

SECTION II.

ON SPIRIT THERMOMETERS AND SELF-REGISTERING THERMOM

Spirit Thermometers.

(73) Mercury becomes solid at $-37^{\circ}.9$: when, therefore, a thermometer is required for lower temperatures, it is necessary to employ alcohol for its construction, as alcohol has not been known to become solid at any temperature, however low.

Alcohol is not so well suited as mercury for the construction of thermometers, chiefly for the following reasons: First, its *inferior sensibility*, occasioned by its large specific heat and low conductivity; secondly, on account of the *inequality* in its expansion; and thirdly, from its *volatility*.

(74) **Inferior Sensibility.**—The *sensibility* of a spirit thermometer, *i.e.*, the readiness with which it takes up the temperature of the surrounding medium, is impaired by the *large specific heat* of alcohol, and its *low conductivity*.

The former of these causes would not be so detrimental to sensibility (see Art. 72), if it were possible to give to the spirit the same volume as that of a mercurial thermometer, as, in consequence of the lightness of spirit as compared with mercury, the quantity of heat required to effect the same change of temperature would be nearly the same in each case. It is not, however, possible so to reduce the volume of the spirit thermometer, as the weight of the spirit if the tube were vertical, or its cohesion if the tube were horizontal, would be insufficient to overcome the adhesion of the spirit to the glass, and the continuity of the column would be frequently broken.

Moreover, a spirit thermometer is slow in taking up the temperature of the surrounding medium (air or water, &c.), on account of the very *inferior conductivity* of spirit as compared with mercury; in fact, the conduction of heat in alcohol, as in other liquids (except mercury), is so slow that it is likely that the distribution of heat through the spirit is effected more by convection (Art. 70) than by conduction, and by the radiation inwards from the interior of the glass.

(75) **Unequal Expansion of Alcohol.**—The inequality at different parts of the scale in the expansion and contraction of spirit which accompany changes of temperature, increases the difficulty of adapting