(No Model.) 3 Sheets—Sheet 1.

F. H. MORGAN.

INCUBATOR.

No. 591,870. Patented Oct. 19, 1897.

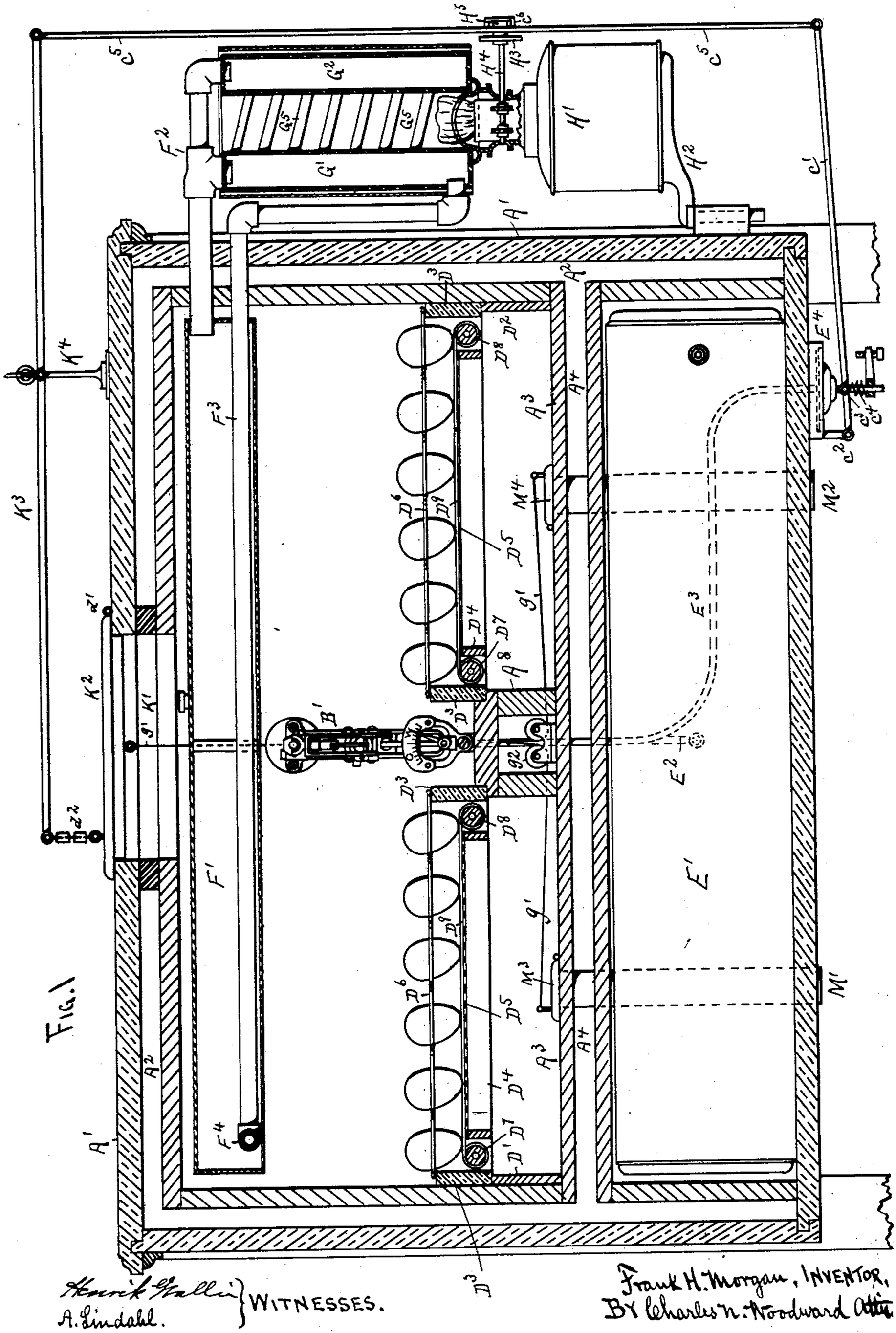

FIG. 1.

