(No Model.)

G. E. TALBOT.

TEMPERATURE REGULATOR FOR INCUBATORS.

No. 382,779. Patented May 15, 1888.

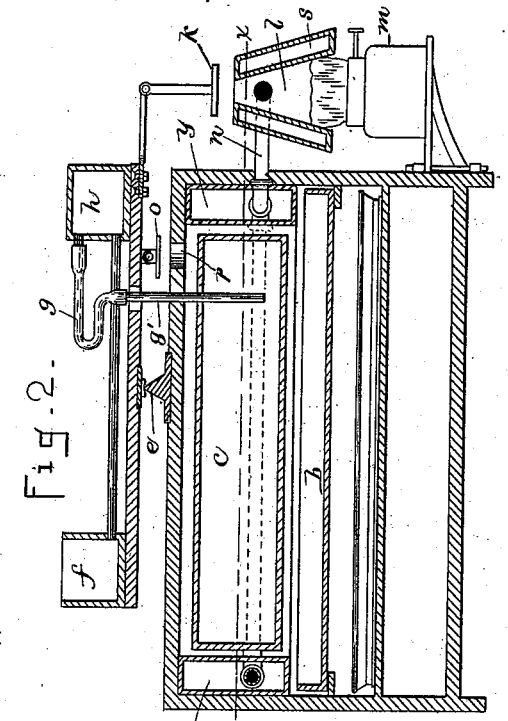

Fig. 2.

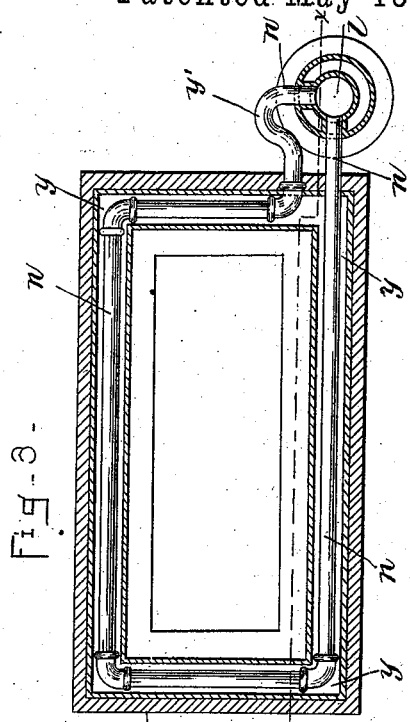

Fig. 3.

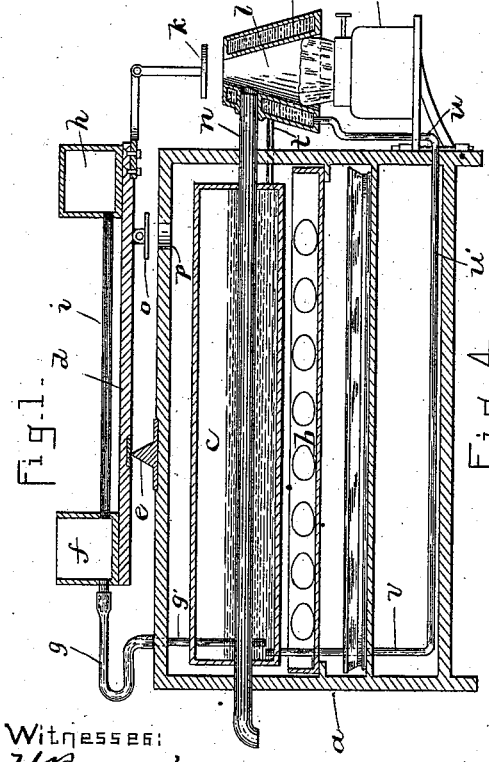

Fig. 1.

