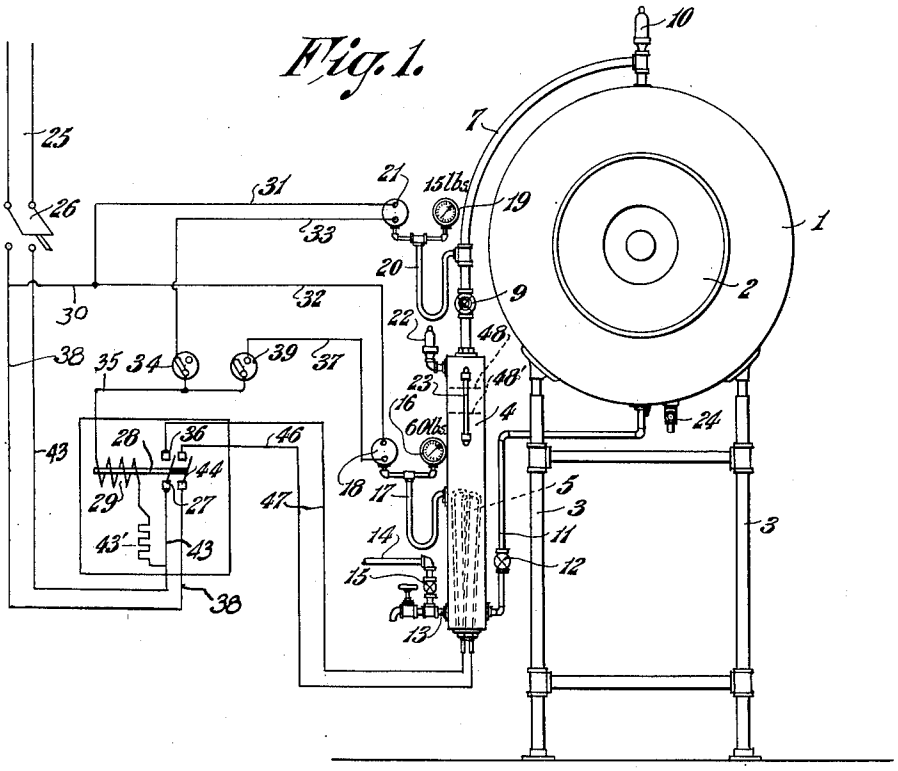
May 29, 1934. H. BIDWELL 1,960,890

METHOD OF AND APPARATUS FOR HEATING AUTOCLAVES OR STEAM PRESSURE STERILIZERS

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Fig. 1.



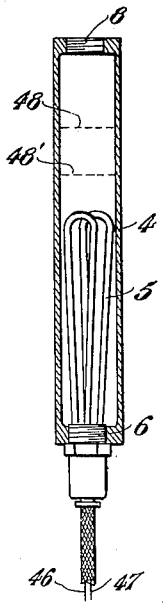


Fig. 2.

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METHOD OF AND APPARATUS FOR HEATING AUTOCLAVES OR STEAM PRESSURE STERILIZERS

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11 Claims. (Cl. 167—3)

This invention relates to improvements in the method of and apparatus for heating autoclaves or steam pressure sterilizers.

An object of the invention is to provide an apparatus for quickly heating or bringing an autoclave up to the required sterilizing temperature or pressure. Heretofore, so far as I am aware, it has been the practice to provide a steam generating unit which operates at the same pressure as on the autoclave, thus causing a substantial delay in building up the required steam pressure, or else requiring a large steam boiler which is necessarily slow in heating the autoclave to the required temperature. The large size boiler, therefore, has been found to be objectionable by reason of the fact that considerable amount of time and fuel, as gas, is required to bring the steam pressure up to the required temperature before it is introduced into the autoclave for sterilization purposes.

Broadly, my invention comprises, in combination with an autoclave, a steam generating boiler of small capacity having an electric heating, or other heating unit, inserted or installed therein. The unit in the boiler is equipped with two separate or independent circuit closing devices which operate at different pressures and temperatures, one being adjusted for a higher pressure than the other.

Each of the circuit closing devices are included in a circuit which automatically opens the electric circuit that supplies current to the electric heating unit of the boiler when the desired high or low temperature and pressure of steam in the small boiler and autoclave is reached, as will be fully described.

