No. 620,486. Patented Feb. 28, 1899.

G. A. McFETRIDGE.

INCUBATOR.

(Application filed May 13, 1896.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

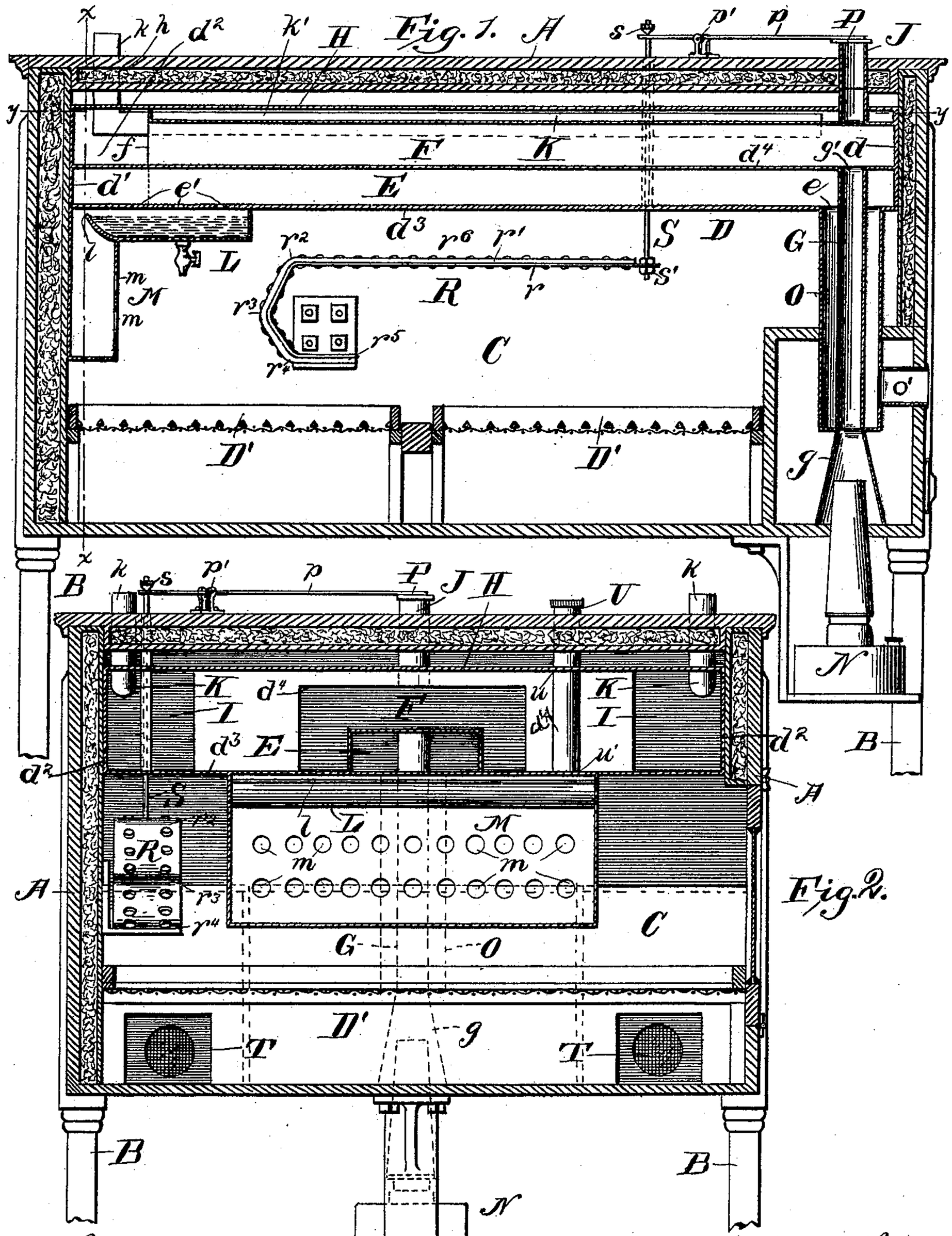

Fig. 2.

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Fig. 3.