Witnesses:
Henrik Gallin
A. Lindahl.

Frank H. Morgan, Inventor,
By Charles N. Woodward Atty

(No Model.) 3 Sheets—Sheet 2.

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Fig. 4

Fig. 3

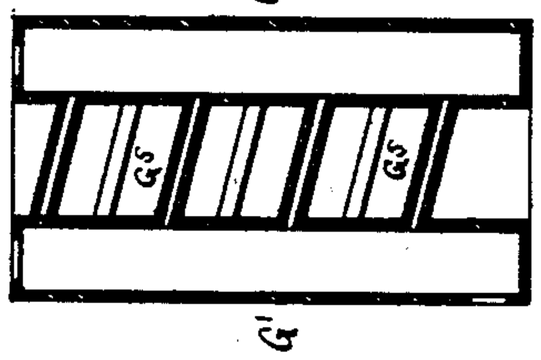


Fig. 5

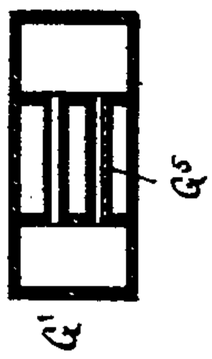
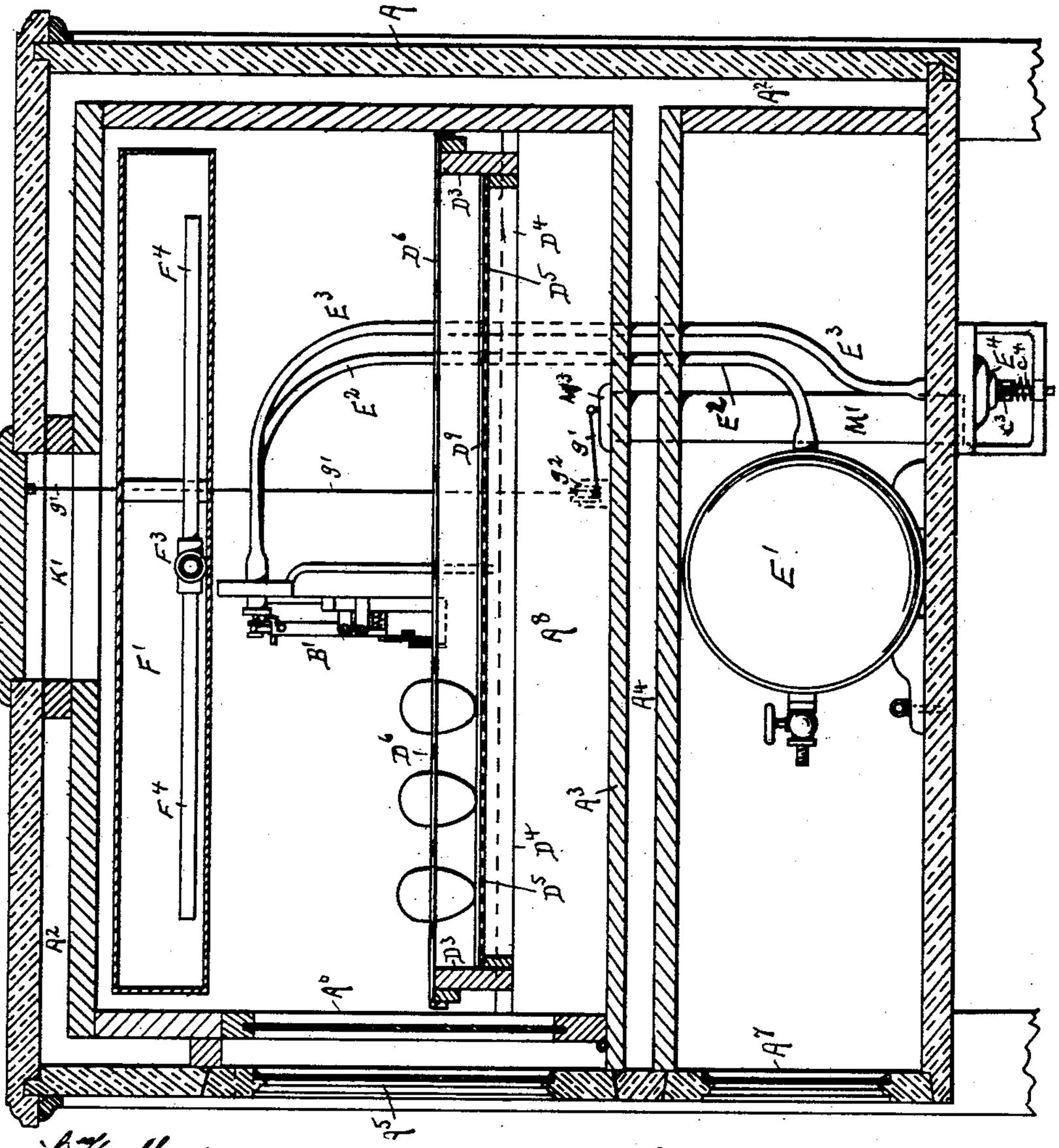


