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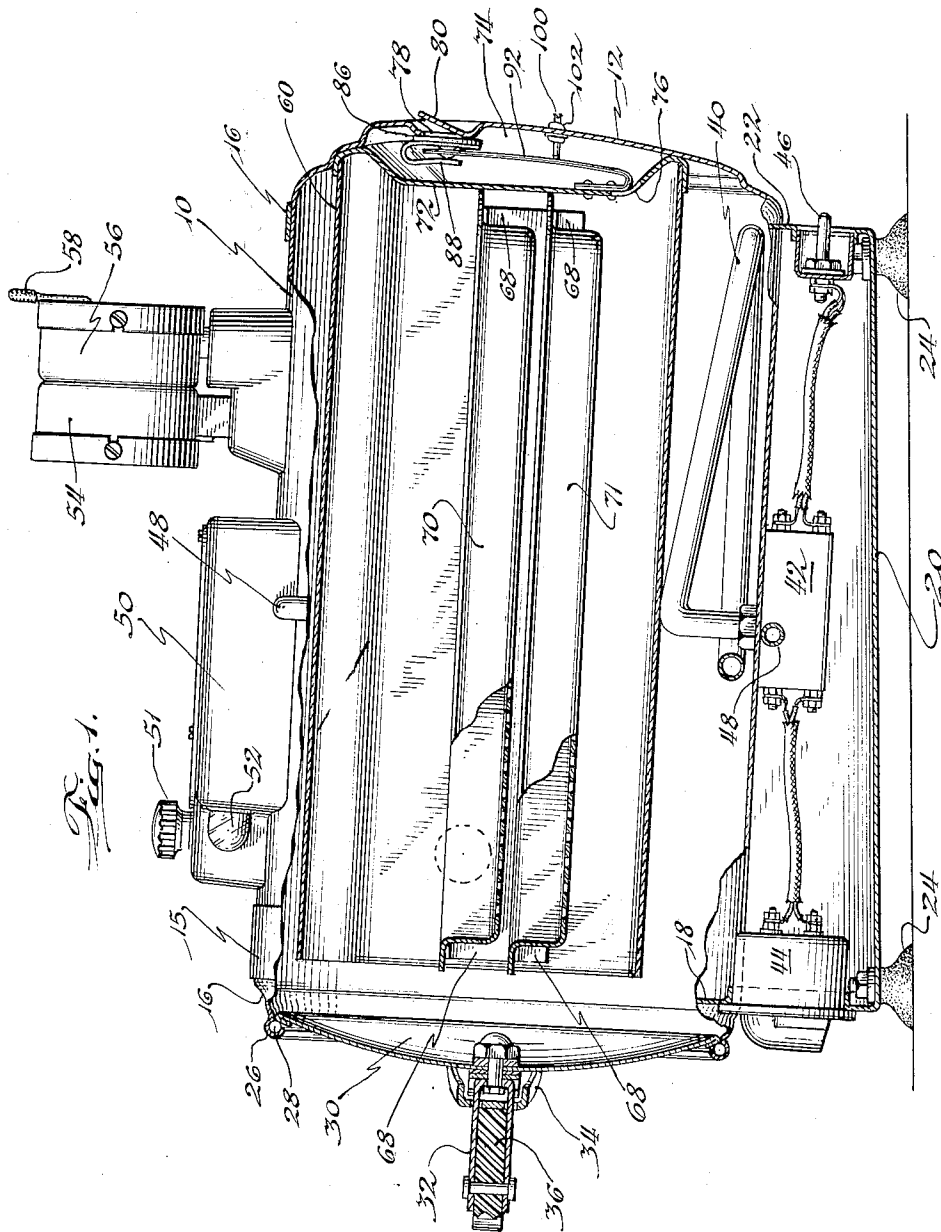
A. VISCHER, JR