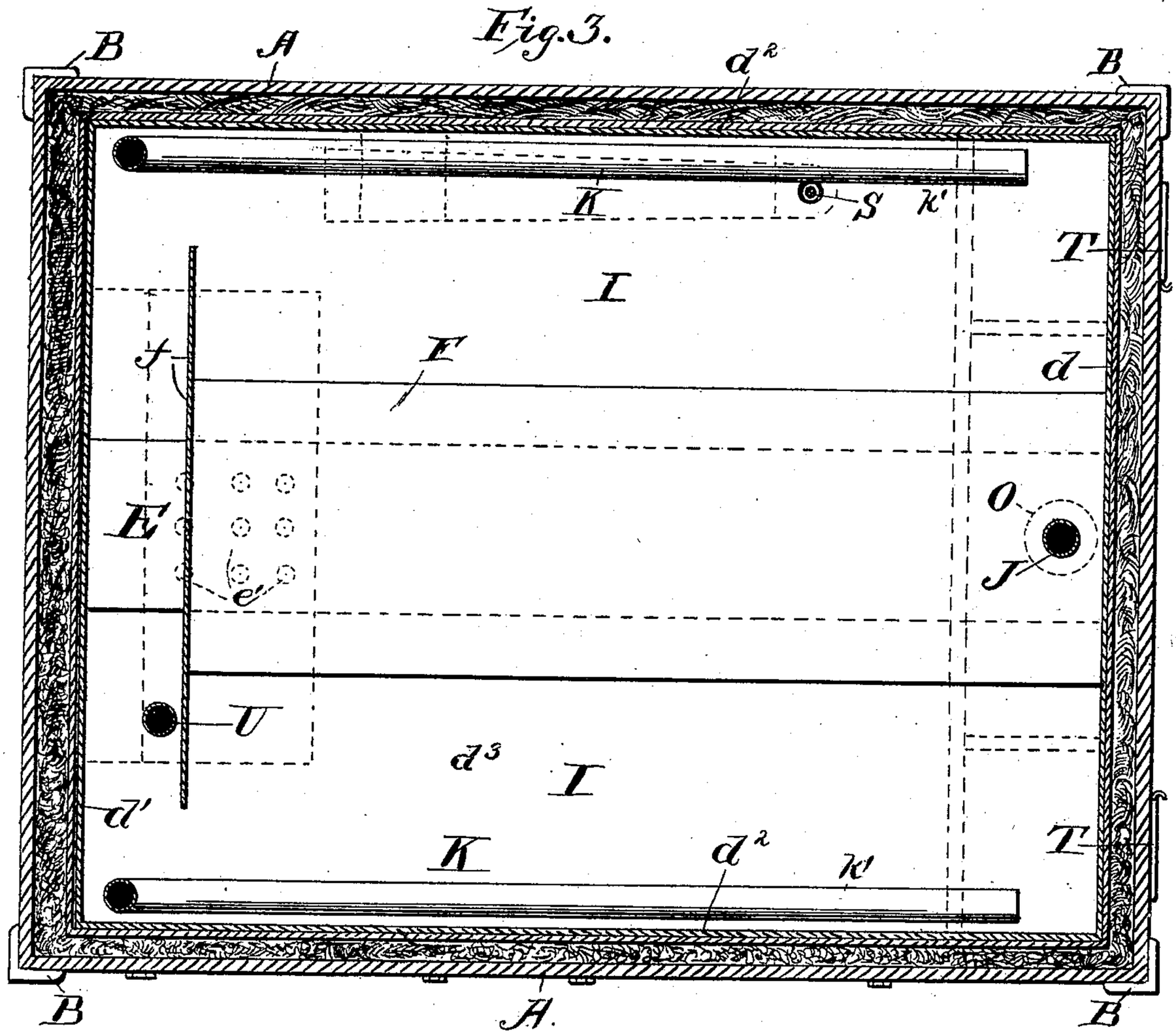
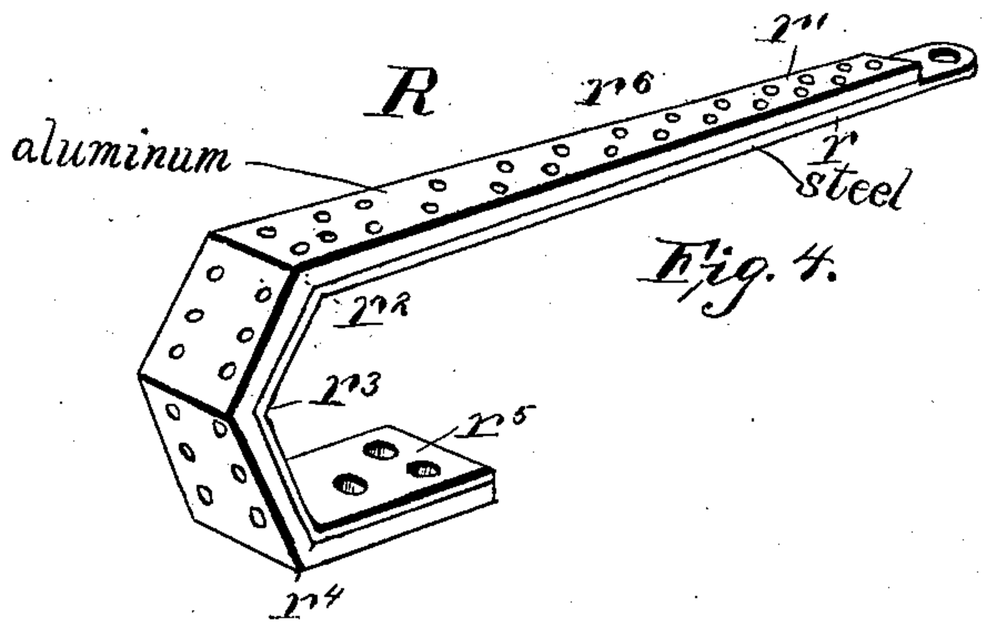