Fig. 2



Witnesses:
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(No Model.) 3 Sheets—Sheet 3.

F. H. MORGAN.

INCUBATOR.

No. 591,870. Patented Oct. 19, 1897.

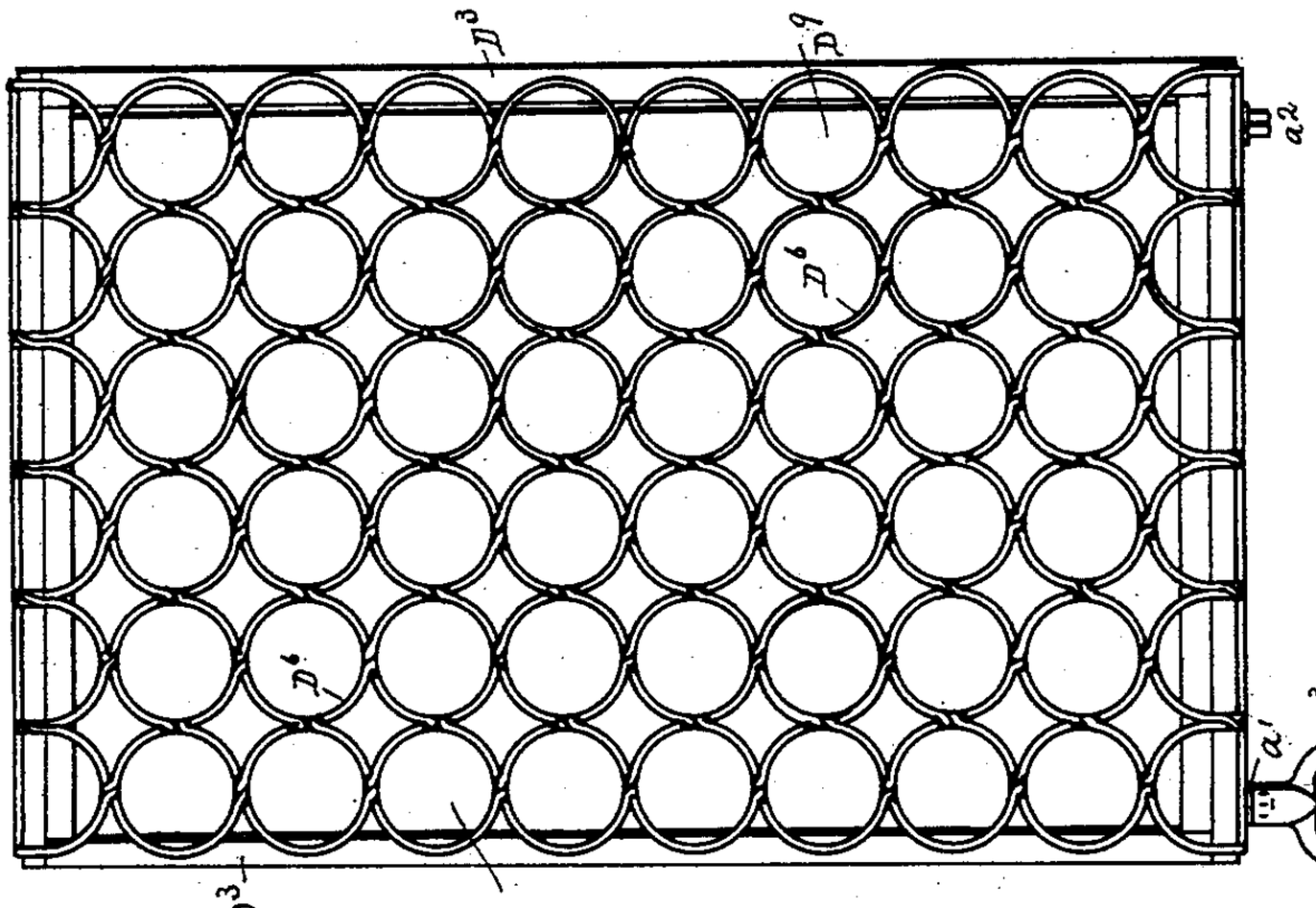

FIG. 7.

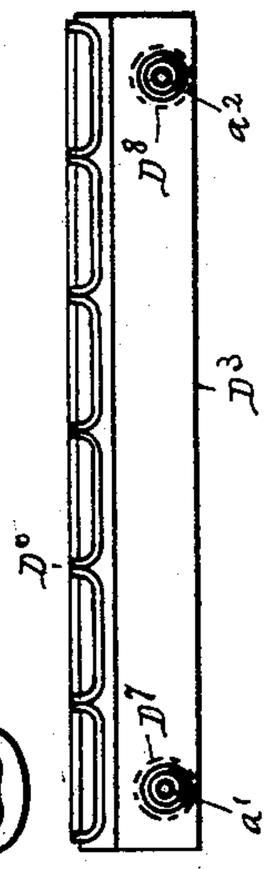

FIG. 8.

