

No. 616,327.

**C. L. HILL.
INCUBATOR.**

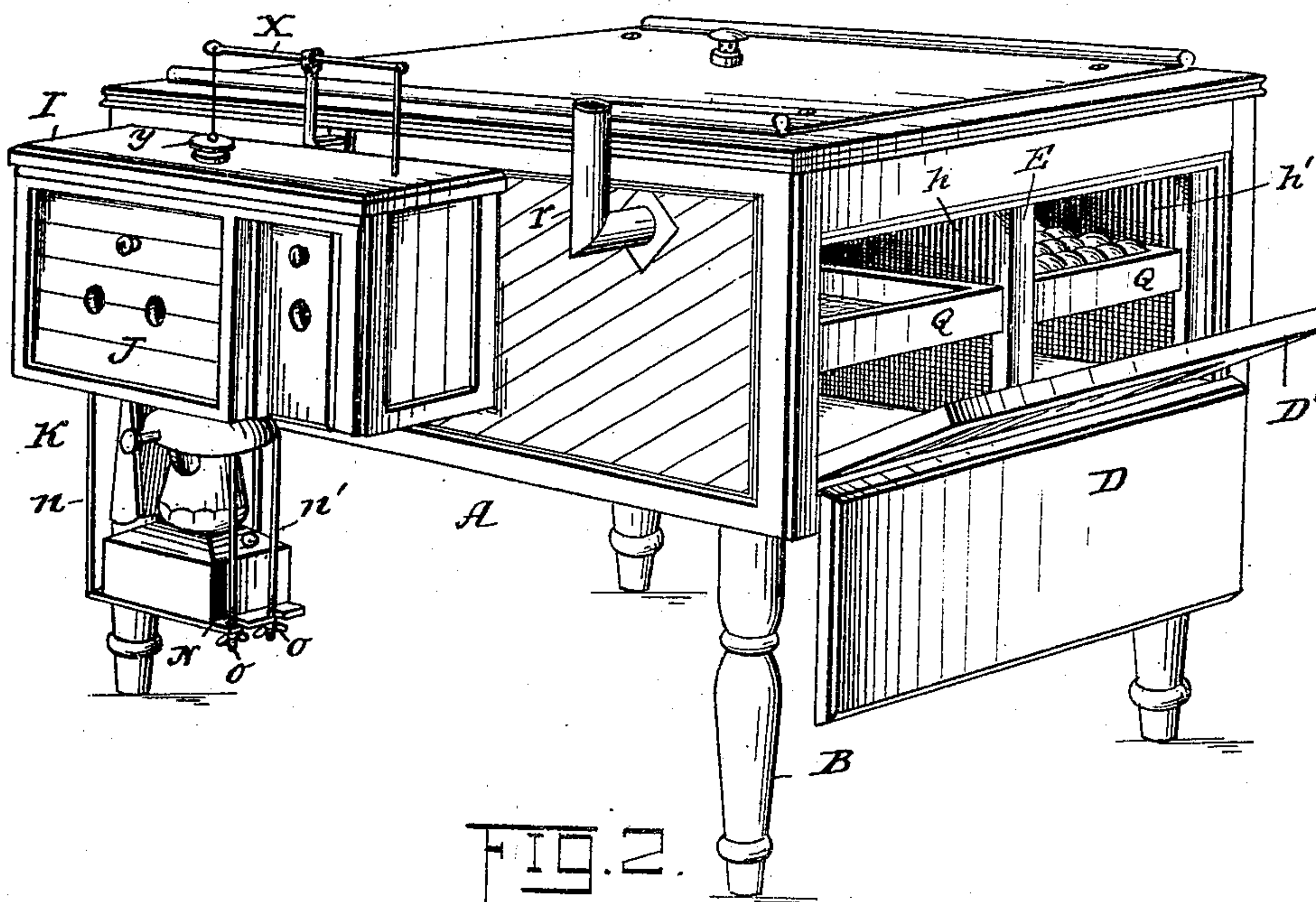
Patented Dec. 20, 1898.

(Application filed Dec. 27, 1897.)

