

(No Model.)

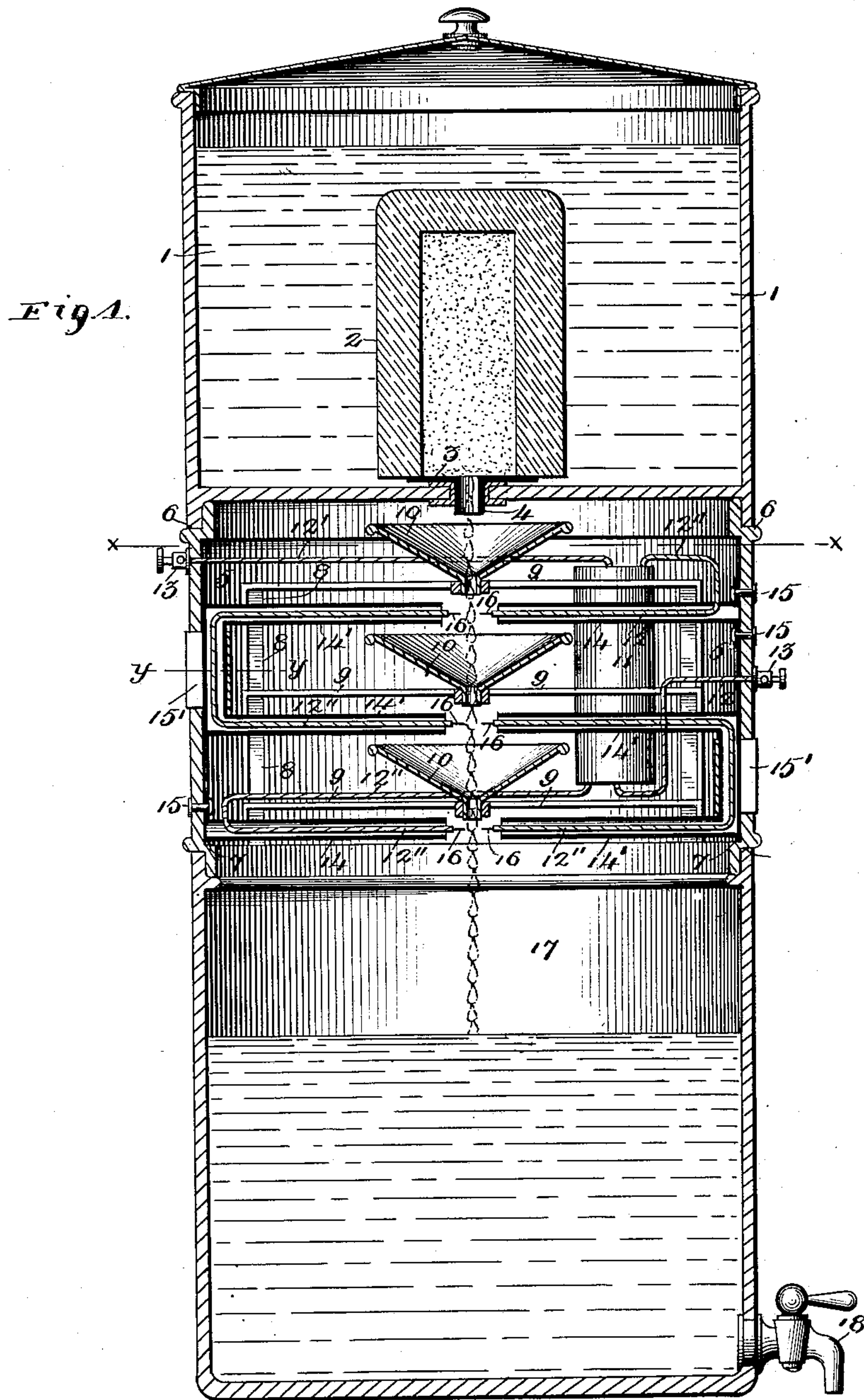
2 Sheets—Sheet 1.

