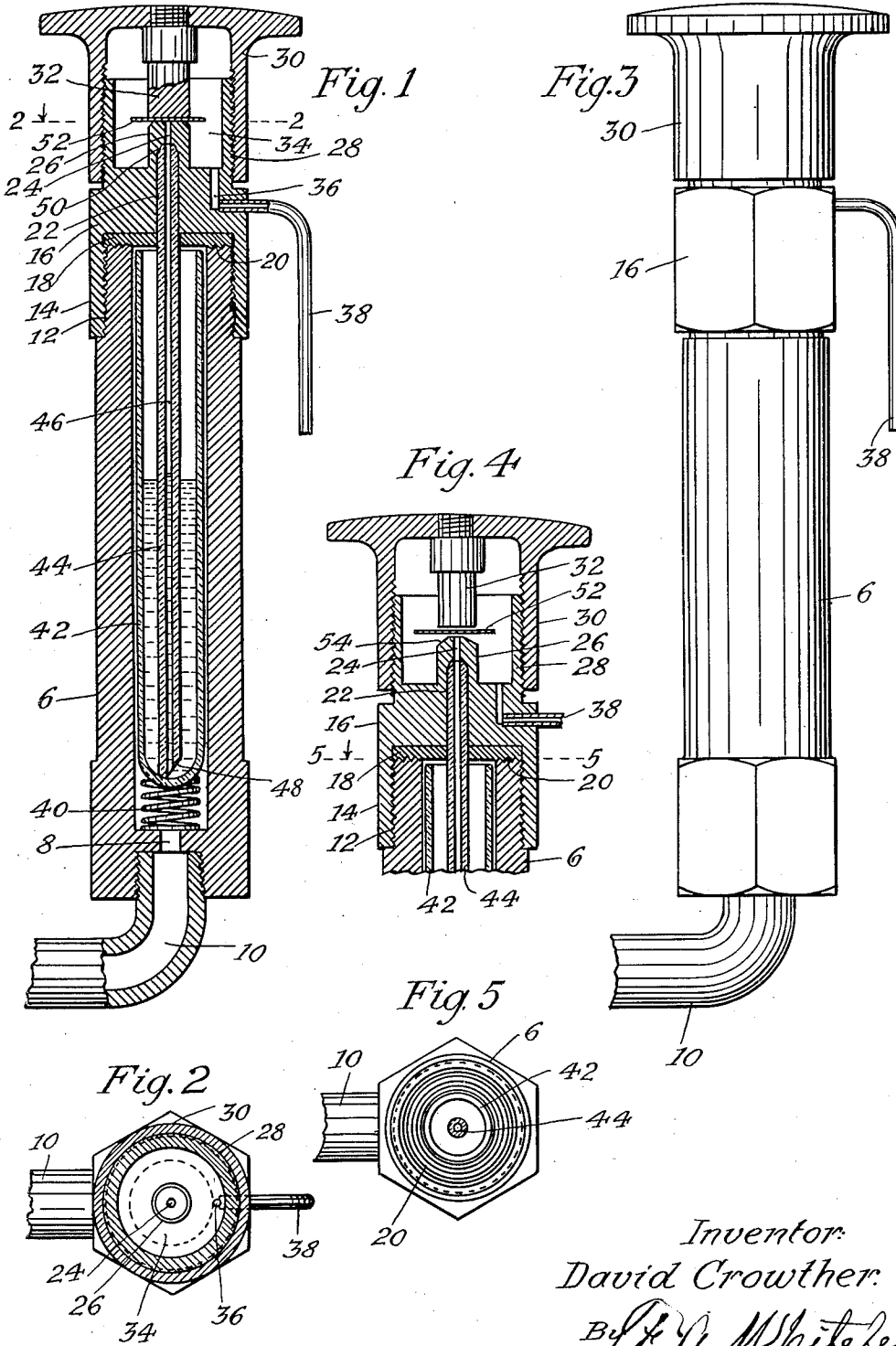


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D. CROWTHER
STERILIZING APPARATUS
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Inventor:
David Crowther.
By *J. A. Whiteley*
his Attorney.

