Dec. 23, 1952 W. M. SMITH ET AL 2,622,779

METHOD OF AND APPARATUS FOR PRESSURIZING AND SEALING THERMOSTAT TUBES

Filed Feb. 25, 1950 2 SHEETS—SHEET 1

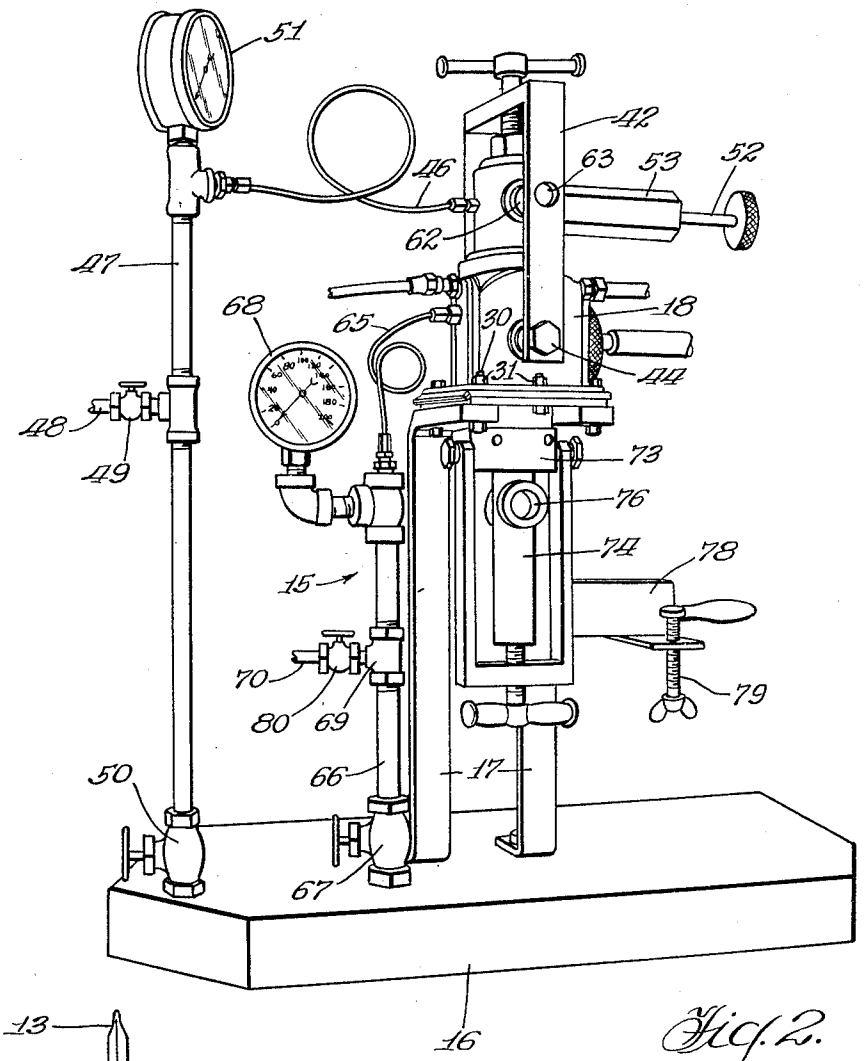


Fig. 2.

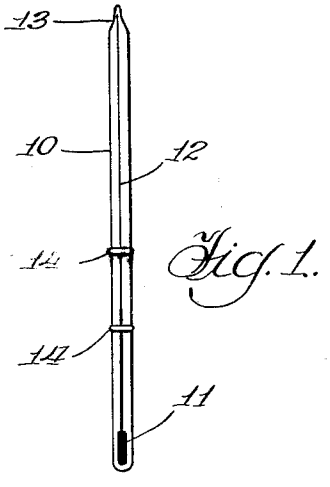


Fig. 1.

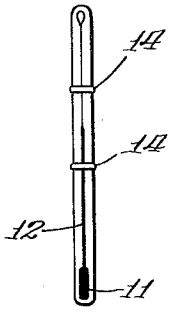


Fig. 5.

INVENTORS.
William M. Smith
Don A. Brosseau
BY
Harvey M. Gillespie
Atty.

Dec. 23, 1952 W. M. SMITH ET AL 2,622,779

METHOD OF AND APPARATUS FOR PRESSURIZING AND SEALING THERMOSTAT TUBES

Filed Feb. 25, 1950 2 SHEETS—SHEET 2

Fig. 3.