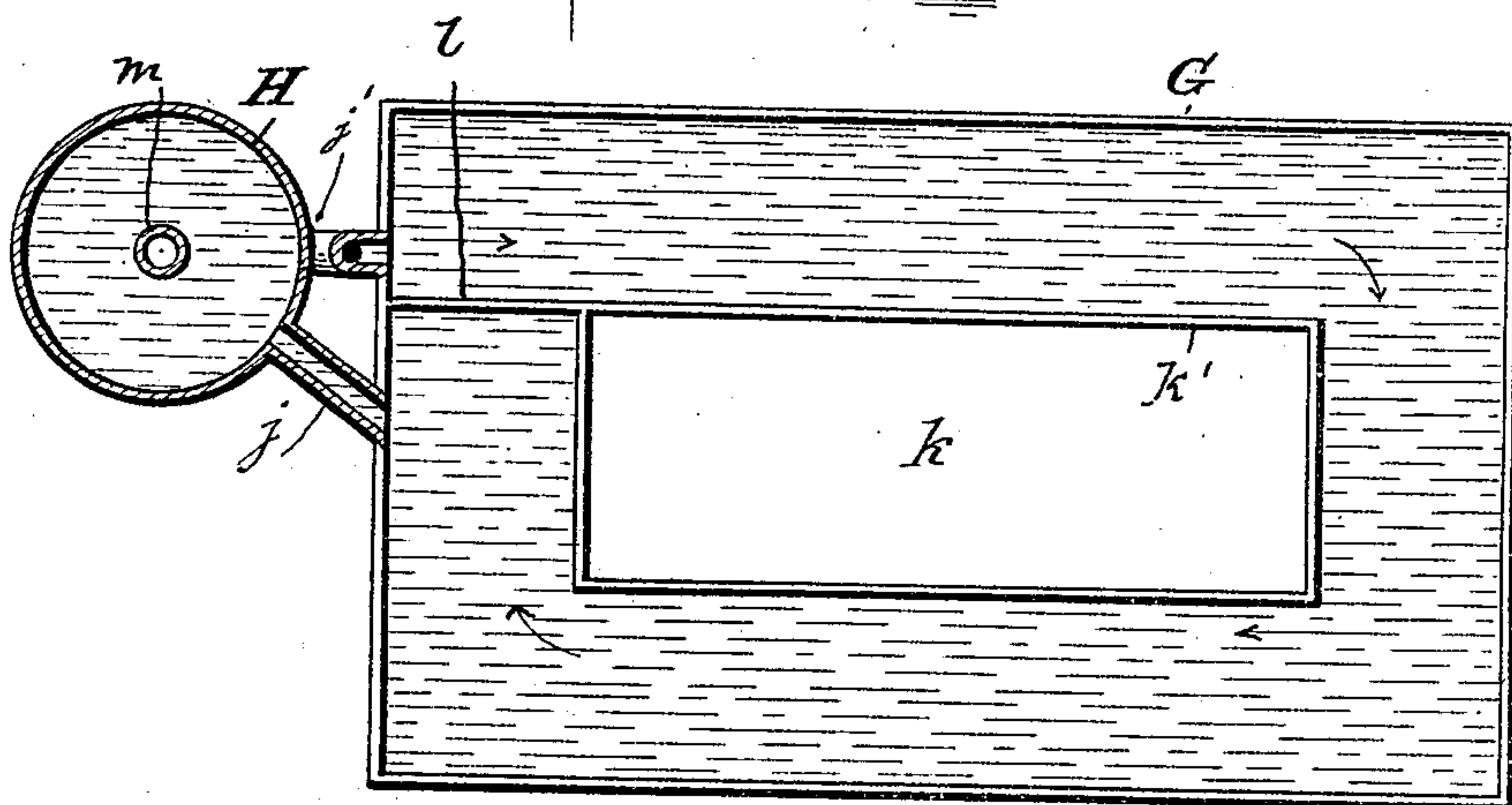
(No Model.)

4 Sheets—Sheet 1.

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Witnesses
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 C. Culbert Hines

