Nov. 20, 1923. 1,474,403

L. F. CHANEY

METHOD OF MAKING THERMOMETER BULBS

Filed Nov. 12, 1920

Fig. 1

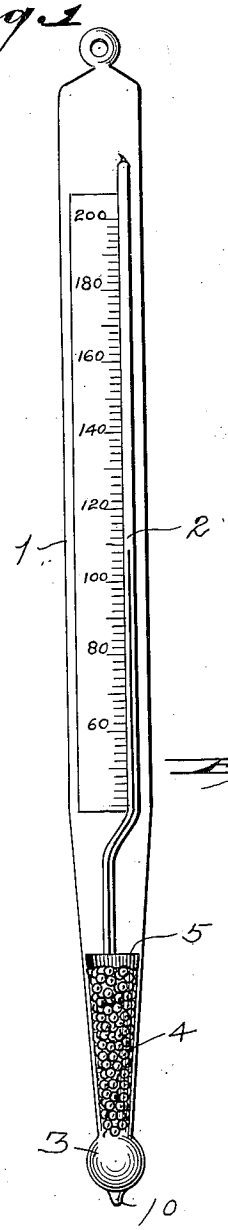


Fig. 2

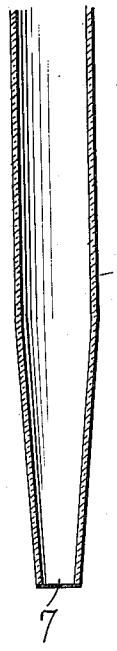


Fig. 4

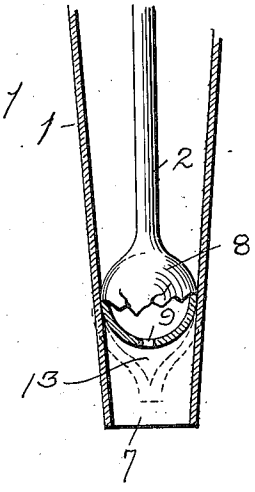


Fig. 6.

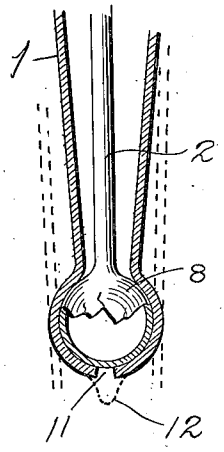


Fig. 5

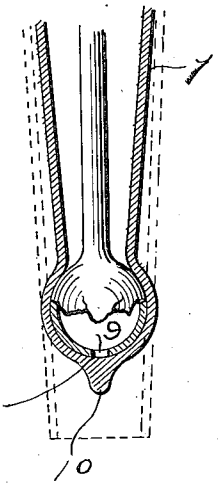


Fig. 3

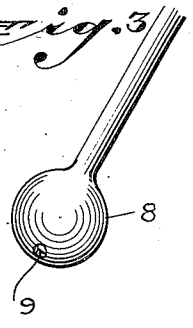
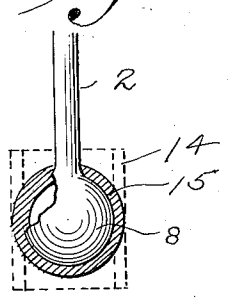


Fig. 7



Inventor

Lee F. Chaney

By L. E. Walker Attorney

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UNITED STATES PATENT OFFICE.

LEE F. CHANEY, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE CHANEY MANUFACTURING COMPANY, OF SPRINGFIELD, OHIO, A CORPORATION OF OHIO.

METHOD OF MAKING THERMOMETER BULBS.

Application filed November 12, 1920. Serial No. 423,658.

To all whom it may concern:

Be it known that I, LEE F. CHANEY, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Methods of Making Thermometer Bulbs, of which the following is a specification.

This invention relates to thermometers of the type known as "insulated thermometers," and generally designated as "dairy" or "floating" thermometers, and more particularly to a method of manufacturing the same, whereby the process of production of such devices will not only be simplified, but will be cheapened without impairing their efficiency and which will enable uniformity of production and afford an instrument having a reenforced bulb, of maximum strength.