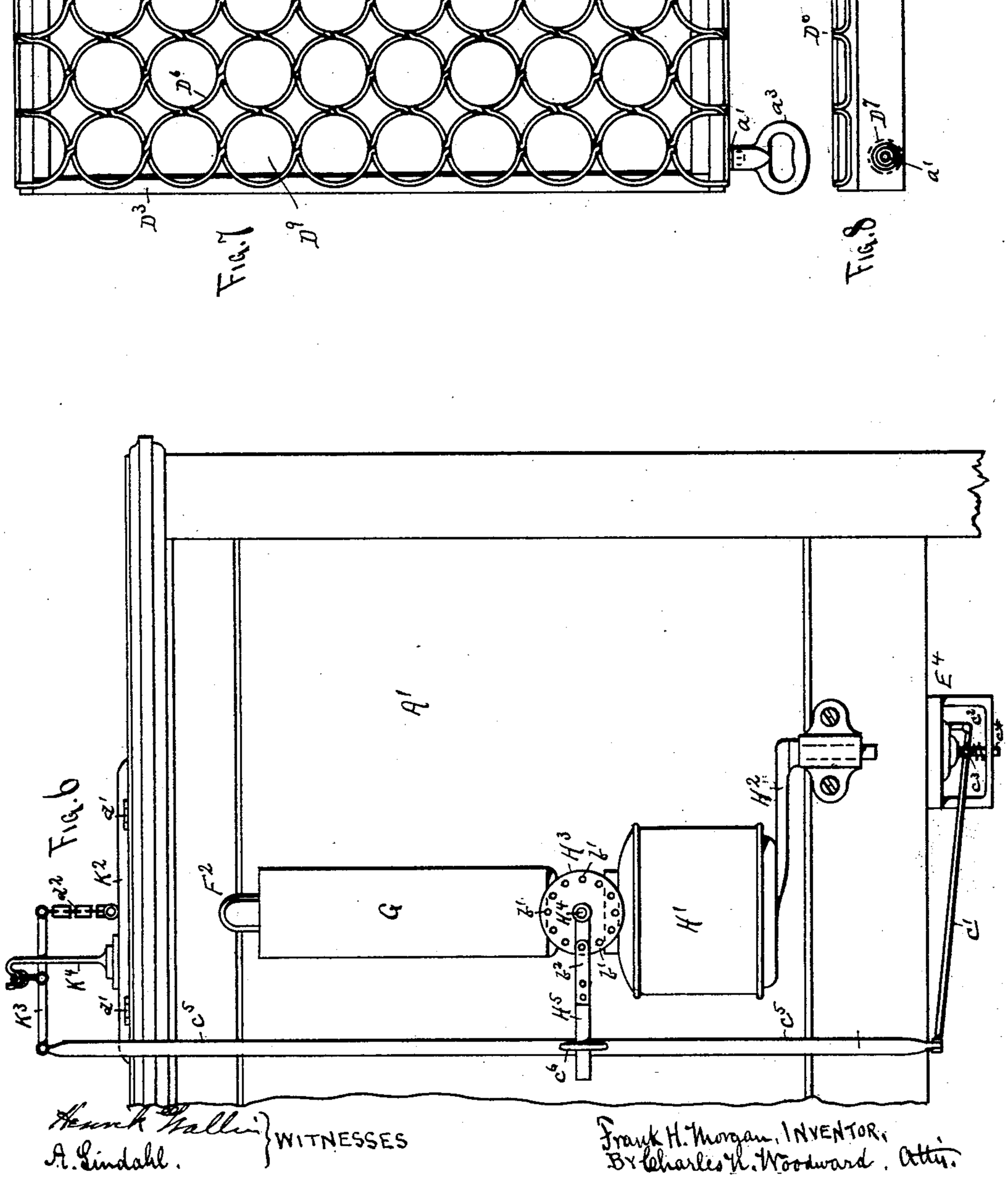

FIG. 6.

Witnesses:
Henry K. Gallin
A. Lindahl.

Frank H. Morgan, Inventor;
By Charles H. Woodward, Atty.

UNITED STATES PATENT OFFICE.

FRANK H. MORGAN, OF ST. PAUL, MINNESOTA.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 591,870, dated October 19, 1897.

Application filed January 20, 1896. Serial No. 576,111. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. MORGAN, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Incubators, of which the following is a specification.

This invention relates to incubators; and it consists in the construction, combination, and arrangement of parts, as hereinafter shown and described, and specifically pointed out in the claims.

In the drawings, Figure 1 is a longitudinal sectional elevation, and Fig. 2 is a cross-sectional elevation. Fig. 3 is a longitudinal section, Fig. 4 is a cross-section, and Fig. 5 is a horizontal section, of the circulating-heater detached. Fig. 6 is an end elevation of a portion of the incubator from the outside. Fig. 7 is a plan view, and Fig. 8 is an end view, of one of the egg-supporting trays removed.