Inventor:
Charles L. Hill,
By R. H. O'Leary,
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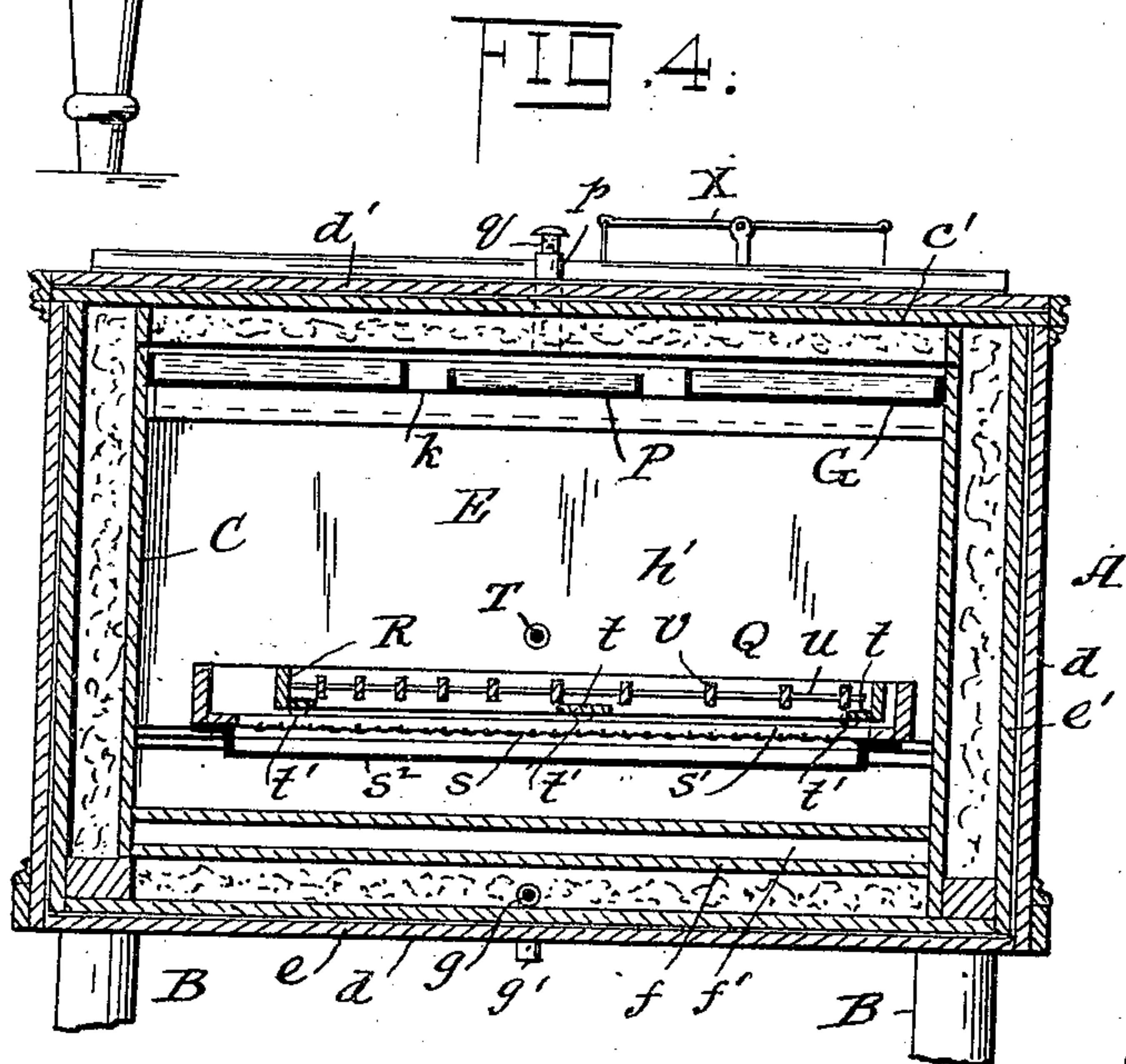
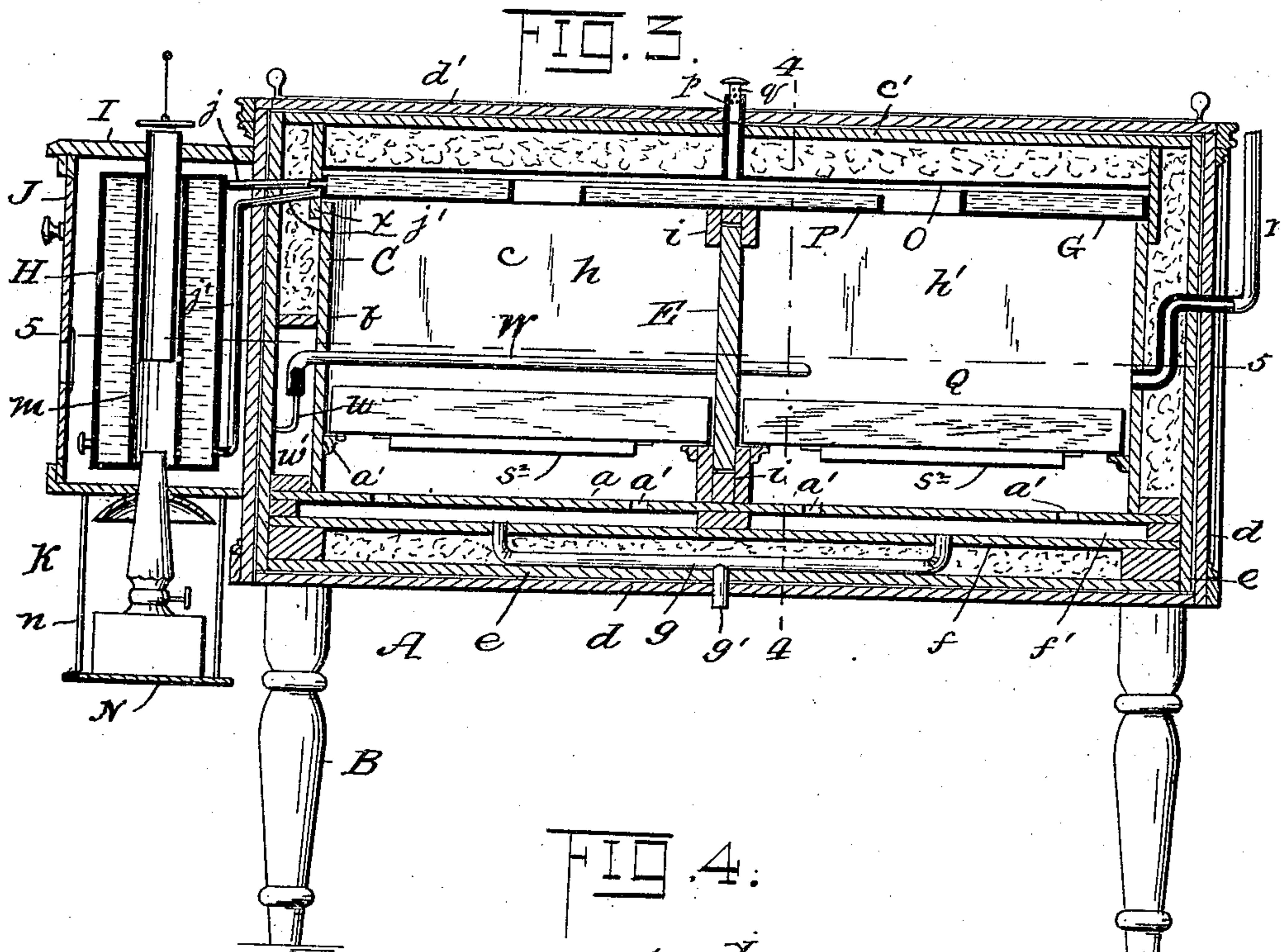
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4 Sheets—Sheet 2.