A further object of the invention is to afford a process whereby such instrument may be rapidly and accurately produced by unskilled labor with minimum losses, from distortion and breakage of the parts.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the steps and operations and the sequence and combinations thereof, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Fig. 1 is a side elevation of the completed thermometer. Fig. 2 is a detail sectional view showing the preparation of the insulating or casing tube. Fig. 3 is a detail view illustrating the preparation of the capillary tube, having a punctured bulb. Fig. 4 illustrates the assembly of the capillary tube and casing tube prior to fusing. Fig. 5 is a detail sectional view of the united capillary and casing tubes after completion of the fusing operation. Fig. 6 illustrates a modification of the construction shown in the preceding figures. Fig. 7 illustrates the reinforcement of an ordinary thermometer bulb by the herein described process.

Like parts are indicated by similar characters of reference throughout the several views.

A thermometer of the insulated or floating dairy type as shown in Fig. 1 comprises an outer or casing tube 1, enclosing the capillary tube 2, which is integrally united with the outer or casing tube thru a common bulb 3. The lower portion of the casing tube 1 surrounding the capillary tube 2 is usually weighted by means of shots, lead or other ballast material, 4, which is retained in place by a deposit of wax 5 or some adhesive. Inserted within the casing tube 1, and adjusted to proper relation with the column of indicating fluid, whether mercury, or alcohol, or other fluid, within the capillary tube 2, is a graduated paper scale 6, upon which is indicated by the height of the column of indicating liquid within the capillary tube, the corresponding temperatures.

Heretofore various methods of manufacturing these insulated or floating dairy thermometers have been in use. The predominating step in the manufacture of such devices has been that of forming the bulb 3 upon the exterior or casing tube and uniting the capillary tube 2 therewith. Various processes have been employed to this end. One of the popular methods has been to expand or flare the lower end of the capillary tube, and to unite the edge of such flared or expanded portion with the wall of the casing tube adjacent to the lower end thereof and subsequently blow or otherwise form the bulb 3 from the wall of the casing tube, below the zone of cohesion of the capillary tube thereto.

A variation of this method also commonly employed has been to first produce by blowing or otherwise a bulb upon the extremity of the capillary tube, which is then inserted within the casing or insulating tube 1. The bulb upon the capillary tube in this process in only temporary. The adjusted tubes are then heated to fuse them one to the other, and the bulb upon the capillary tube is bursted or ruptured by blowing thru the small end of the capillary tube, while the bulb is in a heated or plastic condition. It will be understood that the capillary tube projects beyond the extremity of the casing tube at this stage of the manufacture. After the bursting or dissipation of the bulb upon the capillary tube, by such blowing operation, the permanent bulb is then formed from the material of the outer or casing tube 1. This process requires considerable skill as does that of flaring the end of the capillary tube preparatory to uniting it with the casing tube. Moreover, both processes

afford a bulb having comparatively thin walls, inasmuch as the bulb is formed by stretching the material of the casing or outer tube, and hence reducing its thickness. The bulb walls thus consist of a single reduced thickness of material. Another difficulty of these processes has been the difficulty of securing uniformity of capacity in the manipulation of the wall of the larger tube in forming such bulb.

