

Sprengel pump, which acted quite satisfactorily, even when the ship was rolling steadily through 20° to 30° .

The apparent compressibility of the mixture of mercury and water in glass represented by this instrument was determined in a number of satisfactory soundings between Tahiti and Valparaiso, the temperature being determined by one or more protected thermometers attached to the line close to the piezometer. Of course no "pressure correction" was applied to the readings of these thermometers. The result was, that the apparent compressibility of mercury for 100 fathoms was 0.0000271, being per atmosphere 0.0000015. After the return of the Expedition, the absolute compressibility of glass was directly measured by Mr. Buchanan¹ in a specially designed apparatus, and found to be 0.00000292 per atmosphere up to 240 atmospheres, at a temperature of 12° to 13° C. The absolute compressibility of mercury would therefore be 0.00000442 per atmosphere.

The water piezometer has already been referred to. It is shown in fig. 35. It consists essentially of a thermometer-shaped instrument open at the end. A cylindrical bulb A contained, in the one that was chiefly used, about 9 c.c. The stem, which was rather more than a foot long, had a diameter of almost exactly one millimetre. The end of the stem dips into the bulb D, which was filled so far with mercury, and the instrument was set by heating it to such a temperature, that when it cooled down to the atmospheric temperature the mercury would rise to a convenient height so as to be visible and able to be read at any moment at a given temperature by plunging it into water. The arrangement for protecting the open end of the instrument is somewhat peculiar. It is necessary to allow the water on the outside to have access to the mercury in the bulb in order that the pressure may exert itself in the interior of the instrument, in the same way as air must have access to the mercury in the reservoir of the barometer. At the same time it is of importance that the mercury should not be able to come out of the bulb. For this purpose care was taken to have a bulb D blown, into the neck of which the stem of the instrument fitted with some accuracy. This was connected with the stem by means of a piece of india-rubber, which was prevented from fastening hermetically on the stem by having a small piece of glass rod H pushed in between the india-rubber and the stem. In this way communication was constantly kept open between the outer water and the mercury in the bulb.

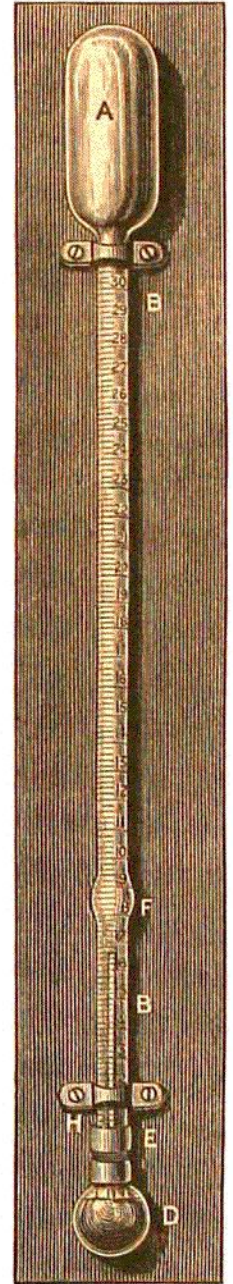


FIG. 35.—Water Piezometer.

¹ *Trans. Roy. Soc. Edin.*, vol. xxix. p. 589, 1880.