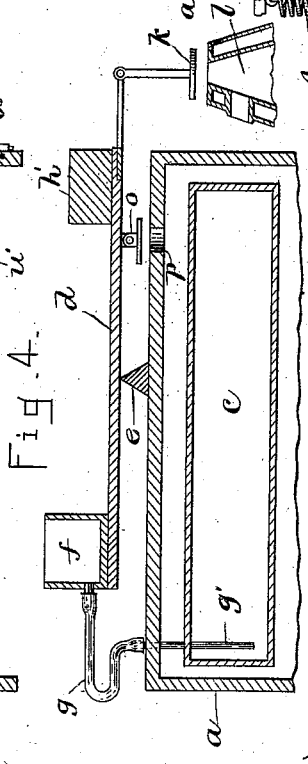

Fig. 4.

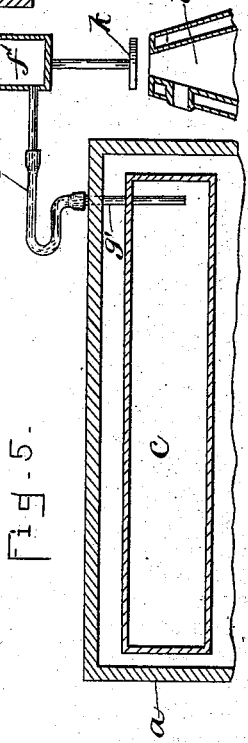

Fig. 5.

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UNITED STATES PATENT OFFICE.

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TEMPERATURE-REGULATOR FOR INCUBATORS.

SPECIFICATION forming part of Letters Patent No. 382,779, dated May 15, 1888.

Application filed November 15, 1886. Serial No. 218,972. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. TALBOT, of Tyngsborough, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Heat-Regulating Apparatus, of which the following is a specification.

This invention has for its object to provide improved means for automatically regulating the heat in the egg-containing compartments of incubators; and it consists in a sealed chamber within the incubator, an external oscillatory lever having at one end a receptacle connected with the interior of said air-tight chamber, and at the other end another receptacle communicating with the first-mentioned receptacle, (unless a weight is used as a substitute for the second receptacle, as hereinafter provided,) and heat-controlling devices operated by the movements of said lever to increase or diminish the temperature within the incubator, the arrangement being such that upon a given rise of temperature in the incubator the expansion of air in the air-tight chamber will cause such a change in the weight of the lever-supported receptacle connected with said chamber as will tilt the lever, and thereby operate the heat-regulating devices in such manner as to decrease the temperature in the incubator, while the fall of the temperature below a given point will reverse the operation until the temperature is increased to or beyond said given point, as I will now proceed to describe.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a vertical section of an incubator embodying my invention. Fig. 2 represents a vertical section of a modification. Fig. 3 represents a section on line *x x*, Fig. 2. Fig. 4 represents a vertical section of another modification. Fig. 5 represents another modification.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents the inclosing-case or body of an incubator.

b represents the egg-tray, which contains the eggs to be hatched, said tray being placed within the casing *a*, and preferably removable therefrom. Above the egg-tray, and in the upper part of the casing *a*, is a sealed chamber, *c*, of sheet metal or other suitable material. Said chamber may be of rectangular, cylindrical, or other suitable form, and when used in an incubator constructed as shown in Figs. 1 and 4 is partly filled with water or other liquid—such as glycerine—the space above said liquid containing air.

d represents a lever or platform adapted to tilt on a fulcrum, *e*, which is here shown as located on the top of the casing *a*, although said fulcrum may be located elsewhere in any convenient relation to the casing. On one end of said lever is placed a pail or receptacle, *f*, which is connected by a flexible tube, *g*, with a fixed tube, *g'*, entering the chamber *c*.

Referring for the present to Fig. 1, it will be seen that the tube *g'* extends downwardly into the liquid in the chamber and is trapped by said liquid, while the flexible tube *g* communicates with the bottom of the receptacle *f*, so that a sufficient expansion of the air in the chamber *c* will force a part of the liquid from said chamber into the receptacle *f*, thereby increasing the weight of the latter. At the opposite end of the lever *d* and at the opposite side of the fulcrum *e* from the receptacle *f* is a second receptacle, *h*, which is connected by a tube, *i*, (preferably flexible,) with the receptacle *f*, and which in the apparatus shown in Fig. 1 is sealed at all points excepting where the tube *i* enters it, said tube communicating with the lower portion of each receptacle, as shown.

