(No Model.)

A. E. SHACKFORD.

INCUBATOR.

No. 358,169. Patented Feb. 22, 1887.

Fig. 1.

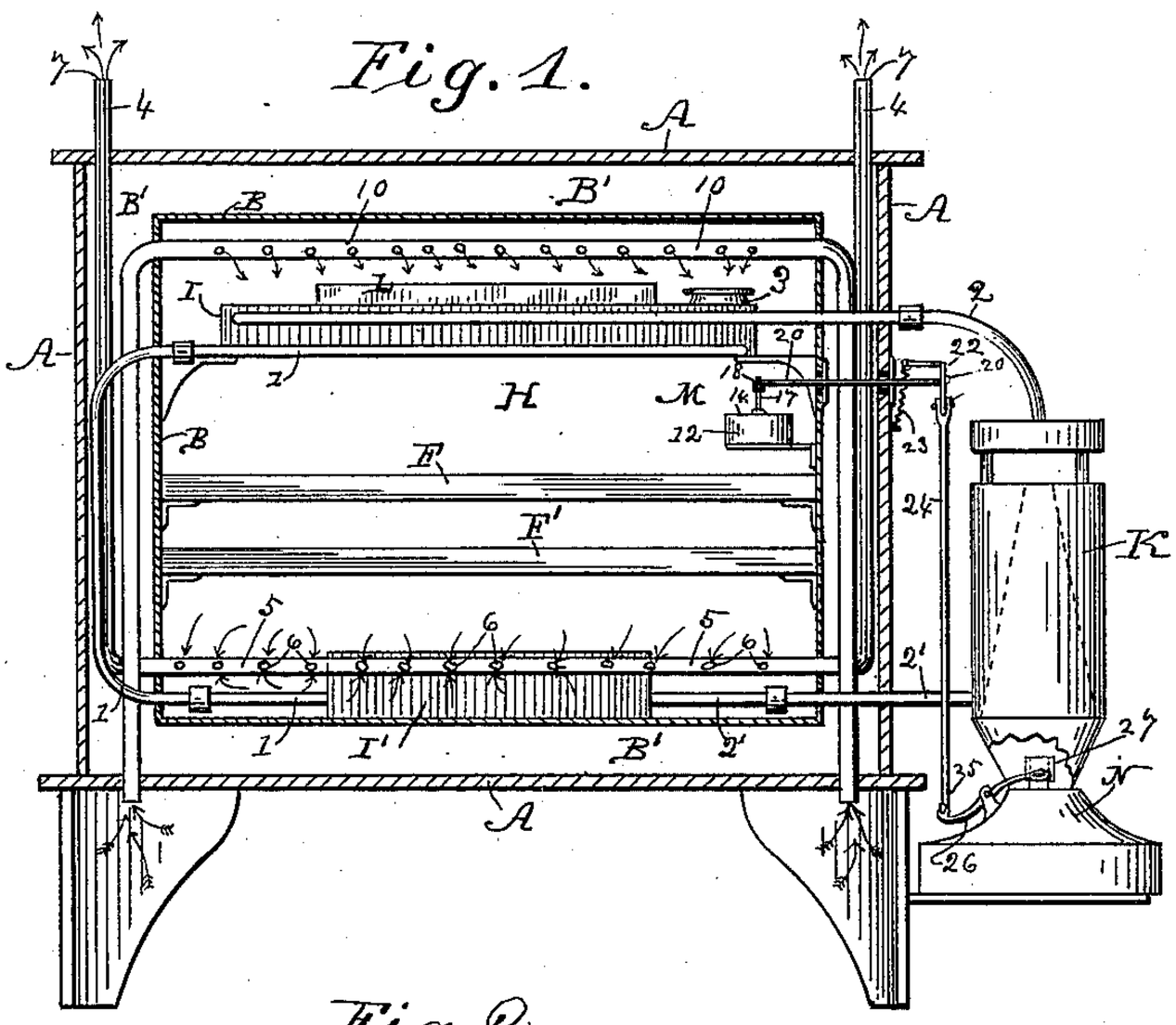


Fig. 2.

