

J. & H. GRAVES.  
INCUBATOR.

No. 110,454.

Patented Dec. 27, 1870.

Fig. 1.

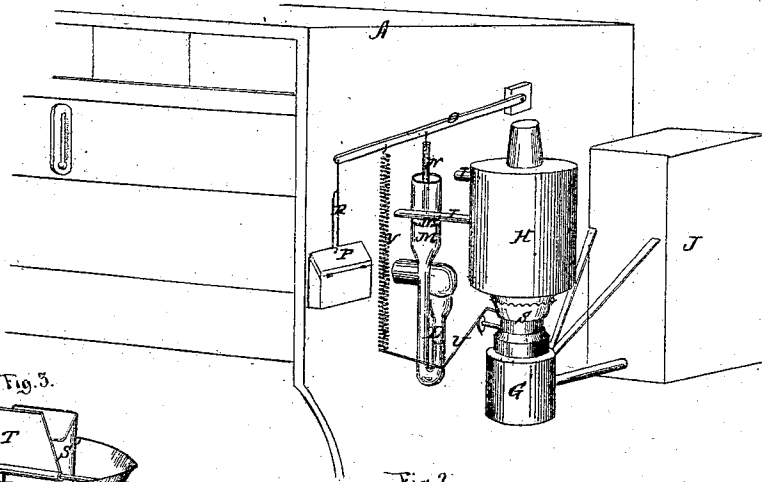


Fig. 3.

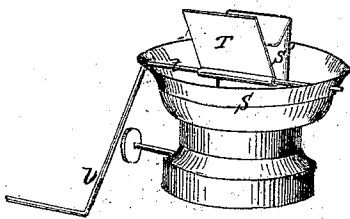


Fig. 2.

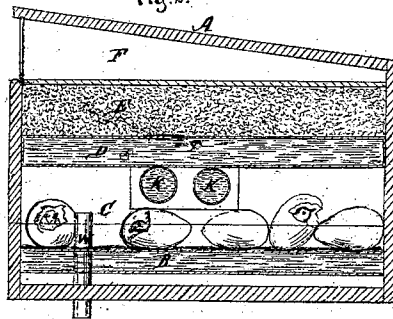
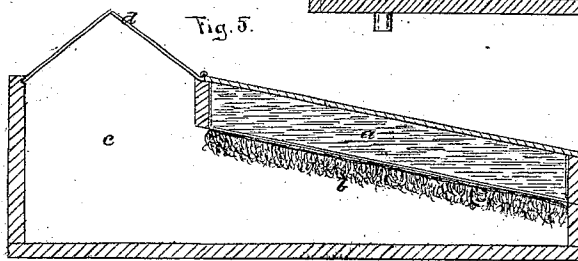


Fig. 4.



Fig. 5.



Witnesses.

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# UNITED STATES PATENT OFFICE.

JACOB GRAVES, OF READING, AND HENRY GRAVES, OF BOSTON, MASS.

## IMPROVEMENT IN INCUBATORS.

Specification forming part of Letters Patent No. 110,454, dated December 27, 1870.

We, JACOB GRAVES, of Reading, Massachusetts, and HENRY GRAVES, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Incubators, of which the following is a specification:

Figure 1 is a perspective view of a portion of an incubator-case, showing the ventilating and heat-regulating devices. Fig. 2 is a transverse vertical section of Fig. 1. Figs. 3 and 4 are views in detail of the heat-regulating device, and Fig. 5 is a sectional view of an artificial mother or protector.

The object of this invention is to maintain a certain definite degree of temperature in incubators heated by water; and it consists, mainly, of two horizontal glass tubes, closed at one end, containing alcohol, and located under the hot-water tank, each tube communicating with a vertical cylinder filled with mercury, one at each end of the incubator, in which cylinders are cork pistons or floats having rods attached to pivoted levers, which are so connected with regulators on the heating-lamps and ventilating-valves communicating with the incubating-chamber that the rising of said floats or pistons beyond a certain point by the expansion of the alcohol will act to check the flames of the lamps and open the ventilating-valves, thus decreasing the temperature of the air and water, while the depression of said floats, in consequence of the contraction of the alcohol, will produce an opposite effect and heighten the temperature, the parts being so arranged as not to be affected by the medium temperature at which the incubator is to be kept, but only by higher or lower degrees.

