H. L. LOWE.

BACTERIOLOGICAL OVEN OR INCUBATOR.

APPLICATION FILED AUG. 22, 1908.

997,070. Patented July 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

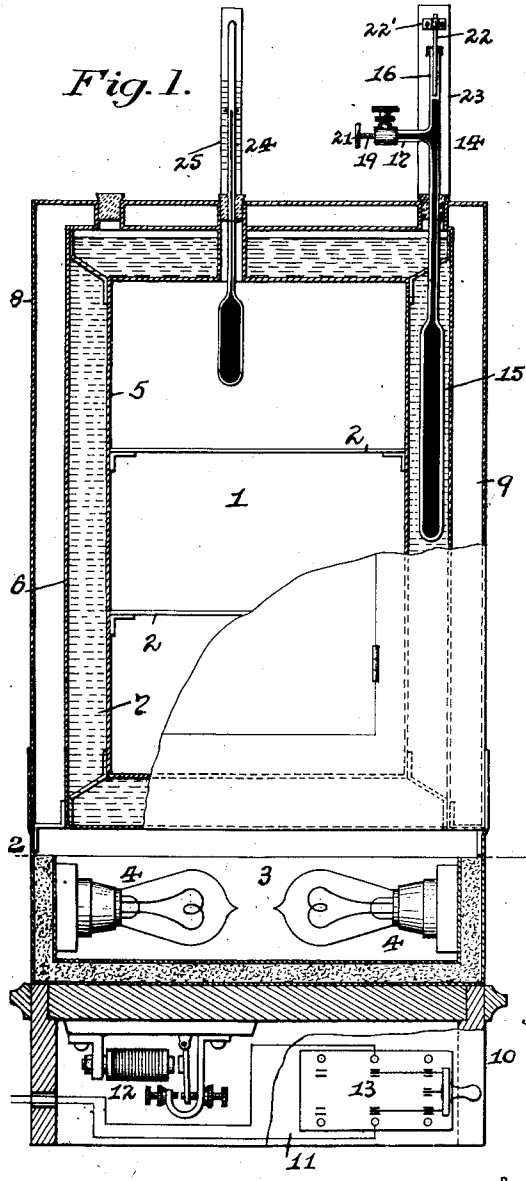


Fig. 2.

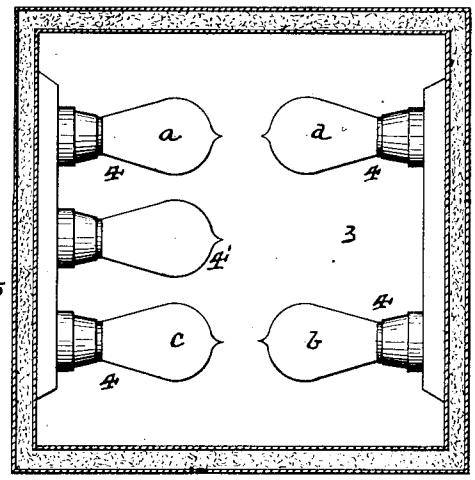


Fig. 4.

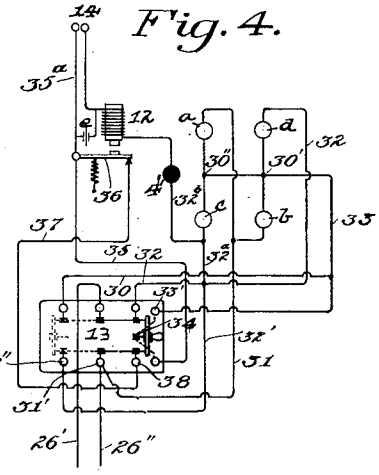
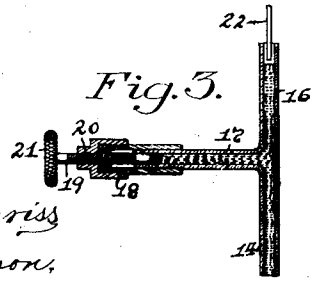


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 5.

