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THERMOSTATICALLY CONTROLLED ELECTRIC HEATING DEVICE

Filed May 23, 1923

Fig. 1

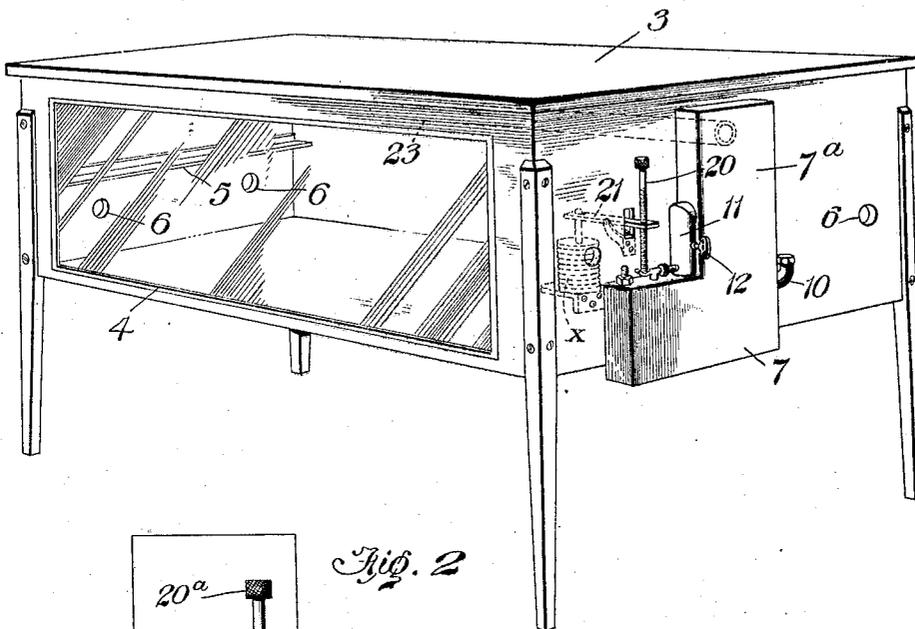
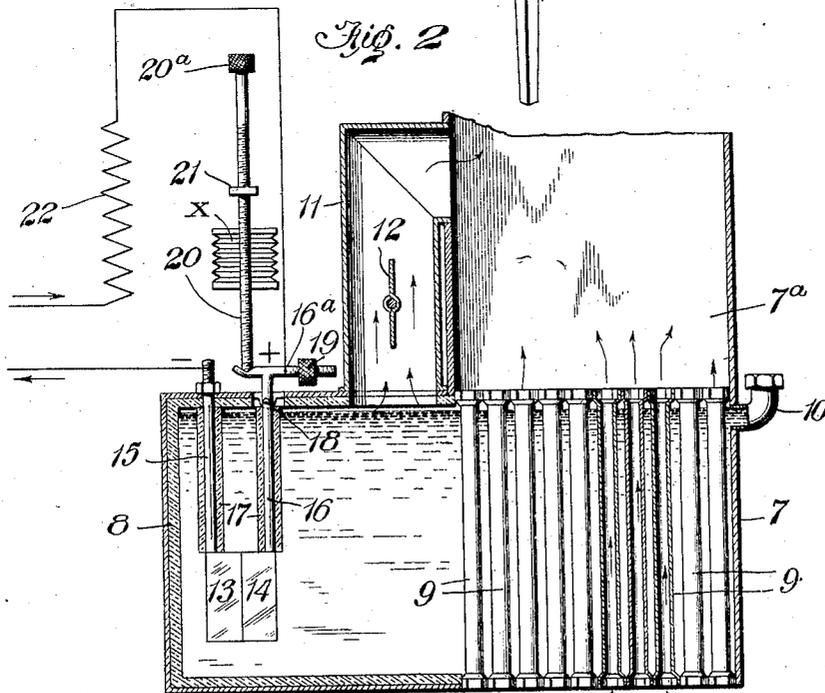


Fig. 2



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THERMOSTATICALLY-CONTROLLED ELECTRIC HEATING DEVICE.

Application filed May 23, 1923. Serial No. 641,022.

