Dec. 11, 1934. E. BANDOLY 1,983,786

THERMOMETER

Filed Oct. 15, 1932

Fig. 1

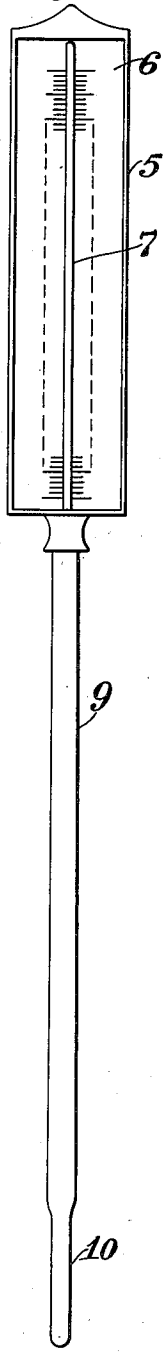


Fig. 2

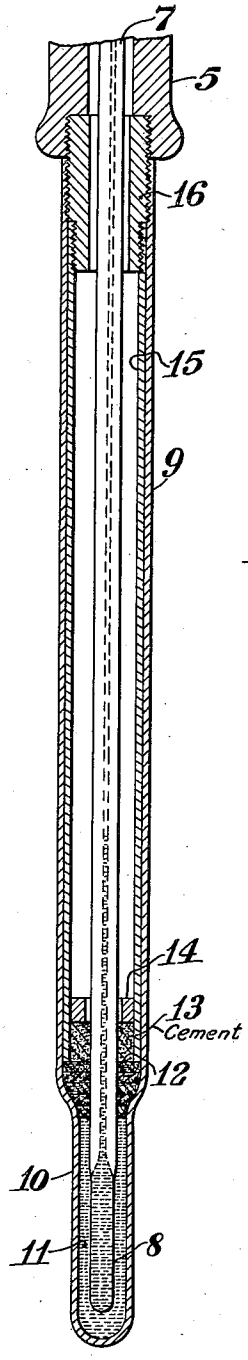


Fig. 4

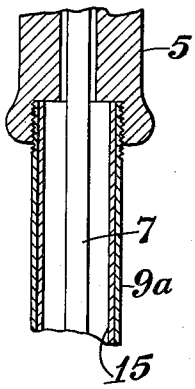


Fig. 3

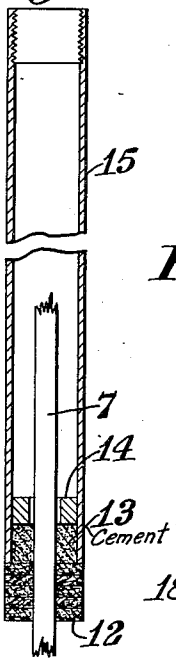


Fig. 5

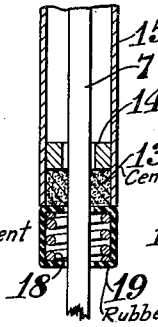
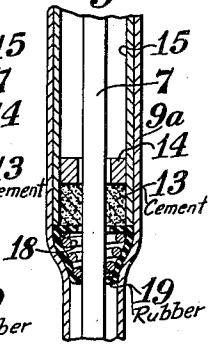


Fig. 6



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Patented Dec. 11, 1934 1,983,786

UNITED STATES PATENT OFFICE

1,983,786

THERMOMETER

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Application October 15, 1932, Serial No. 637,975

7 Claims. (Cl. 73—52)

This invention relates to thermometers and more particularly to an industrial thermometer.

In thermometers having protecting stems, it has been customary to make the stem and bulb chamber in two separate parts to enable suitable sealing material to be inserted into the lower end of the stem about the capillary tube, so that conducting medium surrounding the thermometer bulb in the bulb chamber would be prevented from entering the stem. It has therefore been necessary to join the lower end of the protecting stem to the bulb chamber by a separable connection, which has resulted in an undesirable joint at the junction of these two parts. Furthermore, it is difficult to make a mechanically tight joint between these parts so that frequently there is a leakage of the conducting medium from the bulb chamber therethrough, and since the conducting medium is usually mercury this leakage is particularly undesirable.

The main feature of the present invention resides in a protecting stem thermometer in which the stem and bulb chamber are integral and in which the conducting medium about the capillary bulb is confined to the bulb chamber.

A further feature of the invention resides in a protecting stem thermometer in which the seal between the space in the protecting stem and the bulb chamber is adjustable at a point near the thermometer case.

