

(No Model.)

3 Sheets—Sheet 1.

E. S. RENWICK.
INCUBATOR.

No. 335,961.

Patented Feb. 9, 1886.

Fig. 1.

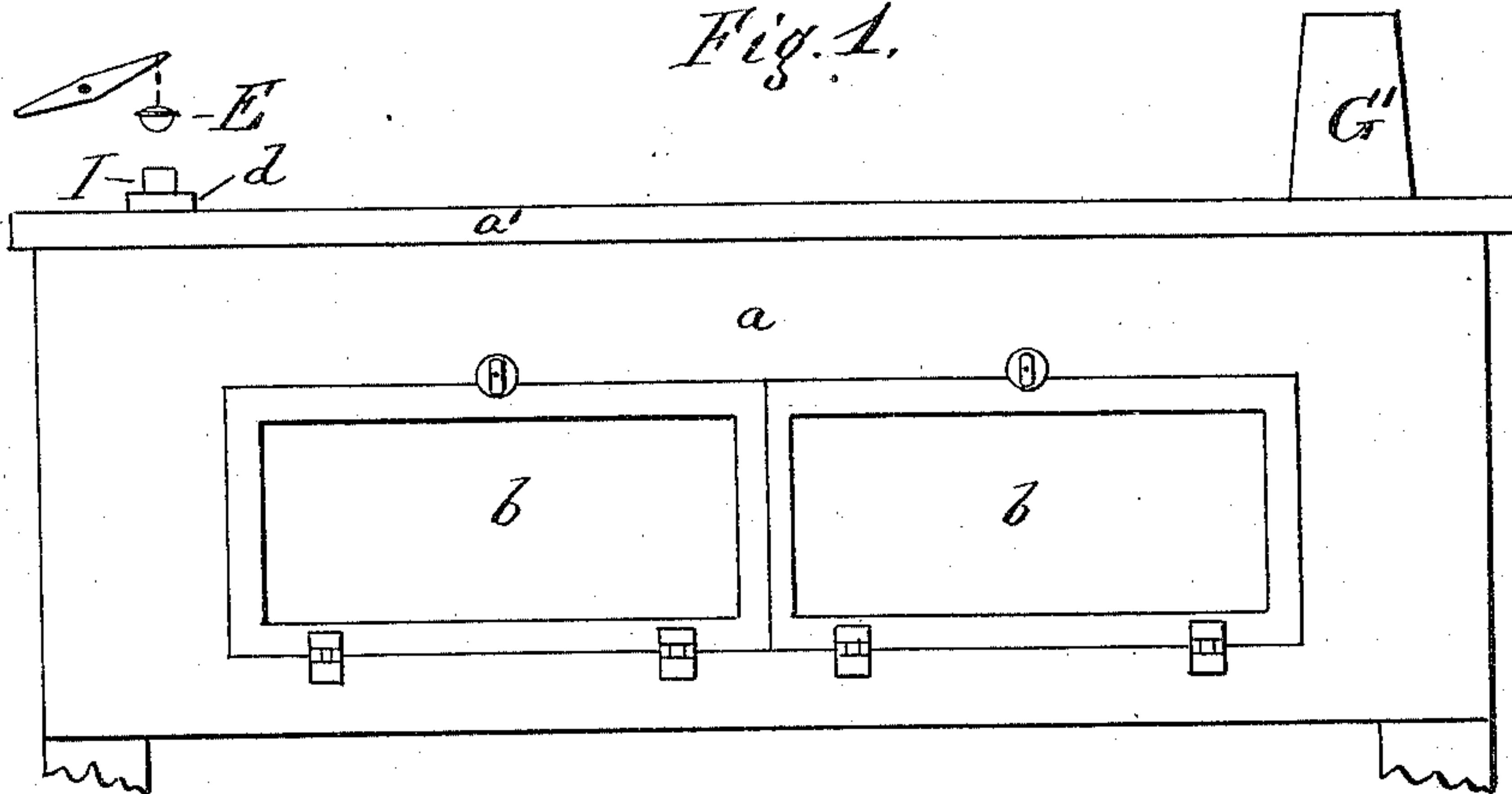


Fig. 2.