Witnesses
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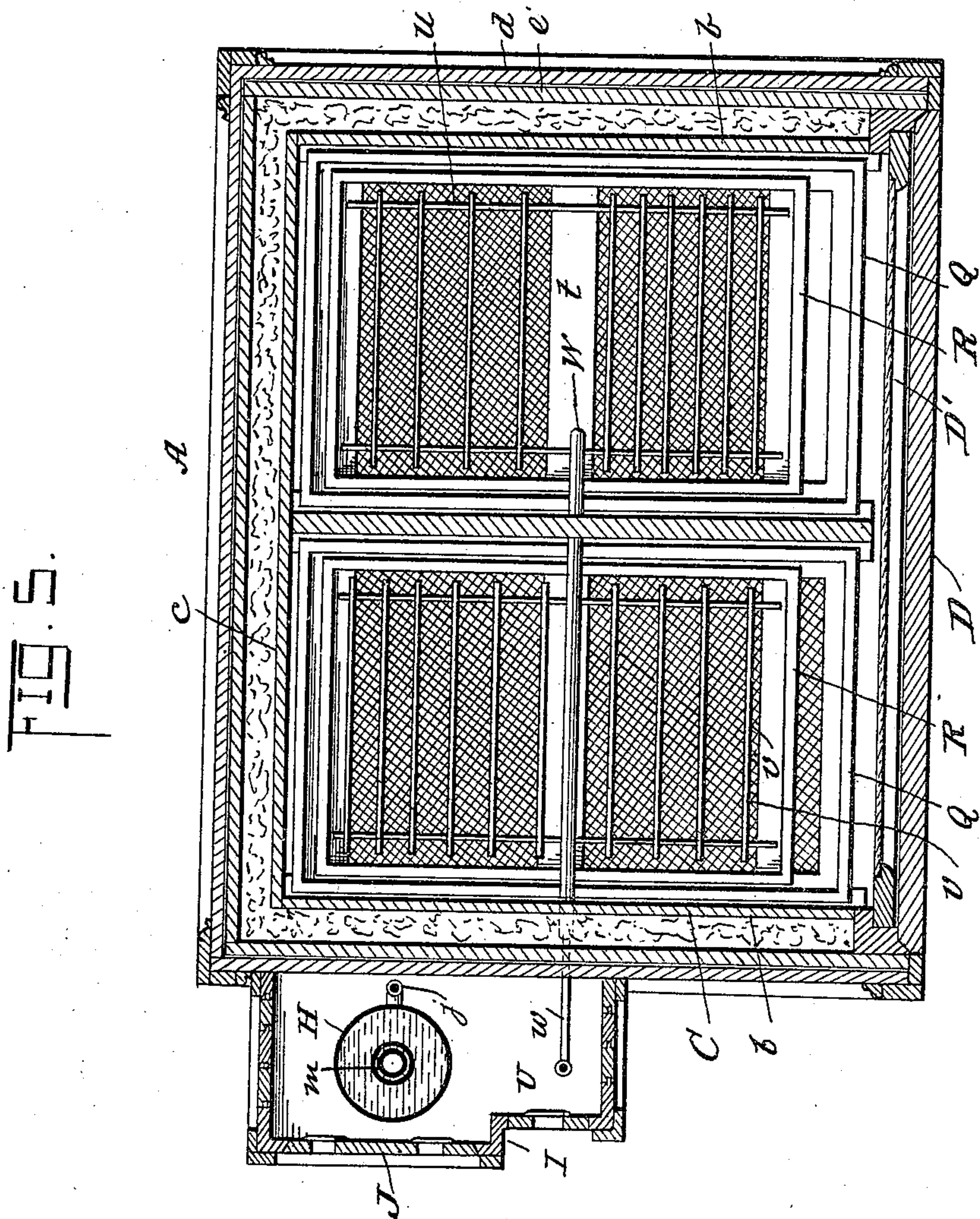
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(Application filed Dec. 27, 1897.)

