

No. 719,614.

PATENTED FEB. 3, 1903.

J. W. SAUER.
INCUBATOR.

APPLICATION FILED OCT. 16, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

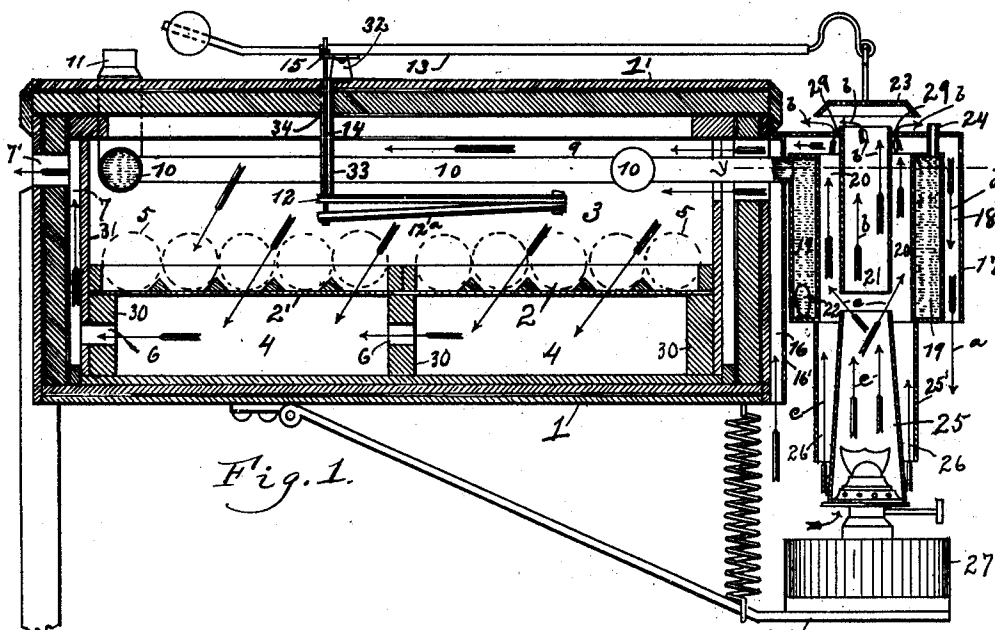
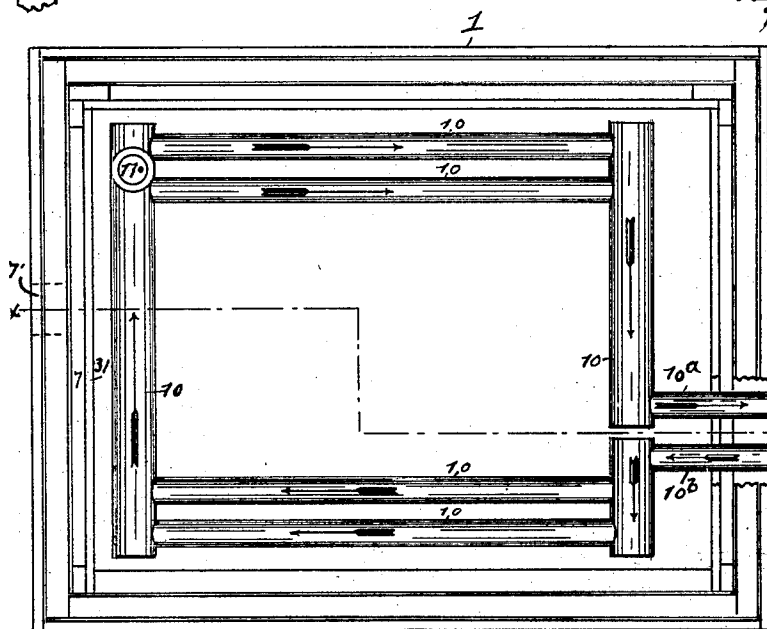


Fig. 1.



A Fig. 2.

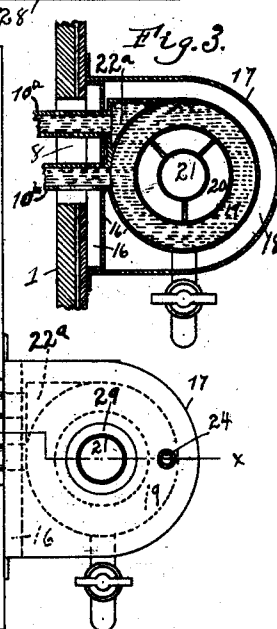


Fig. 3.