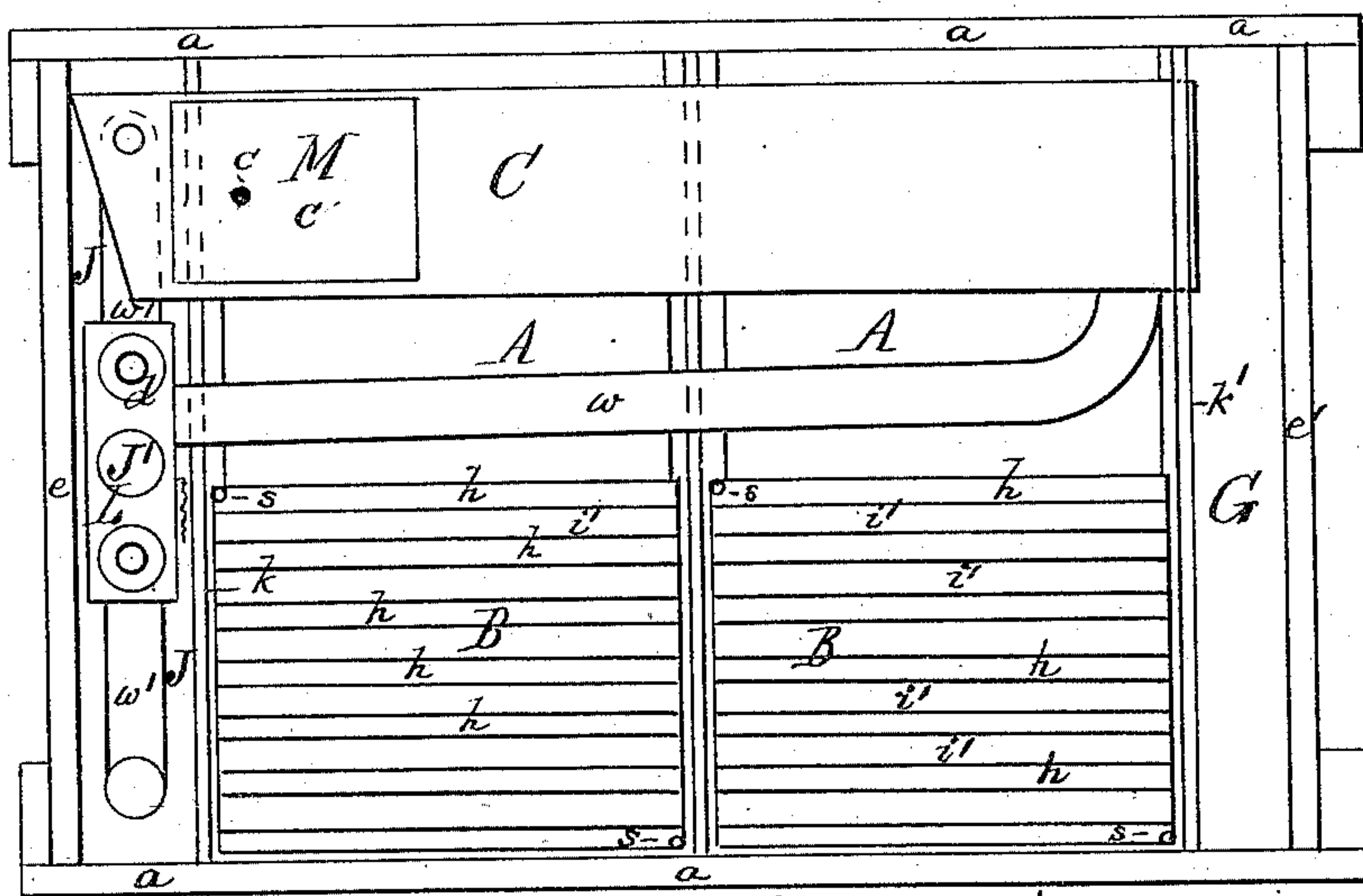