2,715,251

AUTOCLAVE

Filed Aug. 31, 1951

3 Sheets-Sheet 1



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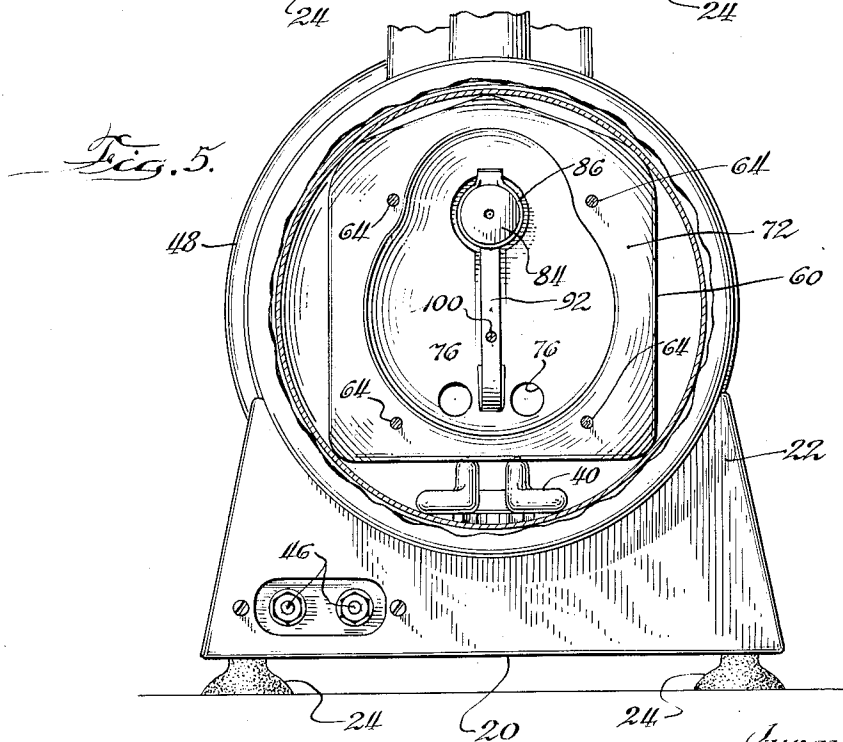
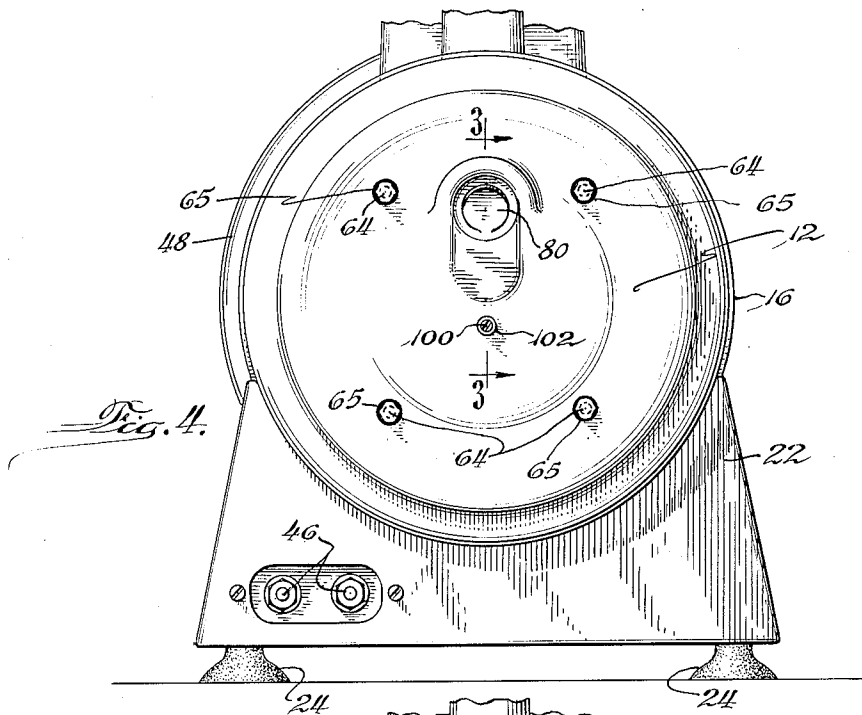
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AUTOCLAVE

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Application August 31, 1951, Serial No. 244,629

7 Claims. (Cl. 21—98)

My invention relates generally to autoclaves, and more particularly to autoclaves used as sterilizers in doctors' and dentists' offices, and hospitals.

