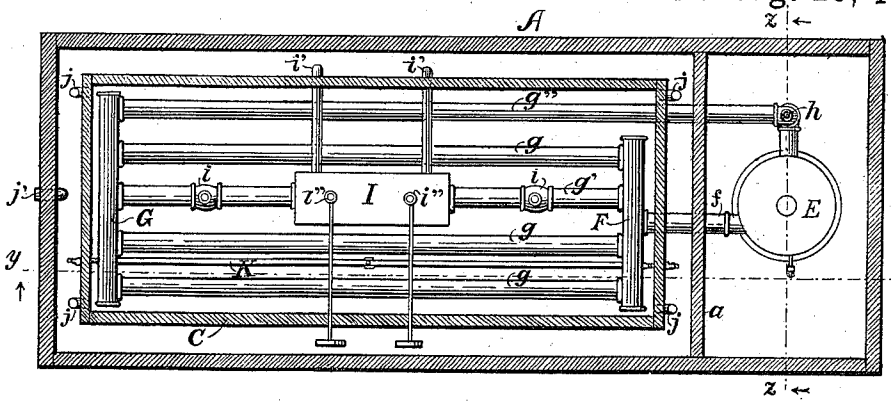
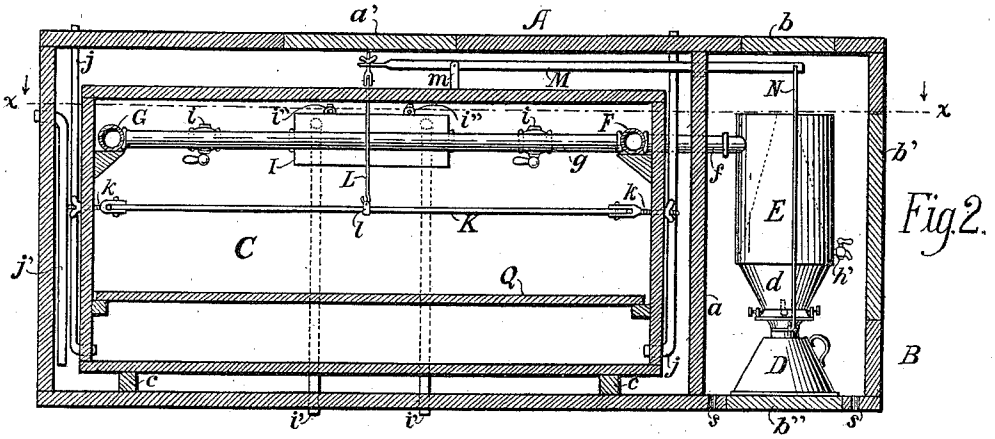
(No Model.)

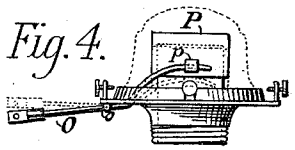
A. J. TOBEY.

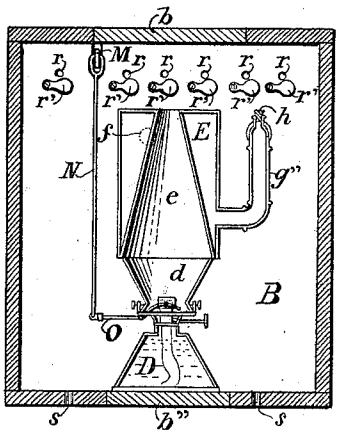
INCUBATOR.

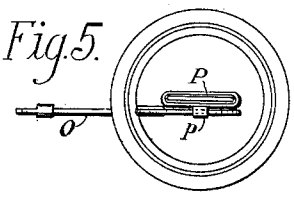
No. 566,429. Patented Aug. 25, 1896.

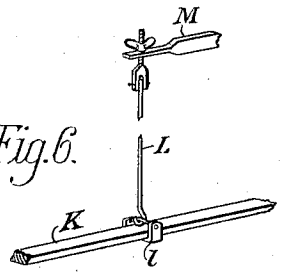












Witnesses
H. H. Mills.
A. S. Diven

Inventor
Alonzo J. Tobey
by Eugene Diven
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALONZO J. TOBEY, OF ELMIRA, NEW YORK.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 566,429, dated August 25, 1896.