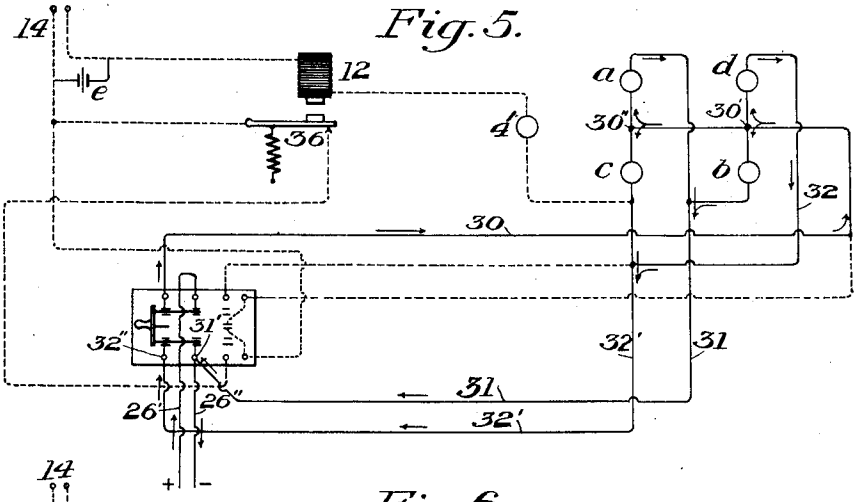


Fig. 6.

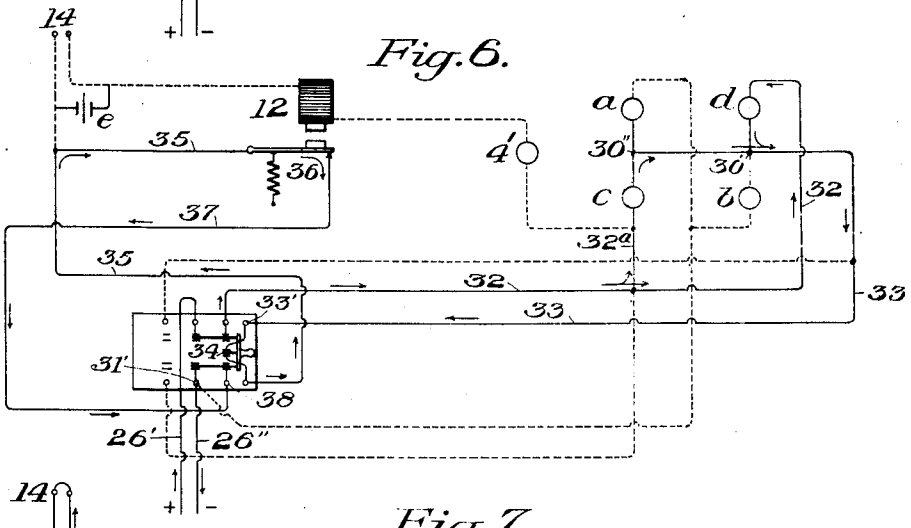
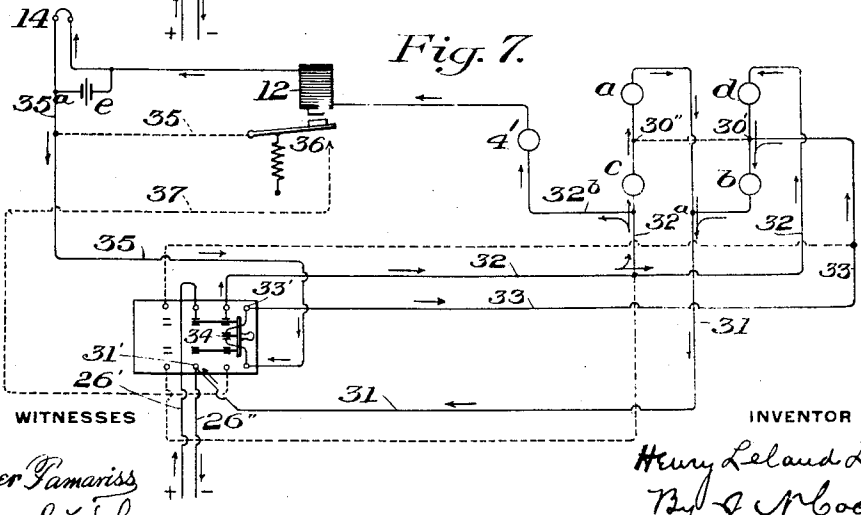


Fig. 7.



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BACTERIOLOGICAL OVEN OR INCUBATOR.

997,070. Specification of Letters Patent. Patented July 4, 1911.

Application filed August 22, 1908. Serial No. 449,867.

To all whom it may concern:

Be it known that I, HENRY LELAND LOWE, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Bacteriological Ovens or Incubators; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to ovens or incubators and has special reference to such devices for use in bacteriological purposes.

