W. H. MAY.

STERILIZER.

APPLICATION FILED AUG. 14, 1915.

1,215,682.

Patented Feb. 13, 1917.

5 SHEETS—SHEET 1.

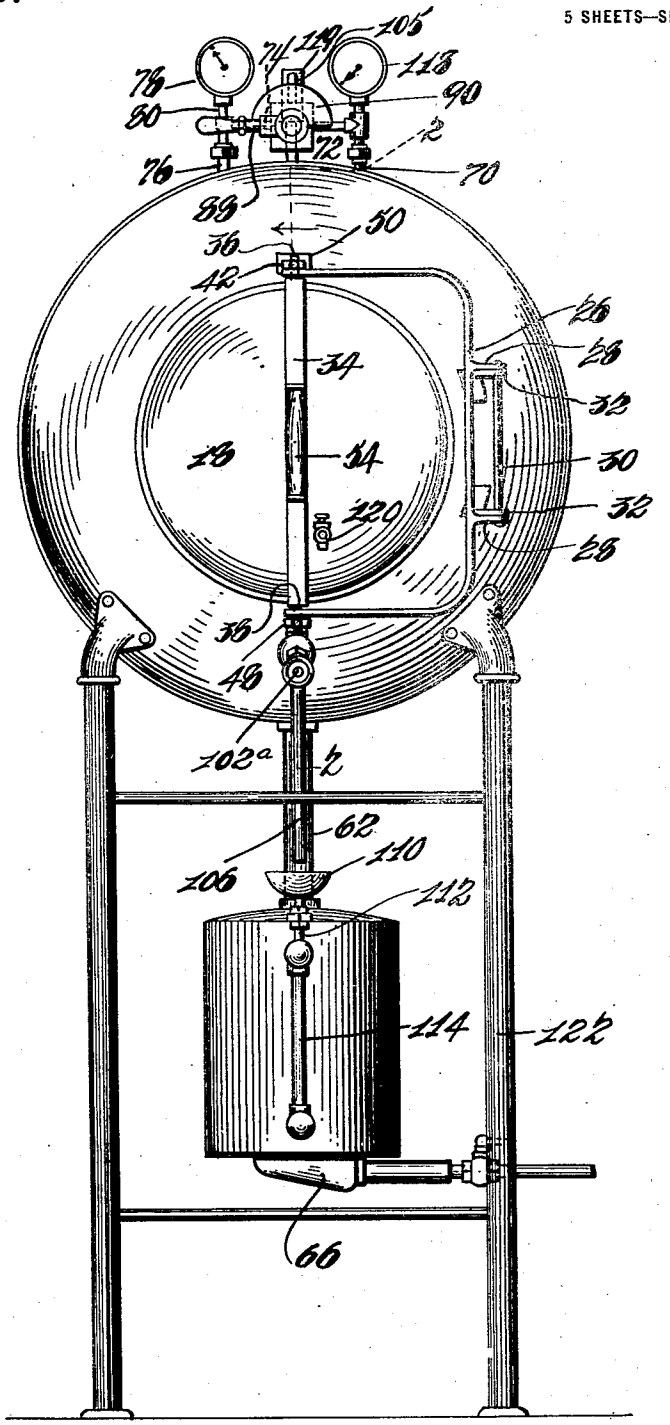


Fig. 1.

Witnesses
E. A. Janes
H. Lebert Hansen

Inventor
William H. May.
by Newell & Neal
attorneys.

W. H. MAY.

STERILIZER.

APPLICATION FILED AUG. 14, 1915.

1,215,682.

Patented Feb. 13, 1917.

5 SHEETS—SHEET 2.

Fig. 2.