H. G. STIEBEL, Jr.

APPARATUS FOR AND METHOD OF STERILIZING LIQUIDS.

No. 583,131.

Patented May 25, 1897.



Witnesses

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Inventor

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By his Attorneys

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

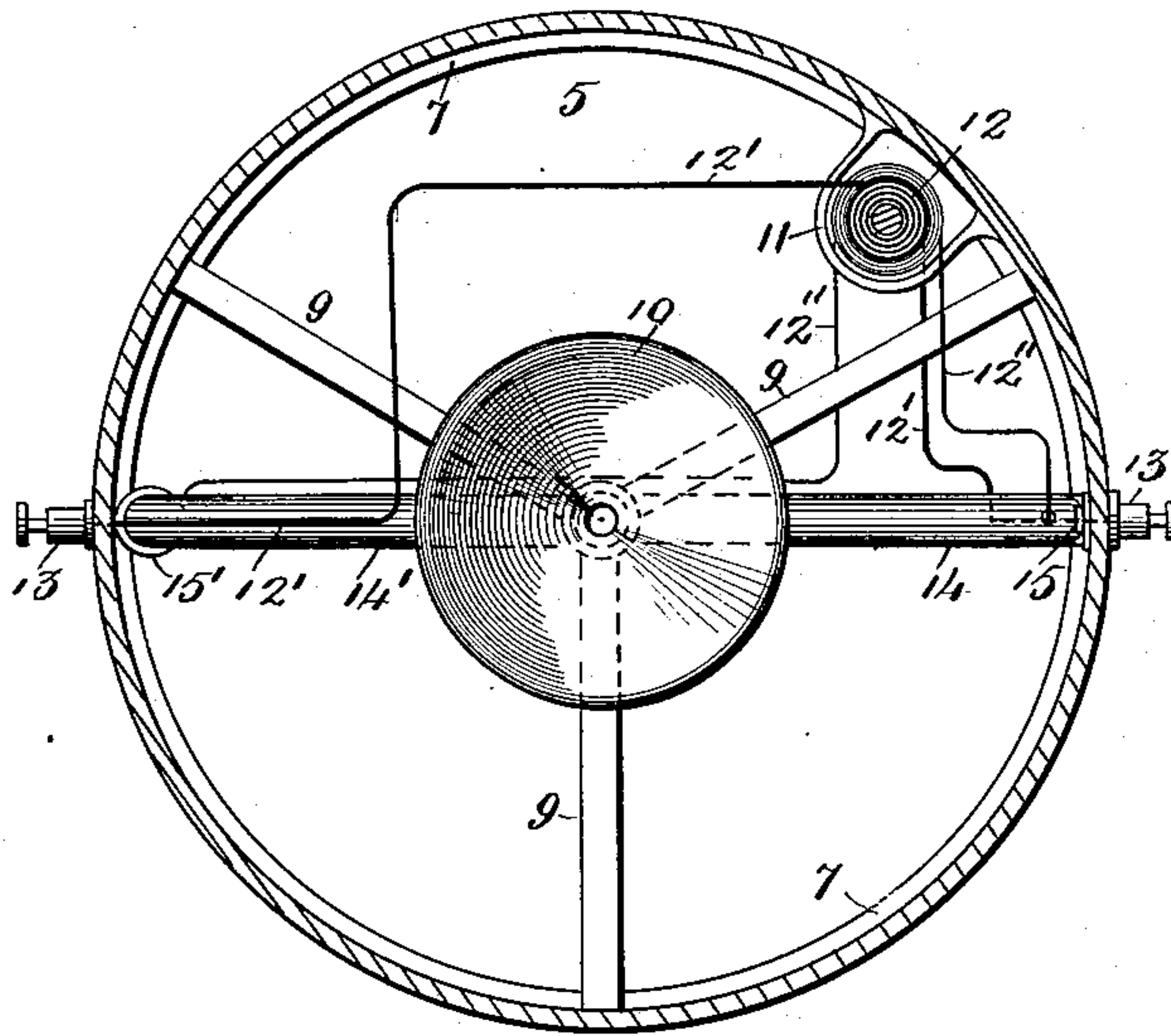


Fig. 3.