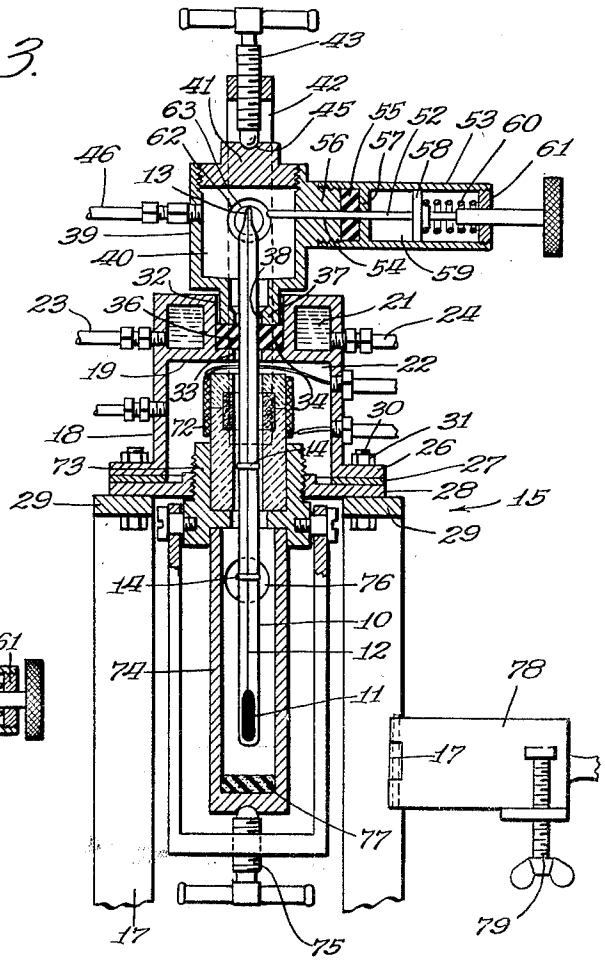
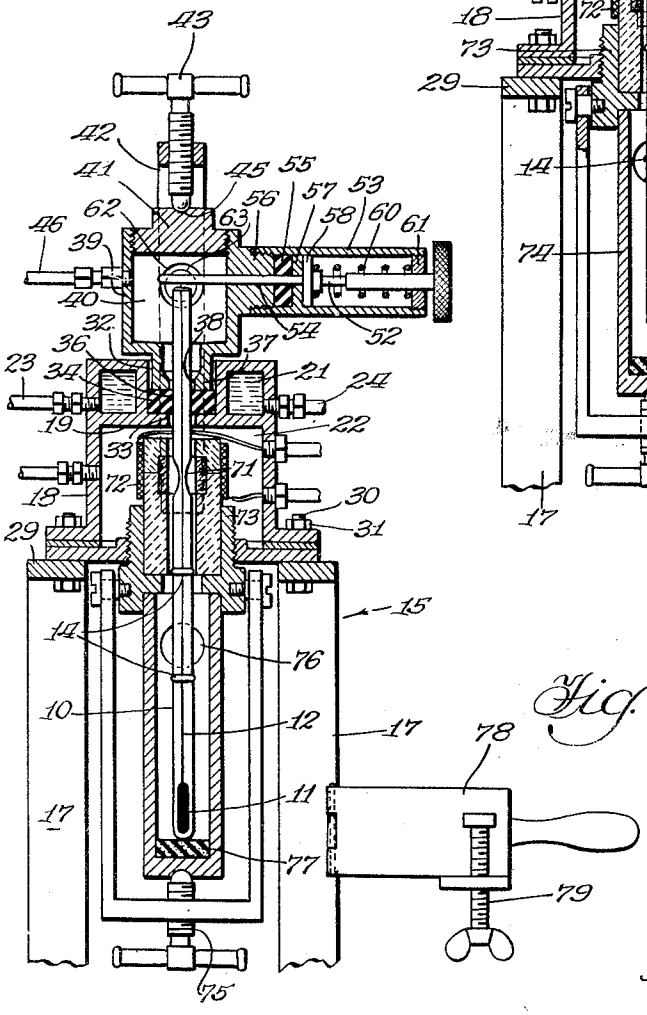


Fig. 4.



