

No. 772,704.

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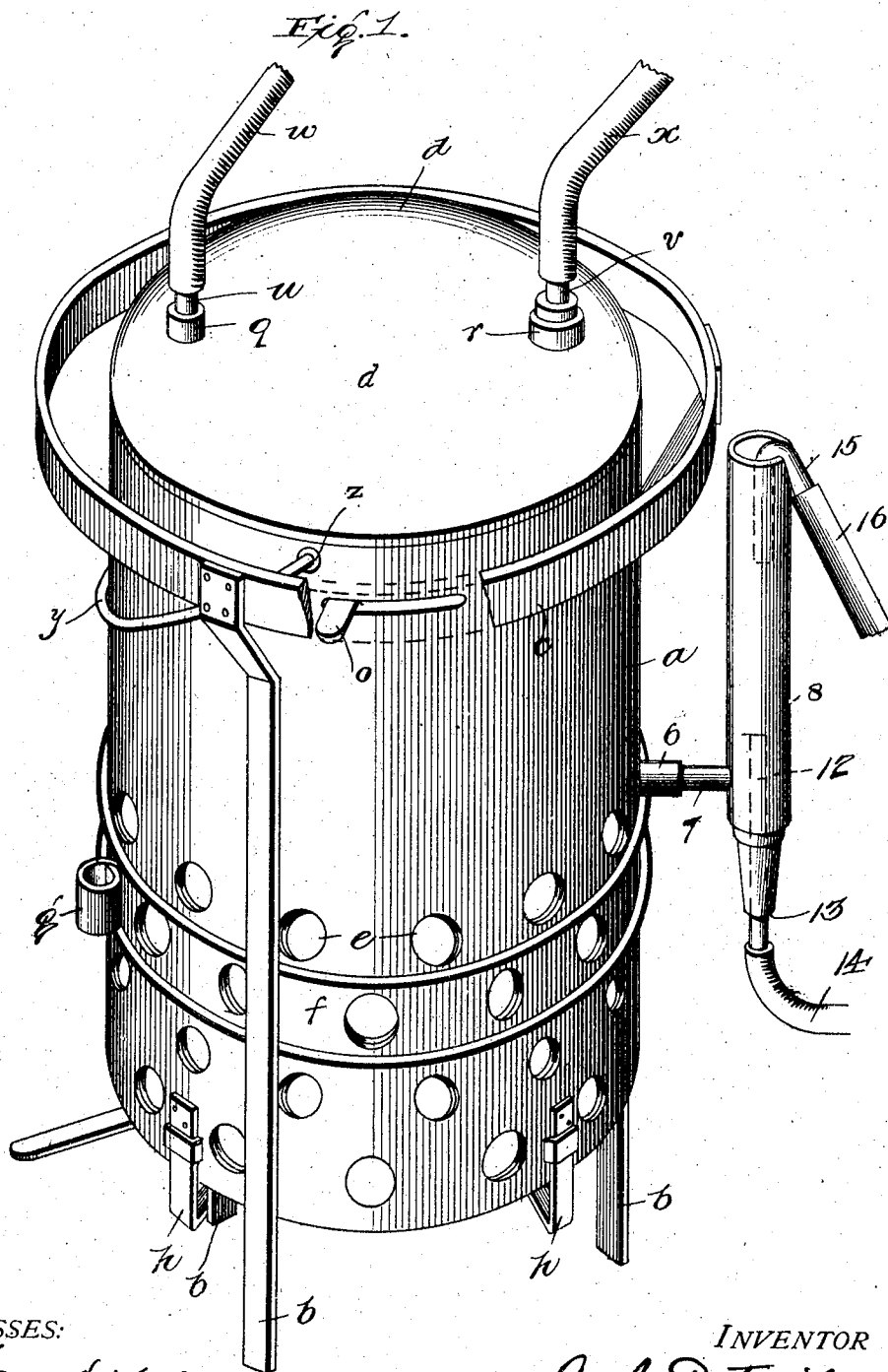
PATENTED OCT. 18, 1904.

APPARATUS FOR PRODUCING SUPERHEATED VAPOR AT
ATMOSPHERIC PRESSURE.

NO MODEL.

APPLICATION FILED OCT. 8, 1903.

