

Notwithstanding previous experience, when H.M.S. "Lightning" was employed in sounding and dredging in the Færøe Channel in 1868, she was supplied with unprotected thermometers. On her return a number of interesting experiments were made by Professor W. A. Miller and Mr. Casella, to find the "pressure correction" for the instruments used.¹ The corrections so found, though good for the thermometers actually experimented on, are of no use for correcting other instruments, even though they may be of the same pattern. This is due to the fact that the bulbs of even the most carefully made thermometers are never uniform in thickness of glass, and consequently yield differently to pressure. It has been mentioned above that the stem of the thermometer suffers compression though the effect so produced on the reading of the thermometer is insignificant. If the stem be uniform, the effect will be proportional to the length utilised. In the case of the thermometers supplied to the Challenger, the bore of the stem was not uniform. Close to the bulb there was a swelling, and at the bend there were other swellings. As it was the minimum limb that was almost exclusively used, the effect of pressure on the reading was limited to that produced on about 2 inches of tube with a slight swelling near the neck of the bulb. Along with each instrument was supplied, as "pressure correction," the amount to be deducted from the reading according to the depth to which the instrument had been sent. During the first part of the cruise this correction was applied without question, and the results embodied in reports with sections sent home to the Admiralty. As, however, observations multiplied, and side by side with the thermometric observations experiments were made on the effects of pressure on various substances contained in *piezometers*, the readings of which required to be "cleared for temperature" the question of the validity of the "pressure correction" came to be seriously considered, and the conclusion was come to that it had been improperly applied. It was obvious that the correction referred to could have been obtained only in one way, namely, by submitting the thermometer to pressure in a hydraulic machine, and noting the rise of the maximum index. This rise would be caused by the compression of the stem forcing the liquid up the tube, and by the actual rise of temperature produced by the compression of the water of the hydraulic receivers. It was at once evident that the part due to actual rise of temperature caused by compression must be rejected altogether, because in use the thermometer takes the temperature of the water in which it is immersed. Of the residual amount due to actual compression of the stem, only so much ought to be taken as is applicable to the portion of stem between the bulb and the mercury on the minimum leg. This would as a rule be about one-sixth of the length of stem from the bulb to the mercury meniscus in the maximum leg, without adding anything for the swellings at the bend. The errors for a pressure of 3 tons per square inch varied from 1° to 1½° F., and even if nothing be rejected for heat effect, the sixth part would be considerably less than the probable error of observation. The temperature

¹ Depths of the Sea, p. 295, 1873.