JOINING SEPARATED MERCURY COLUMNS

The following text outlines procedures for joining separated mercury columns in liquid-in-glass thermometers. The text is adapted from a portion of:

NBS MONOGRAPH 150 Liquid-In-Glass Thermometry
Wise, Jacquelyn A.

Many inquiries are received concerning procedures for joining mercury columns which have separated during shipment. Since no means of avoiding such occurrences has yet been found, some procedures for joining separated mercury columns are described below.

(A) The bulb of the thermometer may be cooled in a solution of common salt, ice, and water (or other cooling agent) to bring the mercury down slowly into the bulb. If the salt solution does not provide sufficient cooling, carbon dioxide snow (dry ice) may be used. Since the temperature of dry ice is approximately -78°C (-108°F), and mercury freezes at approximately -40°C (-40°F), the mercury will solidify. Cool only the bulb and never the stem or mercury column. Moderate tapping of the bulb on a rubber stopper or similar soft spongy object, or the application of centrifugal force, by swinging the thermometer in a short arc (i.e. use of centrifugal force), usually serves to unite the mercury in the bulb. Care must be taken to warm the top of the bulb first, so pressures in the bulb due to expanding mercury may be relieved.

(B) If there is a contraction chamber above the bulb or an expansion chamber at the top of the thermometer, the mercury can sometimes be united by warming the bulb until the column reaches the separated portions in either enlargement. Great care is necessary to avoid filling the expansion chamber completely with mercury, which might produce pressures large enough to burst the bulb. (The expansion chamber should never be more than 2/3 full). Joining the mercury is more readily accomplished if the quantity in either cavity has been shattered into droplets by tapping the thermometer laterally against the hand. This procedure should not be used it if requires the thermometer to be heated above 260°C (500°F) and the bulb should never be heated in an open flame.

(C) As a last resort, especially for thermometers having no expansion chambers, small separated portions of the column can sometimes be dispersed if mercury is warmed into droplets tiny enough to leave space for the gas to by-pass. The thermometer is heated, and the droplets are collected by the rising mercury column.

Organic liquid procedures

The procedure for thermometers containing organic liquids is similar. Separated liquid in the stem can be vaporized and permitted to drain down the capillary. Another method consists of gently tapping the stem above the separation against the palm of the hand, forcing the organic fluid to break away from the wall of the capillary and flow down the bore to join the main column.

Uniting gas bubbles

Minute gas bubbles, which are sometimes found along the surface of the mercury in the thermometer bulb, may be collected by "washing" the bulb with a large gas bubble. Bring all of the mercury into the bulb as outlined in section (A). Hold the thermometer in a horizontal position and gently tap it against the hand to form a large gas bubble. Force the bubble to travel around the walls of the bulb by rotating the thermometer and tapping it against the palm of the hand. When the entire surface has been "washed" rotate the bubble to the top of the bulb and reunite the mercury as described above.

All of these manipulations require patience, and experience is helpful, but they will yield results if care is used. Results can be verified by checking the ice point or some other reference point on the scale.

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