To all whom it may concern:

Be it known that I, STERLING A. OAKLEY, a citizen of the United States, residing at Boise, in the county of Ada and State of Idaho, have invented certain new and useful Improvements in Thermostatically-Controlled Electric Heating Devices; 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.

This invention relates to liquid heating devices and more particularly to a thermostatically controlled electric heating apparatus for incubators.

The object of the invention is to provide an improved device of the character referred to, by which a predetermined degree of moisture containing heat may be supplied to and maintained, without appreciable variation of temperature, within the interior of the incubator or open chamber with which it is associated.

A further object is to provide a simple, inexpensive, compact and efficient heating and regulating unit which will be readily adaptable to the exterior wall of an incubator or other compartment into which it may be desired to introduce dry or moisture laden heat, together with simple adjustment means therefor, by which the temperature within the communicating chamber and the amount of moisture admitted thereto may be independently regulated.

The invention will first be hereinafter more particularly described with reference to the accompanying drawings, which are to be taken as a part of this specification, and then pointed out in the claims at the end of the description.

In said drawings,

Fig. 1 is a perspective view of an incubator illustrating the application and arrangement of my improved liquid heating and regulating device at one end thereof; and

Fig. 2 is a vertical sectional elevation of the heating and regulating apparatus, the section being taken on a central line there-through and the electrical circuit connections being likewise indicated.

Referring to the drawings, in which like reference numerals are used to denote corresponding parts throughout the two views, 3 denotes an incubator having a transparent panel or side 4, parallel tray supporting

brackets or slides 5 and a series of air exits or ventilating holes 6 located near the bottom of the compartment below the egg trays.

Exteriorly secured to one end of the incubator is a water-tight receptacle or tank 7, which is preferably L-shaped as shown and may be formed of copper or other metal. Insulation material 8 is applied interiorly to three of the walls, top and bottom of the lower part or liquid containing portion of the tank, providing a water chamber in open communication with a radiator formed by a spaced series of vertical tubes 9, the latter being open at top and bottom to the atmosphere for the admission of air, and provided or formed with polygonal extremities permitting them to be welded or otherwise joined together to effect a water-tight union after the manner of the well known "honey-comb" structure.

A capped elbow or filler pipe 10 is provided through which liquid may be supplied to the radiator.

Portions of the exterior walls of tank 7 are extended vertically to form a substantially oblong restricted air passage or flue 7^a in communication with and superposed above the tubes 9 of the radiator, the bases of the latter, as above stated, being open to the atmosphere so that fresh air may be drawn into said passage.

An angled pipe or funnel 11 having a controlling butterfly valve 12 is provided to form a communicating passage between the liquid containing portion or chamber of the tank and an intermediate part of the flue 7^a through which vapor from the heated liquid may be introduced into the flue to combine with or saturate the heated fresh air constantly supplied therethrough to the incubator.

Opposed negative and positive electrodes 13 and 14, respectively, are suspended in the liquid within the tank by means of stems or rods 15 and 16, said rods being insulated by ordinary material 17. Electrode 13 is non-movable, its rod 15 being rigidly secured in the top part of the tank, the negative terminal of the electric circuit being connected to its projecting extremity. Electrode 14 is adapted to move in an arc toward and away from the opposing electrode, its rod 16 being pivoted to the top of the tank at a fulcrum point 18 permitting a free oscillatory movement thereof under the varying resistance influences of current flow.

The rod 16 is also formed or provided with a cross-head portion 16^a, on one arm of which is seated the lower end of a rod 20 for a purpose hereinafter described, the other arm being threaded to engage with a movable balancing weight 19 tending to move electrode 14 against its opposing member 13. The positive terminal of the circuit is flexibly connected to the rod 16 in such manner as to avoid any interference with its movement.

A pressure exerting or depressible rod 20, above mentioned, rests preferably with its lower extremity seated in a depression or socket formed in cross-head 16^a. Said rod is supported by an ordinary thermostat fulcrumed lever 21, one end of which projects through an oblong opening in the end wall of the incubator, the shank of the rod being threaded to engage with the end of said lever with respect to which it is transversely adjustable. A knurled head 20^a is also provided on the rod to facilitate its rotation when it is desired to increase or decrease the temperature within the incubator.