A′ is the outer casing, which is preferably made with double outside walls to form a dead-air space A^2 around the outside wall and top, and with a cross-partition A^3, also with a dead-air space A^4, a short distance up from the bottom, as shown. The front of the casing is provided with double glass doors A^5 A^6, while the front of the chamber below the cross-partition A^3 is likewise provided with a door A^7, as shown in Fig. 2. Rising from the center of the cross-partition A^3 is a hollow frame A^8, extending from front to rear, and adapted to support a thermostat B′, of any approved form. Resting by their outer edges upon ways D′ D^2 and by their inner edges upon the cross-frame A^8 are the egg-supporting trays, consisting of outer frames D^3, having an inner frame D^4, the latter supporting a wire-cloth diaphragm D^5 about midway of the outer frame, as shown. Resting upon top of the outer frame D^3 is an egg-supporting grating D^6, formed of woven wire, with the meshes somewhat larger than the smaller diameter of the eggs to be supported thereby. Upon each side of the outer frame D^3 are rollers D^7 D^8, connected by a strip of cloth D^9, the rollers having journals a' a^2, projecting out through the frame and adapted to be turned by a key a^3, as shown in Figs. 7 and 8.

The cloth D^9 rests upon the wire-cloth diaphragm D^5, so that, when the roller D^7 is revolved outward, the cloth will be drawn across the frame in one direction, and drawn in the opposite direction when the other roller D^8 is revolved in the opposite direction. The eggs will be set in place through the meshes of the grating D^6 with their small ends resting upon the cloth D^9 above the wire-cloth support. Then when the cloth D^9 is drawn in one direction by revolving one of the rollers D^7 or D^8, the eggs will all be inclined in one direction, as shown in Fig. 1. Then if the other roller be revolved, the cloth D^9 will be drawn in the opposite direction, carrying the lower ends of the eggs with it, and inclining them in the opposite direction, thus very easily and quickly accomplishing the necessary turning of the eggs at stated intervals.

Within the space beneath the cross-partition A^3 is a compressed-air reservoir E′, connected by a tube E^2 to the inlet side of the thermostat B′, as shown in Fig. 2, while another tube E^3 leads from the outlet side of the thermostat to a diaphragm-governor valve E^4 beneath the casing A′, as shown.

Supported in the interior of the upper part of the casing A′ is a closed hot-water tank F′, and outside the casing A′, preferably at one end, is a circulating-heater consisting of two shells G′ G^2, connected by inclined cross-tubes G^5 and connected at their tops to the upper part of the hot-water tank F′ by piping F^2, while the lower end of one of the shells is likewise connected to the lower part of the tank by piping F^3, the latter extended into the tank along its lower part and ending in a cross-head pipe F^4, so that the water before entering the piping F^3 must traverse the whole length of the tank. By this means heat applied to the shells G′ G^2 will cause the water to freely circulate through the whole length of the tank.

Beneath the shells G′ G^2 a lamp H′ is supported by a swinging bracket H^2, so that it can be easily removed and replaced, and with a disk H^3 upon the outer end of its wick-actuating shaft H^4, the disk being provided with a series of perforations b' near its rim, as shown in Fig. 6.

H^5 is a lever pivoted to the end of the wick-shaft H^4, and having a pawl b^2 fitting into one of the perforations b', so that any movement of the outer end of the lever H^5 will cause the shaft H^4 to be turned, and thus raise or lower the wick of the lamp H′, and correspondingly increase or decrease the flame.

Through the top of the casing A′ an opening K′ is formed and covered by a door or lid K^2, hinged at one side at d' and connected by a chain d^2, or other means, to one end of a lever K^3, the latter supported pivotally by a standard K^4 from the top of the casing A′, as shown.

c' is a lever pivoted by one end to a hanger c^2 from the diaphragm-valve E^4, and pivoted at c^3 to the stem c^4 of the valve, and projecting outward beyond the casing A′, and connected at its longer end by a rod c^5 to the outer end of the lever K^3, as shown. The lever H^5 projects past the rod c^5, and is loosely connected thereto by a strap or loop c^6, so that any rising or falling movement of the rod c^5 will carry the lever H^5 with it.

Fitting down through the cross-partition A^3, and also through the bottom of the casing A′, are tubes M′ M^2, open at their ends to form connections between the interior of the casing A′ and the open air. The upper ends of these tubes M′ M^2 are covered by hinged valves M^3 M^4, the latter connected by cords g', running over pulleys g^2 to the lid K^2, as shown, so that when the lid is lifted the valves M^3 M^4 will likewise be opened.