No Model.)

4 Sheets—Sheet 3.



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No. 616,327.

Patented Dec. 20, 1898.

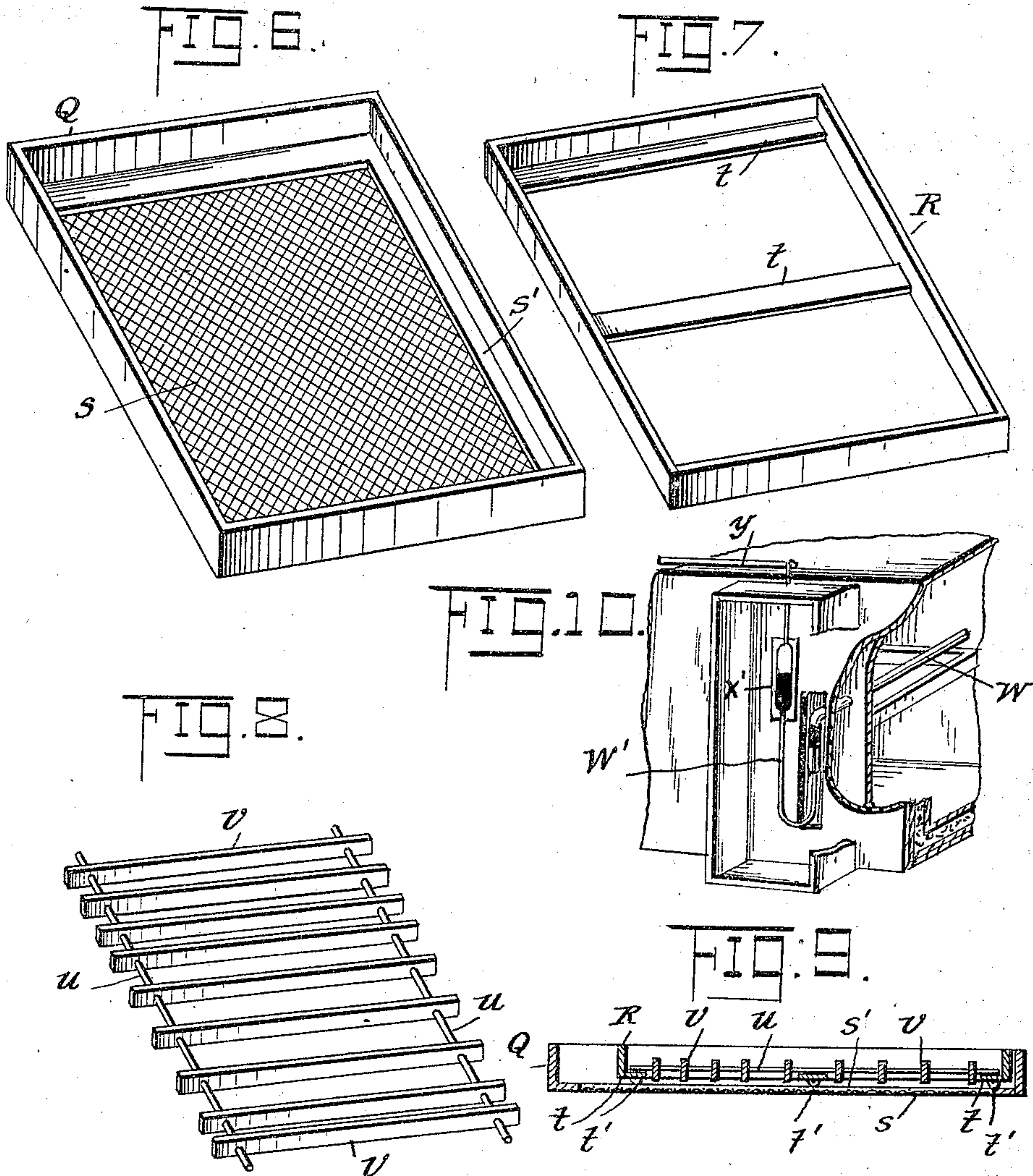
C. L. HILL.

