The stem of the instrument was divided into millimetres, and carefully calibrated, the weight of the water filling the instrument, and also the coefficient of expansion of the glass, being at the same time determined.

If the position of the water-mercury meniscus in the stem be noted under observed conditions of temperature and pressure, and the instrument be then observed under different conditions of temperature and pressure, the apparent volume occupied by the water, and therefore the position of the meniscus, will depend on the difference of the combined effects of temperature and pressure on the water and on the glass. This resultant effect is measured by the position of a magnetic index similar to, and in fact exactly the same as, that used in Six's thermometer. The deep-sea thermometer used was after Six's pattern, with a protected bulb. When the instrument is subjected to increased pressure or diminished temperature, or both together, the index is pushed up by the mercury, which enters owing to the decrease of temperature and the increase of pressure, and its position thus gives the sum of the effects of change of pressure and of temperature on the apparent volume of the water.

If now, along with this instrument a sufficiently protected thermometer has been attached to the line, and its readings be taken at the same time, we have a measure of the temperature to which the instrument has been subjected. Knowing the dimensions of the instrument in every particular, and its behaviour under varying conditions of temperature, we can subtract from the whole reading of the instrument that which is due to temperature, and the remainder is that due to pressure. If the coefficient of apparent compressibility of the liquid be known, the depth is given at once.

Attention was principally directed to determining the apparent compressibility of distilled water and some other liquids by means of the sounding line, that is to say, using the sounding line as the gauge of pressure, and taking particular care to observe that these experiments were made when the sounding was not vitiated by perturbing causes. When currents are present, they are always very evident from the behaviour of the sounding line. If the sounding line remain vertical during the whole of the sounding, then it is perfectly certain that there is no disturbance from currents either at the the surface or below. If there be a current of any appreciable force, the sounding line begins to wander about, and has to be followed by the ship. This is an operation of considerable delicacy, even in good weather, and in bad weather, when the winds and currents cross and complicate each other, it is one which calls for the highest skill on the part of the officer in charge. There was, however, no difficulty in determining whether a sounding had been good, and only such soundings, free from vitiation by any of the above-mentioned perturbing causes, were used for this purpose.

In fig. 35 the stem of the water piezometer is represented as being swelled into a small bulb at F. The purpose of this bulb is to enable the instrument to be used at depths so great that with a uniform stem the contraction produced would be equal to the whole