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE A. McFETRIDGE, OF ALLENTOWN, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE STAR INCUBATOR AND BROODER COMPANY, OF BOUND BROOK, NEW JERSEY.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 620,486, dated February 28, 1899.

Application filed May 13, 1896. Serial No. 591,413. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. McFETRIDGE, a citizen of the United States, residing at Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Incubators; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form apart of this specification.

Figure 1 is a longitudinal section of an incubator embodying my improvements. Fig. 2 is a transverse section on the line *x x* of Fig. 1. Fig. 3 is a horizontal section on the line *y y* of Fig. 1. Fig. 4 is a detail view of a thermostat or heat-regulator.

In the drawings, A indicates the casing of the incubator as a whole, it resting upon suitable legs, as at B B. With respect to these and other details of construction the mechanism may be of any of several forms, I having selected one for the purpose of illustrating the manner of applying my invention.

The bottom of the chamber within the casing is utilized as the egg-chamber, (illustrated at C,) wherein may be placed racks or drawers, as at D, of any suitable character. At the top and within the casing I place the sheet-metal tank D, which contains or has attached to it the several parts by which the heating and regulating of the air are effected. This tank comprises the main external box having end walls *d d'*, a bottom d^3, and side walls d^2. E is a duct extending from one end to the other of the tank and situated along the central lines thereof. At one end it communicates with an aperture *e*, through which air is admitted, and at the other end with apertures *e'*, through which said air escapes. This duct E lies within a duct F, whose top and sides are around those of the duct E. This outer duct F extends from one end of the tank toward and nearly but not quite to the other end, thus providing a free escape-passage at *f*.

G is a pipe communicating with the duct F at a point near its closed end, this pipe being adapted to deliver to the duct currents of heated air, gases, or products of combustion, they passing up through the aperture *g'* and through the upper wall d^4 of the air-duct E. The tank D has cover H, soldered fast, which lies in close proximity to the top wall of the duct F.

From an examination of the drawings it will be seen that the central ducts are so arranged as to divide the body of the tank into two open compartments, as at I I, with which communicates the duct F through the aforesaid passage *f* at its open end. The cover has an exhaust-pipe or short stack J, which is in the vertical line of the above-described pipe G. The cover is also provided at the inner end with apertures *h*. With these communicate pipes K or the pipes pass upward through them. These pipes K have elongated horizontal parts *k'*, which extend to points near the outer ends of the aforesaid side chambers I I of the tank.

The above-mentioned apertures *e'* in the bottom of the air-duct E communicate with a water vessel L. This is formed with tight bottom and vertical walls, one vertical wall being somewhat lower than the others to provide a passage *l*, through which the air can pass from the water vessel.

M is an air-distributing chamber of the shape shown—that is to say, shallow on lines longitudinal of the whole mechanism, but relatively deeper vertically and wider transversely. It is under one end of the tank D and is placed close to the outer wall of the casing A. Its side edges, its bottom, and its inner wall are pierced with numerous perforations *m*.