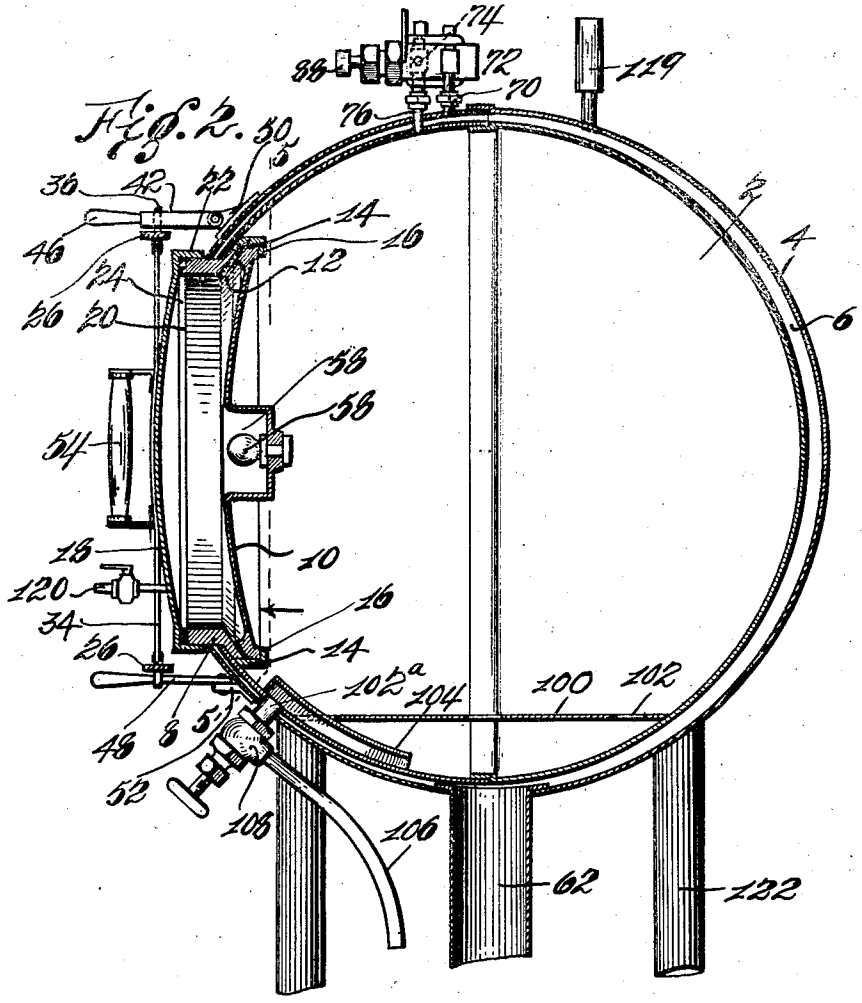


Fig. 3.

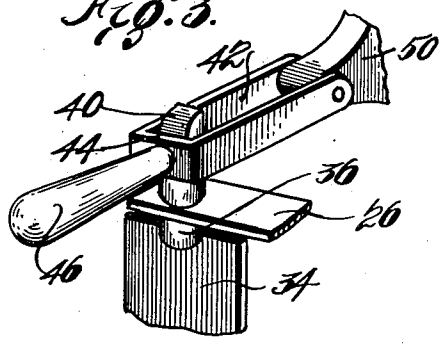
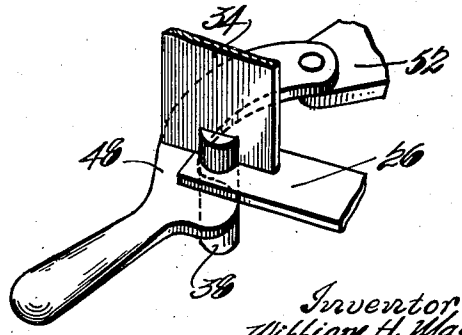


Fig. 4.



Witness
C. A. Jarvis
W. Dorey Spencer

Inventor
William H. May.
by Newell & Reed
attorneys

W. H. MAY.

STERILIZER.

APPLICATION FILED AUG. 14, 1915.

1,215,682.

Patented Feb. 13, 1917.

5 SHEETS—SHEET 3.

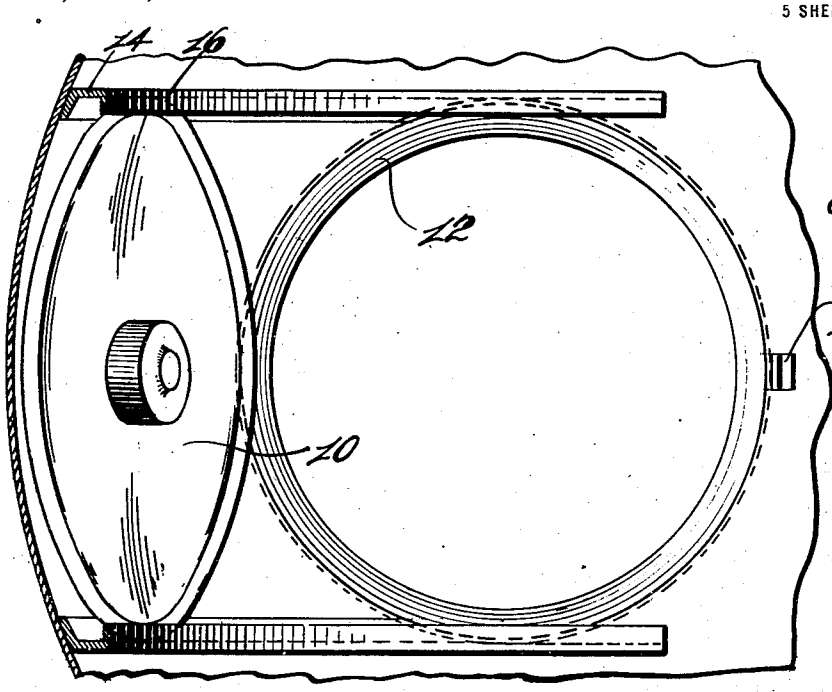


Fig. 5.