The thermostat B′ being set to operate at any predetermined temperature, when that point is reached, the valves of the thermostat will permit a supply of compressed air to pass from the tube E^2, leading from the receiver E′, to the tube E^3, leading to the valve E^4, which by expanding will depress the lever c', which will, through the rod c^5 and lever K^3, raise the lid K^2 and permit the hot air to escape. This will continue until the temperature has fallen to a sufficient extent to cause the thermostat to again close its valves and shut off the supply of compressed air, and thus permit the valve E^4 to collapse and release the levers c' K^3 and rod c^5, and permit the lid K^2 to fall shut.

The upward motion of the rod c^5 will carry the lever H^5 with it and correspondingly lower the lamp-flame and reduce the heat. Then when the return movement of the rod c^5 takes place, the lamp-flame will be again raised to its former position. At the same time that the lid is raised, as before stated, the valves M^3 M^4 will be opened, thus admitting a supply of fresh cool air to replace the hot air escaping from the opening K′.

The opening K′ being placed above the hot-water tank F′, and the latter projecting on all sides nearly to the interior of the casing A′, the escaping air must pass over the heated tank, and the outside air must likewise pass over the heated tank, so that no danger exists of an undue amount of cold air entering the chamber occupied by the egg-trays. By this simple means the temperature is perfectly controlled automatically, the variation of $\frac{1}{2}^\circ$ Fahrenheit being sufficient to cause the thermostat to operate, so that the temperature will never vary more than $\frac{1}{2}^\circ$ Fahrenheit.

As the wick of the lamp burns off, the circle of perforations in the disk H^3 enables the attendant to perfectly adjust the lever H^5 by setting the pawl b^2 into a new perforation.

The sizes of the tubing connecting the tank F′ and heater G′ G^2 will be graduated to correspond to the requirements of the circulation.

Having thus described my invention, what I claim as new is—

1. In an incubator, the combination of an inclosing casing, an outwardly-opening valve through the top of said casing, egg-holding trays supported within said casing, a closed water-tank supported in the interior of said casing near the top and beneath said valve so that the escaping air must pass over and around said tank, a heater outside said casing and connected into said tank, a lamp supported beneath said heater, a reservoir of compressed air, a flexible diaphragm connected by tubing with said compressed-air reservoir, a thermostat connected into said tubing and adapted to admit compressed air to the rear of said diaphragm, and a system of levers connecting said valve and the mechanism for adjusting the wick of said lamp, to the front of said diaphragm, whereby the rising and falling of the temperature within said casing will cause said valve to be opened or closed and the flame of said lamp correspondingly raised or lowered, and the temperature within the casing thereby automatically regulated, substantially as and for the purpose set forth.

2. In an incubator, the combination of an inclosing casing, an outwardly-opening valve through the top of said casing, an inwardly-opening valve through the bottom of said casing and connected to be actuated simultaneously with said upper valve, egg-holding trays supported within said casing, a closed water-tank supported in the interior of said casing near the top and beneath said upper valve, a heater connected into said tank, a lamp supported beneath said heater, a reservoir of compressed air, a flexible diaphragm connected by tubing with said compressed-air reservoir, a thermostat connected into said tubing and adapted to admit compressed air to the rear of said diaphragm, and a system of levers connecting said valves and the mechanism for adjusting the wick of said lamp, to the front of said diaphragm, whereby the rising and falling of the temperature within said casing will cause said connected valves to be opened or closed and the flame of the lamp correspondingly increased or decreased and the heated air allowed to escape from the upper part of the casing and the cooler air to enter through the bottom of the casing, substantially as and for the purpose set forth.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

FRANK H. MORGAN.

Witnesses:
C. N. WOODWARD,
H. S. WEBSTER.