The above-mentioned pipe or duct G extends downward a suitable distance and terminates in a conical hood *g* immediately over the lamp N.

O is a pipe surrounding that at G, it being fastened to the bottom of the tank D around the aforesaid aperture *e*. It extends down along the pipe G and is adapted to receive a

current of pure air through an inlet-port *o'*, communicating through the casing A with the outer air.

At the upper end of the exhaust-pipe or stack J there is a damper P, carried by a vibrating rod *p*. The delicate regulation of the heat within the interior of the mechanism depends upon the automatic opening and closing of this damper P.

The regulator is indicated as a whole by R. It is formed of a bar or plate *r* of steel and a bar or plate *r'* of aluminium. These are riveted together at numerous points, and the compound bar is then bent into the peculiar form shown. It is bent sharply on three transverse lines to form well-defined angles at r^2 r^3 r^4, there being a relatively short foot-piece at r^5 and an elongated operative part r^6. The latter is at the end connected to a vertical draw rod or link S, which in turn is connected to the above-described damper-rod *p*, preferably at a short distance from the pivot *p'*. By the devices at *s* and *s'* the position of the several parts just described can be accurately and delicately adjusted.

The mode of operation of the parts described will be readily understood. The heated products of combustion, gases, and air-currents from the lamp pass upward through the ducts at *g* and G into that at F. At first, the interior being cold the regulator-bar R is at its uppermost point, and consequently the damper P is closed. Therefore the aforesaid products of combustion and heated gases are compelled to travel through the duct F longitudinally of the tank to the end opposite to the lamp. Then they escape through the passage *f* into the side chambers or flues I I and are caused to return again through the tank toward the lamp end. Upon reaching it they pass into the pipes or ducts K K and again travel longitudinally of the tank until they reach the exhaust-duct at *k*. As a result of this arrangement of these ducts there is a uniform and thorough withdrawal of the heat from the products of combustion. This heat is transmitted to and taken up by the currents of pure air which are being caused to enter the duct O around the heated pipe G and are drawn up to the air-duct E, along which they travel till they reach the apertures *e'*, whence they pass downward through the water-chamber at L, and then through the passage at *l* into the distributing-chamber M. From the latter they escape through the minute perforations or orifices at *m m*, being thereby uniformly distributed across the egg-chamber. They move over the layer of eggs and down through the interstices between them, gradually and finally reaching the ultimate escape-orifices at T, through which they pass out from the casing. As soon as the interior becomes warmed the rise in temperature is felt by the regulator-bar R, and at the instant the heat reaches the limiting-degree said bar moves downward at its end sufficiently to open the damper P, whereupon more or less of the products of combustion are diverted from the above-described horizontal path and are allowed to escape immediately into the open air through the direct flue at J.

At certain times during the period of incubation it is necessary to moisten the air which is carried into the egg-chamber. At such times the vessel at L can be in my construction supplied with water through a tube U, which communicates with an aperture at *u* in the cover H and with an aperture *u'* in the bottom of the tank directly over the vessel L.

I am aware of the fact that numerous incubators have been made or proposed and that in many respects the present one is similar to one or another of those referred to; but I believe myself to be the first to have devised a number of matters which I have shown and described and which from my long experience I have found to be of great importance. Among these are the devices for leading the products of combustion repeatedly across the top of the mechanism to uniformly distribute the heat; the subjecting of the air-current to a prolonged action of heating while in contact with the surfaces heated, as aforesaid, by the products of combustion, thereby insuring that all of the air shall be uniformly raised in temperature; compelling all of the air to impinge upon the water, (at the time when water is employed,) thereby insuring a uniform distribution of the moisture; carrying the air through the shallow vertically-prolonged distributing-chamber at one end of the egg-chamber, allowing it to escape through numerous minute perforations, whereby it is evenly delivered to the layer of eggs, and finally exhausting it at points near the opposite side of the egg-chamber.