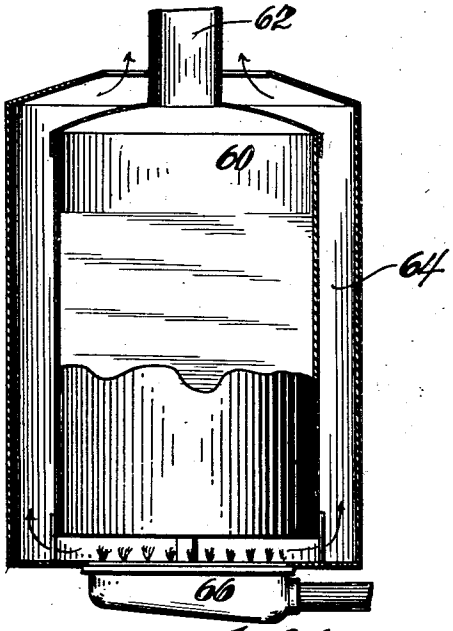


Fig. 6.

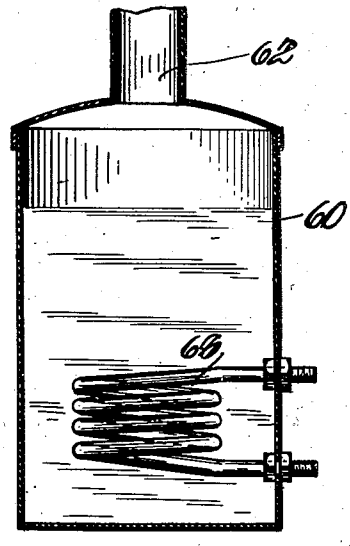


Fig. 7.

Witnesses
E. A. Jarvis
H. Sherman Spencer

Inventor
William H. May.
by Howell & Read
attorneys.

W. H. MAY.

STERILIZER.

APPLICATION FILED AUG. 14, 1915.

1,215,682.

Patented Feb. 13, 1917.

5 SHEETS—SHEET 4.

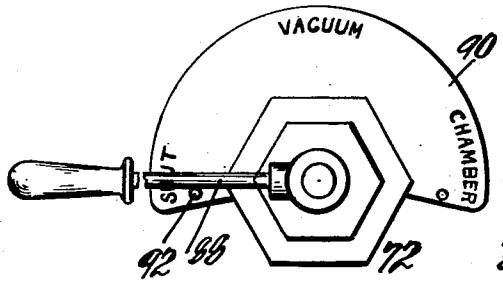


Fig. 8.

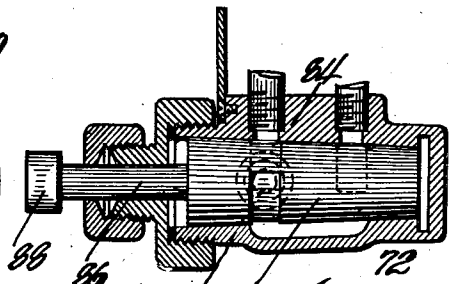


Fig. 9.