5 SHEETS—SHEET 1.



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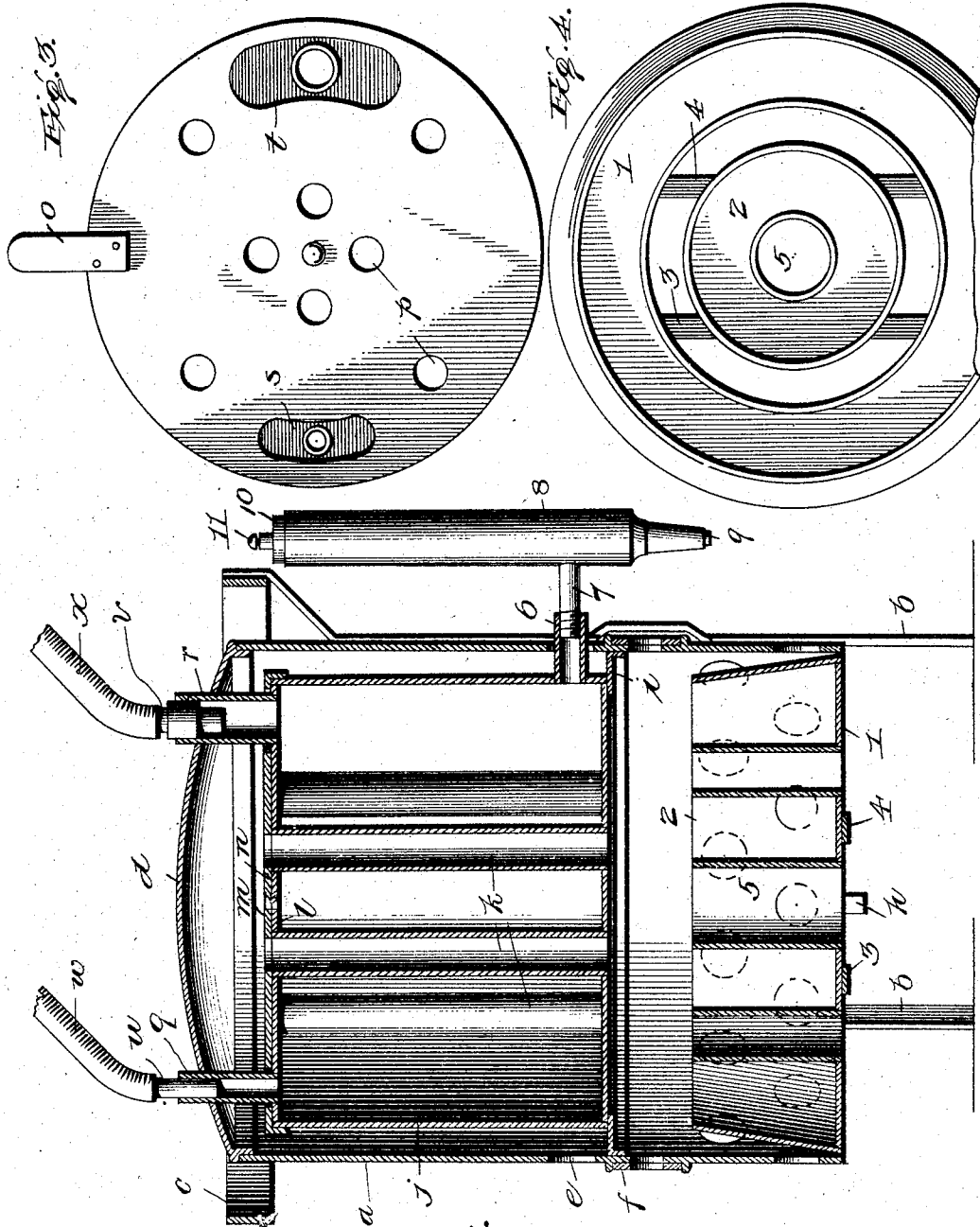
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5 SHEETS—SHEET 2.



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Fig. 2.