It will be seen that when a portion of the liquid in the chamber *c* is forced by the expansion of the air in said chamber into the receptacle *f* the end of the lever *d* supporting said receptacle will be depressed, and that the movement of the lever thus caused may be utilized to act on suitable heat-regulating devices in such manner as to decrease the temperature in the hatching-compartment of the incubator.

It is obvious that the heat may be reduced by turning down the wick of a heat-supplying lamp by mechanism actuated by the described movement of the lever *d*, or by mechanism controlled by electro-mechanical devices, which are caused to act by the closing or breaking of

an electric circuit by the movement of said lever, or by any other suitable arrangement of mechanism which the mind of a mechanic might devise, and my invention is not limited to any particular devices whereby the tilting motion of the lever is made effective.

I have shown in Fig. 1 as the simplest means of which I am aware a valve or damper, *k*, attached to one end of the lever *d*, and arranged to be lifted and thus uncover a tapering funnel, *l*, when the lever is tilted in the manner above indicated. The uncovering of said funnel permits the heat supplied by a lamp, *m*, located under the funnel, to escape into the open air, whereas when said valve is depressed it covers the upper end of the funnel and causes the heat and products of combustion from the lamp to pass through a flue, *n*.

From the above description it will be apparent that when the heat supplied by the lamp to the incubator is below a given degree the lever *d* will remain in position to hold the valve *k* against the funnel *l*, and thus maintain a continuous supply of heat to the incubator; but when the temperature within the incubator exceeds said given degree the expansion of the air in the chamber *c* forces some of the liquid into the receptacle *f*, and thus tilts the lever *d* and opens the valve *k*, thereby permitting the heat to escape without passing through the flue *n*, and at the same time raising a valve, *o*, attached to the lever and allowing the heated air of egg-chamber to escape from the upper portion of the incubator through an orifice, *p*, which is normally covered by said valve. When the temperature is sufficiently reduced, the contraction of the air in the chamber *c* permits part of the liquid to return from the receptacle *f* to said chamber, whereupon the lever *d*, which is so weighted as to close the funnel *l* and orifice *p* when this takes place, resumes its former position and the incubator is again heated.

The receptacle *h*, being air-tight as to its upper portion and having its only opening in the lower portion, is capable of receiving a small quantity of liquid from the receptacle *f* and of retaining more or less of said liquid by atmospheric pressure, the quantity retained being dependent on the temperature of the air surrounding said receptacle. Should the temperature fall the air in the receptacle *h* contracts and draws more liquid into said receptacle, so that more liquid must be forced from the chamber *c* into the receptacle *f* than before to operate the regulator. The receptacles *f h* are preferably adjustable on the lever *d*, so that they may be moved independently toward and from the fulcrum *e*, and thus enable the regulator to be adjusted so as to act at different temperatures with a greater degree of accuracy than by the coarser preliminary method of putting in and taking water from it.

In Fig. 2 I have shown the chamber *c* as containing only air and connected with the upper part of the receptacle *h*, said receptacle being air-tight at its upper portion, like that shown in Fig. 1, and connected by tube *i* (preferably flexible) with the open receptacle *f*. Each receptacle contains a quantity of liquid. The pressure caused by the expansion of the air in the chamber *c* is communicated to the air in the receptacle *h* and expels a part of the liquid therefrom into the receptacle *f*, thus causing the lever to tilt, as before described.

In Fig. 4 I have shown a weight, *h'*, as a substitute for the receptacle *h*, the receptacle *f* being connected with the liquid-holding portion of the chamber *c*, as in Fig. 1. The operation of this modification is the same as of the apparatus shown in Fig. 1, excepting that the regulator is not affected by the temperature of the room in which the apparatus is located.

