(No Model.) 2 Sheets—Sheet 1.

J. W. CAMPBELL.

HEAT REGULATING ATTACHMENT FOR INCUBATORS.

No. 344,474. Patented June 29, 1886.

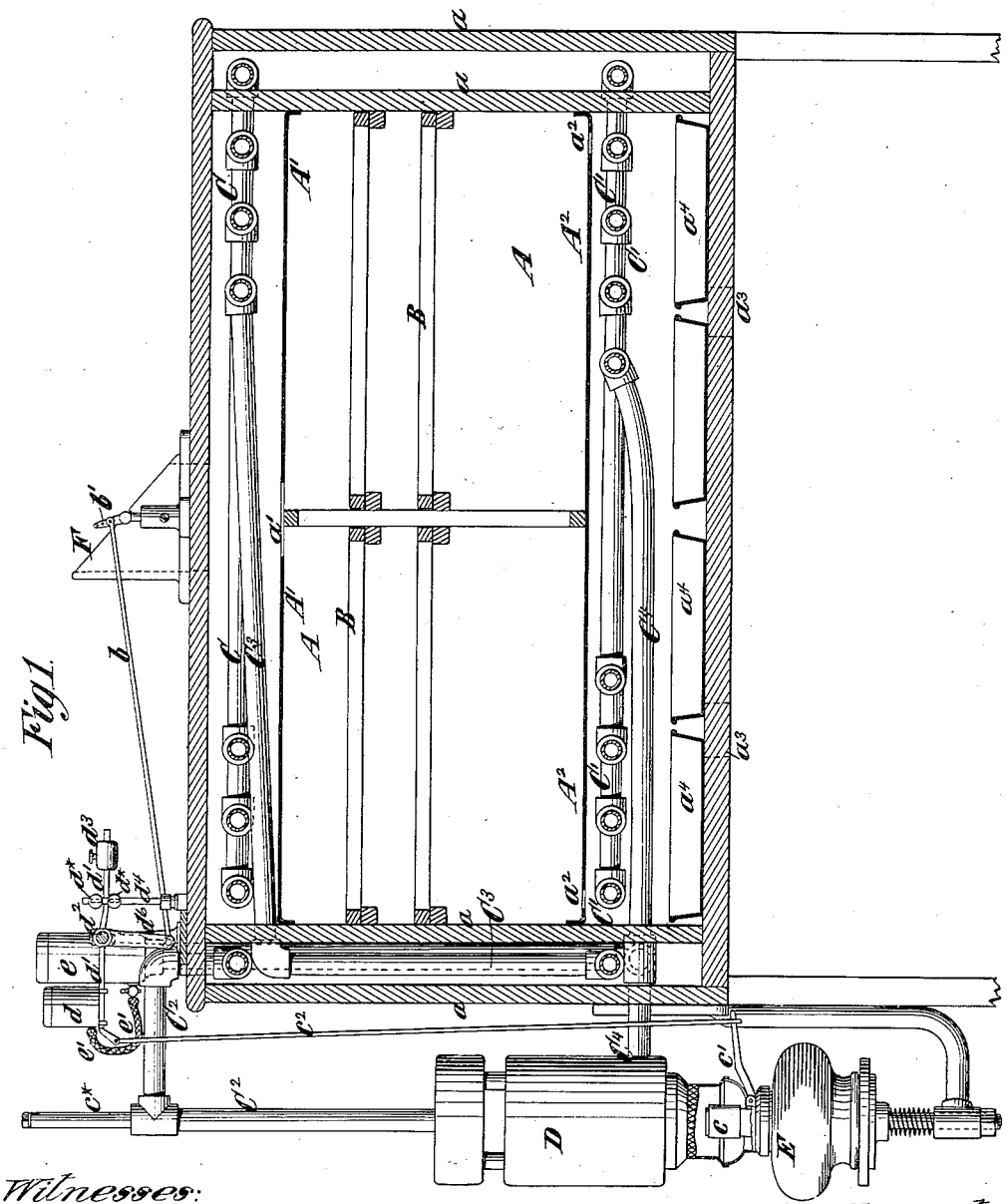

Fig 1.