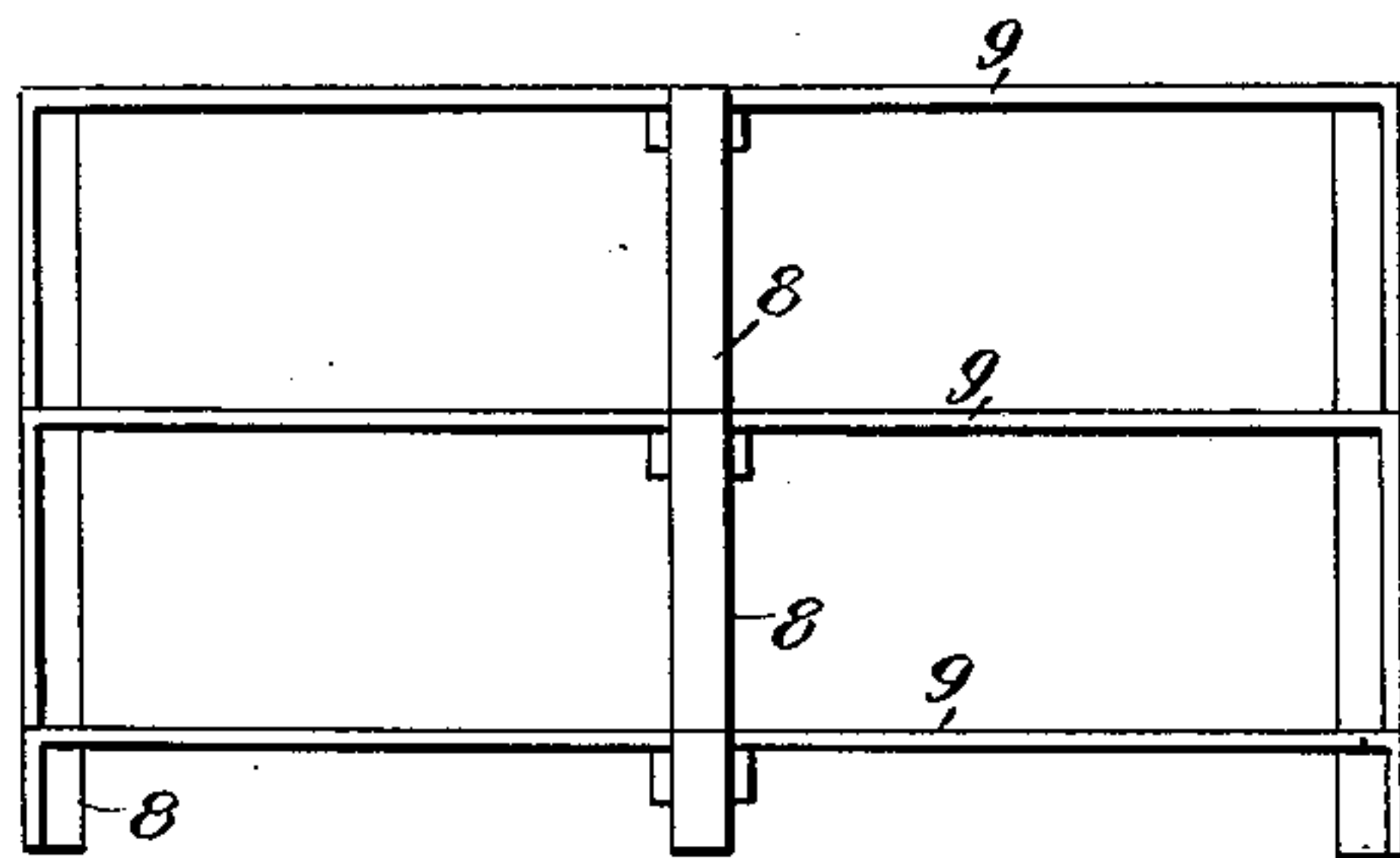