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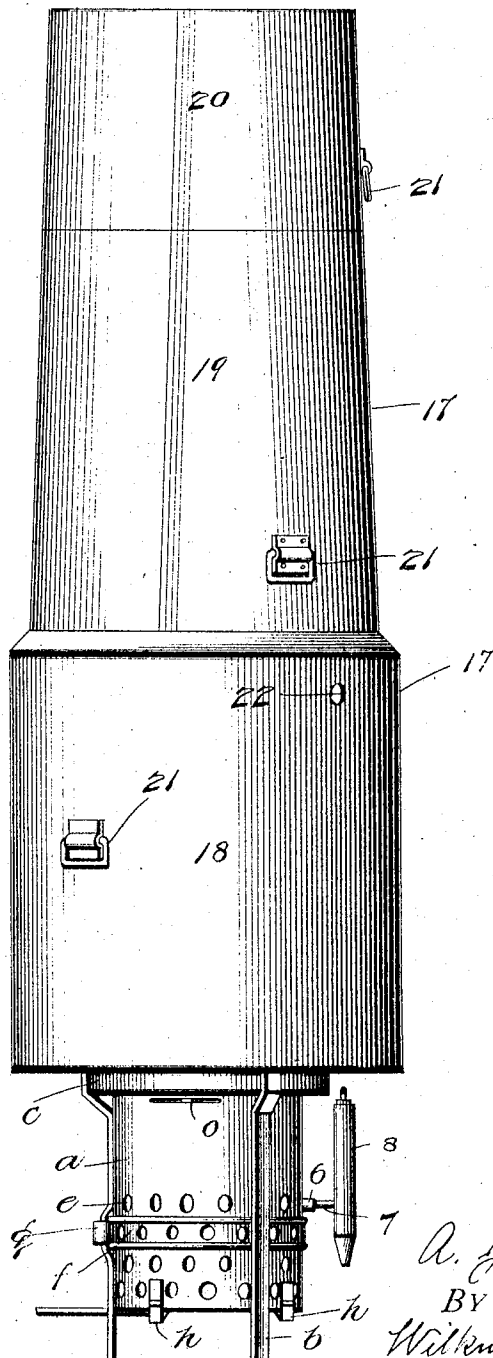
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5 SHEETS—SHEET 3.

Ex. 5.



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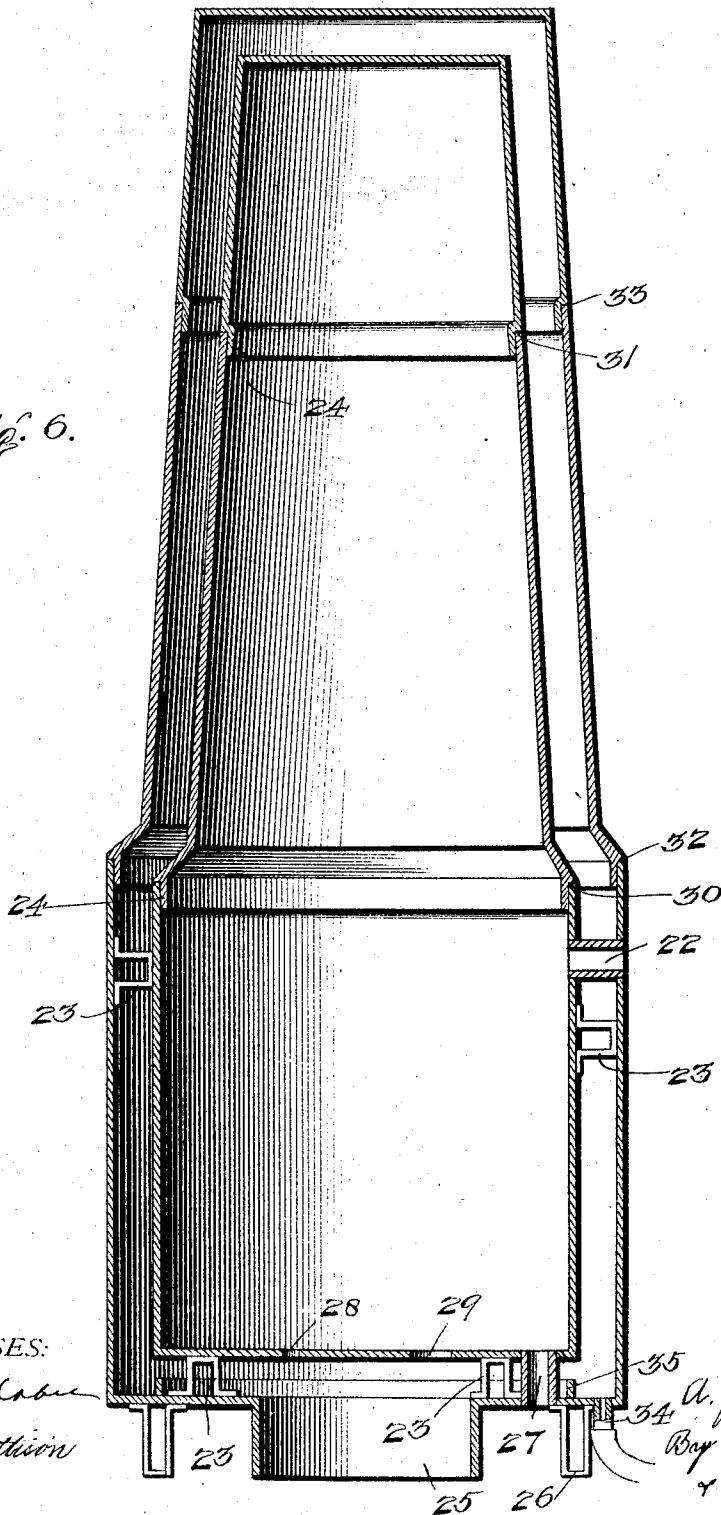
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5 SHEETS—SHEET 4.