INVENTORS.
William M. Smith
Don A. Brosseau
BY
Harvey M. Gillespie
Atty

Patented Dec. 23, 1952

2,622,779

UNITED STATES PATENT OFFICE

2,622,779

METHOD OF AND APPARATUS FOR PRESSURIZING AND SEALING THERMOSTAT TUBES

William M. Smith, Glen Ellyn, and Don A. Brosseau, Chicago, Ill., assignors to Vapor Heating Corporation, Chicago, Ill., a corporation of Delaware

Application February 25, 1950, Serial No. 146,364

13 Claims. (Cl. 226—20)

1

This invention relates generally to the art of manufacturing liquid column thermostats and particularly to the sealing of a thermometer tube containing an expansible liquid column subjected to gaseous pressure.

In the manufacture of thermometers or thermostats of the tube type employing an expansible column of mercury or mercury alloy it has been customary practice to remove the atmosphere from above the mercury column and introduce a non-corrosive gas therein preliminary to the final sealing of the tube. This is done to avoid possible corrosion of the mercury in the thermostat, since any trace of oxygen in the tube will cause objectional corrosion of the mercury contained in the tube.

It is also desirable to subject the column of mercury to gaseous pressure so that the expansible column will not separate from the main body of mercury upon alternate heating and cooling thereof. Hydrogen is an example of a non-corrosive gas which is suitable for use in mercury column thermostats, since it will apply the desired pressure on the mercury column without combining or reacting with the mercury.

In the manufacture of such thermometers the capillary tubes are first sealed under vacuum and the seal at the end of the tube, remote from the main reservoir of mercury, is broken to introduce the pressure producing gas into the tube and the tube is thereafter sealed. Since hydrogen is an explosive gas, it is difficult to reseal the tube without the attendant danger of explosion and fire.

With the foregoing considerations in mind it is an object of this invention to provide a process and apparatus for introducing and sealing a body of gas in an end portion of the thermometer tube containing a column of expansible liquid and thereafter resealing the tube in the presence of an inert gas with the pressure producing gas held within the tube during the process of resealing and at the conclusion of the resealing process.

The several steps of the improved process may be described briefly as follows: The sealed end of a thermometer tube containing the desired quantity of mercury is enclosed in a chamber filled with hydrogen or other pressure producing gas. The sealed end of the tube is opened in the presence of such gas and the tube is thereafter resealed with heat and pressure at a point intermediate of the ends of the thermometer tube. The heat is applied to the tube in an atmosphere of an inert gas, such as nitrogen. The tube is supported at a location above the hot plastic

2

area of the tube. Therefore, the weight of the thermometer tube and the pressure from the inert gas is utilized to cause the tube to neck in at the point of resealing. This facilitates resealing the tube at a location above the mercury column so that a quantity of hydrogen is contained in the sealed tube in the space above the mercury column. The introduction of the hydrogen gas into the tube and the resealing thereof is characterized by complete freedom from any possibility of explosion or fire hazard.

The apparatus herein illustrated for performing the several steps of the method includes the provision of a gas chamber having an opening therein to receive the closed end of a thermostat tube within the said gas chamber. A means in the form of a compressible ring surrounds the thermostat tube for sealing the opening in the gas chamber and for clamping the tube in position to be pressurized and thereafter resealed.

The said resilient ring is interposed between the said gas chamber and a fixed part of the apparatus. A pivoted yoke type of clamp is positioned to move into and out of clamping engagement with the upper end of the housing defining said gas chamber to hold the housing in position and to simultaneously compress the resilient ring into clamping engagement with the thermometer tube.

A plunger extending into the gas chamber is manually operable to knock off the tip of the thermometer tube to permit the pressurizing gas to enter and fill that portion of the thermometer tube which extends above the column of mercury contained in the tube.

Another gas chamber, preferably containing nitrogen under pressure, surrounds the portion of the tube which extends below the resilient clamping ring. The housing defining this chamber is preferably composed of two parts—a fixed portion and a removable lower portion. The lower portion of this housing is removably clamped to the fixed portion by means of a second pivoted yoke form of clamp, which clamp may be quickly released and moved out of its clamping position when it is desired to remove a pressurized tube and thereafter insert another tube in the apparatus. An electrical heater is positioned in the nitrogen chamber at a location where it is desired to sever and reseal the thermometer tube. When the glass walls of the tube are heated to a plastic state the weight of the tube and the mercury contained therein stretches the molten area of glass. Also the external pressure of the nitrogen gas against the plastic portion of the tube aids in sealing the tube. The releasable

yoke type of clamp permits the lower portion of the nitrogen chamber housing to be readily separated. In this way the upper and lower portions of the glass tube which ordinarily remain connected until they are removed, may be withdrawn from the apparatus and another tube inserted therein.