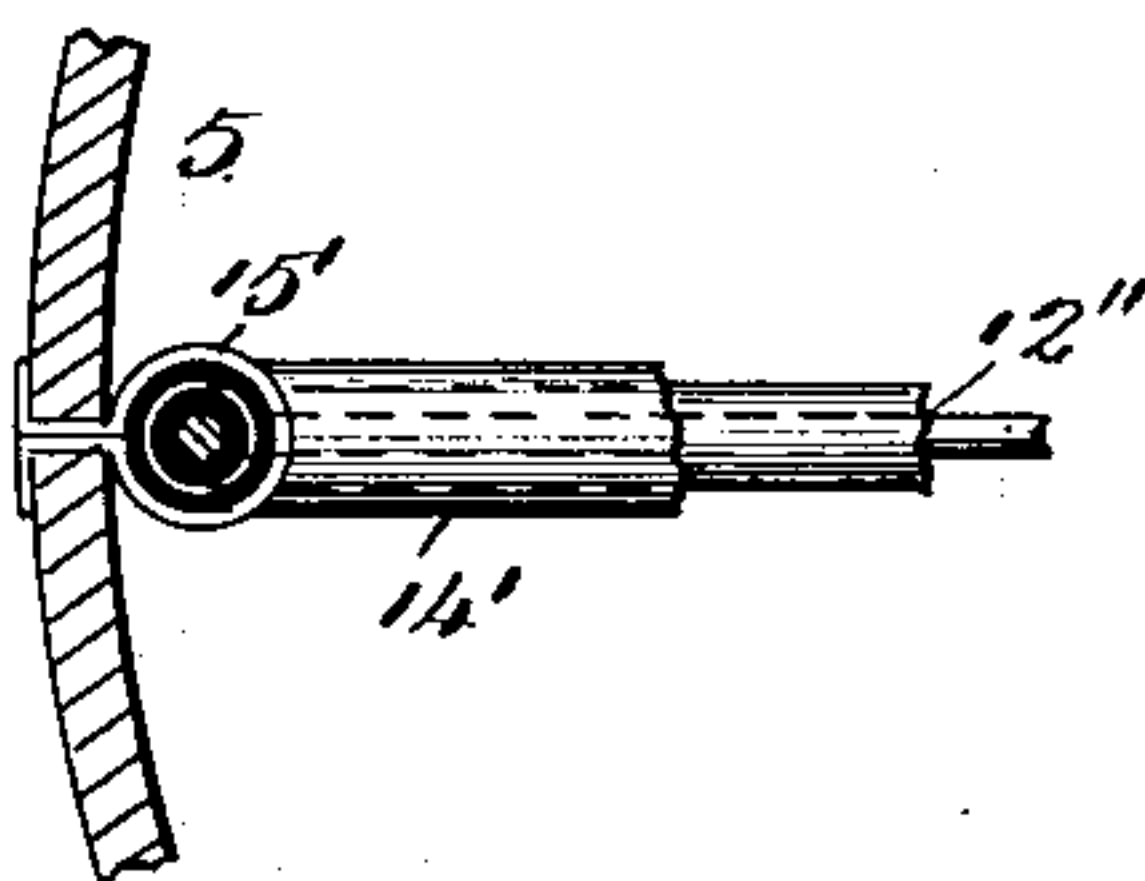