Fig. 6.



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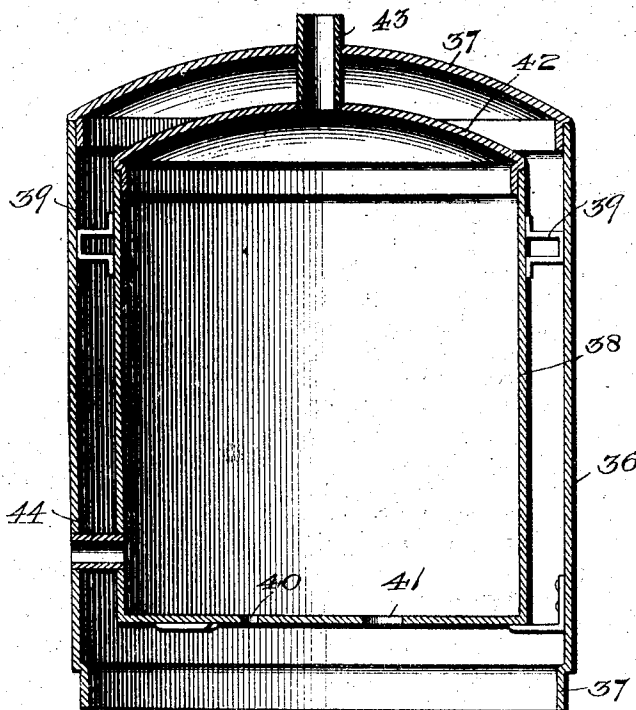
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6 SHEETS—SHEET 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

ANDREW JACKSON DETWEILER, OF COLUMBIA, MISSOURI.

APPARATUS FOR PRODUCING SUPERHEATED VAPOR AT ATMOSPHERIC PRESSURE.

SPECIFICATION forming part of Letters Patent No. 772,704, dated October 18, 1904.

Application filed October 8, 1903. Serial No. 176,240. (No model.)

To all whom it may concern:

Be it known that I, ANDREW JACKSON DETWEILER, a citizen of the United States, residing at Columbia, in the county of Boone and State of Missouri, have invented certain new and useful Improvements in Apparatus for Producing Superheated Vapor at Atmospheric Pressure; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is for an improvement in apparatus for producing superheated vapor. It is primarily used as a formalin-disinfector; but it may be used for disinfecting and sterilizing purposes generally. It may also be used for the production of superheated vapor for organic distillation, for canning fruits and vegetables, and for cooking purposes. Furthermore, it may be used for heating houses either by passing the superheated vapor through coils of pipe or by heating each room directly with the apparatus.

Speaking generally, my apparatus is designed to produce superheated vapor at atmospheric pressure in a simple and economical manner; and the object of my invention is to produce such an apparatus which will be simple, cheap, and easily managed.