It is a principal object of the invention to provide an improved process as hereinabove briefly described for pressurizing thermometer tubes and to also provide an improved apparatus constructed as hereinabove described for carrying out the several steps of the process.

Still other objects of the invention, which are more or less ancillary to those above recited, will appear from the following description of the embodiment of the invention shown in the accompanying drawings. It is to be understood, however, that the embodiment shown is intended as an illustration and not as a limitation.

In the drawings:

Fig. 1 is an elevational view of a thermometer tube containing a column of expansion liquid with an evacuated space above the said column and adapted to be acted upon according to the process and apparatus of the present invention;

Fig. 2 is a perspective view of an apparatus according to the present invention for sealing and pressurizing a thermometer shown in Fig. 1;

Fig. 3 is an enlarged vertical section taken through a portion of the apparatus of Fig. 2 showing the thermometer of Fig. 1 in position to be acted upon by the apparatus of Fig. 2;

Fig. 4 is a view similar to Fig. 3 but showing the thermometer of Fig. 2 after being subjected to pressurizing of the liquid column and partially resealed; and

Fig. 5 is an elevational view of a thermometer which has been sealed under pressure according to the process and apparatus of Figs. 2, 3 and 4.

Referring now to Fig. 1 of the drawings, there is shown a thermostat tube 10 which includes a reservoir 11 for mercury or other expansible liquid having the property of conducting electricity. The tube 10 has a capillary 12 therein, which communicates with the reservoir 11, and which is sealed generally under vacuum, as at 13, at the end remote from the reservoir 11. The tube 10 is provided with circuit closing contacts 14 having fine platinum wire (not shown) sealed in the wall of the tube and intersecting the bore of the capillary 12, so that when the column of mercury is subjected to changing temperature conditions, circuits which include the thermostat 10 will be made or broken.

Referring now particularly to Figs. 2 and 3 of the drawings wherein an apparatus constructed according to the present invention is indicated generally by the reference numeral 15: The apparatus shown represents certain preferred embodiments and is constructed to subject the capillary 12 of the thermostat tube 10 to an internal pressure of preferably 110 pounds. It also facilitates resealing the tube 10 at a desired point above the column of mercury therein while the capillary 12 is under said pressure. The apparatus 15 consists generally of a base support 16 having extending therefrom vertical standards 17. The standards 17 support a generally rectangular housing 18 divided by a wall 19 into a pair of chambers 21 and 22, chamber 21 having pipes 23 and 24 connected thereto for circulating a supply of liquid coolant such as water. The housing 18 is formed with a flange 26 which bears against a sealing gasket 27 and a closure member 28, the assembly of the housing 18, the gasket 27 and the closure member 28 being bolted to laterally bent end portions 29 of the standards 17 by means of attaching bolts and nuts at 30 and 31.

The housing 18 is formed with a cylindrical recess 32 and an axial opening 33, the wall 19 forming a seat for a resilient clamping member 34, having a central circular opening 36 therein which is adapted to have pressure exerted thereon by a nipple-like extension 37, having a central bore 38 of an annular cup shaped housing 39 defining a gas chamber 40. The upper end of said housing is closed by a screw plug 41. The said gas chamber housing 40 is held clamped in its normal operative position by means of a pivoted yoke type of clamp 42 including a thrust or clamping screw 43. The yoke type of pivoted clamp is pivoted at 44 to the housing 18 so that the clamp can be readily swung into and out of clamping position. The screw 43 seats in a socket 45 formed in the plug. It will be seen, therefore, that when the screw 43 is thrust against the plug 41 of housing 39, the housing exerts pressure on the resillient clamping member 34 so as to compress the same and thereby seat the axial opening 38 leading into chamber 40 and also cause the member to grip tightly the outer surface of the thermometer tube 10.

Means are provided for subjecting the sealed end 13 of the tube 10 to gaseous pressure, the seal 13 being broken in the presence of the gaseous pressure to fill the capillary with gas at approximately 110 pounds' pressure per square inch and expose the liquid in the capillary 12 to such pressure. To this end, referring particularly to Fig. 3, the chamber 40 is first connected with a suction device (not shown) to withdraw the atmosphere from the chamber. It is thereafter filled with gas under pressure before the sealed end 13 of the thermometer tube 10 is broken. For the purpose of evacuating the atmosphere from the said chamber 40, a conduit 46 leads from the chamber 40 to a main pipe 47 (Fig. 2) and a branch 48, the latter of which leads through a valve 49 to a vacuum pump (not shown). The conduit 46 and pipe 47 also lead through a valve 50 to a source of hydrogen under pressure (not shown). Consequently, when the valve 50 is closed and the valve 49 is open, the atmosphere is withdrawn from the chamber 40. Preferably the vacuum within the chamber 40 has a value of 29 inches of mercury.