UNITED STATES PATENT OFFICE

DAVID CROWTHER, OF MINNEAPOLIS, MINNESOTA

STERILIZING APPARATUS

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My invention relates to a sterilizing apparatus and is intended for carrying out the process disclosed in my co-pending application Serial Number 212,319, filed January 17, 1918. The object is to provide an apparatus by means of which a process of the nature disclosed therein may be performed with accuracy and without liability of contamination of the material which is being treated. I accomplish these objects by providing a cylinder strong enough to withstand the highest degree of internal pressure which it may be desirable to employ and by constructing of glass, porcelain, china or any other material not acted upon by the gas, that portion of the apparatus which is inside of the cylinder and which is in contact with the material being treated during the time it is maintained under the pressure of a gas to cause super-saturation of such material. Furthermore, these last-mentioned parts are readily removable from the cylinder in order that they may be thoroughly sterilized before each operation, in any desired manner, as by placing them in boiling water. The theory of my process of sterilizing is explained in my prior application above referred to and need not be explained at length in the present application. It is sufficient to state that the bacteria or other material to be treated is subjected to the pressure of a gas for a considerable period of time sufficient to cause super-saturation, and that this pressure is then suddenly released. It is therefore necessary to provide a cylinder which is sufficiently strong to withstand the pressure of the gas to which the material being treated is subjected and to provide means for suddenly releasing this pressure.

I accomplish the objects of my invention by the apparatus shown in the drawings, in which Fig. 1 is a view mostly in vertical central section; Fig. 2 is a view in horizontal section on the line 2—2 of Fig. 1; Fig. 3 is a view in side elevation; Fig. 4 is a sectional detail view of a slight modification; Fig. 5 is a view in section on the line 5—5 of Fig. 4.

A metallic cylinder 6 has an opening 8

in its bottom and a connection 10 through which gas such as carbon dioxide, for instance, is conveyed under pressure from a suitable container. The cylinder 6 is preferably lined with some material such as tin which will not be affected by the gas and at its top has screw threads 12 adapted to receive cooperating screw threads of a depending flange 14 of a plug member 16. The plug member has a bottom portion 18 of soft metal which may have concentric grooves and ridges to engage corresponding grooves and ridges on the top of the cylinder at 20. The plug has a bore 22 extending upwardly part way to the top thereof, and this bore connects with a smaller bore 24 extending through a projection 26 on the plug. The upper end of the plug is provided with a screw threaded flange 28 adapted to cooperate with screw threads on a cap 30. The cap has a downwardly-extending projection 32 adapted to fit closely upon the projection 26 and close the bore therethrough when the cap is screwed down. The flange 28 forms a chamber 34 upon the upper end of the plug and from the bottom of this receptacle there leads a downwardly and outwardly extending opening 36 to which is fitted an outwardly and downwardly extending tube 38. A spring 40 is placed on the bottom of the chamber formed in the cylinder 6, and upon this spring rests a glass tube 42 closed at its bottom for containing the bacteria or other material to be treated. Within the tube 42 is placed a smaller tube 44 having a bore 46 open at both ends. The lower end of the tube is beveled as shown at 48 in order to permit material to pass from the outer tube up through the bore of the smaller tube. The upper end of the tube 44 is coned as shown at 50 in order that it may fit the conical seat which joins the different sized bores 22 and 24 in the plug. The spring 40 and the length of the tube 44 are so proportioned that when the plug is screwed upon the top of the cylinder the coned end 50 of the tube will enter the bore 22 before the screw threads on the plug engage those on the cylinder, and hence the

outer tube 42 is held with its top slightly below the bottom 18 of the plug.

In order to make a more perfect joint between the projections 26 and 32 when the cap 30 is screwed down, I prefer to insert a piece of foil 52 of some soft metal between the projections. This foil also tends to direct downwardly the material when the latter is released by unscrewing the cap.

The construction shown in Fig. 4 is the same as that previously described excepting that the projection 26 is beveled at 54 in order that the material escaping between the surfaces of the projections may expand more quickly.

Bacteria or other material to be treated is placed in the tube 42 into which is also placed the tube 44. The plug 16 is screwed down to make a close joint at 20 and the cap 30 is screwed down to make a close joint between the projections 26 and 32. Gas under pressure is now admitted through the connection 10 into the interior of the cylinder 6 and rises outside of the tube 42 and passes down into the tube so that the material therein is subjected to the full pressure of the gas. This pressure is maintained for the desired length of time and then the cap 30 is unscrewed, suddenly releasing the pressure and forcing the material up the bore 46 of the tube 44 out into the gas expansion chamber 34 which is open to ordinary atmospheric pressure or which may be below atmospheric pressure. From this receptacle it runs out of the tube 38 and may be collected in any suitable manner.

I claim:

1. An apparatus for sterilizing material comprising a chamber in which the material may be subjected to gas under pressure, a removable receptacle in said chamber for the material, means for introducing gas into said chamber and receptacle, a gas expansion chamber having a connection with the first chamber, a tube leading from a point near the bottom of said removable receptacle to said connection, and means whereby said connection may be closed to maintain the pressure of gas in the first chamber and may be opened to release the pressure into said expansion chamber.