Briefly and specifically stated, my improvement comprises the following:

First, a small cylindrically shaped steam boiler of such shape and dimensions that the diameter is only sufficiently large in order to allow, in a practical manner, the insertion of a standard or other water immersion electric heating element (the size or heat generating capacity of the heating element, as well as the boiler, being determined by the steaming requirements that are placed on the boiler), and, to be of only sufficient length or height as to allow, with a reasonable steam space, only sufficient water capacity between allowable high water level and allowable low water level, such volume of water as that required with reasonable margin for safety to fill the autoclave, oven, or other pressure vessel used in conjunction with steam of the required pressure or temperature for sterilizing purposes.

Second, employing dual control, automatic or manual, whereby a higher pressure may be carried, maintained or built up in the boiler than that at which the autoclave, or other vessel in question is being normally operated, in order that when the autoclave is closed, and with the charge therein to be sterilized and ready for the admission of steam, the required pressure and temperature on the autoclave or vessel may be available in the minimum space of time, due to the heat energy contained in the water in the small boiler under a higher pressure than that required in the autoclave and with such pressures and manipulation that when the pressure of the boiler and autoclave are equalized, the pressure required on the autoclave or vessel is available, without delay.

Referring to the drawing:

Fig. 1 illustrates an autoclave with the small steam electric boiler and electrical connections to the source of electrical energy, and

Fig. 2 is an enlarged sectional detail view of the small boiler showing the electric heating unit therein.

Referring to the drawing in detail:

1 designates the autoclave or steam pressure sterilizing receptacle of usual construction having a suitable steam tight closure, or door member 2. While an autoclave is shown in the drawing, it is to be understood that the invention is also adapted to be used with retorts that are not autoclaves, and I intend to include such other similar devices where I employ the word autoclave and the context indicates that such other devices can be substituted therefor in the operation of the invention. 3 designates, as a whole, the supporting standard of tubular or pipe construction. 4 designates the small steam boiler on an enlarged sectional view, as shown in Fig. 2 with the electric heating coil or unit 5 therein which closely fits the interior diameter of the boiler. This unit is secured in place by means of the threaded opening 6 at its lower end, as shown. 7 indicates a steam pipe which is connected to the upper end of the small boiler 4 by means of the threaded opening 8, and 9 is a shut-off valve in the pipe 7. The other or upper end of the steam pipe 7 is connected to and has communication with the upper portion of the autoclave 1, as shown. 10 indicates a safety valve which protects the autoclave, 11 a return pipe which connects the lower portion of the autoclave and the lower end of the small boiler 4 and 12 is a shut-off valve in the return pipe. 13 is a draw-off pipe, 14 a water supply pipe for the boiler with the shut-off valve 15.

A steam pressure gage 16 is connected to the boiler 4 by means of the usual U-shaped pipe 17 and a pressure control electrically operated contact is shown at 18. 19 is a second steam pressure gage which is attached to the pipe 7 by means of the U-shaped pipe 20, and 21 is a second pressure control electrical contact. 22 is a steam safety valve which is attached at the upper end of the small boiler 4. 23 designates a glass water gage. A draw-off for the autoclave is indicated at 24.

The source of electrical energy is indicated by the wires 25 and a main switch 26 is shown in these wires. An electromagnetically operated switch is indicated, as a whole, by the reference numeral 27 with the movable contact member 28 which is actuated by the coil 29. A conductor 30, which is connected to one of the line wires, has two branches 31 and 32. The branch 31 is connected to one terminal of the low pressure automatic control switch 21. The other branch conductor 32 is connected to one terminal of the high pressure automatic control switch 18. The remaining terminal of the low pressure automatic control switch 21 is connected by a conductor 33 to one terminal of a manual switch 34, the other terminal of which is connected by a conductor 35 to one terminal of the coil 29. The other terminal of the high pressure automatic control switch 18 is connected by a conductor 37 to one terminal of a manual switch 39. The other terminal of the manual switch 39 is connected to the conductor 35. One of the line conductors is designated by the reference numeral 38 and it is to this conductor that the conductor 30 is connected. The other line conductor is designated by the reference numeral 43. The conductors 38 and 43 are connected to the lower or line side of the switch 27. The conductor 43 is also connected through a resistance 43' to one terminal of the coil 29. The upper or load side of the switch 27 is connected by means of conductors 46 and 47 to the heating unit 5.