After the chamber 40 is sufficiently cleared of atmosphere, the valve 49 is closed and the valve 50 is slowly opened to admit hydrogen gas into the chamber 40 until a gauge pressure of 110 pounds is obtained; the measuring gauge being designated 51. The sealed end 13 of the tube 10 is then broken, to subject the capillary 12 thereof to pressure within the chamber 40. The means for breaking the sealed end 13 of tube 10 comprises a plunger 52 supported in a tubular guide 53, the plunger to move in a bore 54 leading through a wall of chamber 40. A resilient packing 55 is compressed between a portion 56 of the housing 39 and a guide wall 57 which prevents the escape of gas from the chamber 40. A disk form of collar 58 is secured to the plunger 54. The said disk fits loosely in a chamber 59 and provides a movable abutment for a spring 60 which encircles the plunger 52, and abuts an end wall 61 of the plunger guide 53.

The position of the sealed end 13 of the tube 10 within the chamber 40 may be observed by means of a window 62—62 formed in the opposite

walls of the housing 39. The pivoted arms of the clamp member 42 are likewise formed with holes 63—63 which, when the clamp member 42 is in the position shown in Figs. 2, 3 and 4, provide sight openings in alignment with the windows 62—62. It will be apparent that the sealed end 13 of the tube 10 may be broken by moving the plunger 54 to the right against the force of the spring 60 and then releasing the plunger 54 to cause the end thereof to strike the sealed tip 13 smartly and break same. The capillary 12 is then subject to the pressure maintained within the chamber 40.

The chamber 22 encloses the lower portion of the thermometer tube 10 and is adapted to contain an inert gas, for example, nitrogen at a pressure higher than the internal pressure of the capillary, whereby the differential in the internal and external pressure will aid in collapsing the tube when a portion of it is heated to a plastic state in the lower chamber. The gas pressures herein specified for the chambers 40 and 22 are not critical and may be varied. However, it is desirable, in the present invention, to maintain the hydrogen in the tube 10 at 110 pounds pressure. Consequently, the gas pressure in the chamber 22 surrounding the lower portion of the tube 10 is maintained at 120 pounds pressure so as to provide a convenient differential between the internal and external pressure exerted against the walls of the tube.

The connections for introducing nitrogen into chamber 22 includes a tube 65 branching from a supply pipe 66 provided with a pressure adjusting valve 67 and a pressure measuring gauge 68. It will be seen that the portion of the tube 10 extending below the clamping member 34 is thus subjected to pressure from the gas within the chamber 22. For the purpose of withdrawing the nitrogen from the chamber 22, a T-fitting and valve 69 connect into the supply pipe 66 and in a branch suction pipe 70 leading to the vacuum pump (not shown).

Means are provided for subjecting the portion of the tube 10 extending below the clamping member 34 and within the chamber 22 to localized heat sufficient to cause a portion of the glass tube 10 to become plastic, whereupon the weight of the mercury in the tube causes the heated portion of the glass tube to stretch, during downward movement of the mercury loaded end of the tube. This downward movement of the tube together with the fact that external nitrogen pressure is greater than the internal hydrogen pressure causes the heated portion of the tube to neck in as shown at 71 and thereby effect thorough sealing of the central bore 12 of the tube 10.

The said tube is heated by means of an electrical heater 72 and is mounted in the upper end of a gland element 73 threaded through an opening in the closure member 28 associated with the fixed housing 18 of gas chamber 22. The lower portion of gas chamber 22 is defined by a cylindrical housing 74 which is removably clamped to the lower portion of gland 73 by means of a pivoted yoke type of clamp which includes a thrust screw 75 adapted to exert clamping pressure against the bottom of said cylindrical housing 74 and thereby clamp the open upper end of housing 74 against said gland 73.

The housing section 74 is preferably provided with oppositely disposed windows 76—76 so that the operator of the pressurizing apparatus can see when the lower portion of the thermometer tube 10 has moved downwardly to the position shown in Fig. 4. In this position the lower end of the tube rests on a resilient pad 77.