It is an object of the invention to provide an improved autoclave having automatic means for releasing air upon heating the autoclave, so that the temperature therein during the sterilizing operation will be maintained at the desired sterilizing temperature, usually 250° to 260° F.

A further object is to provide an improved autoclave which is simple in construction, may be economically manufactured, and which will have a long, useful life.

Other objects will become apparent from the following description, reference being had to the accompanying drawings, in which

Fig. 1 is a fragmentary longitudinal sectional view of the sterilizer;

Fig. 2 is a front elevational view thereof, with the door open and portions of the front shown in fragmentary section;

Fig. 3 is a vertical section, taken on the line 3—3 of Fig. 4, shown to an enlarged scale;

Fig. 4 is a rear elevational view; and

Fig. 5 is a fragmentary sectional view, with a portion of the rear wall removed.

The sterilizer comprises a cylindrical shell 10 which is formed integrally with a dished rear wall 12 and supported by a pair of bands 15 and 16 which are suitably secured to a hollow base comprising a front 18, side walls 19, a bottom 20, and a rear wall 22. The base has four rubber suction cups 24 bolted thereto, forming feet which will hold the sterilizer stationary when placed on any smooth surface.

The front end of the shell 10 is provided with an open wire bead 26 in which is located a torroidal-shaped sealing gasket 28. A flexible sheet steel cover or door 30 is supported by a U-shaped bracket 32 carried by a cross piece 34. The cover is drawn into position in which it is shown in Fig. 1, by a cam 36 pivotally connected to the bracket 32. The cross piece 34 is carried by the band 15, being connected thereto by a double hinge 38. The details of construction of the cover and the mechanism by which it is operated are more fully disclosed and claimed in my prior Patents Nos. 2,538,661 and 2,548,691.

It will be noted that the base is formed in such manner that the cylindrical seal 10 is inclined rearwardly, so that an electrical immersion heating element 40 will be immersed in the water placed within the shell. This heating element is connected to a conventional thermostatic overheat safety switch mounted in a conduit box 42 and secured in heat conducting relationship with the shell 10. A time switch 44 is also connected to the conduit box 42 and current is supplied to the overheat switch and timing switch, which are connected in series with the immersion heating unit 40 through plug terminals 46. The conduit box 42 is connected by a wire conduit 48 to a pressure regulator and indicator box 50 which has a pair of indicator lamps 52 and 53 (which may be white and red

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respectively) to indicate when the current is being supplied to the heating unit 40 and when the current is cut off by a pressure operated switch (pressurestat) contained within the housing 50. The switch and the indicator circuits may be of the type shown in my copending application Serial No. 100,346, filed June 21, 1949, now Patent No. 2,691,090.

The sterilizer is provided with a pressure gauge 54 and a housing 56 for a gravity operated safety valve, which may be raised from its seat by operation of a lever 58.

A liner 60 is secured to the rear wall 12 of the shell 10 by four cap screws 64, these screws being provided with suitable gaskets 65. The liner 60 is provided with pairs of rails 68 for reception of trays 70 and 71, the trays preferably having their bottoms perforated as indicated in Fig. 1. The liner 60 includes an indented inwardly dished end wall 72 which, together with the rear wall 12 of the shell 10, forms a valve chamber 74. The wall 72 is provided with a plurality of openings 76 at its bottom.