In the drawing, A represents the incubator, which is divided into several compartments, as shown in Fig. 2, viz., the cold-water tank B, incubating-space C, hot-water tank D, protecting or heat-retaining space E, and drying-left F. The arrangement of these parts constitutes no portion of our invention; they are given to illustrate the nature and operation of the improvement. The ends of the incubator are provided with lamps G, which heat the water in reservoirs H. These latter communicate, through tubes I I, with the hot-water tank D. J is a reservoir, which supplies oil to the lamps. K K represent glass tubes un-

der tank D, and in contact with the bottom thereof. Said tubes are filled with alcohol or other expansile fluid, and communicate at their outer ends, through the bent tubes L, with the cylinders M, which contain mercury. N represents a piston-rod, attached to a cork piston or float, N', in the cylinder M. The upper end of rod N is attached to an arm or lever, O, which is pivoted at one end and swings freely at the other. P represents a valve, which communicates with the incubating-space C, and is connected, by wires R, with the free end of lever O. Said wires are not rigidly connected with valve P, but have a sliding attachment. S represents the lamp-burner, which is provided with the tube S', which is beveled off at one side, as shown. T is a guard or regulator, which is journaled on shaft t beside the tube S, and when not in operation inclines from the same. The shaft t is bent, on the outside of the burner, into an elbow or crank, U, which is connected, by the spiral spring V, to the lever O.

The operation of our invention is as follows: The standard temperature for hatching eggs is about 102° Fahrenheit, at which point our device is arranged to remain inoperative; but when the water in tank D becomes heated above this point the expansion of the alcohol in tubes K causes the cork float or piston N' to elevate the rod N and lever O, which latter, being connected to valve P by wire R, and to regulator T by spring V, opens valve P and causes regulator T to close over the beveled side of tube S', thereby lowering the flame in proportion to the nearness it approaches the tube. When the valve P is opened cold air rushes up through tube W and out through said valve, thus cooling the space C, while, the flame of the lamps being diminished, the temperature of the water in tank D will fall until the medium of 102° is reached, when the alcohol in tubes K will contract far enough to lower the lever O, valve P, and regulator T to their former positions.

It is to be borne in mind that the opposite end of the machine has a similar arrangement to that shown in Fig. 1, with which one of the tubes K connects, the whole operating in connection.

The wires R are not rigidly attached to valve P, as above mentioned, but slide through

a staple or orifice in the same, to the end that the lever O may have free play when the valve is closed or opened to its utmost extent. A similar result is obtained by the use of the spring V, which permits the lever to rise after the regulator has closed over the tube to its utmost extent. The regulator and tube are so arranged, however, that the flame cannot be entirely extinguished by the operation described, while the flame is graduated from a full blaze to a very faint one.

Fig. 5 shows an artificial "mother" or protector for the chickens after hatching. It consists of an inclined tank, *a*, filled with warm water, and provided on its under side with a lining of sheepskin or other soft material, *b*, and having an open space, *c*, covered with a glass roof, *d*. This device is warmed and its temperature regulated by the above-described apparatus for regulating the temperature of the incubator.

It is well known that the great difficulty in artificial hatching is that of maintaining a regular temperature, particularly in so variable a climate as in the Northern States. The differences of temperature between day and night have to be carefully provided for, and constant reference must be had to thermometers. This difficulty has heretofore been a great obstacle in the way of the artificial hatching of chickens.

By our invention, however, we obtain a constant and even temperature at all times, pro-

vided, of course, that the lamps are capable of producing sufficient heat for all exigencies.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The burner S provided with the beveled tube S' and regulator T, as and for the purpose set forth.

2. In combination with the burner S, constructed as described, the cylinder M, cork float N', tube K, rod N, lever O, spring V, and crank U, arranged and operated substantially as described.

3. In combination with burner S, cylinder M, cork float or piston N', tube K, rod N, lever O, spring V, and crank U, the valve P and wires R, substantially as set forth.

4. In combination with burner S, cylinder M, cork float or piston N', tube K, rod N, lever O, spring V, crank U, and valve P, the cold-air tube W, substantially as set forth.

5. The combination of the artificial mother, shown in Fig. 5, with burner S, cylinder M, cork float or piston N', tube K, rod N, lever O, spring V, crank U, and valve P, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JACOB GRAVES.

Witnesses: HENRY GRAVES.

CARROLL D. WRIGHT,

CHARLES F. BROWN.