One of the matters above referred to is of particular importance—namely, the arrangement of the inlet-passages and the outlet-passages for the warmed fresh air communicating with the egg-chamber. I attain an important result by introducing the air at relatively low points adjacent to the horizontal plane occupied by the eggs, compelling the entire body of air after being broken up into numerous jets to move horizontally across the egg-chamber in the plane of the eggs and planes adjacent thereto and to escape from the egg-chamber at orifices in one side only, which side is that opposite to the one where the inlet-orifices are placed. In consequence of this there is assurance that all parts of the air shall come into contact with the eggs and, moreover, so that the eggs shall be in the path of the entire body of air and related to it in such way that they shall be uniformly heated. Heretofore, so far as I am aware, no construction has been devised or intended to accomplish this result. In the earlier constructions air-outlets of such number and location were employed, and the air-inlets were so disposed

with respect to the air-outlets that it was possible for the streams of incoming air to move on lines transverse to the plane of the eggs and to pass directly through the layer to some one or another of the outlets, the arrangement of these parts being sometimes even such that the air was received at the center of the top and was carried downward on numerous diverging paths through the egg-tray and then out at the bottom. From inspection of the drawings it will be seen that my purpose is to avoid this and to compel the mass of air after being broken up into numerous horizontally-directed currents to pass in approximately horizontal lines over, around, and under the eggs, the entire volume of air following more or less approximately the horizontal plane in which the eggs are placed. I prefer to have the air-box M with its apertures a little above the plane of the eggs and the outlet-apertures a little below said plane, so that the tendency of the air to slowly settle can be provided for; but in this respect there can be variations to attain the best results.

Above the tank there is a covering of an inch and a half of asbestos. Above this is a wooden top screwed firmly on.

What I claim is—

1. In an incubator, the combination with a casing having an interior chamber with an egg-compartment at the bottom, the tank, D, across the upper part of said chamber, said tank having the central fire-flue, F, the return fire-flues, I, I, extending in one direction, and the return-flues K, extending in the opposite direction, the stack, J, damper, P, the air-duct, E, extending longitudinally of the tank parallel to the flues F, I, K, and the air-distributer, M, extending vertically down from said duct, E, along one side of the casing, substantially as set forth.

2. In an incubator, the combination with the casing having the interior chamber with the egg-compartment in the lower part thereof, the tank, D, across the top, the air-duct, E, the fire-flue, F, surrounding the air-duct and extending from one end of the tank to a line near the other, the return-flues, I, the return-flues, K, the direct flue for the fire, the vessel, L, arranged to receive all the air from the duct E and also to hold a body of water in the path of the air, the distributer, M, having a plurality of reduced air-passages and arranged near one end wall of the egg-chamber, and the escape-orifices, T, substantially as set forth.

3. In an incubator, the combination of the casing, inclosing an egg-compartment, C, having a closed top, a closed bottom a closed front wall, a closed rear wall, an end wall having an air-distributing box, M, with horizontal apertures, *m*, at point below the closed top and relatively near the horizontal plane of the egg-tray, and an opposite end wall, having air-outlet apertures, T, said air-inlet and air-outlet apertures being arranged substantially as set forth to direct the entire body of air across the entire egg-compartment in planes approximating the horizontal plane of the egg-tray, a fresh-air duct, E, communicating with the air-distributing box, M, a lamp, N, for heating the air in said duct, and a receptacle, L, for water for moistening the said air, substantially as set forth.

4. In an incubator, the combination with the casing inclosing a chamber having an egg-compartment, of a heater, a direct fire-flue leading from said heater, an indirect fire-flue communicating with the direct fire-flue and extending from one end of the incubator to a point near the opposite end, an air-inlet adjacent to said direct fire-flue, an air-duct communicating with the air-inlet and extending across the top of the egg-compartment in proximity to said indirect fire-flue and communicating at one end with the interior of the egg-compartment at a point opposite the air-inlet, and air-outlets arranged in the wall of the egg-compartment opposite the point of entrance of fresh air to said compartment, substantially as described.

5. In an incubator, the combination with the casing inclosing a chamber having an egg-compartment in the bottom thereof, of a heater, a direct fire-flue leading from said heater, an indirect fire-flue communicating with the direct fire-flue and extending from one end of the incubator to a point near the opposite end, an air-inlet adjacent to said direct fire-flue, an air-duct communicating with the air-inlet and extending across the top of the egg-compartment parallel to, and partly surrounded by said indirect fire-flue and communicating at one end with the interior of the egg-compartment at a point opposite the air-inlet, and air-outlets arranged in the wall of the egg-compartment opposite the point of entrance of fresh air to said compartment, substantially as described.

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

GEORGE A. McFETRIDGE.

Witnesses:

MARY E. DAVIES,

CHARLES R. JAMES.