Witnesses:
C. Sundgren
Emil Herter

Inventor:
James W. Campbell
by his Attys
Brown & Hall

(No Model.) 2 Sheets—Sheet 2.

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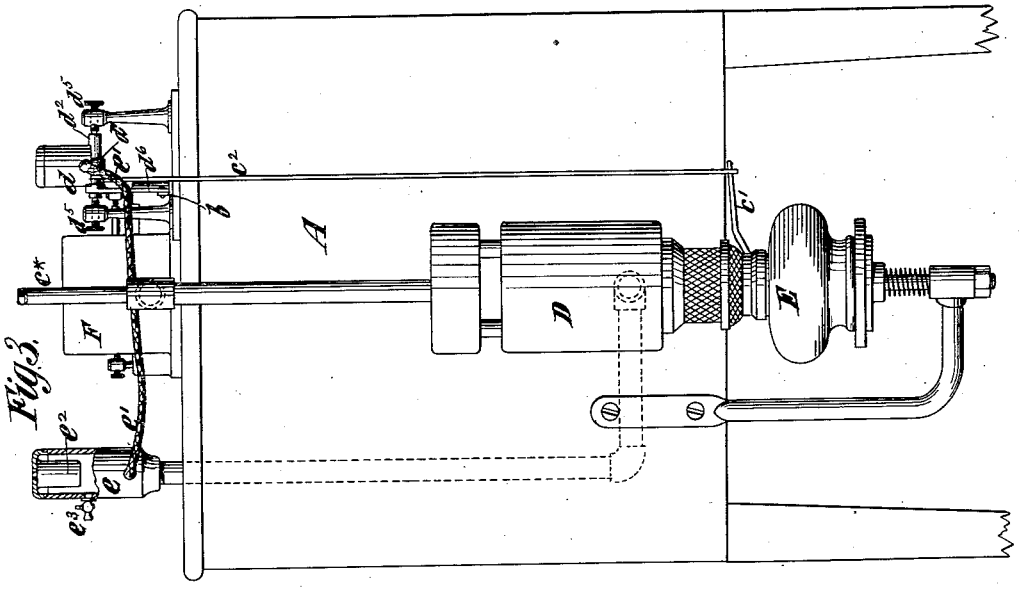

Fig. 3.

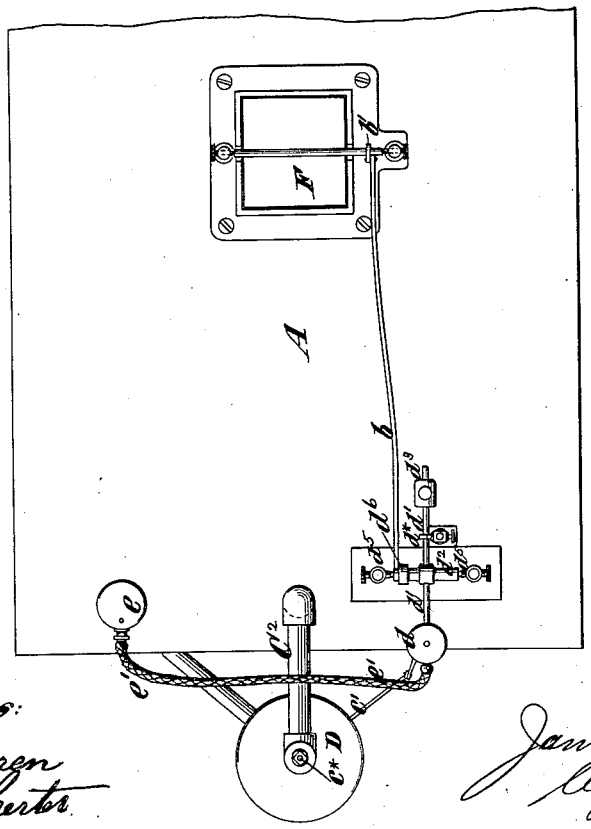

Fig. 2.