With this object in view my invention consists in the construction and combinations of parts, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 represents a side view of my apparatus as used for a disinfector. Fig. 2 is a cross-section of the same. Fig. 3 is a top plan view of the boiler. Fig. 4 is a top plan view of the alcohol-lamp. Fig. 5 is a side view of my complete apparatus as used for disinfecting bulky articles. Fig. 6 is a cross-section of the upper part of the apparatus shown in Fig. 5, and Fig. 7 is a modification of the part shown in Fig. 6.

a represents the outer casing, preferably made of metal and preferably circular in form. This is supported on legs *b b*, attached to the outer part of the casing *a*, which legs are inclined outwardly near the top and are attached to a ring *c*. The casing *a* is open at

the bottom and is adapted to be closed at the top by a removable lid or cover *d*. The casing *a* is provided with a number of rows of holes *e*, preferably arranged as shown in Fig. 1. Around one of the rows of holes is a sliding perforated damper *f*, provided with a handle *g*, by which the holes in this row may be wholly or partly closed, as desired. Each of these circular rows of holes may be provided with a similarly-shaped damper, if desired.

At the bottom of the casing a number of spring-clips *h* are provided for the purpose of holding the lamp or other heating means in position. The damper *f* is preferably made of a circular strip of metal, perforated as shown and with one end rolled up to form a handle, as shown at *g*.

Within the casing *a* is an annular shelf *i*, secured to the casing in any suitable manner. This shelf serves as a support for the boiler *j*.

The boiler *j* is preferably made of copper and is provided with a number of flues *k*, passing through the top and bottom thereof. In the drawings this boiler is shown as provided with eight flues arranged in two circles; but any number of flues, as desired, may of course be used.

Centrally on the top *l* of the boiler is secured a screw *m*, on which is revolvably mounted a plate *n*, provided with a handle *o*. This plate *n* is provided with a number of perforations *p*, arranged to register with the tops of the flues *k*. By turning the plate *n* by means of the handle *o* the flues may be wholly or partially closed, as desired.

Through the top *l* of the boiler and through the plate *n* pass two tubes *q* and *r* for the delivery of the superheated vapor. These tubes are firmly attached to the top *l* of the boiler, and the plate *n* is provided with curved slots *s* and *t*, so that said plate may be moved without interference by the pipes *q* and *r*. When the apparatus is to be used as a formalin-disinfector, the tops of the tubes *q* and *r* are closed with corks, through which pass tubes *u* and *v*, preferably of glass, to which tubes flexible tubes *w* and *x* are attached, so that the formalin vapor may be delivered to the desired point.

The casing *a* is provided with a handle *g*, attached to ears *z* for convenience in handling the same. Underneath the boiler and secured in position by the spring-clips *h* is the lamp or other heating material. The lamp shown in Fig. 4 is an alcohol-lamp, which is composed of two concentric portions 1 and 2, united by braces 3 and 4. The part 2 is provided with a central opening 5, and the parts 1 and 2 are filled with asbestos, upon which alcohol is poured. Of course it is obvious that any desired means of heating the boiler *j* may be employed instead of an alcohol-lamp.

In order to feed the liquid to be vaporized into the boiler *j*, a pipe 6 is provided which passes through the boiler *j* and casing *a*. Into this is screwed a smaller pipe 7, which connects with a larger pipe 8, into which the liquid to be vaporized is poured. The pipe 8 is open at the bottom and the top; but when used as a formalin-disinfector both the top and bottom are closed by corks 9 and 10, the latter being inserted after the liquid has been poured into the pipe 8. The cork 10 is provided with an ordinary light whistle 11, such as is often used with cooking utensils to show when the liquid in the boiler has become exhausted or nearly exhausted.

In case water is to be vaporized and where there is an abundant supply of water instead of closing the tube 8 by corks I use the water-level shown in Fig. 1. This consists of a pipe 12, preferably of glass, which is movably secured in a cork 13 in the lower end of the pipe 8. This pipe 12 serves as an overflow-pipe and prevents the liquid in the boiler *j* from reaching too high a level. The lower part of the pipe 12 is connected to a waste-pipe 14, preferably of flexible material.

The water is supplied to the tube 8 by means of the bent pipe 15, which is connected by a flexible pipe 16 to a suitable source of supply. The water as it is delivered into the pipe 8 passes into the boiler *j* until it reaches the top of the pipe 12, when the excess, if any, passes out through said pipe.