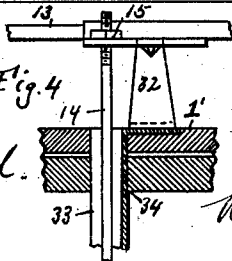


Fig. 4.

WITNESSES.

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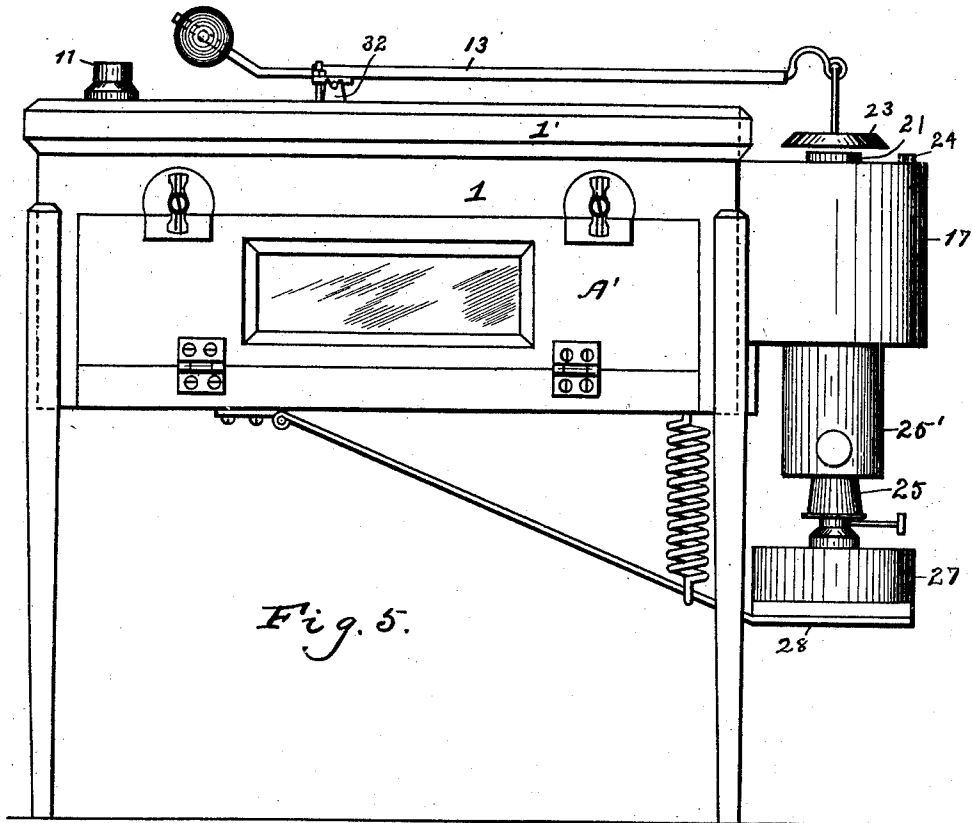
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2 SHEETS—SHEET 2.



WITNESSES.

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SPECIFICATION forming part of Letters Patent No. 719,614, dated February 3, 1903.

Application filed October 16, 1902. Serial No. 127,473. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. SAUER, a citizen of the United States, residing at Trotwood, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Incubators; and I do 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, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in incubators and possesses the features hereinafter described and claimed.

The objects of the invention are, first, to provide means for heating the water which is introduced to the heat-radiating system at the top of the egg-chamber in such a manner that a uniform temperature can be maintained within said chamber irrespective of the varying temperature of the surrounding or outside air; secondly, to provide means for sealing the flues or heating-chambers from the egg-chamber, so that none of the fumes or gases will be permitted to find their way into said egg-chamber; thirdly, to provide proper connections of the thermostat with the lever, so that any movement of the lid or cover of the incubator, which might be due to any variations caused by heat or moisture within the egg-chamber, will not affect the position of the thermostat relatively to the lever which supports the damper.

Preceding a more detailed description of my invention, reference is made to the accompanying drawings, of which—

Figure 1 is a vertical mid-sectional longitudinal elevation illustrating my improved incubator, the same being taken on the line *x x* of Fig. 2. Fig. 2 is a top plan view of the same with the cover or lid removed, showing the interior arrangement of the hot-water-circulating tubes or radiators. Fig. 3 is a horizontal sectional view through the upper portion of the heater on the line *y y* of Fig. 1; Fig. 4, an enlarged sectional view of a portion of the lid or cover, showing the connections of a portion of the thermostat-fixtures.