Witnesses:
C. C. Sundgren
Emil Herter

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UNITED STATES PATENT OFFICE.

JAMES W. CAMPBELL, OF GERMANTOWN, NEW YORK.

HEAT-REGULATING ATTACHMENT FOR INCUBATORS.

SPECIFICATION forming part of Letters Patent No. 344,474, dated June 29, 1886.

Application filed March 6, 1886. Serial No. 194,205. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. CAMPBELL, of Germantown, in the county of Columbia and State of New York, have invented a new and useful Improvement in Heat-Controlling Attachments for Incubators, of which the following is a specification.

My invention relates more particularly to incubators, in which the egg-chamber is heated by means of a water-heater and a system of circulating-pipes, comprising heating-coils arranged in the upper and lower parts of the incubator-chamber.

The water-heater has been heretofore heated by means of a lamp or oil-burner having a flame-controlling device adjustable relatively to the wick-tube, and by this device the amount of heat imparted to the water is controlled.

The object of my invention is to provide for properly operating either the ventilator at the top of the incubator or the heat-controlling device of the water-heater, or both these parts, by means of the expansion of the water in the heater and system of circulating-pipes.

In order to utilize the excessive expansion of the water in the heating system when unduly heated for operating the ventilator and the heat-controlling device, I employ a balance carrying a water-chamber, which is in constant communication through a flexible tube with the circulating system, and which is arranged just above the level of liquid in the circulating system, that liquid being heated to the desired degree.

This chamber, on the liquid or water rising into it by undue expansion, will fall, and thereby shift the ventilator and the heat-controlling device, either or both. I prefer to mount the water-chamber on one end of the beam, which is weighted on the other end, and connect it with a water-reservoir which surmounts the system of circulating-pipes, and which has its upper portion contracted in area, so that the balanced chamber will not receive a large volume of water when it falls, by reason of the small quantity of water entering it.

In the accompanying drawings, Figure 1 is a vertical section of an incubator having my attachments applied thereto. Fig. 2 is a plan thereof; and Fig. 3 is an end view showing the water-reservoir, from which the balanced chamber is supplied, partly in section.

Similar letters of reference designate corresponding parts in the several figures.

A designates the incubator-chamber having double walls *a*, and within which are trays B for eggs.

C C′ are upper and lower heating coils, which, with the heater D, form a water-circulating system. The water may be heated by a lamp, E, and is conducted by a pipe, C^2, to the upper heating-coil, C, thence by a pipe, C^3, to the lower heating-coil, C′, and thence by a pipe, C^4, to the heater D.

A′ A^2 are baffle-plates or deflectors arranged below the upper heating coil and above the lower heating coil, and having, respectively, openings *a′* a^2.

In the bottom of the chamber are air-inlet openings a^3 and water-pans a^4, for moistening the air.

At the top of the incubator-chamber A, I have represented a hinged ventilator, F, which may be swung upon its pivots by means of a rod, *b*, connected with an arm, *b′*, on the pivots of the ventilator, and in order to control the heat to which the water-heater D is subjected I have represented the lamp E as provided with a flame regulator or controlling device, *c*, which, by means of a lever, *c′*, and a rod, c^2, may be shifted to control the flame and the heat produced by the lamp. I also employ means whereby the ventilator F and the heat-controlling device *c* may, either or both of them, be shifted by the weight of water rising into a balanced vessel when the water in the system of circulating-pipes is unduly heated. As here represented, I have shown a balanced water-chamber, *d*, which is mounted upon a beam or lever, *d′*, fulcrumed at d^2, and having an adjustable weight, d^3, applied to the end opposite the vessel or chamber *d*. I have also shown the system of circulating-pipes as surmounted by a water-reservoir, *e*, which is connected by a flexible pipe or tube, *e′*, with the balanced water-chamber *d*. The balance beam or lever *d′* operates between two stops, d^*, which are adjustable upward and downward at different distances apart upon a standard, d^4. The pivot d^2 of the beam *d′* may be supported

