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THERMOMETER GLASS.

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ABSTRACT.

THE lecture began with a resumé of the fundamental principles of thermometry, particularly dealing with those types of thermometers in which the dilatation of a fluid is employed as the measuring principle.

The construction and use of the standard gas thermometers at the International Bureau of Weights and Measures, at Sèvres, and at the National Physical Laboratory were illustrated by numerous slides.

The fundamental scale of temperature, that of the hydrogen thermometer, was defined, and its limitations, both for high and for very low temperatures, discussed. At high temperatures it is impossible to find a substance for the reservoir which is at the same time not attacked by hydrogen and does not permit diffusion through its walls. Hence, other gases such as nitrogen are used in the place of hydrogen at high temperatures. In all but the most accurate work the nitrogen-scale may be considered identical with that of hydrogen. The gas-thermometer is, however, complicated, difficult to use and is quite unsuitable as a general working standard. Therefore it is of fundamental importance to have some more generally available instrument.

The construction and methods of standardisation of standard mercurial thermometers were then dealt with, and an account given of the methods adopted to ascertain the relation of the "scale" of these to that of the hydrogen thermometer. Slides were shown illustrating

the methods of comparison in a water bath of such standard thermometers made of "verre dur" with the gas-thermometers at Sèvres. The construction and annealing of high-range mercurial thermometers were then explained, and the defects of the ordinary type of instrument pointed out. The recent improvements in the quality of glass suitable for high-range thermometers were described, and the methods of construction and graduation of the very high-range type of thermometer containing, over the mercury, nitrogen, or carbonic acid under pressure, illustrated.

Tables were shown giving for various temperatures the change of zero and departure from hydrogen of the natural scales of thermometers made of "verre dur," Jena glass 16", Jena glass 59", and "Kew standard" glass.

Recent investigation had shown that while the newer glasses possessed substantial advantages at high temperatures over the old Kew glass, particularly as regards zero measurements, the latter was found to depart much less from the hydrogen scale than the rest. Very conveniently a temperature of, say, 62° F., on the *Kew* scale was found to coincide extremely closely with the same temperature as the hydrogen scale, whereas a thermometer made of almost any other glass always read distinctly higher.

For the standardisation and testing of high-range mercurial thermometers, special baths had been designed by the National Physical Laboratory; for work up to 220° C. oil is used, and above that temperature a mixture of fused salts.

As working standards for all work above 100° C. the platinum resistance thermometer is used. Its construction and working were explained and illustrated. The Laboratory was engaged in some work on a series of new thermometer glasses made by Messrs. Powell, some of which had given interesting results.