INCUBATOR.

(Application filed Dec. 27, 1897.)

(No Model.)

4 Sheets—Sheet 4.



UNITED STATES PATENT OFFICE.

CHARLES L. HILL, OF DENNISON, OHIO, ASSIGNOR OF ONE-HALF TO
WILLIAM KIMBERLING, OF SAME PLACE.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 616,327, dated December 20, 1898.

Application filed December 27, 1897. Serial No. 863,634. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. HILL, a citizen of the United States, residing at Dennison, in the county of Tuscarawas and State of Ohio, have invented certain new and useful Improvements in Incubators; and I do hereby 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.

My invention relates to improvements in incubators; and it consists in certain novel features of construction, combination, and arrangement of parts, as will be hereinafter more fully described and specifically set forth in the appended claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a perspective view of an incubator embodying my invention. Fig. 2 is a plan view of the hot-water tank and a horizontal section of the heater. Fig. 3 is a vertical longitudinal section of the incubator. Fig. 4 is a vertical transverse section of same on line 4 4 of Fig. 3. Fig. 5 is a horizontal section on line 5 5 of Fig. 3. Figs. 6, 7, and 8 are detached perspective views of the egg-tray, rack-frame, and rack; and Fig. 9, a cross-sectional view showing the parts of the tray assembled. Fig. 10 is a detail perspective view, partly in section, showing the thermic bulb and connecting operating means.

The incubator comprises in its construction an outer casing A, supported upon legs B, and an inner casing C, formed by bottom, side, and end walls *a b c*, respectively. The said outer casing is preferably made of double walls *d e*, with one or more layers of building-paper inserted between them, and the space between the inner and outer casings is filled with mineral wool or some other suitable non-conductor of heat. Below the bottom of the inner casing is a division-wall *f*, forming an air-circulating space or chamber *f'*, and the said bottom of the inner casing is provided with air-inlet openings *a'* for passage of air therefrom into the egg-chambers, hereinafter described. The space between the bottom of the outer casing and this division-wall is also filled with mineral wool. Air enters the space *f'* through a horizontal pipe *g*, having its ends

opening through the wall *f* and provided with a central inlet-tube *g'*, opening to the atmosphere through the bottom of the outer casing. Access to the interior of the outer casing may be had through a hinged door D and to the inner casing through a hinged door D'.

The interior of the inner casing is divided by a partition E to form two independent egg-chambers *h h'*, and this partition is fitted to slide in grooved guideways *i*, so that it may be inserted and removed at will through the doorways to form two egg-chambers, as before stated, or to throw the entire inner casing into a single compartment, as desired. This construction is important and constitutes a valuable feature of the invention. Its advantages are, first, that the partition may be withdrawn and the entire incubator filled at one operation; second, at the end of the seventh or tenth day of incubation all infertile eggs can be removed, the fertile eggs placed in the trays in one chamber and the partition inserted to cut off the filled from the empty chamber, and, third, if but a single tray is to be filled the partition may be inserted and the tray placed in one chamber while the empty chamber may be filled at any subsequent period without liability of chilling the eggs in the filled chamber. Furthermore, a single tray of from one-hundred to two-hundred egg capacity may be inserted into the single chamber formed by removing said partition.