Fig. 4.



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UNITED STATES PATENT OFFICE.

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TO HENRY J. NATHAN, OF SAME PLACE.

APPARATUS FOR AND METHOD OF STERILIZING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 583,131, dated May 25, 1897.

Application filed October 2, 1896. Serial No. 807,692. (No model.)

To all whom it may concern:

Be it known that I, HENRY G. STIEBEL, JR., a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Apparatus for and Methods of Sterilizing Liquids, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.
My invention has relation to apparatus for and method of sterilizing liquids; and it consists, respectively, in the novel arrangement and combination of parts and the novel series of steps more fully set forth in the specification, and pointed out in the claims.

In the drawings, Figure 1 is a middle vertical section of the apparatus. Fig. 2 is a section on $x x$ of Fig. 1, showing, however, the top funnel in plan. Fig. 3 is a detail elevation of the funnel-supporting frames, and Fig. 4 is a detail on $y y$ of Fig. 1.

The object of my invention is to construct a liquid-sterilizing apparatus wherein is developed a sterilizing method by which the destruction and consequent elimination of disease-breeding germs and microbes is rapidly and completely effected within the liquid subjected to said method. The present device is illustrated in connection with the sterilization of drinking-water after the same has been filtered, although it is to be understood that the same apparatus, modified to suit the particular case, and the same method can be employed for the sterilization of any liquid capable of breeding the characteristic germs and microbes above referred to.

In detail the invention may be described as follows:

Referring to the drawings, 1 represents a filter-chamber provided with a filter cylinder or diaphragm 2, supported on a plate 3, having a central hollow tubular extension 4, which passes through the bottom of the chamber and communicates with the top of an ozone-chamber 5. The filter-chamber is supported on the upper peripheral ledge 6 of the outer walls of the ozone-chamber. Resting on a lower inner peripheral ledge 7 of the ozone-chamber is a series of superposed and removable funnel-supporting frames 8, provided

each with a series of radiating arms 9, at the meeting point of each series of which is formed an opening for the reception and passage of the reduced delivery end of a funnel 10, the several funnels being superposed one over the other. Located in a pocket or casing 11, formed integral with or carried by the inner surface of the peripheral wall of the ozone-chamber 5, is a Ruhmkorff coil 12, the free ends 12' of whose primary coil lead to suitable binding-posts 13, carried or disposed along the outer peripheral wall of the ozone-chamber, whereby said wire ends can be connected to the poles of a suitable electric battery, (neither the battery nor the circuit-breaker with which the primary coil is usually provided being shown, as these parts are well known and require no description.) The terminals 12'' of the outer or induction coil pass through and are supported, respectively, within suitable cylindrical and U-shaped glass tubes 14 14', (it being understood, of course, that any non-conducting or insulated material can be substituted for the glass,) the bases of each of which are respectively secured to the inner peripheral wall of the ozone-chamber by rivets 15 and by means of metallic clips 15', whose free ends are passed through the wall of said chamber and then bent back against the outer surface of the wall. (See Fig. 4.) At the points of emergence of the wires 12'' from the ends of the tubes 14 14' the said wires are broken or their continuity is interrupted, the adjacent or contiguous ends of the broken wire being provided with a terminal platinum or non-corroding tip or electrode 16, the members of each pair of electrodes being separated sufficiently as to produce a disruptive electric discharge across the space by which they are separated, when a current is passed through the primary coil (and hence formed in the induction-coil) in the well-known manner.

The discharge-openings of the series of funnels 10 are substantially in vertical alignment, the water escaping from any one funnel dripping in the path of the electric discharges formed directly underneath it, it being understood, of course, that each pair of electrodes is so located as to cause the water

dripping from any funnel to fall across the path of the electric discharges so produced. By the disruptive discharges resulting from the leaping of the electric current from one electrode to the other there is generated in the ozone-chamber 5 an atmosphere of ozone, through which, of course, the water (or other liquid) is obliged to pass or fall, the ozone thus generated having the quality and capacity of destroying all injurious or disease-breeding germs that the liquid may contain before being subjected to the sterilizing process, the effectiveness of the sterilizing action of the ozone being enhanced by causing it to act on the drop of water as it passes between the electrodes and at the moment the ozone is being generated. The ozone-chamber is detachably supported on the clear-water chamber or reservoir 17, from which the filtered and sterilized water can be withdrawn through the faucet 18.

It is to be understood that by my present method of sterilization I do not limit myself to the details of apparatus here shown and described, although that is a convenient form, nor to the manner of generating the current by which the series of disruptive discharges are produced. Suffice it to say, however, that the current should be one of a high electromotive force and capable of producing discharges of the character referred to—that is, such as to produce ozone.