Application filed March 12, 1896. Serial No. 582,910. (No model.)

To all whom it may concern:

Be it known that I, ALONZO J. TOBEY, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Incubators, of which the following is a specification.

My invention relates to improvements in incubators which are heated by hot water circulating through pipes in the interior of the incubating-chamber, the hot water being supplied by a suitably-arranged heater on the outside of said chamber; and the objects of my improvements are, first, to provide the incubating-chamber with an inclosing case so arranged as to leave an air-space on all sides of the incubating-chamber, through which space the waste heat from the incubator-heater is caused to circulate from a separate and conveniently-located heater-chamber; second, to provide means for regulating the amount of heat passing from the heater-chamber to the air-space; third, to provide improved means for supplying moisture to the incubating-chamber and for a more perfect circulation of moist and heated air from the top of the incubating-chamber downward to all points of the lower portions of said chamber, and, fourth, to provide a thermostat which shall control the heat both in the incubating-chamber and in its inclosing case. I attain these objects by the construction and mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a top sectional view on the line *x x* in Fig. 2. Fig. 2 is a sectional elevation on the line *y y* in Fig. 1. Fig. 3 is a cross-section through the heater and its containing-chamber on the line *z z*, Fig. 1. Figs. 4 and 5 show the construction of my attachment to the lamp-burner for regulating the flame, and Fig. 6 is a detail showing my thermostat connection.

Similar letters refer to similar parts throughout the several views.

A represents the inclosing case, which I shall hereinafter designate as the "incubator-case." This case has a chamber B walled off in one end by the partition *a* to contain the heater, and which will hereinafter be termed the "heater-chamber." Within the remaining portion of the incubator-case and centrally located therein, so as to provide an air-space around all sides, is the incubating-chamber C.

The heater-chamber is provided with the top door *b*, end door *b'*, and trap-door *b''*. Upon the trap-door stands the lamp D, which is provided with the flaring chimney *d*. When in position, the top of this chimney comes against the bottom of the cylindrical water-tank E, which is provided with the frusto-conical passage *e*, the bottom of which registers with the top of the chimney. From the top of the tank E passes a pipe *f* through the partition *a* and into the top portion of the incubating-chamber, where it is connected to the manifold F, from which run a number of pipes *g g g g'* across the top of the chamber to the second manifold G at the other end thereof. From one end of the manifold G runs the return-pipe *g''*, which passes through the partition *a* on a level with the pipe *f*, where it bends down alongside of the tank E and enters the tank at the bottom. A filler-plug *h* is located at the bend of the pipe *g''*, and a draw-off cock *h'* is located at the bottom of the tank.

In the center of the top portion of the incubating-chamber is located the moisture-drum I in the line of the pipe *g'*. Two valves *i i* are coupled into the pipe *g'* on either side of the drum to shut it off entirely from the rest of the heating system when required. Two pipes *i' i'* lead from the top portion of the drum, as shown, out through the incubating-chamber, down in the space between it and the incubator-case, and through the bottom of the case, where they are open to the air. The entire air-supply for the incubating-chamber comes in through these pipes, and as these pipes run through the warm-air space between the incubator-case and incubating-chamber the air is warmed and the chill taken off before it enters the moisture-drum. Two cocks *i'' i''* open into the top of the incubating-chamber from the top of the drum, and are provided with long stems, which extend out through the front of said chamber, where they may be manipulated through the door in the front of the incubator-case. From the bottom of the incubating-chamber at the four corners run the pipes *j j j j*, which connect the inside of the chamber with the outer air. A pipe *j'* leads to the outer air from the

bottom portion of the incubator-case opposite the heater-chamber.