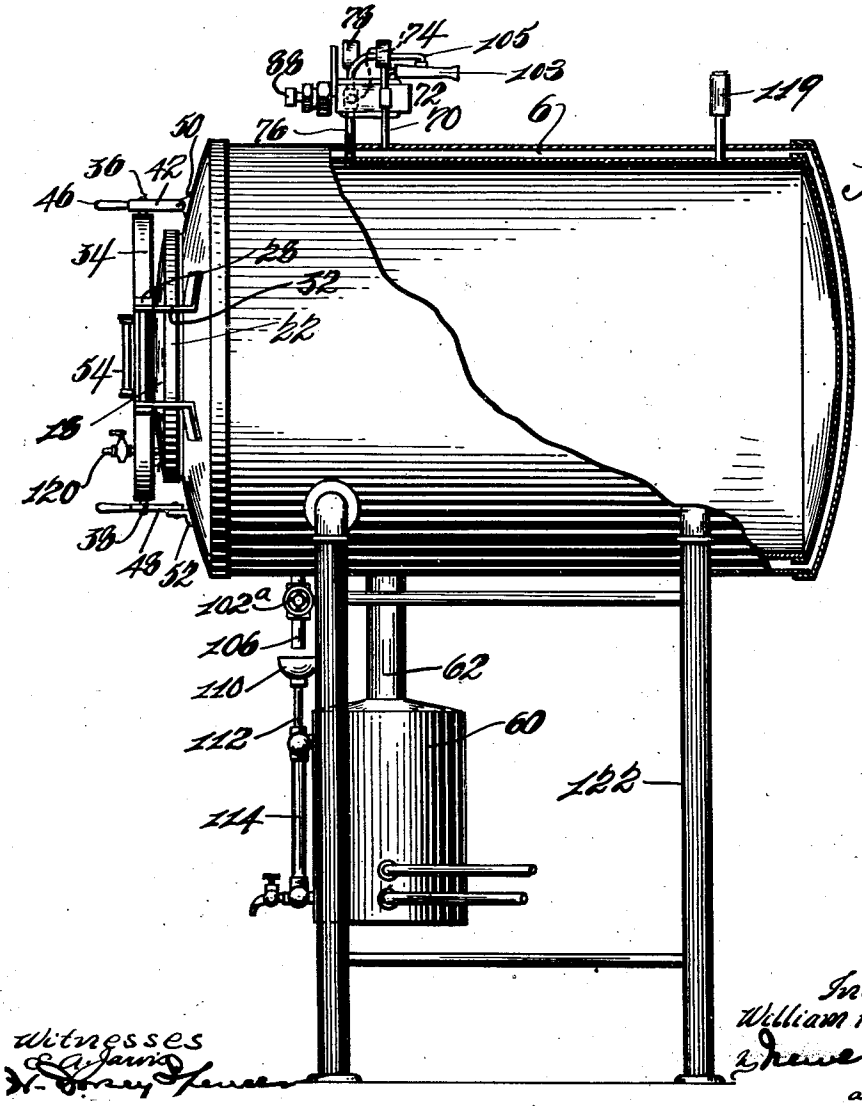


Fig. 10.

Witnesses
C. A. Jarvis
H. Sidney Spencer

Inventor:
William H. May.
by Howell & Howell
attorneys.

W. H. MAY.

STERILIZER.

APPLICATION FILED AUG. 14, 1915.

1,215,682.

Patented Feb. 13, 1917.

5 SHEETS—SHEET 5.

Fig. 11.

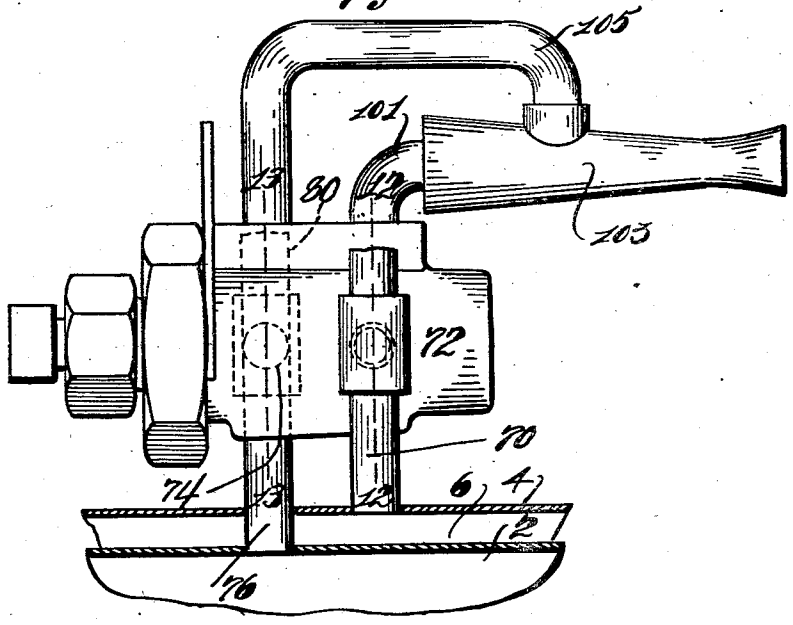


Fig. 12.

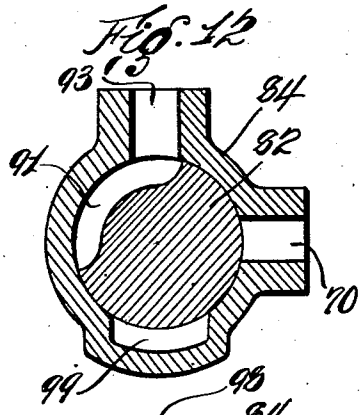


Fig. 14.