The rear wall 12 has an air vent opening 78 which is formed by partially punching a baffle 80 from the rear wall, the baffle being bent backwardly so as to direct any escaping air or steam upwardly. The wall 12 around the opening 78 is indented to form a valve seat 82 (Fig. 3) for a valve disc 84 which is cemented in a flanged metallic holder 86 which has a spring clip-like extension 88 and a central conical nib 90. This nib 90 sockets in a complementary indentation made at the upper end of a thermostatic bimetal strip 92. It will be noted that the end of the clip 88 engages the upper end of the strip 92 at a point opposite to that at which the nib 90 engages the socket-like indentation. The valve disc 84 is therefore normally free to pivot universally in the socket formed by the indentation by the upper end of the strip 92, so that it may align itself with the valve seat 98 to assure a steam-tight closure.

The bimetal strip 92 is riveted to the back 72 of the liner and the temperature at which it will operate to close the valve is adjusted by means of a screw 100 threaded into an elastic stop nut 102, the stop nut being suitably swaged so as to form an air and steamtight seal in the rear wall 12.

In assembling the valve disc and its supporting backing plate 86 and clip 88 on the end of the bimetal strip 92, a drop or two of shellac is placed so that it will congeal around the universal joint at nib 90 and between the back surface of the backing plate 86 and the bimetal strip 92. The shellac used is one which has a melting point of approximately 190° F. Any other suitable resin or similar material having a high melting point in this order, and also having adhesive properties, may be used. The reason for thus fixing the position of the valve disc 86 relative to the bimetal strip 92, will be explained hereinafter in connection with the description of the operation of the sterilizer.

In using the sterilizer, approximately three cups of water (preferably using distilled water) are placed in the shell 10 so as to immerse the heater 40. After inserting the instruments, etc., to be sterilized, the door 30 is closed and locked in place. The gravity operated safety valve is rendered operative by lowering the handle 58, and assuming that the sterilizer has been connected to a suitable current supply, the timer 44 is operated to set the time switch for from 15 to 30 minutes, whereupon current will be supplied to the immersion heater 40 and the red pilot lamp 53 will light up to show that the immersion heater is being energized. Steam will shortly commence to form in the autoclave and will expel all of the air, the air passing through the holes 76 and the valve opening 78 since the thermostat is adjusted to hold the valve open until a temperature of approximately 2½° lower than the boiling point of water at

the normal barometric pressure at the place in which the sterilizer is being used.

The reason that the thermostat 92 is not adjusted to close the valve exactly at the boiling point of water is that there is a slight temperature gradient between the interior of the liner 72 and the rear wall 12 of the shell 10, making the temperature in the valve chamber 74 about $2\frac{1}{2}^{\circ}$ lower than that within the liner 72. The thermostatic strip 92 is of sufficient strength that it is not appreciably affected by the air flow past the valve or the slight differences in pressure on the opposite sides thereof, so that the closing movement of the valve is controlled nearly exclusively by the temperature change in the bimetal strip 92. The openings 76 are near the bottom of the liner 60 so that the heavier air will be forced from the liner before it is completely filled with steam.

When the temperature in the valve chamber 74 exceeds that of the melting point of the shellac by which the valve disc holder 86 is bonded to the bimetal strip 92, the shellac will melt so that the valve 84 will be free, upon subsequent engagement with the seat 82, to align itself therewith, and thus provide complete sealing contact. After practically all of the air has been exhausted and steam commences flowing into the valve chamber 74, the temperature will rise sufficiently to cause the bimetal strip to force the valve disc 84 against its seat.

Thereafter the pressure within the shell 10 will rise to the extent permitted by the adjustment of the temperature controlling pressurestat contained within the box 50, such adjustment being effected by rotating the knob 51. As soon as the desired temperature and pressure are attained, the timing switch is reset for the correct sterilizing period. During the sterilizing period the pilot lamps 52 and 53 will glow alternately, indicating that the sterilizer is operating properly to maintain the desired operating pressure within the shell. After the timer switch has returned to zero, a bell forming part thereof will ring and the sterilizer may commence cooling. Since it takes approximately four minutes for the sterilizer to cool sufficiently that the steam therewithin will be at atmospheric pressure, the steam may be released by slightly opening the gravity operated safety valve by raising the handle 58. After the pressure has dropped to zero as noted by the gauge 54, the door 30 may be swung open. Whenever the pressure in the autoclave is above atmospheric, the door will be held closed by being forced against the sealing member 28.