The end of rod 21 is adapted to move vertically when actuated by the diaphragm of an ordinary thermostat X (shown in dotted lines), which is secured in place within the incubator or heated compartment. The rod 20 is consequently slightly elevated or depressed in consonance with the imperceptible expansion and contraction of the diaphragm under variable temperature influences.

A resistance coil 22 is also introduced in the circuit intermediate the electric current generative source and the point of contact with the positive electrode. This resistance coil (diagrammatically indicated in Fig. 2) is located within the incubator or compartment to be heated, and generates heat there-within when the circuit is closed.

Introductory air pipe 23 (shown in dotted lines, Fig. 1) leads from the upper extremity of the air passage 7^a to the interior of the heated compartment.

The operation of my improved liquid heating and regulating device is as follows:

When the circuit is closed heat will be generated by resistance coil 22 within the incubator to heat the same. The current passing with considerable resistance from electrode 14 to electrode 13, immersed in water or other liquid, will heat these elements which in turn radiate and transmit their heat to the surrounding fluid. Vapor will consequently be liberated from the heated liquid and pass through funnel 11 into the air passage or flue 7^a when butterfly valve 12 is opened, the quantity of vapor thus rising, dependent of course upon the position of said valve. Fresh air entering at the bottom of tubes 9 of the radiator (which are heated by the surrounding hot

liquid) will consequently become heated as it is admitted and passes therethrough into air passage 7^a, latently absorbing the vapors emitted through funnel 11.

This fresh warm air containing the desired proportion of moisture flows out of passage 7^a through the introductory pipe 23 into the incubator and becomes uniformly distributed within its interior space. As the moist air within the heated chamber tends to cool, it settles toward the bottom of the compartment and escapes through ventilating holes 6. Thus a continuous current of fresh warm air is forced over the eggs arranged on the trays.

As the temperature within the incubator rises, the diaphragm of the thermostat will expand, forcing the projecting end of fulcrumed lever 21 downward. The rod 20 is consequently pressed against the arm of cross-head 16^a, upon which its free end rests, causing the rod 16 to swing upon its pivot and move electrode 14 away from its opposing element 13. The increased resistance in the circuit thus effected tends to retard the current flow so that resistance coil 22 will radiate less heat until the thermostat, controlled by the surrounding temperature, relieves the tension upon its associated parts sufficiently for electrode 14 to return to normal position and again increase the current. The tension with which the thermostat will react upon pivoted rod 16 may be adjusted as desired by the operator, by turning threaded rod 20 one way or the other to increase or decrease the length or span between its free end and lever 21. Balancing weight 19 is likewise adjustable longitudinally of cross-head 16^a to exert a greater or less counterbalancing influence upon pivoted rod 16.

From the foregoing it will be readily understood that the electrodes 13 and 14 serve essentially as a heat controller or regulator and that great refinements of adjustment with respect to their relative movement and the functioning stroke of their associated parts may be readily effected.

It will be understood of course that various changes in the details and arrangement of parts may be made without departing from the spirit and scope of my invention, and I do not desire to be restricted by the appended claims to the specific structure hereinbefore illustrated and described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with an incubator, a liquid container having an air chamber in communication with the interior thereof, a valve-controlled vapor conduit leading from said liquid container into said air chamber, a series of air tubes extending through the liquid in said container and having their

upper ends opening into said air chamber and their lower ends in communication with the outer air, and means for heating the liquid in said chamber, said means comprising an electric circuit including a heating coil within the incubator and a swinging electrode suspended in the liquid in said container normally in contact with a fixed electrode in the container, and a thermostat acting on said swinging electrode to decrease the electric current after the temperature in the incubator has reached a predetermined point.

2. In combination with an incubator, a liquid containing tank secured exteriorly thereof, spaced radiator tubes adjacent said tank and surrounded by the liquid therein, an air conducting passage above said radiator tubes communicating with the interior of the incubator, a valve-controlled vapor conduit communicating with said air passage and said tank, separable heating electrodes immersed in the liquid in said tank and normally in contact, one of said electrodes being stationary and the other electrode adapted to move toward and away from the stationary electrode to increase or decrease the current, a heating coil interposed in the circuit within said incubator, a thermostat also located therein, and means associated with said thermostat by which the movable electrode is separated from said stationary electrode after the temperature in the incubator has reached a predetermined point.