The flue *n*, which conducts the heat from the funnel *l* into the incubator, preferably passes through the liquid in the chamber *c* when the apparatus is constructed as shown in Fig. 1, and passes from thence out through the casing *a*. The liquid in said chamber thus becomes the means of diffusing the heat upon the eggs in the egg-tray under said chamber and of heating the air in the chamber. Said flue may, if preferred, extend outside of the chamber *c*, (thus communicating heat directly to the chamber,) or may pass through a tank, *y*, surrounding said chamber and containing water. (See Figs. 2 and 3.) In this case the flue may return to the funnel *l*, as shown in Fig. 3, so that the same air and products of combustion may be repeatedly reheated. The flue should have a small opening at *y'* to allow for expansion and contraction.

I prefer to provide the funnel *l* with a water-jacket, *s*, communicating by a pipe, *t*, with the lower portion of the chamber *c*, (in case the latter contains water,) and by a pipe, *u*, with a coil, *u'*, in the casing *a* below the egg-tray, said coil communicating by a pipe, *v*, with the chamber *c*. The object of this arrangement is to warm the lower portion of the casing *a* by a circulation of warm water through the coil *u'*.

The air in the incubator may be moistened by evaporation of water from cloths placed below the egg-tray, or from a pan, or in any other suitable way.

A spring, A, sustaining a receptacle, as *f'*, may be substituted for the lever *d*, as shown in Fig. 5. In said figure I have shown the damper *k* attached directly to the receptacle *f*.

My invention is not confined to the regulation of heat in incubators, but may be used to regulate furnace heat supplied to apartments, the air-tight chamber *c* being placed in an apartment to be heated by the furnace and the movable receptacle *f*, or the movable receptacles *f h* and their supporting-lever, in suitable proximity to the furnace. In this case movements of the receptacle or receptacles, caused by the expansion or contraction of air in the chamber *c*, may be caused to check or increase the draft of the furnace, as usual in heat-regulators for furnaces.

I claim—

1. The combination of a casing or apartment, means for artificially heating it, a chamber within said apartment containing a fluid, a lever without said apartment having an open and closed receptacle, a communication from both receptacles to said chamber independent of said lever, and heat-controlling devices connected with and operated by said receptacles, substantially as set forth.

2. The combination of a casing or apartment, a chamber within said casing containing a fluid, the heating-pipe extending therethrough and connected with the source of supply of heat, an external tilting lever, a receptacle at one end of said lever and having a communication with said chamber independent of said lever, and a counterpoise for the receptacle on said lever, and heat-regulating devices connected with and operated by said lever, substantially as set forth.

3. The combination of a casing or apartment, means for heating it externally, a chamber, *c*, containing a fluid, an external tilting lever, and two receptacles, *f h*, at opposite ends of said lever, said receptacles having a tubular connection with each other, and with the chamber independent of the lever, substantially as set forth.

4. The combination of the casing, the sealed chamber *c* within the casing, an external heater, a funnel or passage over the same, a flue, *n*, adapted to conduct heated air through the casing, the tilting lever *d* outside of the casing, having the valve *k*, adapted to either divert the heated air into the flue *n* or permit it to pass directly through said funnel or passage, the receptacle *f* on said lever, connected, as described, with the chamber *c*, and a counterpoise on said lever for the receptacle *f*, as set forth.

5. The combination of the casing, the chamber *c* therein, the external funnel, *l*, the flue from said funnel extending through the chamber *c*, the lever *d*, having the valve or damper *k*, the receptacle *f* on said lever, connected, as described, with the chamber *c*, and a counterpoise on the lever for said receptacle, as set forth.

6. The combination of the casing, the chamber *c* therein, means for heating said casing, the tilting lever *d*, the open receptacle *f*, and the sealed receptacle *h* on said lever, connections, substantially as described, between said receptacles and between the receptacle *f* and chamber *c*, and heat-regulating devices operated by the lever *d*, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of November, 1886.

GEO. E. TALBOT.

Witnesses:
CHARLES DUTTON,
CARRIE A. DUTTON.