The thermostat consists of an expansible bar K, preferably of hard rubber, which is held in the position shown and is provided with adjusting-screws *k k* at its ends. These screws pass through the ends of the incubating-chamber and are provided on the outside with thumb-nuts for adjusting the tension of the rod. At its center the bar K passes through the stirrup *l* on the end of the rod L, which hangs down from the short arm of the lever M through a hole in the top of the incubating-chamber. The rod L has a thumb-screw connection with the lever M, so that it may be properly adjusted. The lever M is pivoted at *m*, and its long arm runs through a narrow slot in the partition *a* into the heater-chamber, where it it is coupled to the rod N, which connects with the outer end of the lever O, which in turn is pivoted at *o* beneath the burner of the lamp. The other arm of the lever O runs up by the side of the wick-tube, where it is curved and passed with a close sliding fit through a hole in the boss *p*, attached to the sliding tube P, the hole in *p* being set at right angles to the line of travel of the sliding tube and the curve of the lever-arm being such that its tangent at the point where it passes through *p* will at all times be at right angles to the line of travel of the sliding tube. By this manner of connecting the lever and sliding tube there is always insured direct pressure upon the tube in the direction of its line of travel, there is no lost motion, and the tube responds to the slightest movement in the lever caused by the thermostat. When the curved arm of the lever is in its highest position, the sliding tube may be readily removed for cleaning out the pieces of charred wick, which, after a little use, will work in between it and the wick-tube and cause it to stick and respond with difficulty to the action of the thermostat.

The incubating-chamber C is set up from the bottom of the case A by the blocks *c c*, the incubator-case itself being set up the required distance from the floor by suitable legs. The egg-drawer is removed through doors in front of the chamber *c* and case A, the former of glass to permit observations to be made of the interior conditions, and the latter unglazed to render the interior of the case and chamber dark. A door *a'* is located in the top of the case A, through which to reach the adjustment for the thermostat-lever.

The holes *r* in the top of partition *a* allow the hot air from the lamp to enter the incubator-case and circulate around the incubating-chamber, and the amount of hot air let in may be regulated by the shutters *r'*. In the bottom of the heater-chamber are the holes *s*, which admit fresh air to the lamp.

The operation of the incubator is as follows: The tank E is filled with water through the opening for the plug *h*, and as this opening is above the top of the pipe system all of the pipes are filled at the same time and also the drum I, the cocks *i'' i''* being left open to allow the air in the pipes to escape. The lamp is then lighted and set up through the trap-door *b''* under the tank. As the water is heated it circulates through the pipe system and back to the tank through the pipe *g''*. As the incubating-chamber is closed on all sides with the exception of the openings into the pipes *j* at the four lower corners the hot air is drawn down from the top of the chamber across all parts of the egg-drawer Q and escapes through the pipes *j*. This produces an even distribution of heat throughout the chamber. At the same time the heat given off by the lamp and tank in the heater-chamber passes through the holes *r* in partition *a*, the doors *b* and *b'* being tightly closed, and circulates through the air-space surrounding the incubating-chamber and finally escapes from the bottom of this air-space through the pipe *j'*. In this way the incubating-chamber is surrounded by a warm atmosphere that is uniform and not subject to drafts and sudden changes of temperatures, as it would be if it stood in a room without this air-jacket. At the same time I utilize the heat from the lamp that would otherwise be wasted and economize fuel, since the warm air surrounding the incubating-chamber keeps it warmer and requires less heat to be developed in the hot-water system. In warm weather and at other times when it is not desired to pass the air from the heater-chamber into the incubator-case the holes *r* are closed by their slides and cover *b* slightly lifted to give escape to the hot air from the lamp. The amount of heat passing through partition *a* may also be regulated by closing one or more of the openings *r* and by properly adjusting the opening through door *b*. It will also be seen that when the warm-air circulation is shut off from the incubator-case there is a still-air jacket around the incubating-chamber, which protects it from sudden changes in temperature.