Fig. 5 is a perspective view showing the front of the incubator.

In the following detailed description similar reference characters indicate corresponding parts in the several views of the drawings.

1 designates the body of the incubator, and 1' the cover or lid thereof, which is secured thereto by screws or any other suitable manner.

3 is an egg-chamber in the interior of said body above the egg-tray 2, said egg-tray being supported on supports 30 above the chick tray or nursery 4.

16 designates a ventilating-duct through which the initial supply of atmospheric air is introduced to the air-chamber and from there is drawn down between the eggs 5 (shown in dotted lines) to the nursery-compartment 4, as indicated by the various arrows. The air thus drawn down into said compartment passes through wire network or any other suitable fabric 2' having the necessary openings to admit of the passage of air and which forms the bottom of the egg-tray. The ventilation thus produced in the egg-chamber 3 and nursery-compartment 4 passes through ventilation-openings 6 in the supports 30 and thence through chamber 7 and out through exit-opening 7'. It will be understood that the ventilation-openings 6 in the supports 30 are of a suitable number to admit of a free and easy circulation of air throughout the interior of the incubator.

The air-duct 16 is in close proximity to the heater, (which will presently be described,) so that the air entering said duct is subjected to a suitable heat to raise its temperature before it enters the egg-chamber. The properly-heated air thus entering through said duct finds its way to the interior of the egg-chamber in proximity to the hot-water pipes or radiators 10 and is increased to suitable extent thereby, so as to bring the temperature of said incoming air slightly above the temperature of the air within the egg-chamber. The warm air thus entering the egg-chamber 3, coming in contact, as before stated, with the air in said egg-chamber of a lower temperature, the tendency will be to slightly reduce the temperature of said incoming air, and thus cause a downward cur-

rent through the egg-tray into the nursery-compartment below. It is therefore clear that whatever foul air or gases are contained within the egg-chamber will be drawn down 5 and out through the ventilation-openings 6 and out through the duct 7 and the exit-opening 7', thus maintaining within the incubator a constant supply of pure warm air. The rear wall 31 above the egg-chamber is 10 heated by radiation of the heated air within said chamber. Therefore, this wall being warmer than the parts surrounding the openings 6 in the nursery, there will be caused an upward flow of the air through the duct 7 15 and opening 7'.

Having described the construction and interior arrangement of the incubator to illustrate the manner of obtaining the proper ventilation, I will next describe in detail the 20 heating devices through which a proper circulation of warm water is obtained.

27 designates a heat-generator or lamp which is conveniently supported on an arm or bracket 28. 25 designates a flue or chimney inclosing the burner of said lamp at the bottom, the said chimney or flue tapering inwardly to its upper end. Surrounding the said flue 25 is a tubular construction 25', which provides an annular chamber 26 around 30 the interior of the flue 25 to receive the air from below, as indicated by the arrows, and which air is heated by the radiation of heat from the flue 25. Above the flue 25 and the tubular construction 25' is placed a boiler 35 or water-column consisting of an annular chamber 19, the outer circumference of which chamber is surrounded by a jacket or casing 17, which provides an air-chamber 18 around the outer circumference of the water-column. 40 Inclosed by the water-column is a tube 21, placed above the flue 25 and providing an annular chamber 20 around the interior circumference of said water-column. This chamber 20 is practically a continuation of 45 chamber 26 and extends above the water-column. There is also a free communication from the flue 25 to said chamber 20, as indicated by the arrows. The space provided on the interior of the tube 21 has also a communication with the flue 25; but there is essentially a space between the lower end of said tube 21 and the upper end of the flue 25. The casing or jacket 17 is closed at its top 50 with the exception of a suitable opening 55 which permits an outlet of the upper end of the tube 21, and there is also an annular opening 29 in the top of said casing, which surrounds the tube 21, and a further opening for an air-escape tube 24, which communicates with the water-column. The upper 60 end of the tube 21, as well as the surrounding opening 29, is covered and uncovered in a manner hereinafter specified by means of a cap or damper 23.

65 10 designates a series of circulating hot-water pipes which are arranged in the upper

portion of the egg-chamber 3 and are connected substantially as is shown.

The inlet-tube 11, through which the water column or boiler 19 is supplied, connects at a 70 suitable point with said circulating-pipes and is closed by a cap.