The present process is designed to overcome these difficulties, and to afford a method by which these thermometers may be economically and rapidly produced by persons unskilled in glass blowing. To this end, the outer or casing tube 1 is prepared by drawing one end to a suitable taper, as shown in Fig. 2 leaving the end of such tapered portion open as at 7. The capillary tube 2 is prepared by blowing or otherwise forming at one end thereof, a closed bulb 8 as is commonly employed in the ordinary type of thermometers. While the bulb 8 of the capillary tube 2, is still in a plastic condition or upon reheating the bulb subsequent to its formation, the bulb is punctured as shown at 9. This puncture is a comparatively small vent, and may be effected without destroying the symmetry of the bulb by various methods. One of these methods, and perhaps the most convenient is to provide in the table or bench of the worker, an upstanding wire pin or stud, upon which the finished bulb may be thrust while still in a plastic condition, thereby causing such pin or stud to puncture the bulb to afford the vent 9. Another convenient method of forming such vent or opening 9, is to touch the bulb to a hot metal plate or other heated support having thereon a suitable glass bait, and then pulling the bulb away, thereby pulling a portion of the material from the wall of the bulb, leaving the hole or vent 9 therein. A third method which has been used with success is to fuse the hole or vent 9 in the bulb by means of a pin flame directed thereon. The capillary tube with the punctured bulb 8 is then inserted within the outer or casing tube 1 until the bulb fits closely within the tapered extremity of such casing tube, and the adjusted tubes are subjected to fusing heat. In this fusing operation, the wall of the bulb and the wall of the casing tube are caused to unite. The wall of the casing tube being more directly subjected to the heat, becomes plastic first, and to a greater degree. Under the action of the fusing heat the wall of the casing tube is deflected inwardly into conformity with the bulb 8 of the capillary tube, which in reality forms a core or form about which the wall of the outer or casing tube is shaped. In this fusing operation, the terminal opening 7 of the casing tube is closed or sealed in many instances before the casing tube has been conformed to the inserted bulb 8, thereby causing a body of air to be entrapped beneath the bulb 8 and within the closed end of the casing tube as at 13 Fig. 4. It is to provide for the escape of such entrapped air or gases, that the vent 9 is provided in the bulb 8. By the present process, any air which may be so entrapped escapes thru the vent 9 and thence outward thru the capillary tube 2, as the walls of the casing tube gradually close over the bulb 8. The wall of the casing tube being in a fused condition also contracts somewhat above the bulb as shown in Fig. 5. In this figure the original position of the tapered end of the casing tube is shown by dotted lines while the ultimate shape of the casing tube is shown by solid lines. The tube is finished by drawing out the end of the casing tube, leaving the usual teat 10 which effectually closes the orifice or vent 9 in the bulb. By this construction it will be seen that the resulting bulb has walls of double thickness. That is to say, the finished bulb comprises the initial bulb formed upon the capillary tube 2 around which is formed and integrally united therewith, an enclosing bulb formed from the material of the outer or casing tube. This affords a bulb of maximum strength, and moreover the size of such bulb is gaged by that of the inserted bulb 8, which forms the core or lining.

In Fig. 6 there is shown a modification in which the perforation 9 is omitted from the initial bulb 8. In this construction the capillary tube 2 with the bulb 8 intact, is inserted within the tapered portion of the casing tube 1, which tapered portion is of such size or cut off to such proportion that the bulb 8 approaches quite closely to the extremity of the tapered end of the casing tube. The relation of the bulb to the end of the casing tube is such that the material of the tapered casing walls projecting beyond the bulb 8 is insufficient to completely cover the bulb when fused. The relation of the tapered walls of the casing tube is shown in dotted lines prior to fusing and in solid lines after completion of the fusing operation. By this relation and proportion of parts, the fusing of the casing tube does not completely close off, any cavity or recess nor trap any body of air. To the contrary there is afforded in the partially completed product a central orifice 11 thru which any body of air or heated gas may escape. In other words the walls of the casing tube do not completely meet over the bulb 8, but leave a central uncovered portion which affords egress to any entrapped air. This recess or depression 11 is subsequently closed by the deposit of a body of fused glass as shown at 12 by dotted lines. This is effected by touching the end of the partially completed tube with a partially fused rod of glass, causing

the glass rod and partially completed tube to adhere and then pulling out the fused portion of glass to form the teat 12.

In the event that it is found that the bulb is not of sufficient size, it may be increased by heating and blowing thru the capillary tube 2 in the usual manner, without however, rupturing or breaking the bulb as has heretofore been the practice. Thus after the inner core bulb or lining and the outer casing have been united, to form a double walled bulb, such bulb of increased wall strength may be expanded or shaped, or otherwise modified in the usual manner.