For a clearer understanding of the invention, reference is made to the drawing in which Fig. 1 is a front view of a thermometer including the present invention; Fig. 2 is a vertical section of the lower part of the thermometer and a fragment of the lower part of the case somewhat enlarged over its showing in Fig. 1; Fig. 3 is a sectional view similar to that shown in Fig. 2 but with the case and its connecting piece and with the protecting stem and its integral bulb chamber omitted; Fig. 4 is a fragmentary sectional view illustrating a modified form of connection between the case and the protecting stem; and Figs. 5 and 6, respectively, represent in section a modified form of sealing means for the bulb chamber before and after mounting in the protecting stem.

Referring especially to Fig. 1, 5 designates a thermometer case provided with the usual scale plate 6 in front of which the upper portion of a capillary tube is supported in any well known manner. The capillary tube 7, as best shown in Fig. 2, extends through the lower end of the case and terminates in a bulb 8 containing the usual expansive medium such as mercury. The lower portion of the capillary tube 7 projecting through the case, extends into a metallic protecting stem 9 terminating in an integral bulb chamber 10 in which the bulb of the capillary tube 7 is positioned substantially as shown in Fig. 2. The upper end of the stem 9 has a screw-threaded connection with a hollow connecting piece 16 surrounding tube 7 and supported by a screw-threaded connection in the lower end of the case 5. The bulb chamber 10 contains mercury indicated at 11, to fill the space between the inner wall of the chamber 10 and the bulb 8, thereby ensuring good heat conduction from the outside of the bulb chamber 10 to the bulb 8. This mercury is only necessary about the bulb 8 and must be confined to the bulb chamber of the stem.

In former types of thermometers having a protecting stem, it has been found necessary to make the bulb chamber 10 separable from the stem 9. This necessity, in part, has arisen from the need for the proper mounting of the capillary tube with respect to the other parts of the thermometer while sealing the mercury or other conducting medium within the bulb chamber. By the present arrangement, it is possible to make the stem 9 and the bulb chamber 10 in one piece, thereby eliminating the unsanitary joint which is present when these parts are made in two pieces. This arrangement also ensures the proper relationship between the capillary tube and its bulb with respect to the thermometer case, the stem and the bulb chamber.

For the purpose of confining the mercury 11 in the bulb chamber 10, suitable packing 12 is provided surrounding the lower portion of the capillary tube 7 and engaging the inner wall of the stem 9 at a point on the stem where it merges with the bulb chamber 10. The packing 12 may be made of various materials well-known in this art but it is herein illustrated, by way of example, as comprising a series of washers formed from asbestos impregnated with graphite or similar composition to make the asbestos impervious to mercury. A sleeve 15 closely fitting within the stem 9, is supported at its upper end on connecting piece 16 by a screw-threaded connection and has its lower end engaging the top surface of the packing. A rigid washer 14 loosely fitting about the capillary tube 7, has an outer dimension such that it makes a forced fit with the inner wall of the sleeve 15. The washer 14 is positioned a short distance away from the lower end of the sleeve, thereby forming an annular space surrounding the capillary tube and this space is filled with a suitable cementing material 13.

It has been mentioned that the hollow connecting piece 16 is screwed into the lower end of the case 6 and into the upper ends of both the stem 9 and the sleeve 15. Thus, as the stem 9 is screwed into the connecting piece 16 in the final assembly of the thermometer, the lower end of the sleeve 15 forces the packing 12 into the tapered part of the stem 9 where it joins the bulb 10. In this manner, by compressing the washers into the form shown in the lower part of Fig. 2, a mercury-tight seal is provided at the open end of the bulb chamber 10 so that the mercury cannot leak therefrom. By screwing the connecting piece 16 a greater or less amount into the sleeve 15, the compression of the packing 12 may be adjusted to control the sealing of the bulb chamber.

In Fig. 4 there is shown a slightly different arrangement for joining the casing 5 to the stem 9*a*, in which arrangement the upper end of the stem is screw-threaded into the lower portion of the case 5. However, the sleeve 15 is not screw-threaded at its upper end, but instead, this end engages an internal shoulder of the case so that the lower end of the sleeve is forced downward to compress the packing or washers 12 in the manner illustrated in Fig. 2.

In a further modified form of the invention, as illustrated in Figs. 5 and 6, the packing washers 12 may be replaced by an annular packing 19 formed of flexible material such as rubber and containing the coil spring 18 surrounding capillary tube 7. In this last-mentioned arrangement, when sleeve 15 is forced downward in the manner previously mentioned, coil spring 18 is deformed as shown in Fig. 6, so that the flexible packing 19 closes the joint between the lower end of sleeve 15 and stem 9*a* and also tightly engages the plug of cement 13, thereby causing a mercury-tight seal to confine the mercury in the bulb chamber. The spring 18 forces the packing 19 against the inner wall of stem 9*a* even when this stem and sleeve 15 expand different amounts in response to sudden changes in surrounding temperature conditions, so that a tight seal is insured under all conditions encountered during use.

