

substance, whether solid or liquid. The best way to secure this is, first to distil it, and it may then, if the subsequent processes be carefully attended to, be expected to give the same results, in how many instruments soever it may be employed.

To obtain a means of observing the contraction or expansion which the liquid may suffer is the next object. For this purpose the student may provide himself with a capillary tube that has a spherical bulb at one end, the bulb having a considerable proportion to the bulk of the whole tube. In selecting the tube, great care must be taken that its bore be uniform; for as the instrument is to be graduated, so it is necessary that any quantity of the liquid may stand at the same height in all places. To fill the tube requires a particular process; for, as the bore is capillary, the mercury cannot be poured into it. But if the bulb be held over a spirit-lamp, and the temperature of the contained air be raised, its expansion, and the consequent escape of a portion, will produce an exceedingly rarefied atmosphere. If the open end of the tube be then plunged into mercury, and the bulb be cooled, the enclosed air will lose a part of its elastic force, and the mercury will be driven into the tube by the pressure of the atmosphere. A small portion of the tube will be still occupied by air, and to expel it the instrument must be again submitted to a high temperature; and when the mercurial vapour occupies the space to the exclusion of the air, the open end of the tube must be hermetically sealed. The mercurial vapour condenses as it cools, and a tolerably perfect vacuum is formed.

The mercurial column being obtained, a scale must be attached to it. First plunge the bulb into a vessel containing melting snow or ice, and the mercury will contract, falling to a level at which it will remain until the liquefaction is complete; and as the result is the same in all places, the point of elevation may be marked on the tube, and is called the freezing point.

Then plunge the instrument in boiling water, and the mercury will expand until it reaches a certain height, and there it will remain stationary, however intense may be the fire applied to the water; and hence we discover that there is a temperature above which it cannot be raised, and the level of the mercury may be marked as the boiling point.