By the above described process, the bulb will be reenforced and the walls thereof thickened and materially strengthened. The instrument is thereby rendered more substantial, and less liable to breakage than when the bulb is formed by the usual or other processes. By forming the bulb in the manner described, the bulb is uniformly and evenly merged into both the capillary and the casing tube, and the outlet or orifice from the bulb 8 into the passageway of the capillary tube 2 is maintained perfectly smooth, even and uniform, the bore of the capillary tube and the recess of the bulb 8 merging uniformly and gradually one into the other, which facilitates the subsequent steps of exhausting the air and moisture or gases from the bulb and tube. After the bulb has been completed, as herebefore described, the capillary tube and bulb are filled with indicating liquid, by any of the usual or well known processes, as for instance, by the process described in my prior Patent No. 1,345,347, issued July 6, 1920, and the tube is calibrated and the scale adjusted thereto in uniformity with said calibration, by any suitable calibrating process, as for instance as described in my prior Patent No. 1,391,878, issued September 27, 1921.

The exhaustion of air and gas and subsequent filling of the tube and calibrating thereof having been completed, the capillary tube is finished by closing the upper or outer end thereof, by fusing the same, and the end of the casing tube is also closed by fusing in the usual manner.

The method heretofore described may be utilized for reinforcing the bulb of an ordinary thermometer tube as shown in Fig. 7, wherein a short glass tube 14 is fused into conformity with the bulb 8 as indicated at 15 to afford walls of increased thickness, to compensate for the stretching of the walls of the ordinary bulb due to the expansion of the material in its formation.

By the herein described process, thermometers of the type heretofore described, are produced rapidly and economically by persons unskilled in the glass blowing art, and with minimum losses from breakage or distortion. While the preferred mode of procedure has been shown and described, it will be understood that the invention is not limited to the exact details, nor specific steps, and changes therein and modifications thereof, may be made within the legitimate and valid scope of the appended claims without departing from the spirit of the invention or sacrificing its advantages.

Having thus described my invention, I claim:

1. The herein described process of producing a thermometer tube, comprising providing a casing tube, and a capillary tube, forming a bulb upon one end of the capillary tube inserting the bulb of the capillary tube within the casing tube, heating the portion of the casing tube enclosing the bulb and utilizing the bulb as a form or core to which the casing tube is made to conform and adhere to afford a reinforced bulb common to both tubes.

2. The herein described process of producing thermometers comprising providing a casing tube and a capillary tube, forming a bulb upon the extremity of the capillary tube, inserting the capillary tube and bulb within the casing tube and contracting the casing tube about the capillary tube bulb with which it is integrally united.

3. The herein described process of producing a thermometer tube comprising providing a casing tube, inserting the capillary tube bulb within the casing tube and utilizing the bulb as a core or form about which the casing tube is shaped, and to which it is integrally united.

4. The herein described process of producing a thermometer tube, comprising providing a casing tube and a capillary tube, forming a bulb within the casing tube and utilizing the bulb as a core or form about which the casing tube is shaped, and providing a vent for the escape of air and gases from intermediate the bulb and casing tube during the shaping process.

5. The herein described process of producing thermometer tubes comprising providing a bulb upon one end of a capillary tube and a casing tube one end of which is tapered, puncturing the bulb, inserting the punctured bulb within the tapered portion of the casing tube, heating the portion of the casing tube enclosing the bulb and causing it to conform to and unite with the bulb and seal the puncture therein.

6. The herein described method of forming thermometer tubes consisting in providing a bulb at one end of a capillary tube, inserting such bulb within a casing tube, and subsequently forming a bulb upon the casing tube around and enclosing the capillary tube bulb.

7. The herein described method of reinforcing thermometer tube bulbs, consisting in utilizing the bulb as a core or form and

shaping an exterior shell about such bulb with which the shell is integrally united by fusing.

8. The herein described method of reinforcing thermometer tube bulbs, consisting in puncturing the bulb, and forming a shell about the exterior of the bulb and over the puncture thru which heated air and gases may escape from such shell during the forming operation.

9. The herein described method of reinforcing thermometer tube bulbs, consisting in utilizing the bulb as a core or form and shaping about such bulb an exterior adherent shell, and providing a vent for the escape of air and gases from between the shell and bulb during the forming operation.

In testimony whereof, I have hereunto set my hand this 5th day of November A. D. 1920.

LEE F. CHANEY.

Witnesses.
W. F. HEROLD.
JOHN B. MCGREW.