volume of the stem. The capacity of F is equal to the contractions due to the fall of temperature and the increase of pressure produced by the first 1000 or 1500 fathoms of depth, so that the instrument would only register depths greater than 1000 or 1500 fathoms, but it would do so with almost as much precision as can be obtained at less depths.

The observations which have been taken as a basis for determinations of depth were made in the latter part of the year 1875, in the South Pacific Ocean. They were twenty in number, and were made at depths varying from 500 to 2300 fathoms, and at temperatures varying from 1°·4 to 4°·03 C. The mean compressibility of water determined from these observations was 0·0008986 per 100 fathoms of sea water, the extreme values being 0·000915 and 0·000882. Observations made at greater depths in the North Pacific, gave as a mean of six observations at depths varying from 2740 to 3125 fathoms the value 0·000878, indicating a slight diminution in the coefficient of compression at very high pressures.

The change of volume of water with change of temperature at the low temperatures found in the deep sea is very slight. The change of volume of mercury, however, for all ordinary temperatures is very considerable. On the other hand, the compressibility of water, or its sensibility to change of volume with change of pressure is very great, whereas that of mercury is very small. Consequently, by sending a pair of these instruments down on the sounding line, and reading them when they come up, two independent values of the sum of the effects of change of temperature and of pressure are obtained. Taking as the first approximation to the depth the length of the sounding line, applying it to the reading of the mercury instrument, and so correcting it for pressure, we have a first approximation to the temperature; applying this temperature to the reading of the water piezometer, we obtain a second approximation to the depth, indeed, practically the true depth. The reading of the mercury piezometer now being corrected for pressure by this value of the true depth, we have a second approximation to the temperature. In fact we have now practically the true depth and the true temperature.

Fig. 36*a* refers to the water piezometer, and fig. 36*b* to the mercury piezometer; the thick lines represent the apparent changes of volume for changes of pressure, and the dotted lines the apparent changes of volume for changes of temperature. Distances measured along the horizontal line of abscissæ represent depths on the scale of 0·01 inch to a fathom, and temperatures on the scale of 0·1 inch to a degree centigrade. Distances measured along the line of ordinates represent scale divisions (millimetres) on the scale of 0·1 inch to a division. For 100 fathoms of depth the apparent contraction of the mercury instrument was 0·7 millimetre on the stem; in the water instrument the apparent contraction for 100 fathoms was somewhat over 7·8 millimetres. Considering that the effect of a change of temperature of 1° C. causes an apparent change of volume in the mercury piezometer represented by about 2·5 millimetres, while in the water piezometer at the low temperature always found in the deep sea the temperature may be anything