The object of my invention is to provide a cheap, simple and efficient apparatus of this character which shall be inexpensively heated by such means and in such manner that the temperature will be automatically regulated and maintained substantially uniform throughout any desired period of operation.

My invention consists, generally stated, in the novel arrangement, construction and combination of parts, as hereinafter more specifically set forth and described and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved oven or incubator, I will describe the same more fully, referring to the accompanying drawing, in which—

Figure 1 is a longitudinal sectional view, partly in full lines, of an apparatus constructed in accordance with my invention. Fig. 2 is a cross-section on the line 2—2 Fig. 1, and looking in the direction of the arrow. Fig. 3 is a sectional detail view of the contact device. Fig. 4 is a diagram view of the electric circuits employed in the heating and regulating apparatus. Fig. 5 is an enlarged diagram view of the circuits and showing in full lines the starting position. Fig. 6 is a like view of the circuits and showing in full lines the running position. Fig. 7 is a like view showing in full lines the circuits in use when the thermostatic contact is closed.

Like symbols of reference herein indicate like parts in each of the figures of the drawing.

As illustrated in Fig. 1, the oven, which may be of any suitable form and have any desired structural characteristics, is indicated as comprising a chamber 1, having a plurality of shelves 2 therein, and a chamber 3, having suitable heaters located therein, such as a plurality of incandescent lamps 4 of equal candle power and of a size to suit conditions, and a like lamp 4′ of eight candle power or smaller for acting as a resistance to protect the contact thermometer and relay hereinafter described. The chamber 1 is here shown as having sheet metal walls 5 and as surrounded by a shell 6, between which and said walls 5 is a chamber filled with liquid 7. Surrounding the shell 6 is an outer shell 8, and between which and said shell 6 is an air-space 9, and the air in said space on account of its poor conductivity of heat will serve to aid in maintaining a constant temperature in the chamber 1.

The structure above described is mounted upon a base portion 10 which forms a compartment 11 having an ordinary telegraph relay 12 mounted therein for forming a circuit making and breaking device, and an ordinary knife switch 13 of the double pole and double throw character is mounted on the outer surface of the said base portion.

Connected to and extending through the top of the oven is a thermostat 14 which is provided with a bulb 15 and capillary tube or stem 16 connected together, with the bulb projecting downward into the liquid 7 between the shells 5 and 6 to a point therein as may be desirable, and the stem extending somewhat above the top of the oven. A side tube 17 extends out from the stem 16 and above the top of the oven, which is provided with a nut 18 at its end for the reception and engagement of a displacement screw 19 passing through a stuffing box 20 on the outer end of said nut and provided with a handle 21 at its free outer end for operating the same. The bulb 15 and stem 16 are filled with mercury which extends into the side tube 17 and above the same in the stem 16 and a contact wire 22 of steel or platinum is inserted into the bore of said stem from above the same through its upper open end, and is clamped in a bearing 22′ on a standard 23 extending up from the top of the oven. In case the wire 22 inserted into the bore of the tube 16 is used to make the contact, a rough adjustment of the temperature of contact may be made by sliding said wire in said tube, and a fine adjustment can be made by the displacement screw 19 in the side tube 17.

A thermometer 24 of the ordinary approved character passes through the top of the oven and enters into the same above the upper shelf 2 therein to determine the tem-

perature of the oven and the graduated portion 25 extends above the top of the oven for the reading of the same.

The operation of the circuits is as follows:—For starting the apparatus with the switch thrown over to the left as shown in dotted lines in Fig. 4 and in full lines in Fig. 5, the circuit is as follows:—Considering the circuit as entering by main wire 26′ through switch by wire 30 to lamps *a b c* and *d* the current being divided at points 30′ and 30″ as shown. The circuit is complete through lamps *a* and *b* by wire 31 to terminal 31′ of switch while the circuit of lamps *c* and *d* passes by wire 32 to 32′ to contact 32″ of the switch all to wire 26″.

When switch is thrown over to the full line position as shown in Fig. 4 and Fig. 6, which is the normal running position, the current from main wire 26′ passes through wire 32 and dividing, by wires 32 and 32ª to lamps *d* and *c* respectively and returning by wire 33 to contact 33′, special contact 34, wire 35, contact 36 and wire 37 to switch contact 38 and thence through switch to main wire 26″.

Lamps *a* and *b* while in a normally closed circuit could receive no appreciable amount of current as they could only be energized by current which has passed through lamps *c* and *d* which lamps have a direct return circuit of practically no resistance through the line 33.