10^a 10^b designate pipes which connect the circulating-pipes 10 with the water column or boiler and through which a constant circulation of hot water is maintained, as indicated by the arrows. The return-pipe 10^a is 75 connected in a manner that permits of the return or cooler water communicating with the bottom of the water-column 19 through opening 22, which is at a lower end of an auxiliary chamber 22^a, with the top of which said pipe 10^a communicates, and thus inducing a constant circulation throughout the heating system. The pipes 10^a and 10^b pass through 85 the air-duct 16 and are sealed by soldering or otherwise at the point where they pass through the wall 16' in order to exclude any admission of gases or gaseous vapors from the lamp to the egg-chamber. The movement of 90 the damper or cover 23 is controlled by the thermostat, which is placed at a suitable point in the egg-chamber.

The connection between the thermostat and the lever 13, which supports the damper or 95 cover 23, is as follows: 12 12^a designate the two parts or members of a thermostat, the upper member 12 of which has a suitable connection with the fulcrum-bracket 32, which is secured to the lid 1' and supports said lever. Said member 12 of the thermostat is 100 connected to a tube 33 or other device, which is also made fast to the fulcrum-bracket 32. A rod 14 connects with the lower member 12^a of said thermostat and with the lever 13 on one side of said fulcrum-bracket 32. 105 The connection 33 passes snugly through the opening 34 in the lid. The rod 14 passes loosely through the tube or support 35 in order that there may be no resistance to a free movement of the rod and thence to the lever 13, due to the changes in the temperature within the egg-chamber affecting said thermostat. The influence of the thermostat upon the lever 13, it will be understood, raises 115 or lowers the damper 23 after said thermostat has been adjusted. I will now proceed to describe briefly its mode of operation.

In beginning the operation of the incubator the water-column is supplied with water 120 through the tube 11, leaving the air-escape tube 24 open to permit the air in radiating or heating system to escape, thus preventing the pocketing of air in the water-column. After the radiating system is filled with water to overflow, the air-escape 24 is closed, 125 the filling-tube 11, which is provided with a cap, having a small vent to prevent overpressure. The lamp is then placed in position, and the thermostat is adjusted by rod 130 14, so as to keep damper 23 closed, said adjustment being had through thumb-nut 15 on

rod 14. The air entering chamber 26 and the flue 25 through the burner is heated by radiation and combustion, and passing upwardly enters the annular chamber 20, passing upwardly, as indicated by the arrows *e*, and thence downwardly through the annular chamber 18, around the outer circumference of the water-column, as indicated by the arrows *a*, thus completely enveloping said water-column with heat and causing the water contained therein to become suitably heated in a comparatively short space of time and circulated through the radiating system. When the temperature in the egg-chamber, due to the circulating system, reaches the desired temperature, the rod 14 should be adjusted by thumb-nut 15 so as to permit the damper 23 to slightly rise, as shown in Fig. 1. This changes the circuit of hot air generated by the lamp, as indicated by the arrows *b*. The hot air instead of circulating around the water-column finds its exit through the upper end of the tube 21 and the surrounding opening 29, thus reducing the heating influence upon the water-column and causing a cessation in the rise of temperature within the egg-chamber. The result of this elevation of the damper 23 causes a reverse current of cooler air to enter chambers 26 and 18, and thus enveloping the water-column in a manner to cool and reduce the heating temperature. There is a constant current of this cool air passing through the chambers 26 and 20 and out at the opening 29 and pipe 21. This cooling effect will have a tendency to reduce the temperature in the egg-chamber and will cause the thermostat to slightly contract, and thereby close or partly close the damper and automatically maintain a supply of heat sufficient to maintain the required temperature in the egg-chamber.

The equable distribution of heat throughout the chamber will be apparent from the engagement of the pipes. As shown in Fig. 2, the opening or door *A'* of the incubator, through which the trays are removed, is on the side *A*, and it will be observed from the manner of connecting the radiating-pipes that the hot water from the water-column first enters the system of pipes lying on that side of the egg-chamber, it being essential to counteract the cooling influences on that side of the egg-chamber, due to the door being located thereat.

Having described my invention, I claim—

1. In an incubator, the combination with an egg-tray, of a series of heat-radiating pipes located in the egg-chamber above said tray, and so arranged that hot water entering said pipes will be introduced to the egg-chamber at points adjacent to the door of the incubator, a water-column with which said pipes have a circulating connection, air-spaces surrounding the inner and outer sides of said water-column, means for heating the air entering the space around the inner side of the water-column, and automatic means for re-

lieving said air-space of the heated air when the temperature within the egg-chamber has reached the desired point, substantially as set forth.