2. An apparatus for sterilizing material comprising a chamber in which the material may be subjected to gas under pressure, a removable receptacle in said chamber for the material, means for introducing gas into said chamber and receptacle, a gas expansion chamber having a connection with the first chamber, means for resiliently supporting the removable receptacle from the bottom of said chamber, a tube having a beveled end resting upon the bottom of said receptacle and leading to said connection, and means whereby said connection may be closed to maintain the pressure of gas in the first

chamber and may be opened to release the pressure into said expansion chamber.

3. An apparatus for sterilizing material comprising a cylinder provided with a chamber in which the material may be subjected to gas under pressure, means for introducing gas into said chamber, a plug member adapted to be secured upon the upper end of said cylinder, a gas expansion chamber formed in said plug member, having a connection with the first chamber, a cap adapted to be screwed upon said plug member, and means carried by said cap whereby said connection may be closed to maintain the pressure of gas in the first chamber and may be opened to release the pressure into said expansion chamber.

4. An apparatus for sterilizing material comprising a cylinder provided with a chamber in which the material may be subjected to gas under pressure, a removable receptacle in said chamber for the material, means for introducing gas into said chamber and receptacle, a spring for supporting the removable receptacle from the bottom of said chamber, a tube having a beveled end resting upon the bottom of said receptacle, a plug member adapted to be screwed upon the upper end of said cylinder, a gas expansion chamber in said plug member having a connection with the first chamber, said connection comprising a bore extending through the plug member adapted to receive the upper end of said tube, a cap adapted to be screwed upon said plug member, means carried by said cap whereby said connection may be closed to maintain the pressure of gas in the first chamber and may be opened to release the pressure into said expansion chamber, and a tube extending from the bottom of said expansion chamber.

5. An apparatus of the class described comprising a receptacle for fluid containing bacteria having means for connection with gas under pressure and soluble in said fluid, a gas expansion chamber having inlet and outlet ports and means for normally closing said inlet port, and means for conducting mingled gas and bacterial fluid to said inlet port for delivery to and release in said chamber when said closing means is opened.

6. An apparatus of the class described comprising a casing having means for connection with gas under high pressure, a test tube fitting within said casing to contain bacteria suspended in fluid in which gas is soluble, said casing having a gas releasing chamber and inlet and outlet ports therefor, and means for normally closing said inlet port, said inlet port having means submerged in said fluid for conducting the mingled gas and fluid to said port for release in said chamber when said closing means is opened.

7. An apparatus of the class described

comprising a casing having means for connection with gas under high pressure, a test tube for fluid having bacteria suspended therein fitting within said casing and in which fluid said gas is soluble, said casing having a gas releasing chamber with inlet and outlet ports, a tube for said inlet port submerged in said fluid, means for normally closing said inlet port, the mingled fluid and gas flowing thereto and being released in said chamber when said closing means is opened.

8. An apparatus of the class described comprising a metallic tube having means for connection with a suitable gas under high pressure, a test tube containing fluid having bacteria suspended therein fitting within said metallic tube, a spring normally holding said test tube in its raised position, a passage being provided between the walls of said test tube and said metallic tube for admitting the gas pressure to said fluid, a head mounted on said metallic tube and having a gas releasing chamber provided with inlet and outlet ports and means for normally closing said inlet port, and a tube communicating at its upper end with said inlet port and having its lower end seated in said test tube within the fluid therein, the mingled gas and fluid flowing through said inlet port and being released in said chamber when said closing means is opened.

9. An apparatus for sterilizing material comprising a casing having two chambers formed therein, one of said chambers adapted to contain said material, means for introducing gas under pressure into said chamber, a connection between the chambers, and means whereby said connection may be closed to maintain the pressure of gas in said material-holding chamber and may be opened to release the gas and material into the other chamber.

10. An apparatus for sterilizing material comprising a casing having two chambers formed therein, a removable receptacle in one of said chambers adapted to contain said material, means for introducing gas under pressure into the receptacle and chamber containing it, a connection between the chambers, and means whereby said connection may be closed to maintain the pressure of gas in said material-holding chamber and may be opened to release the gas and material into the other chamber.

11. An apparatus for sterilizing material comprising a casing having two chambers formed therein, one of said chambers adapted to contain said material, means for introducing gas under pressure into said chamber, a common port between said chambers, and a valve device for said port whereby the latter may be closed to maintain the pressure of gas in said material-holding

chamber and may be opened to release the gas and material into the other chamber.

In testimony whereof I hereunto affix my signature.

DAVID CROWTHER.

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