When the heat in liquid 7 reaches a certain predetermined point the contact is closed at 14, as shown in full lines in Fig. 7, by reason of contact between the rising mercury and terminal 16 as previously described, at which time the circuit over wire 35 to contact 36 and wire 37 will be broken by reason of the energizing of magnet 12 through the following circuit; from switch by wires 32, 32ª and 32ᵇ, lamp 4′, magnet 12, mercurial contact 14, wire 35ª and 35, special contact 34, wire 33, lamp *b* and wire 31 to switch. The energizing of magnet 12 breaks the contact between 36 and wire 37 and the lamps will be thrown in series by pairs as follows: From switch by wire 32 through lamps *d* and *b* and wire 31 to switch terminal. Another circuit from switch passes over wires 32, 32ª, lamps *c* and *a* and wire 31 to switch. The circuits remain with lamps *d* and *b* in series and lamps *c* and *a* in series, and magnet 12 interposed in series with lamps 4′ and *b* through special contact 34, until the temperature of liquid 7 is sufficiently reduced to lower mercury and break contact 14, at which time arm 36 is released and the circuits are restored to the condition above described and illustrated in Fig. 6.

A condenser, such as is shown at *e* in Fig. 4 is connected around the mercury contact of the thermometer 14 and mounted beneath the relay 12 for protection, and a special contact, such as is shown at 34 in Fig. 4, is provided on the switch 13 and is interposed in the circuit of the relay 12, so that when said switch is thrown to the left, as shown in dotted lines in said figure and all the lamps *a b c* and *d* are being operated at full current, as at the start, this contact will be broken and thus throw said relay and its protecting lamp 4′ out of circuit.

Either direct or alternating current of any potential may be used and the condenser and lamps must be selected to suit the voltage.

The apparatus is very sensitive and certain in its operation and is so readily susceptible of regulation by means of variations in the heat that any desired uniform temperature may be maintained by regulating the number of lamps employed and by adjusting the thermostatic device, so that it will act in accordance with the degree of heat desired.

The parts of the oven or incubator are few and generally of commercial character, with the exception of the contact thermometer, and they are so arranged and used as to enable the practically instant use of the apparatus in its entirety. The device is compact in form and when set up for shipment, will be practically complete.

Other suitable arrangements of the circuit and controlling devices may be employed if desired, as well as others of resistance devices, while various changes in the design, construction and operation of the apparatus may be resorted to, without departing from the spirit of the invention or sacrificing any of its advantages.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an incubator or bacteriological oven, the combination of a chamber having a water jacket, a heating chamber located outside of the water jacket, an electrical heating resistance in said heating chamber, a circuit for said heating resistance, a second circuit including a make-and-break device, a thermostat extending into said water jacket and adapted to automatically close the make-and-break circuit, and a resistance device also located in said heating chamber and adapted to be automatically thrown into circuit with the first named resistance when said make-and-break circuit is closed by said thermostat.

2. In an incubator or bacteriological oven, the combination of a chamber having a water jacket, a heating chamber located outside of the water jacket, a plurality of electrical heating resistances located within said heating chamber for heating said water jacket, a circuit for said resistances, a second circuit including a make-and-break device, a thermostat extending into said water jacket and adapted to automatically close the make-

and-break circuit, the closing of said make-and-break circuit altering the resistance in said heating circuit, and an electric resistance in said make-and-break circuit adapted to be automatically thrown into circuit with the first named resistances when the make-and-break circuit is closed by said thermostat.

3. In an incubator or bacteriological oven, the combination of a chamber having a water jacket, a heating chamber located outside of the water jacket, a plurality of heating resistances in said heating chamber normally in parallel, an electrical circuit for said resistances, a second electrical circuit including a make-and-break device, and a thermostat extending into said water jacket and adapted to automatically close the make-and-break circuit, the closing of said last mentioned circuit throwing said resistances from parallel into series and thereby reducing their heating action.

4. In an incubator or bacteriological oven, the combination of a chamber having a water jacket, a heating chamber located outside of the water jacket, a normal heating resistance in said heating chamber, a regulating resistance also located in said heating chamber and which is normally inoperative, and a thermostatic device controlled by the temperature within the water jacket for placing the regulating resistance into and out of circuit with the normal heating resistance.

In testimony whereof, I, the said HENRY LELAND LOWE, have hereunto set my hand.

HENRY LELAND LOWE.

Witnesses:
C. H. ABBETT,
FRANK E. ABBETT.