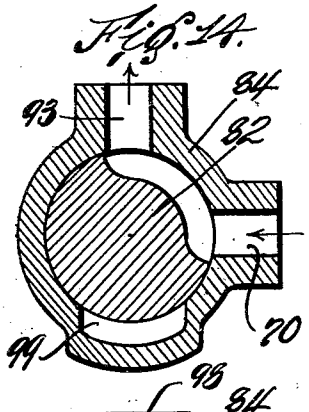
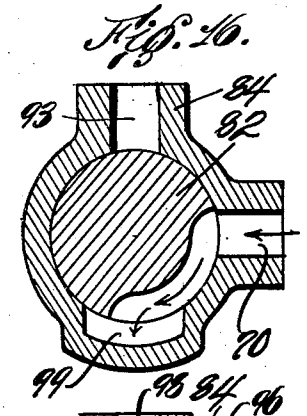


Fig. 16.



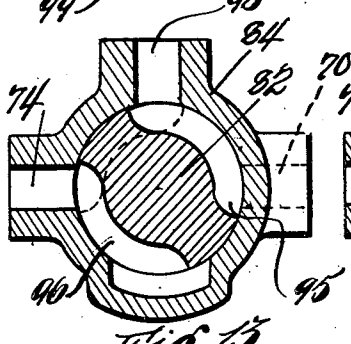


Fig. 13.

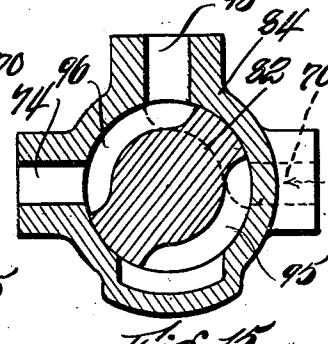


Fig. 15.

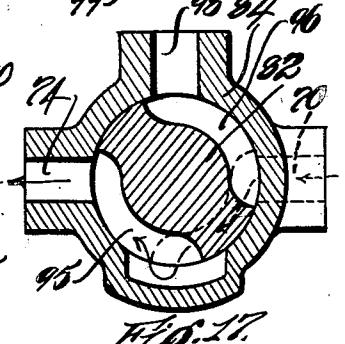


Fig. 17.

Witnesses

Inventor
William H. May.
by Newell & Neal
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM H. MAY, OF YONKERS, NEW YORK, ASSIGNOR TO BRAMHALL DEANE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STERILIZER.

1,215,682. Specification of Letters Patent. Patented Feb. 13, 1917.

Application filed August 14, 1915. Serial No. 45,457.

To all whom it may concern:

Be it known that I, WILLIAM H. MAY, a citizen of the United States, residing at Yonkers, New York, have invented certain new and useful Improvements in Sterilizers, of which the following is a clear, full, and exact description.

This invention relates to sterilizing apparatus and particularly to sterilizing apparatus of the type used in sterilizing surgical dressings.

The modern practice in sterilizing surgical dressings and similar articles employed in the operating room is to place these articles in a tight chamber into which steam or some other sterilizing agent may be introduced, usually under pressure, the chamber being tightly closed to prevent the escape of the sterilizing agent. In the patent to Royal E. Deane #643,949, granted February 20, 1900, a sterilizing apparatus is shown and described which is used extensively in sterilizing by the process just set forth.

It has been found in practice, however, that in sterilizing some kinds of dressings the steam will permeate the dressings more thoroughly if the air is exhausted from the chamber in which the sterilization is to take place before the introduction of the steam or other agent. An important object of the present invention, therefore, is to provide a sterilizing vessel or chamber which can be employed in the practice of this improved process of sterilization, in which process there are successive conditions of vacuum and pressure in the same chamber, and particularly to provide a closure for such a vessel or chamber which can be quickly and easily adjusted to meet such successive conditions of vacuum and pressure. More particularly the invention aims to provide a sterilizing apparatus for practising the improved sterilizing process above set forth, in which will be retained all of the advantages of the pressure door construction disclosed in the patent to Royal E. Deane above identified, and which in addition will have convenient and certain means for effecting a tight closure of the chamber when it is desired to produce a vacuum therein.

In the illustrated preferred embodiment of the invention, the foregoing objects are attained by providing a double closure for the opening through which the articles to be sterilized are introduced, said closure comprising a door arranged to be seated by internal pressure, and a second door arranged to be seated by external pressure, said doors being so constructed and arranged that neither interferes with the seating of the other under the appropriate pressure condition. By arranging the door which resists internal pressure upon the inside of its seat so that the pressure seats said door, all danger of the door bursting open, which sometimes occurs with sterilizing apparatus having external doors, is avoided, and by arranging the vacuum door upon the outside of its seat so that it also is seated by the appropriate pressure condition, that is, by the external pressure when the air within is exhausted, I avoid the necessity of providing special clamping means for effecting a positive closure of the vessel, or for locking it in closed condition, either for the vacuum step of the process or for the step which involves the introduction of steam or other sterilizing means under pressure.