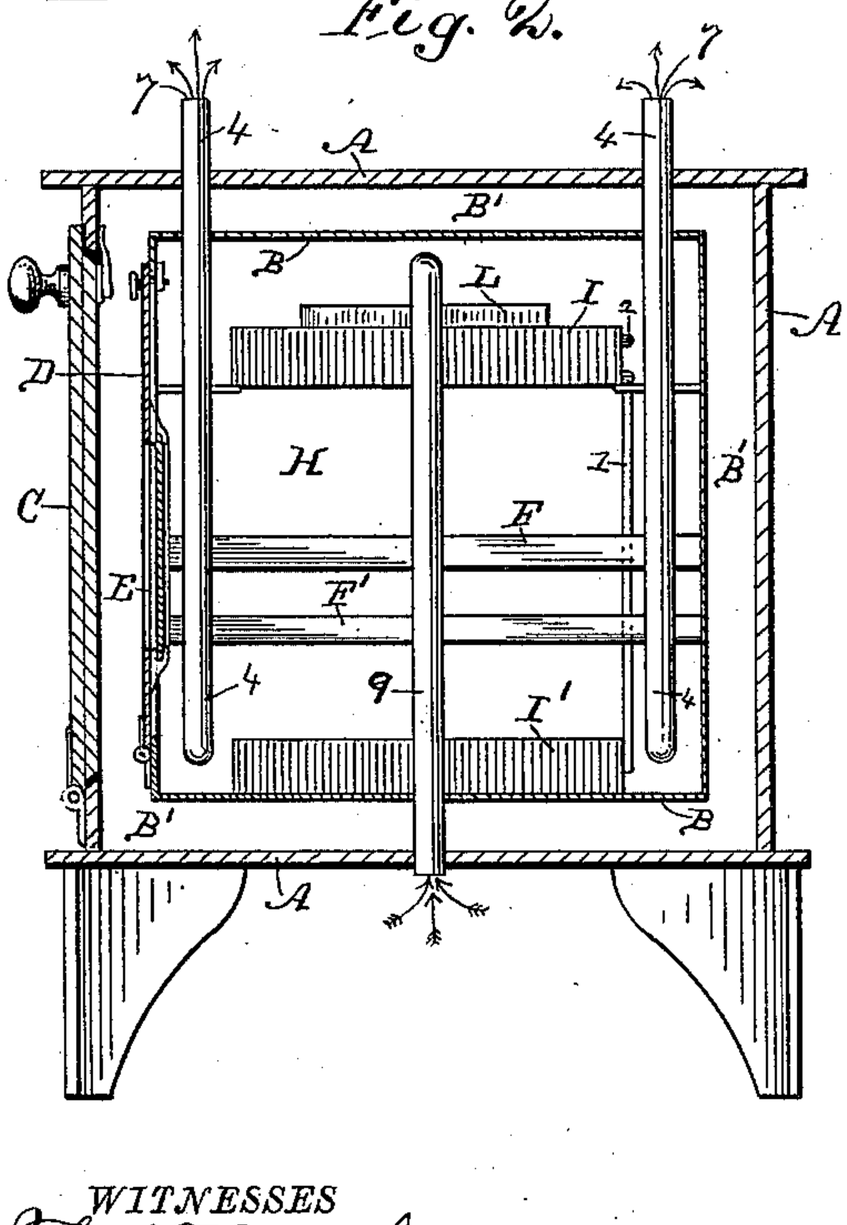
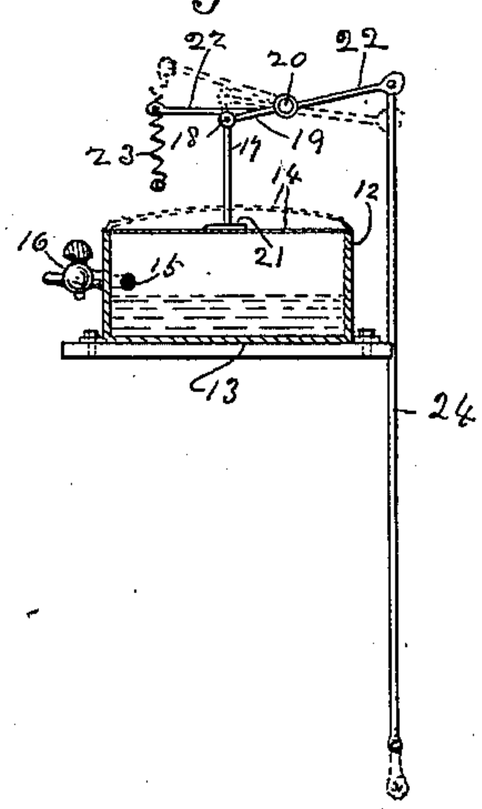


Fig. 3.



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UNITED STATES PATENT OFFICE.

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INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 358,169, dated February 22, 1887.

Application filed November 19, 1886. Serial No. 219,378. (No model.)

To all whom it may concern:

Be it known that I, ALBERT EUGENE SHACKFORD, a citizen of the United States, residing at Brattleborough, in the county of Windham and State of Vermont, have invented a new and useful Improvement in Incubators, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to certain new and useful improvements in incubators, which will be hereinafter more fully described, and pointed out in the claims, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal vertical section of the outer and inner casing of an incubator embodying my invention. Fig. 2 is a transverse vertical section of the same. Fig. 3 is a detail of the lamp-regulator.

The object of this invention is to provide a new and improved device for hatching eggs, and to provide for a more effectual distribution of heat and moisture, and insuring a safe development of the embryos.

The invention consists in the peculiar construction and arrangement of parts, as will be hereinafter more particularly described.

The incubator is made of an outer casing, A, of wood, and an inner casing, B, of metal, galvanized iron being preferred. The space between these casings forms an air-chamber, B′.

