# NOTE ON A SUBMARINE TEMPERATURE RECORDER

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With this new apparatus for recording submarine temperatures, two difficulties have had to be met up to the present time: first, suitable insulation of the submerged wire so that the phenomena of electrolysis shall not disturb the results; and, second, the construction of a sufficiently sensitive recording galvanometer which is uninfluenced by the ship's movements.

Once these difficulties were surmounted, it was possible to construct an instrument the sensitiveness of which can be extended to 0°.01 (centigrade) and with such rapidity of action that equilibrium of temperature in the water is attained in a few seconds.

For this purpose, the metal wire by which the observations are recorded is enclosed in a thin copper tube, coiled spirally and attached to the conductor-cable by a system of joints so devised that the pressure of the water due to depth increases the tightness; the ultra-sensitive needle galvanometer is perfectly balanced for all positions. The record is made photographically on a film 2 metres (= 6' - 6") in length which can be wound off as desired at such speeds that it lasts from 4 hours to 8 days.

The whole apparatus (galvanometer, adjustable bridge and photographic recorder) is only 20 $^{c}/_{m}$ × 20 $^{c}/_{m}$ × 15 $^{c}/_{m}$ in size. Records made in the anchorage at Villefranche-sur-Mer showed the smallest variations in the temperature of the various strata. Curious oscillations, like submarine waves, of which the periodicity was on an average from 10 to 15 minutes, can be seen. Among other things, a thin layer corresponding to an isothermic stratum (16°.3 C.), not more than 2 or 3 m. (= 6 to 10 ft.) thick, is evident at a depth of about 85 m.; this would have been almost impossible to record by means of a reversing thermometer.

With this apparatus it is possible, at least in depths of not more than some hundreds of metres, to obtain thermic sections of seas or lakes rapidly; it can be used also for continuous recording of slight local variations of temperature which are of importance in investigating the internal movements of the waters of the sea, which is so useful to marine biology.