3. In combination with an incubator, a liquid containing tank secured to the incubator, spaced air admission radiator tubes open to the atmosphere adjacent said tank and surrounded by the liquid therein, an air conducting passage above said tubes and communicating therewith and with the interior of the incubator, a valve-controlled vapor conduit communicating with said air passage and said liquid containing tank, separable heating electrodes immersed in the liquid within the tank, one of which is stationary and the other adapted to move toward and away from said stationary electrode to increase or decrease the current, a heating coil within the incubator interposed in the electric circuit, a thermostat also located therein, and adjustable means in connection with said thermostat by which the positive electrode may be moved from the negative electrode to decrease the current after the temperature in the incubator has reached a predetermined point.

4. An electrical liquid heating and regulating device comprising separable electrodes immersed in the liquid and normally in contact, insulated rods by which said electrodes are suspended therein, one of said rods being rigidly secured to hold one of said electrodes stationary, the other of said rods being

counter-balanced and pivoted to swing the other electrode toward and away from said stationary electrode to increase or decrease the current, together with a thermostat by which the swinging motion of said pivoted rod is controlled.

5. An electrical liquid heating and regulating device for an incubator, comprising an insulated liquid containing tank secured exteriorly thereof, separable electrodes immersed in the liquid and normally in contact, insulated terminal rods by which said electrodes are suspended in the liquid, one of said rods being rigidly secured to hold one of said electrodes stationary, the other of said rods being counter-balanced and pivoted to swing its electrode toward and away from said stationary electrode to increase or decrease the current, an electrical heating coil interposed in the circuit within the incubator, together with a thermostat located therein adapted to swing said pivoted rod and its electrode away from the stationary electrode and decrease the current after a predetermined temperature within the incubator is reached.

6. An electric liquid heating and regulating device for an incubator, comprising an insulated liquid containing tank secured exteriorly thereof, air admission spaced radiator tubes adjacent said tank and surrounded by the liquid therein, an air conducting passage above said radiator tubes communicating with the interior of the incubator, a valve-controlled vapor passage communicating with said air passage and said tank, separable electrodes immersed in the liquid and normally in contact, insulated rods by which said electrodes are suspended therein, one of said rods being rigidly secured to hold one of said electrodes stationary, the other of said rods being counter-balanced and pivoted to swing the other electrode toward and away from said stationary electrode to increase or decrease the current, together with a thermostat by which the swinging motion of said pivoted rod is controlled.

7. An electric liquid heating and regulating device for an incubator, comprising an interiorly insulated liquid containing tank secured exteriorly thereof, air admission spaced radiator tubes adjacent said tank and surrounded by the liquid therein, an air conducting passage above said radiator tubes communicating with the interior of the incubator, a valve-controlled vapor passage communicating with said air passage and said tank, separable electrodes immersed in the liquid and normally in contact, insulated rods by which said electrodes are suspended therein, one of said rods being rigidly secured to hold one of said electrodes stationary, the other of said rods being counter-balanced and pivoted to swing the other electrode toward and away from said

stationary electrode to increase or decrease the current, an electrical heating coil interposed in the circuit within the incubator, together with a thermostat located therein
5 adapted to swing said pivoted rod and move its suspended electrode away from the stationary electrode and decrease the current after a predetermined temperature within the incubator is reached.

10 8. An electric liquid heating and regulating device for an incubator or the like, comprising a liquid containing tank secured exteriorly thereof, insulating material applied to the interior walls, top and bottom
15 of said tank, air admission spaced radiator tubes adjacent said tank and surrounded by the liquid therein, an air conducting passage above said radiator tubes communicating with the interior of the incubator, a valve
20 controlled vapor passage communicating

with said air passage and said tank, separable electrodes immersed in the liquid and normally in contact with a thin film of water therebetween, insulated rods by which said electrodes are suspended therein, one of said rods being rigidly secured to hold one of said electrodes stationary, the other of said rods being counter-balanced and pivoted to swing the other electrode toward and away from said stationary electrode, together with a thermostat by which the swinging motion of said pivoted rod is controlled to maintain an invariable degree of heat within the incubator.

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

STERLING A. OAKLEY.

Witnesses:

CHESTER H. TREICHEL,
JAMES W. BRIGGS.