

many important problems we have not yet sufficiently numerous observations. In a rapid sketch like this, only some of the principal facts can be dealt with; we shall first examine the methods employed in physical oceanography, and then endeavour to draw some conclusions from the observations available.

In the first place, one must have a line with which to send down the instruments and draw them up again. Formerly hemp lines were used, but they have now been superseded by wire; steel piano-wire is used for sounding, and wire rope for thermometers, water-bottles, etc. For general use the wire

Lines for sending down instruments.

need not be more than 2 to 3 mm. in diameter, and it will, nevertheless, bear the weight of several hundred kilograms without breaking. The old hemp line was marked at regular intervals for the determination of the depth, but this cannot well be done with the wire, which is run out over the metre- or fathom-wheel (see Fig. 151), and this is both a convenient and accurate method. The wheel communicates with a clock-work arrangement with dials and hands, by means of which the length of wire run out can always be read off correct to within a metre. When, however, an observation is to be taken at a depth of 1000 metres, it is not enough to run out 1000 metres of line. The line must be

Metre-wheel.

“up and down,” and this is not always

easily managed, especially in a wind or strong current, when the ship is drifting. Some manœuvring is then required, and the apparatus must either in itself be sufficiently heavy to straighten the line, or an extra weight must be added. Many of the instruments are so constructed that they may be attached to the side of the line as well as at the end, and thus several instruments may be used simultaneously. They are fastened at certain intervals on the line as it is being paid out, and a number of observations are made at the same time at different depths. By this method a comprehensive series of observations from the surface down to two or three thousand metres may be taken in a couple of hours. This method was employed during the “Challenger” Expedition.

Several instruments used simultaneously.

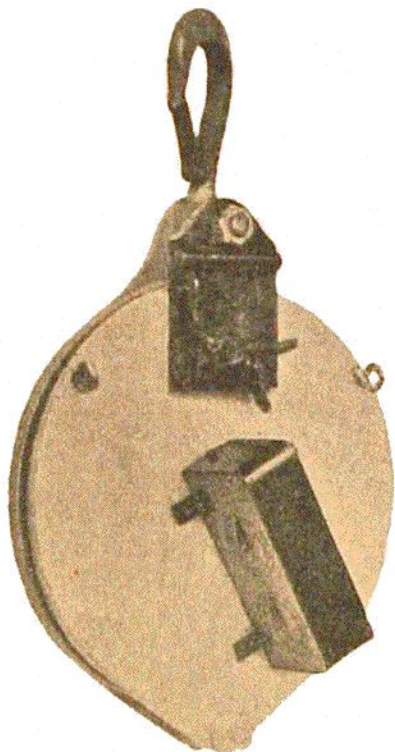


FIG. 151.—METRE-WHEEL.