The outer casing, A, is provided with a wooden door, C, lined with metal, and opposite the door C is a door, D, of metal, in the side of the inner casing, B, provided with a glass panel, E, said door D opening into the inner chamber, wherein are placed the egg-trays F F′. By this arrangement of the doors C and D the eggs may be seen at any time without opening the inner door.

The egg-trays F F′ are placed one above the other, and are so located that they can be passed into or out of the incubator or egg-chamber H when the doors C D are opened.

I I′ are tanks, made of galvanized iron, located, one in the upper part, the other on the bottom, of the chamber H. They are connected together, as shown in Fig. 1, by pipe 1, and with the boiler K with pipes 2 2′. Pipe 1 is secured to tank I at its right-hand end, and pipe 2 at the opposite or left-hand end, (as you look at Fig. 1,) so as to cause a circulation of the hot water from the boiler K through tank I before being carried down to the lower tank. Tank I is provided with a screw-cap, 3, which covers the aperture through which the tanks and boiler are filled with water. A pan, L, containing water for evaporation, is placed on the top of tank I.

To insure the proper amount of ventilation and moisture, I provide as follows: Four vertical pipes, 4, one in each corner, pass downwardly through the upper part of the incubator; thence in the space B′ between the outer and inner casings to a point near the bottom of chamber H. At this point two opposite pipes, 4, on the same side of the incubator are connected by a horizontal perforated pipe, 5, these pipes 5 lying near the bottom of the egg-chamber, as seen in Fig. 1. By this arrangement of pipes 4 and 5 all the vitiated air in the egg-chamber will be carried through the apertures 6 in the horizontal pipes 5, and upward until discharged from the outer ends, 7, of pipes 4, as indicated by arrows 8 in Figs. 1 and 2.

To give a continual supply of fresh heated and moistened air, I provide other vertical pipes, 9, passing through the bottom of the incubator; thence upwardly in space B′ to a point midway between the evaporating-pan L and the top of chamber H. At this point the upper ends of two of said pipes 9 are connected by a perforated horizontal pipe, 10, similar to pipe 5 at the bottom of chamber H. The operation of this arrangement of pipes 9 and 10 is as follows: The vertical pipes 9 being heated by radiation from the side metallic plates of chamber H, an upward current of air will be induced to pass into pipe 10. Here the air will be moistened as it passes out of perforations 11 in pipe 10, and in this manner the entering fresh air will be heated and moistened before being diffused into the egg-chamber. It will be seen from the above description that this arrangement of flues or pipes gives a continual supply of fresh heated and moistened air to the egg-chamber, while at the same time the vitiated air is continuously withdrawn.

To regulate the supply of heat to the water in the tanks, there is provided a very sensitive

regulating device, M, of the following construction:

12 is a copper cylinder, having a copper bottom, 13, and a thin silver or other suitable metal top, 14, which must be capable of easy expansion, so as to be influenced by a slight increase of temperature. One degree of heat I have found to be sufficient to change the flame of the lamp N perceptibly. Cylinder 12 is partly filled with alcohol, and is provided with a tube, 15, connected to an air-cock, 16, on the outside of the incubator, for the purpose of gaging the heat to any required degree.

17 is a vertical rod pivoted at 18 to an arm, 19, secured to a reciprocating pivot, 20. The lower end of rod 17 has a foot, 21, resting upon the central portion of expansible top 14. To the outer end of pivot 20 an arm, 22, is rigidly secured, and which arm projects in two opposite directions from said pivot.

23 is a spiral spring attached to the short end of arm 22, and is so arranged as to keep the foot 21 of the rod 17 in continual contact with the expansible top 14. The other end of arm 22 is provided with a vertical rod, 24, attached at its lower end, 25, to a lever, 26, which is so arranged as to raise or lower the flame cut-off 27 of the lamp N, as shown in Figs. 1 and 3.

The temperature of the egg-chamber is completely controlled by regulator M, which operates in combination with the ventilating flues or pipes and the fresh-air flues or pipes, as hereinbefore described, and gives the best results in artificial incubation possible, and by the simplest means.

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

1. The combination of the vertical tubes 4, connected by a perforated horizontal tube, 5, the fresh-air tubes 9, passing through the bottom, connected by horizontal perforated tube 10, the evaporating-pan L, tanks I, pipes 1, 2, and 2′, and the boiler K, as and for the purpose described.

2. In an incubator, a regulating device, M, containing an expansible fluid and provided with an expansible top, 14, and a tube with an air-cock, 16, in combination with the rod 17, pivoted to arm 19 at the inner end of pivot 20, and the arm 22, spring 23, rod 24, and lever 26, connected to the flame cut-off of the lamp N, substantially as described.

In testimony that I claim the foregoing as my own I hereto affix my signature in presence of two witnesses.

ALBERT EUGENE SHACKFORD.

Witnesses:
JAMES CONLAND,
GEO. L. CLARY.