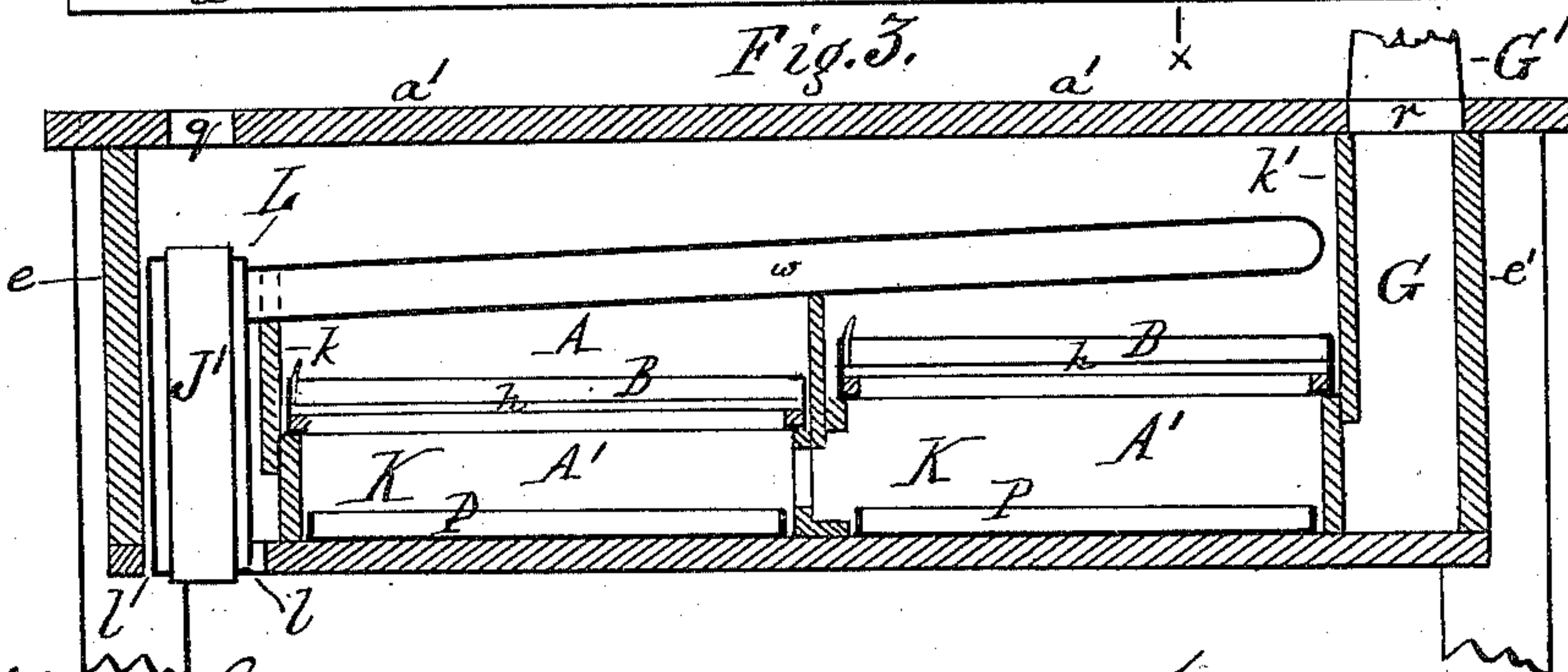