In operation, the pressure exerted by the thrust screw 75 is released and the cylindrical housing 74 is removed. The end 13 of a thermometer tube 10 is thrust past the resilient support 34 into the chamber 40, the proper position of the tube being observed through the windows 62. However, in order to insure that all tubes of a predetermined length shall be located in like positions, a hinged gauge support 78 provided with an adjustable screw 79 to support the tube 10 in position swings inwardly beneath the tube so as to support it until the thrust screw 43 is tightened to compress the resilient ring 34 and thereby hold the tube 10 in its proper position. After the ring 34 is compressed sufficiently to hold the tube 10, the gauge support 78 is swung outwardly to its inoperative position, as shown in Figs. 2 and 4, and the cylindrical housing 74 is inserted over the lower end of the tube and clamped firmly against the gland 73. The valves 49 and 80 are opened and the suction pump (not shown) functions to withdraw the atmosphere from the chambers 40 and 22. When a vacuum equivalent to 29 inches of mercury is drawn on said chambers 40 and 22, the valves 49 and 80 are closed and the valves 50 and 67 are opened to fill the said chambers 40 and 22 with gas, preferably hydrogen for chamber 40 and nitrogen for chamber 22. The hydrogen in chamber 40 is maintained at a gauge pressure of 110 pounds and the nitrogen in chamber 22 is maintained at a gauge pressure of 120 pounds. The valves 50 and 67 are closed and plunger 52 is operated to knock off the sealed end 13. A localized portion of the glass tube 10 is then heated to a plastic state. This is performed by energizing the electrical heater 72 of the apparatus. When the glass tube is heated sufficiently to permit it to move downwardly to the position shown in Fig. 4, as may be observed through the window 76, the pressure chambers 22 and 40 may be relieved by partially opening the valves 80 and 49, respectively. The thrust screw 75 may be released and the cylindrical housing removed whereupon the entire tube 10 may be removed from the apparatus by releasing the thrust screw 43 so as to relieve the compression and consequently the tube clamping action of the resilient ring 34.

After removing the entire tube from the apparatus, it may be broken at the "necked in" seal 71. The sealed end of the portion containing the mercury is then heated and the sealed end rounded substantially as shown in Fig. 5.

According to the present invention there has been provided a novel and simple apparatus and process for resealing thermometers with the liquid column under pressure, the sealing being characterized by employing a differential of the internal and external gaseous pressure to facilitate the resealing process, the process and apparatus being also characterized by freedom from danger of explosion or fire in the event an explosive gas is employed to pressurize the liquid column.

While the invention has been described in terms of an embodiment which it may assume in practice its scope is not intended to be limited in terms of the embodiment shown nor otherwise than by the appended claims.

We claim:

1. The process of pressurizing a column of liquid within a sealed tube which comprises sub-

jecting a sealed end of the tube to gaseous pressure, breaking the sealed end in the presence of said gaseous pressure to admit the gas under pressure into the interior of the tube above said liquid column, subjecting an external portion of said tube at a point remote from said sealed end to an inert gas at a pressure higher than the interior pressure of the tube, and heating said external portion of said tube locally to a plastic condition in the presence of said inert gas, whereby the higher external gaseous pressure forces the plastic glass inwardly toward the center of the tube to seal the same.

2. The process of pressurizing a column of liquid within a sealed tube which comprises freely supporting said tube at a point intermediate its ends, subjecting a sealed end thereof to gaseous pressure, breaking the sealed end in the presence of said gaseous pressure, subjecting an external portion of said tube at a point remote from said sealed end to inert gaseous pressure substantially higher than the pressure inside the tube, and heating a portion of said tube to a plastic condition at a location intermediate said sealed end and said column of liquid in the presence of said inert gas to reseal said tube under gaseous pressure, and employing the weight of the free end of said tube and the pressure from said inert gas to effect necking in of said tube at the point of local heating thereof during the resealing thereof.

3. In apparatus of the class described for pressurizing a column of liquid within a sealed tube, means for supporting said tube at a point intermediate its ends, means defining a chamber exposed to a source of gas under pressure into which a sealed end of said tube extends, means for breaking the sealed end of said tube within said chamber to expose said column of liquid to said pressure, means defining a second chamber intermediate the point of support of said tube and the opposite end thereof for subjecting the exterior of said sealed tube to an atmosphere of inert gas under pressure substantially higher than the internal pressure in the tube, and means surrounding said tube within said last named chamber for applying localized heat to said tube to produce localized plasticity thereof in the presence of said inert gas, whereby the external pressure on the tube forces the plastic glass in a direction to seal the bore of the tube.

