immersed in a liquid and was found to float freely in it, the surface of the liquid reaching to any division on the stem, the volume of the instrument thus immersed could be readily ascertained by reference to the calibration tables of the instrument, regard being had to the temperature of the liquid. But the volume of the immersed portion of the hydrometer is equal to that of the displaced portion of the liquid, and the weight of this displaced volume of liquid is equal to that of the hydrometer which displaces it. By dividing this weight by the volume of displaced liquid, the density of the liquid is obtained. The unit of weight (the gramme) being the weight of the unit volume (cubic centimetre) of distilled water at the temperature of its maximum density at atmospheric pressure (4° C.), the *density* so found is identical with the *specific gravity*, referred to that of distilled water at 4° C. as unity.

In using a hydrometer so delicate as that described, it is necessary that the liquid experimented on should have as nearly as possible the temperature of the atmosphere, otherwise convection currents are set up which interfere with the accuracy of the observations. In practice, therefore, all the observations were made at the temperature of the laboratory, which was that of the atmosphere, and usually very approximately that of the surface water. Waters brought from the bottom or from intermediate depths were always stored in stoppered bottles until they had taken the temperature of the air. Two advantages were gained by this—first, the observations themselves were trustworthy, disturbing causes being eliminated; and second, the variations in the density of waters from different depths at the same Station could be depended on when all the determinations were made under exactly the same conditions. This was of the more importance as the variations in question were comparatively small. The results thus obtained give the density of the water at the temperature at which it was observed, which necessarily varied with the locality. In order that the density may furnish an indication of the salinity of the water, it is advisable to reduce it to its value at one standard temperature. The only tables which were available for this purpose at the time of the voyage were those of Professor Hubbard, published in Maury's Sailing Directions.[1] As they were drawn up with a view to reducing the results to their value at 60° F. (15°·56 C.), this temperature was chosen as the constant temperature to which all the densities should be reduced, in order that they might be comparable as indices of salinity. Later experiments have shown that Hubbard's table is not quite accurate when applied in the reduction of observations made at high temperatures (25° to 30° C.), and the reduced values have been corrected accordingly. Besides reducing the observed densities to their value at 15°·56 C., they have been reduced to their value at the temperature which the water had when in its place in the ocean. In the case of waters from the bottom or intermediate depths, a further reduction for pressure due to depth would give the actual density of the deeper waters as it is in the ocean. In the tables published in Mr. Buchanan's Report[2]

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[1] Maury's Sailing Directions, vol. i. p. 237, 1858.

[2] Phys. Chem. Chall. Exp., part ii., 1884.