The operation may be described as follows: it being understood that only a sufficient quantity of water is placed in the small boiler 4, whereby a fluctuating water level is sufficient to provide a volume of steam that will fill the autoclave at a definite temperature and pressure for sterilization purposes, when the valve 9 in the pipe 7 is opened. In other words, the specific volume of steam at a definite pressure and temperature in the autoclave is determined by the quantity of water in the small boiler 4 when it is at a definite pressure and temperature, before the valve 9 is opened, whereby the small volume of water, or some of it in the boiler 4 is immediately converted into steam, when the valve 9 is opened in order to produce the required temperature and pressure in the autoclave for sterilization purposes.

Assume that the water in the small boiler 4 at starting is at the dotted line level, indicated at 48. The main switch 26 and the electromagnetic switch 27 are closed and an electric current is flowing to the heating unit 4 by means of the wires 43, 47, 46, 35 and 38. The steam generated will rise in pressure until the gage 16 indicates, say 60 lbs., at which pressure the pressure control contacts 18 would open if set for this pressure. The manual switch 39 is understood as being closed. As soon as the contact at 18 opens, a current ceases to flow through the coil 29, which opens the electromagnetic switch 27 and cuts off the current to the heating unit 5. The current through the coil 29 is as follows: wire 43, resistance coil 43', coil 29, wires 30, 32, control switch 18, and wire 37, manual switch 39, wire 38, to the other pole of the main circuit. The current in this circuit operates the part 28 and opens the circuit in the wires 46 and 47 to the heating unit 5. The operator now opens the valve 9 and allows steam at 60 pounds to enter the autoclave 1. By reason of a sudden release of the pressure, a sufficient quantity of water in the boiler 4 is converted into steam and passes into the autoclave at 15 lbs., or the desired sterilizing pressure, which is the usual sterilizing pressure. The low water level is now indicated at 48'. In order to indicate the sterilizing temperature at 15 lbs. pressure, the second steam gage 19 is employed. The low pressure control contact 21 will open at 15 lbs., or at the desired pressure. The manual switch 39 is now opened and manual switch 34 closed causing the switch 27 to supply current again to the heating unit 5. When the pressure reaches 15 lbs., the coil 29 again operates to open the electromagnetic switch 27. The circuit is now as follows: wire 43, resistance 43', coil 29, wires 31, 31, control contact 21, wire 33, manual control 34 and wire 38 to the other main wire.

By means of this apparatus, which employs a double pressure control, the apparatus is thus rendered practically continuous in its operation. The valve 12 is left closed, until the pressures in the autoclave and boiler are equalized, as indicated by the two pressure gages, 16 and 19, when this valve is opened to allow the water in the autoclave to drain back into the boiler. During the sterilizing process, the pressure applied to the autoclave is automatically under the control of the pressure control 21.

What I claim is:

1. The method of operating an autoclave or similar device which comprises heating a substantial amount of vaporizable liquid in a boiler to a temperature and pressure higher than the normal operating values in the autoclave and thereafter permitting the vapor to pass from the boiler to the autoclave whereby the pressures therebetween are equalized and the available heat resulting from the lowered pressure and temperature in the boiler is transferred in the latent heat of vaporization of the vapor to the autoclave and utilized for rapidly raising the temperature of the autoclave to its normal operating value.

2. The method of operating an autoclave or similar device which comprises heating a substantial amount of vaporizable liquid in a boiler to a temperature and pressure higher than the normal operating values in the autoclave, permitting the vapor to pass from the boiler to the autoclave whereby the pressures therebetween are equalized and the available heat resulting from the lowered pressure and temperature in the boiler is utilized for rapidly raising the temperature of the autoclave to its normal operating value and continuing to heat the liquid in the boiler to the temperature necessary to maintain the pressure and temperature in the altoclave at normal operating values.