An important feature of the invention is the arrangement of two doors to close a single opening, one of the doors serving to prevent the entry of gases into the chamber when the pressure inside is less than that outside, and the other serving to prevent the escape of gases from the chamber when the pressure inside is greater than that outside, which involves having that one of the doors which is inside the vessel with respect to the other movable toward and away from its seat by changes in the pressure conditions so that it adapts itself automatically both to the vacuum conditions and to the pressure conditions.

Other objects and important features of the invention will appear from the following description and claims when considered in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of the preferred form of the invention;

Fig. 2 is a section on the line 2—2 of Fig. 1, part of the stand being broken away;

Fig. 3 is a detail perspective of one of the combined pressure applying and locking catches for the vacuum door;

Fig. 4 is a detail perspective of the other catch for the vacuum door;

Fig. 5 is an inside elevation showing the

pressure door and the track upon which it runs;

Fig. 6 is a section through the steam generating means showing the water heated by a gas flame;

Fig. 7 is a section through the water container showing a steam heated coil in the water;

Fig 8 is a detail elevation of the valve handle and the indicating dial;

Fig. 9 is a section through the three-way valve;

Fig. 10 is an elevation partly in section of a modification of the invention;

Fig. 11 is an enlarged side elevation of the three-way valve and ejector;

Figs. 12 and 13 are sections on the lines 12—12 and 13—13, respectively, of Fig. 11, with the valve in closed position;

Figs. 14 and 15 are sections similar to Figs. 12 and 13, showing the valve in "vacuum" position;

Figs. 16 and 17 are sections similar to Figs. 12 and 13, showing the valve in "chamber" or pressure position.

In the preferred form of my invention shown in Figs. 1 to 9 inclusive, which is intended for use where the quantity of dressings to be sterilized is not very great, the chamber 2 is preferably made substantially spherical. Surrounding this chamber 2 is a jacket 4 between which and the chamber wall is a space 6 in which steam or other heating fluid for heating the chamber may circulate.

At the front of the apparatus is provided an opening, through which the dressings or other articles to be sterilized may be introduced, this opening being surrounded by a door casing 8, and where the walls of the chamber 2 and jacket 4 join the casing 8, these walls are brought substantially into contact with each other, the steam heating space 6 thus converging toward the door. In order to close the chamber so that it may be subjected to successive conditions of vacuum and pressure, two closures are provided, as shown, one operating under pressure conditions and the other under vacuum conditions, the two closures being so arranged with relation to each other that neither interferes with the operation of the other.

To insure absolute safety against bursting open of the chamber under pressure, the pressure door 10 is located upon the inside of its seat 12 and is arranged to roll along tracks 14 upon the inner wall of the chamber, a space being provided between the inner flange 16 of each track and the door, when the door is in its seat, so that the door may be moved back out of its seat in order to roll it along the track, this looseness at this point also serving another purpose, in fact, its principal purpose in the present construction, namely, that it permits the pressure door automatically to unseat itself when a vacuum is produced in the chamber, whereby the vacuum can act directly upon the vacuum door 18. In order that the vacuum door may be held against its seat by the pressure conditions produced by a vacuum in the chamber, this door is arranged upon the outside of its seat 20. The door 18 has an annular flange 22 which overlaps the casing 8 and the seat 20, and carried by the door in a position to engage the seat 20 is a packing ring 24 of any suitable material, such as rubber, to insure a tight vacuum joint when the door is seated. For convenience in moving the door into and out of operative position, the door is mounted upon a yoke 26 having ears 28 through which passes a hinge pin 30 by which the yoke is hinged upon a pair of ears or lugs 32 formed upon or carried by brackets attached to the front of the jacket 4. A spring 34 is attached at its middle to the center of the door 18 and at its ends is provided with trunnions 36 and 38, which have bearings in the two arms of the yoke 26. These trunnions extend a little distance beyond the outer sides of the arms of the yoke 26 and catches are provided for engaging these trunnions to lock the vacuum door in closed position, one or both of these catches being preferably so arranged that it serves to tension the spring 34 in the direction to press the vacuum door tightly against the seat 20. In Fig. 3 of the drawings, the trunnion 36 is shown as provided with a cam surface 40 at its outer end, and the catch 42 which coöperates with this trunnion, is shown as made in the form of a fork which straddles the trunnion and has an end 44 that coöperates with the cam 40 to bend the spring 34 down toward the seat 20, thus pressing the door 18 yieldingly against its seat. A handle 46 is provided for operating this catch. The other catch 48 is shown as made in the form of a dog which hooks over the trunnion 38, being mounted to move transversely to said trunnion into and out of engagement therewith. The catches 42 and 48 are mounted upon brackets 50 and 52 attached to the jacket 4.

A handle 54 is attached to the front of the vacuum door for use in manipulating said door, and a knob 56 located in a recess formed by a depression 58 in the pressure door 10 is used in sliding said door into and out of its seat in the door frame 8.