2. In an incubator, an egg-tray, a series of heat-radiating pipes located in the egg-chamber and so arranged that the hot water entering said pipes will be introduced to the egg-chamber adjacent to the door of the incubator, a water-column with which said pipes have a circulating connection, the said water-column having its inner and outer sides surrounded with air-spaces which communicate with each other above the water-column, means for heating the air entering the space surrounding the inner side of said water-column, a tube placed within the space surrounding the inner side of the water-column, said tube having its upper end opening to the atmosphere, and the air-space surrounding the inner side of the water-column having openings communicating with the atmosphere, a damper closing said openings and the upper end of said tube, and thermostat devices located within the egg-chamber and having connection with said damper, whereby when the temperature within the egg-chamber reaches a predetermined point, the damper is lifted and thereby the heat permitted to escape from the air-space around the inner side of the water-column, substantially as set forth.

3. In an incubator, the combination with an egg-tray, of a series of heating-pipes located above said egg-tray and so arranged that the hot water entering said pipes will be introduced at points adjacent to the door of the incubator, a water-column with which said pipes have a circulating connection, air spaces or chambers surrounding the inner and outer sides of said water-column, said air-spaces communicating with each other above the water-column, a heating-flue placed below the air-space surrounding the inner side of the water-column, an air-heating chamber surrounding said heating-flue and from which heated air passes to the chamber surrounding the inner side of the water-column and thence to the air-chamber surrounding the outer side of said water-column, substantially as set forth.

4. In an incubator, the combination with an egg-tray, of a series of hot-water pipes located above said egg-tray and so arranged that the heated water entering said pipes will be introduced at a point adjacent to the door of the incubator, a water-column with which said pipes have a circulating connection, air-spaces on the inner and outer sides of said water-column, said air-spaces having communication above said water-column, a heating-flue placed below the air-space surrounding the inner side of the water-column, an air-heating chamber surrounding said heating-flue and from which heated air passes to the chamber or space surrounding the inner side of the water-column, and thence to the

space surrounding the outer side of said water-column, a tube arranged above the heating-flue within the space or chamber surrounding the inner side of the water-column, said tube being open at both ends with its upper end opening to the atmosphere above the water-column, an opening in the outer casing surrounding the upper end of said tube, said opening communicating with the top of the chamber or space surrounding the inner side of the water-column, a damper controlling the upper end of said tube, and said annular opening, and means for automatically lifting said damper when the temperature in the egg-chamber rises to a predetermined point, and whereby the operation of heating the water-column ceases and cooler air is permitted to circulate through the air spaces or chambers surrounding the inner and outer sides of the water-column, substantially as set forth.

5. In an incubator having an egg-chamber and a nursery-chamber, an egg-tray interposed between said chambers and having suitable openings in its bottom through which a circulation of the air entering the egg-chamber is maintained, a series of hot-water pipes arranged in said egg-chamber and adapted to maintain an equable temperature therein, a water-column with which said pipes have a circulating connection, a fresh-air duct communicating with the egg-chamber and lying parallel with and adjacent to the water-column, so that atmospheric air entering said duct is given an increase in temperature before it enters the egg-chamber, separate air spaces or chambers adjacent to the inner and outer sides of said water-column, said air-spaces communicating above the water-column, means for heating the air introduced to

the air-space on the inner side of said water-column, and automatic means for relieving said air-spaces of hot air when the temperature within the egg-chamber reaches a predetermined degree, substantially as set forth.

6. In an incubator, a series of heat-radiating pipes located within the egg-chamber, a water-column with which said pipes communicate, air-circulating chambers 20 and 18 on the inner and outer sides of said water-column, a heat-outlet tube 21 arranged within the inner circulating-chamber 20 and having its upper end projected through the casing which incloses the water-column, said inclosing casing also having an opening which communicates with the inner circulating-chamber 20 and through which, hot air may escape from said chamber, a damper adapted to close the heat-outlet tube 21 and the opening communicating with the inner circulating-chamber 20 and to cause the heated air entering said chamber 20 to pass to the outer circulating-chamber 18, a lever connected to said damper, a thermostat on the interior of the egg-chamber, and a connection between said thermostat and the lever, whereby, when the temperature within the egg-chamber rises to the desired point the damper will be elevated to permit the hot air to escape through the tube 21 and from the chamber 20, and thereby cause a reduction of the temperature within the egg-chamber to the desired point, substantially as set forth.

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

JOHN W. SAUER.

Witnesses:

R. J. MCCARTY,
WM. B. NEVIN.