4. In apparatus of the class described for pressurizing a column of liquid within a sealed tube, means for supporting said tube at a point intermediate its ends, means defining a chamber exposed to a source of gas under pressure into which a sealed end of said tube extends, means for breaking the sealed end of said tube within said chamber to expose said column of liquid to said pressure, means defining a second chamber intermediate the point of support of said tube and the opposite end thereof for subjecting the exterior of said sealed tube to an atmosphere of inert gas, said support means defining a seal between said chambers for preventing movement of gas from either of said chambers to the other and means surrounding said sealed tube within said last named chamber for heating an area of said tube to a plastic condition in the presence of said inert gas, whereby the external pressure forces the plastic glass inwardly to reseal the tube at a location above the said liquid column.

5. In apparatus of the class described for pressurizing a column of liquid within a sealed tube, means for supporting said tube at a point intermediate its ends, means defining a chamber exposed to a source of gas under pressure into which a sealed end of said tube extends, means for breaking the sealed end of said tube within said chamber to expose said column of liquid to said pressure, means defining a second chamber intermediate the point of support of said tube and the opposite end thereof for subjecting the exterior of said sealed tube to an atmosphere of inert gas, means surrounding said sealed tube to an atmosphere of inert gas, means surrounding said sealed tube within said last named chamber for heating a localized area of said tube to a plastic condition in the presence of said inert gas for resealing and severing said tube within the column therein subject to gaseous pressure, and a chamber interposed between both of said chambers for providing circulation of a coolant for localizing the heating of said tube.

6. In apparatus of the class described for pressurizing a column of liquid within a sealed tube, means for supporting said tube at a point intermediate its ends, means defining a chamber exposed to a source of gas under pressure into which a sealed end of said tube extends, means for breaking the sealed end of said tube within said chamber to expose said column of liquid to said pressure, means defining a second chamber intermediate the point of support of said tube and the opposite end thereof for subjecting the exterior of said sealed tube to an atmosphere of inert gas, said support means defining a seal between said chambers for preventing movement of gas from either of said chambers to the other, means surrounding said sealed tube within said last named chamber for localized heating of said tube to a plastic condition in the presence of said inert gas for resealing said tube while the liquid column therein is subjected to gaseous pressure, and a chamber interposed between both of said chambers for providing circulation of a coolant.

7. An apparatus for pressurizing and resealing a thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermometer tube extending through said passages, the upper chamber enclosing a sealed end portion of the tube and the lower chamber enclosing the portion of the tube containing the liquid column and a portion contiguous thereto and intermediate the said liquid column and the sealed end of the tube, compressible means interposed between said chambers for sealing said connecting passages and for supporting said tube, means for delivering gas under pressure into said upper chamber, means for delivering gas into said lower chamber at a higher pressure than that maintained in the upper chamber, means for rupturing the sealed end of the tube, and means located within the lower chamber for plasticizing a portion of said contiguous portion of said tube, whereby the gaseous pressure in said lower chamber compresses the plasticized portion of the tube to seal the same.

8. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermometer tube extending through said passages, the upper chamber enclosing a sealed end portion of the tube and the lower chamber enclosing the portion of the tube containing the liquid column and a portion contiguous thereto and intermediate the said liquid column and the

sealed end of the tube, compressible means interposed between said chambers for sealing said connecting passages and for supporting said tube, means for delivering gas under pressure into said upper chamber, means for delivering an inert gas into said lower chamber at a higher pressure than that maintained in the upper chamber, means for rupturing the sealed end of the tube, and means located within the lower chamber for heating a portion of said contiguous portion of said tube to a plastic condition, whereby the gaseous pressure in said lower chamber compresses the plasticized portion of the tube to seal the same.

9. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermometer tube extending through said passages, the upper chamber enclosing a sealed end of the tube and the lower chamber enclosing the portion of the tube containing the liquid column and a portion contiguous thereto and intermediate the liquid column and the sealed end of the tube, compressible means interposed between said chambers for sealing said connecting passages and for supporting said tube, means for delivering gas under pressure into said upper chamber, means for delivering an inert gas into said lower chamber at a higher pressure than that maintained in the upper chamber, means for rupturing the sealed end of the tube comprising a manually actuated spring pressed plunger extending into said chamber at one side thereof, and means located within the lower chamber for heating a portion of said contiguous portion of said tube to a plastic condition, whereby the gaseous pressure in said lower chamber compresses the pressurized portion of the tube to seal the same.

10. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermometer tube extending through said passages, the upper chamber enclosing a sealed end of the tube and the lower chamber enclosing the portion of the tube containing the liquid column and a portion contiguous thereto and intermediate the liquid column and the sealed end of the tube, compressible means interposed between said chambers for sealing said connecting passages and for supporting said tube, clamping means for maintaining the upper chamber in position and for exerting compressive force on said compressible means, means for delivering gas under pressure into said upper chamber, means for delivering an inert gas into said lower chamber at a higher pressure than that maintained in the upper chamber, means for rupturing the sealed end of the tube comprising a manually actuated spring pressed plunger extending into said chamber at one side thereof, and means located within the lower chamber for heating a portion of said contiguous portion of said tube to a plastic condition, whereby the gaseous pressure in said lower chamber compresses the pressurized portion of the tube to seal the same.

11. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermometer tube extending through said passages, the upper chamber enclosing a sealed end of the tube and the lower chamber enclosing the portion of the tube containing the liquid column and a portion contiguous thereto and intermediate the liquid column and the sealed end of the tube, compressible means interposed between said chambers for sealing said connecting passages and for supporting said tube, clamping means for maintaining the upper chamber in position and for exerting compressive force on said compressible means comprising a pivoted yoke movable into and out of position above the upper chamber housing and a screw carried by the yoke for exerting downward pressure on the top portion of said upper chamber housing, means for delivering gas under pressure into said upper chamber, means for delivering an inert gas into said lower chamber at a higher pressure than that maintained in the upper chamber, means for rupturing the sealed end of the tube comprising a manually actuated spring pressed plunger extending into said chamber at one side thereof, and means located within the lower chamber for heating a portion of said contiguous portion of said tube to a plastic condition, whereby the gaseous pressure in said lower chamber compresses the pressurized portion of the tube to seal the same.

12. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermostat tube extending through said passages, the upper chamber enclosing a sealed end portion of the tube and the lower chamber comprising separable housing sections which together enclose the portion of the tube containing the liquid column and a portion contiguous thereto intermediate said liquid column and the sealed end of the tube, means for clamping the separable housing sections together comprising a pivoted yoke and a thrust screw carried thereby for releasably clamping the separable sections of the lower chamber housing together, means for delivering gas under pressure into said upper chamber, means for delivering an inert gas into said lower chamber at a pressure higher than that maintained in the upper chamber, manually operable means for rupturing the sealed end of the tube, and means located within the lower chamber for heating a portion of said contiguous portion of said tube to a plastic condition, whereby the gaseous pressure in said lower chamber compresses the plastic portion of the tube to seal the central bore therein.

13. An apparatus for pressurizing and resealing a glass thermometer tube containing a liquid column therein, comprising housing means defining upper and lower chambers having connecting passages and together enclosing a sealed thermostat tube extending through said passages, the upper chamber enclosing a sealed end portion of the tube and the lower chamber comprising separable housing sections which together enclose the portion of the tube containing the liquid column and a portion contiguous thereto intermediate said liquid column and the sealed end of the tube, means for clamping the separable housing sections together, a swingable support for adjustably positioning the tube in position preliminary to the application of the removable section of the lower chamber housing so that the

lower end of the tube is supported in spaced relation to the bottom of said removable housing section, means for delivering gas under pressure into said upper chamber, means for delivering gas into said lower chamber at a pressure higher than that maintained in the upper chamber, means for rupturing the sealed end of said tube, an electrical heating means located within the lower chamber for heating a portion of said contiguous portion of the tube to a plastic condition, whereby downward movement of the lower portion of the tube, by action of gravity, stretches the plastic portion of the tube and the external gaseous pressure against said plastic portion causes a necking in of the tube to seal the central bore thereof.

WILLIAM M. SMITH.
DON A. BROSSEAU.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,215,100	Gustin	Sept. 17, 1940
2,278,500	Smith	Apr. 7, 1942
2,361,413	Pujol y Font	Oct. 31, 1944
2,381,764	McFarland, Jr.	Aug. 7, 1945

FOREIGN PATENTS

Number	Country	Date
507,307	France	June 18, 1920