Fig. 3.
Keying circuit for photo-electric contacting mechanism.