The shell 10, liner 68, trays 70 and 71, and the base 18, are preferably made of stainless steel, and the sterilizer will thus have a long useful life.

When it is known that the sterilizer is to be used at a place of a known altitude, adjustment of the bimetal valve operator 92 may be made by means of the adjusting screw 100 at the factory, but if it is not adjusted correctly for the altitude of the place where it is used, this adjustment may readily be made by the user. If the adjustment is substantial, there might be a slight change in the angle the valve disc 84 has as it approaches the seat 82, but by virtue of the presence of the shellac around the nib 90 and around the limited angle universal connection between the spring clip 88 and the projections and indentations at the upper end of the bimetallic strip 92, the valve disc 84 and its flanged holder 86 will automatically adjust themselves to bring the face of the valve disc 84 in the plane of the valve seat 82 the first time the sterilizer is used. The spring clip 88 provides sufficient friction to hold the valve in its adjusted position until, upon lowering of the temperature in the valve chamber 74, the resin or shellac around the socket connection for the valve again congeals. Thereafter the valve will be in the proper position relative to the bimetallic strip 92 fully to engage its seat upon subsequent use of the sterilizer. The valve will similarly adjust itself to the seat if, due to rough handling in shipment, the shellac bond be-

comes broken and the valve displaced from its correct position.

The sterilizer may be used to sterilize instruments placed in the removable trays 70, the instruments preferably being wrapped or covered with a towel of cotton or tissue. Cotton materials, such as surgical sponges, rolls, gauze, and the like, should be placed in a muslin compress or paper tissue.

The temperature (and pressure) at which the sterilizer is to operate may readily be adjusted by the knob 51 which sets the control pressurestat within the housing 50, so that it may be used at the most desirable temperature and length of sterilization period for the particular objects of materials being sterilized.

While I have shown and described a preferred embodiment of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. In a sterilizer comprising a container having means for supplying heat thereto to cause the formation of steam under pressure, the combination of means forming a valve chamber communicating with the interior of the container and having a valve opening to the atmosphere, a thermostatic bimetal strip, a valve in a valve disc holder for closing the valve opening, means for mounting one end of said bimetal strip in said chamber so that deflection of said strip causes movement of said valve to and from said valve opening, means for securing the valve disc holder to the bimetal strip providing for limited universal movement of the valve disc relative to the strip, and means for preventing such universal movement comprising a resin having adhesive qualities and having a melting point of approximately 190° F. adhering to both the bimetal strip and the valve disc holder.

2. In a sterilizer comprising an apertured container, means to permit escape of air through the aperture in the container but to prevent the escape of steam therefrom comprising, a valve chamber communicating with the interior of the container by means of air escape openings near its lower end, a relatively soft valve disc cooperable with a valve seat formed around the aperture in the container, a thermostatic bimetal strip, means for mounting one end of said bimetal strip in said chamber so that deflection of said strip causes movement of said valve to and from said valve opening, means connecting the valve disc to the bimetal strip in a manner to permit limited universal movement of the valve relative to the strip, and adhesive means having a melting point in the order of 190° F. around the connecting means to provide a bond between the valve disc and the strip and thereby prevent such limited universal movement of the valve disc whenever the temperature of the strip is less than said melting point.