Any suitable means may be provided for generating the steam or otherwise heating the fluid which circulates in the heating chamber 6 of the apparatus, the illustrative means comprising a water container or boiler 60 having a pipe 62 leading from its upper end to the chamber 6, the boiler 60 being surrounded by an air circulating jacket 64 between which and the boiler the hot air and burnt gases produced by the

flame of a gas burner 66 circulate. If high pressure steam is available, the water may conveniently be heated by a steam coil 68 located in the water, as shown in Fig. 7, or the water may be heated by any other suitable means, such for example as electric resistance coils.

An important feature of the invention is the novel means for quickly changing from one pressure condition within the chamber to the other, the invention also comprehending the utilization of the steam for producing the vacuum condition.

In Figs. 9 and 11 to 17 inclusive, are illustrated the valve mechanism and the ejector by which the pressure conditions within the chamber are controlled. Referring to these figures, it will be seen that the steam chamber 6 between the jacket 4 and the sterilizing chamber 2 has leading from its upper end a pipe 70 connected to a three-way valve 72. The three-way valve 72 is also connected to the chamber 2 through a horizontal pipe 74 and a vertical pipe 76, a combined pressure and vacuum gage 78 being connected to the pipes 74 and 76 at their junction by means of a pipe 80. The three-way valve comprises the valve proper 82 and the valve casing 84, the valve stem 86 being provided with a handle 88 for operating the valve. A dial 90 having thereon three indications is arranged so that the handle can move over these indications, whereby the operator can tell the condition of the valve by the indication opposite the handle.

From an inspection of Fig. 11 it will be noted that the pipes 70 and 74 communicate with the valve 72 at points spaced longitudinally of the valve, the valve being provided with a groove 91 in the plane of the opening 70 and of a second opening 93, and being provided with two grooves 95, 96, in the plane of the opening 74 and of a second opening 98. The valve casing in its lower part is provided with a groove 99 which extends lengthwise of the casing and at times serves to connect the groove 91 with the groove 95. When the valve is in the closed position shown in Figs. 12 and 13, it will be seen that no communication is provided between any two of the openings into the valve casing. When the parts are in the position shown in Figs. 14 and 15, that is, in "vacuum" position, communication is provided between the opening 70 and the opening 93 by means of the groove 91 and between the opening 74 and the opening 98 by means of the groove 96. In this position, steam from the chamber 6 passes through the opening 93 into a pipe 101 forming part of an ejector of any suitable well-known construction, the other part 103 of which is connected by means of a pipe 105 with opening 98. This opening 98 in the valve casing being at this time connected with the chamber 2 by means of the pipes 74 and 76, the ejector 101, 103, serves to exhaust the air in the chamber 2. When the vacuum condition within the chamber 2 has been maintained for a sufficient length of time, the valve may be turned into the position shown in Figs. 16 and 17, that is, into the position marked "Chamber" upon the dial, in which position the pipe 70 from the steam chamber 6 will communicate with the pipe 76 through the grooves 91, 99 and 95, and the vacuum in the chamber 2 will be relieved by the introduction of steam. It will thus be seen that there is no opportunity for the relief of the vacuum by the introduction of any other gas before the steam is turned into the chamber.

In use, heating fluid from the heating apparatus is preferably always circulating in the chamber 6 so that the chamber 2 is always heated. The dressings to be sterilized are introduced into the chamber through the door opening at the front and are preferably placed upon a rack or shelf 100 having drainage openings 102. In case any moisture or water has accumulated in the chamber, it may be blown out through the valve-controlled pipe 102^a which has a communication with the inside of the chamber 2, said chamber being preferably provided upon its inside with a covered passageway 104 leading approximately to its lowest point. A nipple 106 is provided upon the valve 108 to guide the water into the cup 110 having therein a straining and an anti-spattering gauze. The cup 110 is utilized in filling the boiler 60, said cup communicating through a pipe 112 with the water gage 114. The dressing being in position, the door 10 is moved around on its tracks into position in the door opening, such position being determined by a stop 116 upon the inside of the door casing. The vacuum door 18 is then swung into position upon its seat 20 and the catches 42 and 48 are brought into locking relation to the trunnions 36 and 38. This last named operation serves to seat the vacuum door 18 tightly enough upon its seat 20 so that when the air is exhausted from the chamber 2, the door will be forced still more tightly against its seat, and there will be no leakage to disturb the vacuum.