When the temperature in the incubating-chamber rises to the desired degree, the thermostat-bar K bends or buckles upward with its expansion and causes the lever M to push the rod N down, throwing up the free end of the lever O, which in turn lifts the tube P and reduces the flame of the lamp, thereby shutting off the heat more or less, according to the rise of the bar K. Thus the temperatures in the chamber C and in the air-space about it are regulated at the same time. By connecting the bar K with the rod L by means of the stirrup *l* I provide a solid bar with no perforations or reduced portions to be broken or permanently set by the expansion. The expansion is uniform throughout the length of the bar, and I thus obtain superior results.

In order to moisten the air within the incubating-chamber, I provide the drum I, located in a central position. Air enters this drum from the pipes *i' i'* above the water-

level, and is given off in a moistened condition through the cocks *i'' i''* in the top, the amount of air thus given off being regulated from the outside by means of the long stems. If desired, the hot water may be shut off from the drum entirely by closing the valves *i i*, in which case air will issue from cocks *i'' i''* in the same condition as it comes in from the outside of the incubator-case. It often occurs that the humidity of the outside air is sufficient to furnish all the moisture required within the incubating-chamber, and it would increase the amount of moisture to a harmful degree if this already moist air were to be passed through the moisture-drum when filled with hot water. By connecting the drum so as to shut it off from the rest of the heating system and by providing the air-cocks *i'' i''* I am able to control perfectly both the supply and the condition of the air entering the incubating-chamber. Whenever it becomes necessary to trim or refill the lamp, it is withdrawn through the trap-door *b''*, the door *b'* giving access to the interior of the heater for the purpose of uncoupling the rod N from the lever O. By means of the doors in the incubator-case the moisture and thermostat adjustments can all be reached without opening the incubating-chamber.

I am aware that prior to my invention incubators have been made with a hot-water heating system in which the water circulates through pipes from a tank heated by a lamp; also that they have been made with a double casing to provide a dead-air space around the incubating-chamber; also that the flame of the lamp has been regulated by means of a thermostat-bar within the incubating-chamber; and I do not claim these things broadly.

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

1. In an incubator, the combination of an outer inclosing case, and incubating-chamber within the inclosing case, with an air-space on all sides of the incubating-chamber between it and the inclosing case, a heater-chamber in the inclosing case separated from the incubating-chamber and from the air-space, a heater within the heater-chamber from which heat is supplied to the incubating-chamber, an air-passage from the heater-chamber to the air-space and from the air-space to the outer air whereby the waste heat from the heater-chamber is made to circulate through the air-space around the incubating-chamber, and means for regulating the amount of heat passing from the heater-chamber to the air-space.

2. In an incubator, the combination of an outer inclosing case, an inner incubating-chamber with an air-space on all sides between case and chamber, a heater-chamber at one end of the inclosing case with a partition between it and the air-space, a heater within the heater-chamber from which heat is supplied to the incubating-chamber and passages provided with shutters through the upper portion of the partition whereby waste heat from the heater and lamp in regulated quantities may pass from the heater-chamber around the incubating-chamber and escape through a properly-arranged outlet at the opposite side of the case.

3. In an incubator, the combination with an incubating-chamber of a heat-radiating system consisting of pipes running across the upper portion of the chamber and connected at their ends with the top and bottom of a water-heater, a drum through which the hot water circulates from the pipes of the system provided with an air-inlet and an air-outlet at its top, and suitable means for shutting off the drum from the rest of the system and for regulating the amount of moistened air issuing from the drum through the air-outlet.

4. In a heat-radiating system for incubators, the combination of the manifolds at the upper ends of the incubating-chamber, pipes connecting the manifolds, a drum at the center of the central pipe, valves in said pipe on either side of the drum, air-inlets leading from the outer air to the upper portion of the drum, air-cocks at the top of the drum, and circulating-pipes connecting the respective manifolds with the top and bottom of a suitably-located water-heater.

5. In a thermostat for incubators, an expansion-bar stretched across the incubating-chamber, tension-adjusting screws at the ends of the bar, a stirrup through which the expansion-bar passes intact at its central point, and a rod connecting the stirrup with one end of the regulating-lever, all combined substantially as shown and described.

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

ALONZO J. TOBEY.

Witnesses:

EUGENE DIVEN,

HOLLIS H. MILLS.