3. The method of operating an autoclave or similar device which comprises heating a substantial amount of vaporizable liquid in a boiler to a predetermined temperature and pressure sufficiently higher than the normal operating values in the autoclave to give the requisite heat storage, automatically maintaining said predetermined temperature and pressure, and thereafter per-

mitting the vapor to pass from the boiler to the autoclave whereby the pressures therebetween are equalized and the available heat resulting from the lowered pressure and temperature in the boiler is transferred in the latent heat of vaporization of the vapor to the autoclave and utilized for rapidly raising the temperature of the autoclave to its normal operating value.

4. The method of operating an autoclave or similar device which comprises heating a substantial amount of vaporizable liquid in a boiler to a predetermined temperature and pressure sufficiently higher than the normal operating values in the autoclave to give the requisite heat storage, automatically maintaining said predetermined temperature and pressure, permitting the vapor to pass from the boiler to the autoclave whereby the pressures therebetween are equalized and the available heat resulting from the lowered pressure and temperature in the boiler is utilized for rapidly raising the temperature of the autoclave to its normal operating value, and continuing to heat the liquid in the boiler to the predetermined temperature necessary to maintain the pressure and temperature in the autoclave at normal operating values, and automatically maintaining said last named predetermined temperature during the operation of said autoclave at normal temperature and pressure.

5. In combination, an autoclave, a boiler positioned below the level of said autoclave and adapted to contain a substantial amount of vaporizable fluid, pipe connections between said autoclave and the upper part of said boiler, a valve in said pipe connections, and means for heating said fluid, while said valve is closed, to a temperature and pressure substantially above the normal operating temperature and pressure in the autoclave.

6. In combination, an autoclave, a boiler positioned below the level of said autoclave and adapted to contain a substantial amount of vaporizable fluid, pipe connections between said autoclave and the upper part of said boiler, a valve in said pipe connections, means for heating said fluid, while said valve is closed, to a temperature and pressure substantially above the normal operating temperature and pressure in the autoclave, and means for continuing to heat the fluid, after said valve is opened, to the temperature necessary to maintain the pressure and temperature in the autoclave at normal operating values.

7. In combination, an autoclave, a boiler positioned below the level of said autoclave and adapted to contain a substantial amount of vaporizable fluid, pipe connections between said autoclave and the upper part of said boiler, a valve in said pipe connections, and means for heating said fluid, while said valve is closed, to a predetermined temperature and pressure substantially above the normal operating temperature and pressure in the autoclave, and control means for said heating means for automatically maintaining said predetermined temperature and pressure.

8. In combination, an autoclave, a boiler adapted to contain a substantial amount of vaporizable fluid, pipe connections between said autoclave and said boiler, a valve in said pipe connections, means for heating said fluid, while said valve is closed, to a temperature and pressure substantially above the normal operating temperature and pressure in the autoclave, control means for said heating means for automatically maintaining said predetermined temperature and pressure, and means for continuing to heat the fluid, after said valve is opened, to the predetermined temperature necessary to maintain the pressure and temperature in the autoclave at normal operating values, and means for automatically maintaining said last named predetermined temperature during the operation of the autoclave.

9. In combination, an autoclave, a boiler positioned below the level of said autoclave, pipe connections between the upper part of said boiler and the upper part of said autoclave, other pipe connections between the lower part of said boiler and the lower part of said autoclave, a valve in each of said pipe connections, and heating means positioned within the lower portion of said boiler.

10. In combination, an autoclave, a boiler positioned below the level of said autoclave, pipe connections between the upper part of said boiler and the upper part of said autoclave, other pipe connections between the lower part of said boiler and the lower part of said autoclave, a valve in each of said pipe connections, heating means positioned within the lower portion of said boiler, a vaporizable fluid in said boiler, automatic control means for said heating means for maintaining a pressure and temperature in said boiler above the normal operating values of said autoclave when said valves are closed, and other automatic control means for said heating means for maintaining the pressure and temperature in said boiler at the normal operating values of said autoclave when said valves are open.

11. In combination, a sterilizing compartment, a chamber containing a vaporizable fluid positioned adjacent to said compartment, means for supplying heat at a moderate rate to said chamber and fluid, connections between said compartment and said chamber, and shut-off means in said connections whereby sufficient excess heat may be supplied to and stored in said fluid while said shut-off means are closed to raise the temperature of said compartment immediately to normal operating values when said shut-off means are opened.

HOWARD BIDWELL.