On the top of the inner casing rests a hot-water tank G, which communicates with a boiler or water-heater H on the exterior through supply and return pipes *j j'*. This tank is in the form of a shallow pan provided with a central opening *k*, surrounded by a flanged wall *k'* and a partition *l*, arranged between the supply and return pipes, so that the hot water entering through the pipe *j* will flow completely around the tank and then back into the boiler through the pipe *j'*. An effective circulation of the hot water is thereby produced. These pipes *j j'*, extend through the walls of the incubator and connect, respectively, with the top and bottom of the boiler. The boiler or heater H is arranged within a closed chamber or casing I on the exterior of the incubator, which casing is pro-

vided with a hinged door J, whereby the boiler may be conveniently repaired in case of leakage and removed whenever desired. The boiler is formed with a hot-air flue *m*, and into the lower end of the flue extends the chimney of a lamp or oil-heater K, supported below said casing by a bracket N. This bracket is hinged at one end to rods *n* and provided at the other end with notches for the reception of rods *n'*, said rods *n* being threaded at their lower ends and fitted with wing-nuts *o*, by which the free end of the bracket is adjustably supported. This construction permits of the lamp being readily lowered for removal or trimming of the wick.

Above the hot-water tank is a radiating-plate O, which deflects the moisture and hot air rising from said tank down into the egg-chambers *h h'*, and extending downward from the top of the casing and opening through said plate immediately above the opening in the tank is a vent-tube *p*. Fitted to slide in the upper end of this tube is a perforated valve-tube *q*, which when open permits the moisture-laden air rising from the tank and moisture-pans to vent directly to the atmosphere. Simple, convenient, and effective means are thereby provided by which the degree of humidity of the incubator atmosphere may be regulated. In order to insure good results, it is important that the air in the upper portions of the egg-chambers, which in circulating comes in contact with the upper portions of the eggs, should be as fully saturated with moisture as the air below and that there should be an equalization of heat and moisture throughout the entire incubator atmosphere. To accomplish this, I locate in the upper portion of the inner casing a moisture-pan P, which rests upon the upper guideway *i* in the space formed by the hot-water-tank opening *k*. The vapor rising from this pan thoroughly saturates the partially moisture-laden air heated by the tank, and the air then gravitates downward through egg-trays, and when partially relieved of its moisture passes out through vent-tubes *r* in the walls of the casings provided for that purpose. The proper conditions of heat and moisture are thus maintained in the most effective and economical manner, and at the same time ample ventilation is afforded by the admission of air through the pipe *g* and tubes *r*. The air entering through pipe *g* is stored in the space or chamber *f'* and absorbs sufficient heat before entering the egg-chambers to prevent chilling of the eggs.

The double walls *d' e'*, forming the top of the outer casing A, are preferably detachably secured by screws or other suitable fastening devices, so that they may be quickly and conveniently removed for repacking the walls with non-conducting material and for lifting out the hot-water tank and upper moisture-pan for repairs or for other purposes.

One or more egg-trays may be supported in each egg-chamber upon suitable cleats on the

side walls, guideways, and removable partition. Each tray comprises in its construction a rectangular tray proper, Q, provided with a reticulated bottom *s* and longitudinal bottom trackways *s'* at each side thereof. In this tray fits an open rack-frame R, provided with end cross-pieces *t* and rollers *t'*, which rest on and are adapted to traverse said trackways *s'*. The length of this rack is several inches less than that of the tray, so that it may be moved freely back and forth therein. The rack R consists of two longitudinal parallel rods *u*, whose ends are adapted to rest upon the cross-pieces *t* of the rack-frame, and a series of transverse slats *v*, fitted to slide thereon, so that they may be adjusted to receive different sizes of land and water fowl eggs. The eggs are supported in parallel rows by said slats and rest upon the reticulated bottom *s* of the tray proper, and by adjusting these slats relatively to each other to increase or diminish the space between them different sizes and kinds of eggs may be placed in the same tray for incubation. Preferably hen and other small eggs are placed in the tray in an inclined position, with their point ends resting on the reticulated bottom and one side against a slat, and larger eggs, such as duck and turkey eggs, placed longitudinally, with one side thereof resting on said rectangular bottom to secure good results and to enable them to be turned at the proper periods with facility. By simply sliding the rack-frame R in the tray Q the eggs may be turned simultaneously without jarring or danger of injuring the embryo.