It will be understood that there may be numerous modifications and variations of the present arrangement within the scope of the following claims, without departing from the spirit of the present invention.

I claim:

1. In a thermometer, a case, an integral stem and a bulb chamber supported by said case, a capillary tube provided with a bulb having an expansible medium therein, said tube being supported within said case and said stem with said bulb positioned in said bulb chamber in spaced relation to the walls thereof, a conducting medium in said bulb chamber surrounding said bulb, sealing material surrounding said tube and engaging the inner surface of said combined stem and bulb chamber, a sleeve surrounding the tube and extending from a point near said case to said sealing material for engaging the same, and a screw-threaded connecting piece in screw-threaded engagement with the case, the stem and the sleeve to bring them in adjusted relation with respect to one another.

2. In a thermometer, a case, a hollow connecting piece fastened to said case, an integral hollow stem and bulb chamber fastened to said connecting piece, the junction between said stem and said bulb chamber having a tapered wall portion, a capillary tube terminating in a bulb having an expansible medium therein, said capillary tube being mounted in said case and said stem with said bulb positioned in said bulb chamber in spaced relation to the inner surface thereof, a conducting medium in said bulb chamber surrounding said bulb, sealing means engaging said tube and the tapered wall portion, a hollow sleeve surrounding said capillary tube and having its upper end adjustably fastened to said connecting piece and having its lower end engaging said sealing means to compress the same against the tapered wall portion.

3. In a thermometer, a case, a hollow connecting piece fastened to said case, an integral hollow stem and bulb chamber fastened to said connecting piece by a screw-threaded connection, the junction between said stem and said bulb chamber having a tapered wall portion, a capillary tube terminating in a bulb having an expansible medium therein, said capillary tube being mounted in said case and said stem with said bulb positioned in said bulb chamber in spaced relation to the inner surface thereof, a conducting medium in said bulb chamber surrounding said bulb, sealing means engaging said tube and the tapered wall portion, a hollow sleeve surrounding said capillary tube and having its upper end fastened to said connecting piece by a screw-threaded connection and having its lower end engaging said sealing means to compress the same against the tapered wall portion.

4. In a thermometer, a case, a hollow integral stem and bulb chamber, said stem being connected to said bulb chamber by a tapered portion, a capillary tube terminating in a bulb containing an expansible medium, said tube extending from a point in said case through said stem and with its bulb positioned in said bulb chamber in spaced relation to the walls thereof, a heat-conducting medium in said bulb chamber, sealing means engaging said tube and the reduced portion of said stem and said bulb chamber, a hollow sleeve having its upper end engaging a part carried by said case and its lower end engaging said sealing material to compress the same against said tapered wall portion.

5. In a thermometer, a case, a capillary tube terminating in a bulb containing an expansive medium, said tube having a portion extending into said case, an integral stem and bulb chamber supported on said case and enclosing the remainder of said tube and its bulb with said bulb extending into said bulb chamber, the junction between said stem and said bulb chamber including a tapered wall portion, a heat conducting medium in said bulb chamber, sealing means surrounding said tube and engaging the inner wall of said stem, said sealing means including packing material and a spring, and means within said stem for forcing said packing material into engagement with the tapered wall portion against the action of said spring.

6. In a thermometer, a case, a hollow integral stem and a bulb chamber, said stem being connected to said bulb chamber by a portion of reduced diameter, a capillary tube terminating in a bulb containing an expansible medium, said tube extending from a point in said case through said stem and with its bulb positioned in said bulb chamber in spaced relation to the inner surface thereof, a heat-conducting medium in said bulb chamber sealing means engaging said tube and the reduced portion of said stem and bulb chamber, said sealing means including resilient

packing and a coil spring substantially enclosed by said packing, and a sleeve within the stem engaging said packing to compress the stem against the action of said spring.

7. In a thermometer, a case, a capillary tube terminating in a bulb containing an expansive medium, said tube having a portion extending into said case, an integral stem and bulb chamber supported on said case and enclosing the remainder of said tube and its bulb with said bulb extending into said bulb chamber, the junction between said stem and said bulb chamber having a tapered wall portion, a heat-conducting medium in said bulb chamber, sealing means surrounding said tube and engaging the inner wall of said stem, and means within said stem for adjustably forcing said sealing material against said tapered wall portion.

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