3. An autoclave for sterilizing surgical instruments and the like comprising, a generally cylindrical shell having a rear end wall, a door for sealing the front end of the cylinder, means supporting the cylinder in an inclined position with the closed end lowermost when placed on a level surface, an electrical immersion heater located within the rearward part of the cylinder at its bottom, a closed end liner secured to the shell with its closed end spaced from the end wall of the shell to form a valve chamber, the end of the liner having openings near the bottom for the flow of air and steam from the liner into the valve chamber, means forming a valve seat around an opening in the rear end wall of the shell, a thermostatic bimetal element secured by one end within the valve chamber, and a valve carried by the thermostatic element and cooperable with the valve seat, said valve being operable

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to prevent the escape of air and steam from the valve chamber as the temperature within the valve chamber rises to within a few degrees (Fahrenheit) of the boiling point of water.

4. A portable autoclave for the sterilization of surgical instruments comprising, a cylindrical shell having a rear end wall, a removable closure for sealing the front end of the shell, means for supporting the shell in a rearwardly and downwardly inclined position when the autoclave is placed on a level surface, a partition within the shell adjacent the end wall of the shell and forming therewith a valve chamber, said partition having air escape openings near its lower end, means forming a valve seat around an opening in the end wall of the shell, a thermostatic bimetal strip mounted by one end thereof within the valve chamber, a thermostatic bimetal operated valve attached to said bimetal strip and cooperable with the valve seat to cut off the escape of air from the shell when the temperature within the valve chamber rises to a value closely approaching the boiling point of water, and an electrical immersion heater in the bottom of the shell.

5. An autoclave for sterilizing surgical instruments and the like comprising, a generally cylindrical shell having a rear end wall, a door for sealing the front end of the shell, means supporting the cylinder in an inclined position with the closed end lowermost when placed on a level surface, an electrical immersion heater located within the rearward part of the cylinder near its bottom, a closed end liner secured to the shell with its closed end spaced from the end wall of the shell to form a valve chamber, the end of the liner having openings for the flow of air and steam from the liner into the valve chamber, means forming a valve seat around an opening in the rear end wall of the shell, a thermostatic bimetal element secured within the valve chamber, a valve mounted for limited universal movement on the thermostatic element and cooperable with the valve seat, said valve being operable to prevent the escape of air and steam from the valve chamber as the temperature within the valve chamber rises to within a few degrees (Fahrenheit) of the boiling point of water, and a small amount of an adhesive, high melting resin having a melting point of less than 200° F. between a part of the valve and the thermostatic element to prevent relative movement of the valve and element when these parts are relatively cool and to permit the automatic adjustment of the relative positions of these parts when heated above the melting point of the resin.

6. An autoclave for the sterilization of surgical instruments comprising, a shell having a rear end wall with an

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air escape opening therein, a removable closure for sealing the front end of the shell, means for supporting the shell, a liner within the shell having a wall adjacent the end wall of the shell and forming therewith a valve chamber, said liner wall having air escape openings near its bottom, means forming a valve seat around the opening in the end wall of the shell, a thermostatic bimetal strip attached by one end thereof to a wall of the chamber, a thermostatic bimetal operated valve within the valve chamber attached to the bimetal strip such that deflection of the strip causes movement of the valve to and from the valve opening co-operable with the valve seat to cut off the escape of air from the shell when the temperature within the valve chamber rises to a value closely approaching the boiling point of water, and an electrical immersion heater in the bottom of the shell.

7. A portable autoclave for sterilizing surgical instruments and the like comprising, a shell having a rear end wall provided with an air escape opening, a door for sealing the front end of the shell, means supporting the shell in an inclined position with the closed end lowermost when the autoclave is placed on a level surface, an electrical immersion heater located within the rearward part of the shell at its bottom, a closed end liner secured to the shell with its closed end spaced from the end wall of the shell to form a valve chamber, the end of the liner having openings near the bottom for the flow of air and steam from the liner into the valve chamber, means forming a valve seat around the opening in the rear end wall of the shell, a thermostatic bimetal element secure by one end within the valve chamber to a wall of said chamber in such a position that deflection of the strip causes movement of the valve to and from the valve opening, and a valve carried by the thermostatic element and cooperable with the valve seat, said valve being operable to prevent the escape of air and steam from the valve chamber as the temperature within the valve chamber rises nearly to the boiling point of water.

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