It is apparent that by my present method the sterilization of the liquid is effected without electrolyzing the same, as the liquid does not come in contact with the electrodes, but simply passes through the electric discharges and between the electrodes.

Having described my invention, what I claim is—

1. In the method of sterilizing liquids, the process of producing a series of disruptive electric discharges thereby generating ozone, and passing the liquid through the atmosphere of ozone thus formed and between the electrodes but out of contact therewith, substantially as set forth.

2. In the method of sterilizing liquids, the process of first producing a series of electric discharges between two electrodes, and thereby generating ozone, and passing the liquid between the electrodes but out of contact therewith, and in the path of said discharges and the ozone thus generated during the continuance of said discharges, substantially as set forth.

3. In the method of sterilizing liquids, the process of producing a series of electric discharges, and passing successive drops of the liquid to be sterilized in the path of the discharges, but out of contact with the electrodes, substantially as set forth.

4. In the method of sterilizing liquids, the process of first producing a series of electric discharges, and successively passing different portions of the liquid between the electrodes

and in the path of such discharges, but out of contact with the electrodes between which the discharges are produced, substantially as set forth.

5. In the method of sterilizing liquids, the process of first producing a series of disruptive electric discharges, and successively passing different portions of the liquid between the electrodes and in the path of such discharges but out of contact with the electrodes, and passing said liquid through the atmosphere of ozone produced by said discharges, substantially as set forth.

6. In a liquid-sterilizing apparatus, a suitable ozone-chamber, a wire leading thereinto and adapted to conduct an electric current, the continuity of the wire being broken so as to form adjacent electrodes, whereby upon the passage through the wire of a current of suitable intensity and character a series of disruptive electric discharges will be formed between the electrodes, and whereby an atmosphere of ozone is generated in the chamber, and means for conducting the liquid in the path of the said electric discharges between the electrodes but out of contact therewith, substantially as set forth.

7. In a liquid-sterilizing apparatus, a suitable ozone-chamber, an electric wire leading into and confined within the same and having a series of brakes adapted to produce a series of electric discharges, a series of funnels supported within the chamber and having their delivery ends in proximity to the path of the electric discharges whereby the liquid delivered or discharged from the funnels will drop in the path of the electric discharges but out of contact with the electrodes, and suitable means for delivering or conducting the liquid from the ozone-chamber, substantially as set forth.

8. In a liquid-sterilizing apparatus, a suitable ozone-chamber, a frame mounted within the same, a series of superposed funnels carried by the frame, one funnel being adapted to discharge into the one immediately below it, an electric wire having a series of brakes adapted to produce a series of disruptive discharges below the outlet from each funnel whereby the liquid escaping from the funnels is caused to pass in the path of the discharges, but out of contact with the electrodes by which said discharges are produced and through the atmosphere of ozone generated by the discharges, an inlet-opening for the liquid into the ozone-chamber and an outlet-opening therefrom for the sterilized liquid, substantially as set forth.

9. In a sterilizing apparatus for liquids, a suitable ozone-chamber, a pocket carried along the inner wall of the same for holding a suitable electric coil, a primary wire and an induction-wire leading from said coil, a series of tubes disposed along the inner surface of the chamber-walls, the induction-wire being adapted to pass through the tubes and its con-

tinuity interrupted at its point of emergence from the tubes and platinum or non-corroding tips carried by the projecting ends of the wire whereby upon the passage of the current
5 through the wire a series of disruptive discharges are formed between the electrodes and an atmosphere of ozone is generated in the ozone-chamber, substantially as set forth.

10 10. In a liquid-sterilizing apparatus, a suitable ozone-chamber, U-shaped tubes of glass or insulated material disposed within the

same, electrodes supported within the tubes and projecting within the chamber, and suitable clips for supporting the bases of the tubes to the inner walls of the chamber, substantially as set forth. 15

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

HENRY G. STIEBEL, JR.

Witnesses:

ALFRED A. MATHEY,
EMIL STAREK.