Below each tray is a moisture-pan *s²*, of suitable construction, which may be fitted to slide in guideways on the bottom of the tray or detachably secured thereto in any other suitable manner. These pans may be filled with water or moist sand, as desired.

The heat-regulating mechanism comprises a thermic tube or bulb W, arranged in the egg-chamber above the trays and having one end projecting into a chamber W', formed between the walls of the inner and outer casings and provided with an elbow forming a mercury-chamber *w*. To this mercury-chamber is connected one end of a flexible tube *w'*, which extends from said chamber W' into a casing U, arranged alongside the casing I. In said chamber U is a variable weight *x*, carrying a gage-tube *x'*, to which the outer end of the flexible tube is attached. A scale-balance lever Y is mounted exteriorly of the casing upon a bracket Y', secured to the main casing, and is connected at one end to the variable weight by a cord or wire *y* and provided at its free end with a damper *z*, which controls the escape of hot air from the boiler-flue *m* in the usual manner. A sliding counterbalancing-weight *z'* may be employed on the free end of the lever to adapt the mechanism to operate at different degrees of temperature. In operation when the temperature of the atmosphere in the egg-chambers

rises above the normal the mercury in chamber *w* expands and is forced through the flexible tube *w'* into the gage-tube *x'*, thereby causing the lever to tilt and raise the damper to allow the hot air to escape from the flue. When the temperature falls below the normal, the mercury contracts and causes the formation of a vacuum in the chamber *W*, which is immediately filled by the mercury receding from the gage-tube and passing into said chamber. The end of the lever is then tilted down by the weight *z'* and the flow of hot air through flue *m* partially or wholly cut off.

From the above description, taken in connection with the accompanying drawings, the construction and operation of my improved incubator will be clearly understood. It will be seen that all the conditions necessary for attaining successful results are provided for and at the same time the parts are rendered readily accessible for removal and repair.

I desire it understood that I do not limit my invention to the specific construction and arrangement of parts shown, as it is obvious that changes in the form, proportion, and details of construction may be made within the scope of the invention without departing from the spirit thereof.

Having thus fully described my invention, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. In an incubator, the combination with an outer casing provided with a removable top having depending walls, of an inner casing, a removable vertical partition sliding in guideways in the latter, a hot-water tank resting on the top of the inner chamber, said tank being open at top and provided with a central opening, a metal radiating-plate secured to the depending walls of the said removable top of the outer casing and arranged immediately above the hot-water tank, a packing of non-conducting material between said plate and removable top, and a moisture-pan supported upon the upper guideway of the vertical partition in line with the tank and occupying the space therein formed by said central opening, substantially as described.

2. In an incubator, the combination of an

outer casing, an inner casing having its bottom wall formed with air-inlet openings, a vertical partition separating the inner casing into two independent egg-chambers, a horizontal division-wall between the bottoms of the casings forming with the bottom of the inner casing a fresh-air chamber in which the air circulates before passing into the egg-chambers, a pipe for conducting air from the exterior to said circulating-chamber, a removable top on the outer casing provided with depending walls, a radiating-plate secured to said walls, a packing of non-conducting material between the plate and top, a hot-water tank resting upon the top of the inner chamber below the radiating-plate, said tank being open at top and provided with a central opening, and a moisture-pan supported in line with the tank and occupying the space therein formed by said opening, substantially as described.

3. In an incubator, an egg-tray having longitudinal trackways, a rack-frame provided with rollers adapted to traverse said trackways, and an egg-rack inclosed therein and consisting of a pair of parallel rods, and a series of slats fitted to slide thereon, whereby said slats may be adjusted to receive different-sized eggs, and the eggs turned by sliding the rack-frame longitudinally in the tray substantially as described.

4. In an incubator, an egg-tray comprising a tray proper provided with a reticulated bottom and longitudinal trackways at each side thereof, an open bottom rack-frame of less length than the tray and inclosed therein and provided with end cross-pieces and rollers which rest on and are adapted to traverse said trackways, and a detachable rack inclosed in said frame and consisting of a pair of parallel longitudinal rods adapted to rest on said cross-pieces, and a series of transverse slats fitted to slide independently on the rods, substantially as described.

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

CHARLES L. HILL.

Witnesses:

B. BALDWIN,
 F. C. MANN.