by pivot-screws d^5, as best shown in Figs. 2 and 3, and it has an arm, d^6, with which the rod *b*, for controlling the ventilator F, is connected, and the rod c^2, which serves to move the heat-controlling device, is also connected with the extremity of the lever or beam *d'*. The upper part of the water-reservoir *e* should be greatly contracted in area, for a purpose hereinafter described, and in Fig. 3 I have represented this contraction as produced by a downwardly-extending projection, e^2, on the cap which closes the upper end of the reservoir *e*. When the water becomes unduly heated and the temperature in the incubator-chamber approaches the maximum limit, the great expansion of water will cause a volume of water to flow into the balance-chamber *d* sufficient to overcome the weight d^3 and to cause the chamber to fall, thereby shifting the flame-controlling device *c*, and also opening the ventilator. It will be understood that the water rises to a considerable height in the water-reservoir *e* before it enters the balance-chamber *d*, and hence, as the balance-chamber falls by the increment of weight due to the volume of water entering it, a larger volume of water will flow into the chamber *d* and hold it down for a longer time than is desired. To prevent a too great increment of water into the chamber *d* when it thus falls, I contract the upper part of the water-reservoir *e*, so that after the water rises therein to the bottom of the plug or projection e^2 a further rise will represent but a very small volume of water, and these parts should be so arranged that the bottom of the plug or projection e^2 will be on about a level with the bottom of the balance water-chamber *d* when the latter is in its lowest position. If it is desired to change the degree of heat in the incubator-chamber, it may be accomplished by adding a small quantity of water through the pipe c^*, which surmounts the system of circulating-pipes, or by drawing off a small quantity of water through the cock e^3. If it is desired to maintain a less degree of heat in the incubator-chamber, a small quantity of water may be added through the pipe c^*; but if it be desired to increase the temperature of the chamber a suitably-small quantity of water may be drawn off through the cock e^3.

I am aware that heat-controlling devices for incubators and ventilators for other purposes have been controlled by the expansion of air or vapor of liquid under excess of heat acting upon mercury to operate a balance, and hence do not claim such device as of my invention. In my incubator I employ a closed circulating system for heating, and a water vessel or chamber, *d*, which is in constant communication with said circulating system, is arranged at such a height that when the desired heat is not exceeded the chamber *d* will receive no water; but when the desired temperature is exceeded the chamber will receive an increment of water by reason of expansion of the water in the circulating system, and the chamber, by the addition of the water to its weight, will fall and move the balance-beam *d'*.

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

1. The combination, with a ventilator or heat-controlling device of an incubator, a water-heater, and a system of circulating-pipes for heating the incubator, of a balanced water-chamber in closed and constant communication with the circulating system, and arranged just above the level of water in the system, said water being heated to the desired degree, and into which water from the system will flow on being expanded by excess of heat, and connections through which the ventilator or heat-controlling device will be shifted by the downward movement of such water-chamber on said water rising thereinto, substantially as herein described.

2. The combination, with a ventilator or heat-controlling device of an incubator, a water-heater, and a system of circulating pipes for heating the incubator, of a weighted beam carrying a water-chamber which has a constant communication through a flexible tube with the circulating system, and is arranged just above the level of water in the system, said water being heated to the desired degree, and a connection between said beam and the ventilator or heat-controlling device, whereby said ventilator or heat-controlling device will be shifted on said water rising into the water-chamber by undue expansion produced by excess of heat, substantially as herein described.

3. The combination, with the ventilator or heat-controlling device of an incubator, of a water-heater and a system of circulating-pipes for heating the same, a water-reservoir, *e*, surmounting the system of pipes, and having the water-space in its upper portion contracted, and a balance supporting a water-chamber connected flexibly with the water-reservoir, and itself connected with the ventilator or heat-controlling device, substantially as herein described.

JAMES W. CAMPBELL.

Witnesses:
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CLAUDIUS ROCKEFELLER.