The valve handle 88 is now turned into position over the indication "Vacuum" on the dial 90, and the air is exhausted from the chamber 2. As this operation begins, the door 10 will be drawn back away from its seat, thus permitting the vacuum to extend to the space between the doors 10 and 18. Vacuum conditions having been maintained in the chamber for the desired length of time, the handle 88 is turned from the indication "Vacuum" to the indication "Cham-

ber," which serves to shut off the connection to the air exhausting means and to open communication between the chamber 6 and the chamber 2, thus permitting steam to enter the chamber 2 and relieve the vacuum. See Figs. 16 and 17. The relief operation takes place very quickly, and as the pressure increases upon the inside of the chamber, it immediately seats the door 10 against its seat 12.

The pressure of the steam can be determined by a steam pressure gage 118. In practice, I preferably use a vacuum of not over fifteen inches of mercury and a succeeding steam pressure of not over seventeen pounds. The relief of the vacuum in the chamber takes place so suddenly that the door 10 frequently seats itself before the vacuum between the doors is relieved. In order that this may be relieved to permit the door 10 to be easily opened, I provide a relief cock 120 upon the door 18.

The apparatus may conveniently be supported upon a stand 122. The modification shown in Fig. 10 differs from the preferred form of the invention only in that for the spherical chamber a cylindrical chamber of somewhat larger capacity has been substituted.

What I claim as new is:—

1. An apparatus of the class described, having, in combination, a vessel adapted to withstand either internal pressure, as of a gas under compression, or external pressure, as when vacuum conditions obtain within, said vessel being provided with an opening, and a double closure for said opening comprising a door arranged to be seated by internal pressure and a second door arranged to be seated by external pressure, said doors being unconnected and so arranged that each acts as a closure only when the appropriate pressure condition prevails.

2. An apparatus of the class described, having, in combination, a vessel adapted to withstand either internal pressure, as of a gas under compression, or external pressure, as when vacuum conditions obtain within, said vessel being provided with an opening, and means for closing said opening comprising a normally loosely seated pressure door and a normally tightly seated vacuum door, said vacuum door being yieldingly held against internal pressure whereby each door acts as a closure only when the appropriate pressure condition prevails.

3. An apparatus of the class described, having, in combination, a vessel adapted to withstand either internal pressure, as of a gas under compression, or external pressure, as when vacuum conditions obtain within, said vessel being provided with an opening, and means for closing said opening comprising a pressure door arranged to be seated upon the inside of said vessel and a vacuum door arranged to be seated upon the outside of said vessel, said doors being unconnected and so arranged that each is held in chamber sealing position by the appropriate pressure condition and only when said condition prevails.

4. In a sterilizing apparatus for use in sterilizing under successive conditions of vacuum and pressure, in combination, a vessel adapted to resist both internal pressure and external pressure and having an opening through which articles to be sterilized may be introduced into said vessel, and a double closure for said opening comprising a door arranged to be seated by internal pressure, a second door arranged to be seated by external pressure and means for supporting said doors for independent movement into and out of closing relation to said opening, that one of the doors which lies within the vessel with respect to the other being freely movable away from its seat whereby said doors are automatically held in their respective operative positions by the respective pressure conditions.

5. In a sterilizing apparatus for use in sterilizing under successive conditions of vacuum and pressure, in combination, a vessel having an opening through which articles to be sterilized may be introduced into said vessel, and means for closing said opening comprising a vacuum door and a pressure door each having a seat about said opening, each of said doors being supported for movement independently of the other and being arranged to be automatically moved away from its seat under the action of the pressure condition which serves to seat the other.

6. An apparatus of the class described, having, in combination, a vessel adapted to withstand either internal pressure, as of a gas under compression, or external pressure, as when vacuum conditions obtain within, said vessel being provided with an opening, a double closure for said opening comprising a door arranged to be seated by internal pressure and a second door arranged to be seated by external pressure, means for successively producing the aforementioned pressure conditions, and independent means for relieving the vacuum sometimes left between said doors when a vacuum within the vessel is quickly relieved.

7. In a sterilizing apparatus for use in sterilizing under successive conditions of vacuum and pressure, in combination, a vessel having an opening through which articles to be sterilized may be introduced into a sterilizing chamber within said vessel, a vacuum door having a seat about said opening and located outside its seat, means for lightly pressing said vacuum door into

chamber-sealing position on its seat, and independent means for sealing said chamber against internal pressure.

8. In a sterilizing apparatus for use in sterilizing under successive conditions of vacuum and pressure, in combination, a vessel having an opening through which articles to be sterilized may be introduced into said vessel, a vacuum door having a seat about said opening and located outside said seat, and means for yieldingly holding said vacuum door against its seat, whereby said door is in operative position to seal said opening against external pressure but may yield to internal pressure, and independent means for sealing said opening against internal pressure.

Signed at New York, N. Y., this 5th day of August, 1915.

WILLIAM H. MAY.

Witnesses:
ABR. BERNSTEIN,
F. JACKSON.