

between  $0^{\circ}$  and  $10^{\circ}$  C. without altering the apparent volume of the water by more than 2 millimetres on the stem, we see that an error in determination of the depth of 100 fathoms would only make a difference in the reading of the mercury instrument of about 0.6 millimetre, equivalent to a difference of temperature of about  $0^{\circ}.25$  C. Therefore, applying the possibly erroneous depth given by the sounding line to "clear" the reading of the mercury piezometer for effect of pressure, we obtain a first approximation to the temperature which would almost always be within half a degree of the truth, but which might occasionally differ more than a degree from it. Using the temperature thus found to clear the reading of the water piezometer for the effect of temperature, we obtain a second approximation to the depth which cannot differ appreciably from the true depth. Applying the depth so found to clear the reading of the mercury instrument for effect of pressure, we

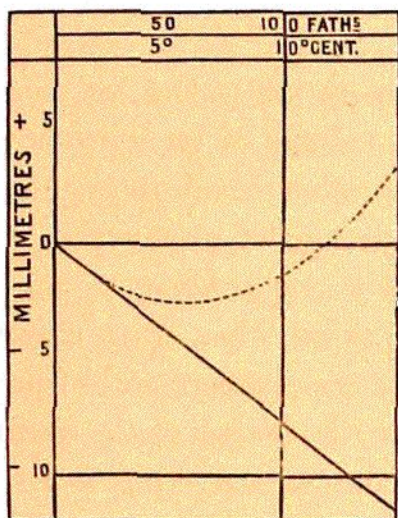


FIG. 36a.—Diagram for Water Piezometer.

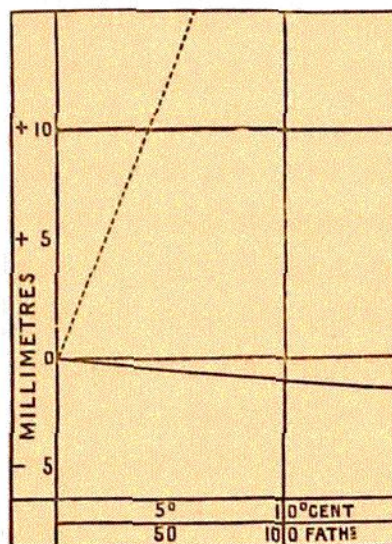


FIG. 36b.—Diagram for Mercury Piezometer.

obtain a second approximation to the temperature which cannot differ appreciably from the truth. This process of gradual approximation may of course be carried as much farther as we please, but the results obtained in the second approximation may under all circumstances be taken as representing the truth.

The use of water for filling piezometers to be used in the determination of great depths is not to be recommended, as its elasticity varies greatly with the temperature, so that a small error in the determination of the temperature has a serious effect on the depth as given by the piezometer.

The piezometer, when filled with sea water, shows directly, when corrected for the contraction of the glass, the density of the water at the depth where it registers. A certain number of observations in this direction was made during the cruise.

*Specific Gravity of Ocean Water.*—It has been shown above that the density of the water, in so far as it depends on temperature and pressure, can be directly observed with the piezometer. When the salinity of the water varies, and it is required to observe its variations, it is necessary, by one method or another, to measure and weigh a mass