In using the apparatus as a formalin-disinfector I take the commercial solution of formalin, which contains about forty per cent. thereof, and dilute it with two to four volumes of water. The solution is then introduced into the pipe 8, which is then closed by the cork 10. A measured amount of the solution may be introduced, or the pipe 8 may be provided with a glass window, so that the amount of liquid in the boiler *j* may be easily seen. The lamp is then lighted, and the hot air and products of combustion pass upwardly through the flues *k*, heating the liquor contained in the boiler and superheating the vapor in the upper part of the boiler. The hot air and products of combustion then pass over the top of the boiler and down around the sides thereof, still further heating the vapor, and out through the upper row of

holes *e*. The formalin vapor thus produced, which is considerably hotter than boiling water, passes out through the tubes *w* and *x*. These tubes *w* and *x* are passed through holes in the door, one hole being produced by removing the lock and the other through the opening made for the bolt which carries the door-knob. The vapor is thus delivered in a superheated condition into the room which it is desired to disinfect.

In an apparatus of ordinary size two delivery-tubes are necessary, inasmuch as the vapor produced will not be carried off through a half-inch tube, and a larger tube cannot be used on ordinary doors.

In Fig. 5 my apparatus for producing superheated vapor is shown in connection with a closed casing for disinfecting bulky articles—such as blankets, mattresses, books, &c.—which cannot ordinarily be properly disinfected in private houses. On the casing *a*, supported thereby and upon the ring *c*, is a large casing 17, made in three sections 18, 19, and 20, each of these sections being provided with a set of handles 21. The lower section is provided with an opening 22 for the insertion of a thermometer. This casing is made double throughout and closed both at the bottom and top except as hereinafter described. The two parts of the lower section 18 are secured together by braces 23, attached to both the outer and inner casing. The upper sections 19 and 20 are not attached together, but they are simply held on the section next below by means of flanges, such as 24, making loose joints. The whole casing may be taken apart and the upper sections nested into the lower ones, if desired. The casing 17 is adapted to fit over the top of the casing *a*, as shown in Fig. 5, and the ring *c* attached to the casing *a*. The projection 25 fits within the case *a*, making a tight joint. This arrangement closes the top of the case *a* and makes the space between the two shells of casing 17 a part of the hot-air space surrounding the boiler in case *a*. Braces 26 project from the bottom of the section 18 and fit down outside of the ring *c*. These braces 26 serve as legs upon which the casing 17 rests when it is taken apart and telescoped together. The legs then rest upon the ground or floor. 27 is a pipe running through both walls of the section 18, through which pipe the steam delivered into the casing 17 may escape if it should be supplied in too large quantities into the interior of the casing 17. The steam enters the casing 17 through the openings 28 and 29, which are located above the pipes *q* and *r*, the articles to be disinfected being placed, of course, in the interior of the casing 17. The steam passes out under ordinary circumstances through the loose joints 30 and 31 from the inner casing into the space between the inner and outer casings. In this space it is partly condensed and part of it escapes through the

loose joints 32 and 33 into the atmosphere. A pipe 34 is provided, which is connected to a suitable waste-pipe or which may be connected directly to the pipe 8 to conduct off the vapor which is condensed between the walls of the casing. A circular ledge 35 is provided, which, together with the outer part of the section 18, forms a circular trough which delivers the condensed vapor into the pipe 34. Should the apparatus become top-heavy by reason of putting too much material into the casing 17, it may easily be braced by passing sticks or slats through the handles 21.

For cooking and heating purposes I use above the casing *a* the modified form of chamber shown in Fig. 7. In this modification 36 represents an open casing provided with a ring or flange 37 on its lower edge, which ring is adapted to fit within the casing *a*, thus making a close joint. The upper part of the casing 36 is closed by a removable lid 37. Within the casing 36 and separated from it by a narrow space is another casing, 38, which is held in position in said casing 36 by braces 39, attached to both casings. This arrangement causes the space between the inner casing 38 and the outer casing 36 to become a part of the hot-air space surrounding the boiler in the case *a*. The bottom of the casing 38 is provided with openings 40 and 41 for the reception of the pipes *q* and *r*. The top of the casing 38 is provided with a removable lid 42. A pipe 43 is centrally located and fastened to the lid 42, and this pipe passes up through an opening in the lid 37, the pipe 43 being intended for the reception of a thermometer. A pipe 44 passes through the casings 36 and 38 and permits the steam or other vapor to escape into the open air. The articles to be subjected to the action of the superheated vapor are supposed to be put into the casings 17 and 38 from the top; but of course said casings may be provided with doors, if desired.

The complete apparatus, as shown in Fig. 5, is intended primarily for use in houses. It should be noted, however, that an apparatus built on exactly the same principle, but of course on a much larger scale, can be used at quarantine stations for disinfecting all the clothing, &c., of a ship. This apparatus is also intended to do the work of and to be a substitute for the ordinary autoclave.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-orifices near the bottom thereof, a boiler provided with flues, and heating means, the parts being so arranged that the products of combustion pass up through

said boiler and down around it, substantially as described.

2. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at its top and provided with escape-openings near its bottom, a boiler provided with flues supported in said casing, means for heating said boiler, and means for varying the amount of air supplied to said heating means, substantially as described.

3. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with a closed top and escape-openings near the bottom thereof, a boiler provided with flues supported in said casing, means for heating said boiler, and means for wholly or partially closing said flues, substantially as described.

4. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-openings near the bottom thereof, a boiler provided with flues supported in said casing, means for heating said boiler, and means for maintaining the liquid in said boiler at a constant level, substantially as described.

5. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-openings near the bottom thereof, a boiler, provided with flues, supported in said casing, means for heating said boiler, and means for giving a signal when the liquid in said boiler has become nearly exhausted, substantially as described.

6. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-openings at the bottom thereof, a boiler, provided with flues, supported in said casing, means for heating said boiler, and spring-clips for holding said heating means in position in said casing, substantially as described.

7. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-openings near the bottom thereof, a boiler, provided with flues, supported in said casing, means for heating said boiler, and a removable perforated plate on the top of said boiler, whereby by the movement of said plate said flues may be wholly or partially closed, substantially as described.

8. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with a closed top and escape-openings near its bottom, a boiler supported in said casing, a pipe running through said casing and into said boiler, a supply-pipe connected to said first-named pipe, and an overflow device in said last-

named pipe, whereby the liquid in said boiler is prevented from reaching too high a level, substantially as described.

5 9. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with a closed top and escape-openings near the base thereof, a boiler supported in said casing, a pipe passing through said casing and into said boiler,
10 a supply-pipe connected to said last-named pipe, means for constantly supplying fluid to said supply-pipe, and an overflow device in said supply-pipe, whereby the liquid in said boiler is maintained at a constant level, substantially
15 as described.

10 10. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with a closed top and escape-openings near the bottom thereof, a boiler, provided with flues, located
20 in said casing, delivery-pipes attached to said boiler, means for heating said boiler, and means for maintaining the liquid in said boiler at a constant level, substantially as described.
25

11. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with a closed top and escape-openings near the bottom thereof, a boiler, provided with flues, located
30 in said casing, means for heating said boiler, a second casing adapted to rest upon said first-named casing and to receive the article or articles to be treated with the superheated vapor, said second-named casing being provided
35 with openings communicating with said boiler, and with discharge-openings, substantially as described.

12. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing closed at the top and provided with escape-openings near the bot-

tom thereof and with a supporting-ring, a boiler, provided with flues, located in said casing, and a second casing adapted to fit over
45 and rest upon said first-named casing and ring, said second casing being composed of two parallel shells provided with inlet and discharge outlets for the superheated vapor, substantially as described. 50

13. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing provided with escape-openings near its bottom and also provided with a supporting-ring, a boiler, provided
55 with flues, supported in said casing, a second casing adapted to rest upon said first-named casing and upon said ring, said second casing being composed of two parallel shells and provided with inlet and outlet openings for the
60 escape of the superheated vapor, and means for conducting the condensed vapor back into said boiler, substantially as described.

14. In an apparatus for producing superheated vapor at atmospheric pressure, the combination of a casing, open at the top and bottom and provided with a series of holes near the bottom and with spring-clips, a series of braces attached to said casing, said
70 braces serving as supports therefor, a ring attached to the upper ends of said braces, a lid adapted to fit into the upper part of said casing, and a perforated damper for closing some of the holes in said casing, said damper being provided with a handle and being kept
75 in place by said braces, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ANDREW JACKSON DETWEILER.

Witnesses:

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J. W. SAPP.