Fig. 3.



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Fig. 6

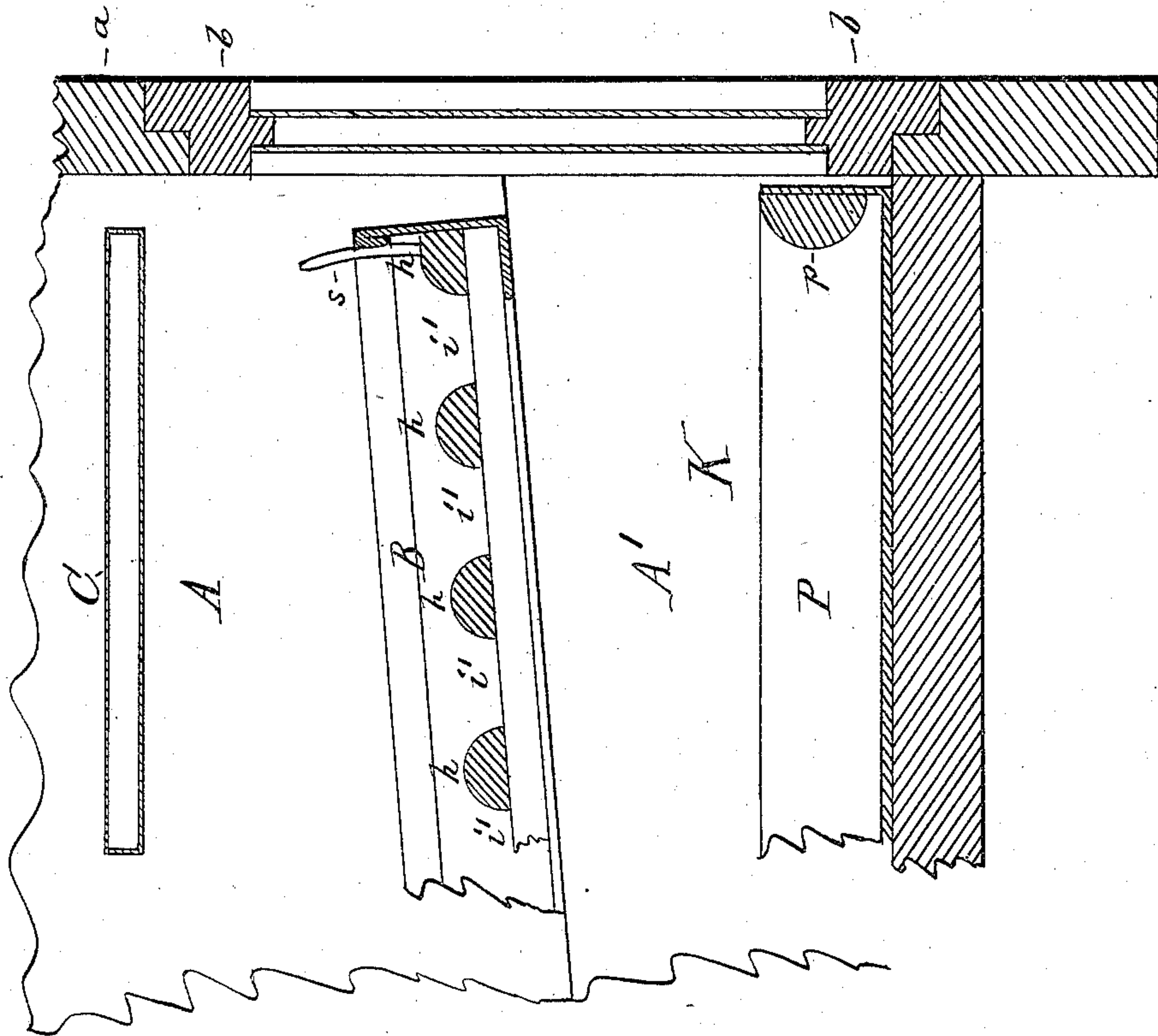


Fig. 4.

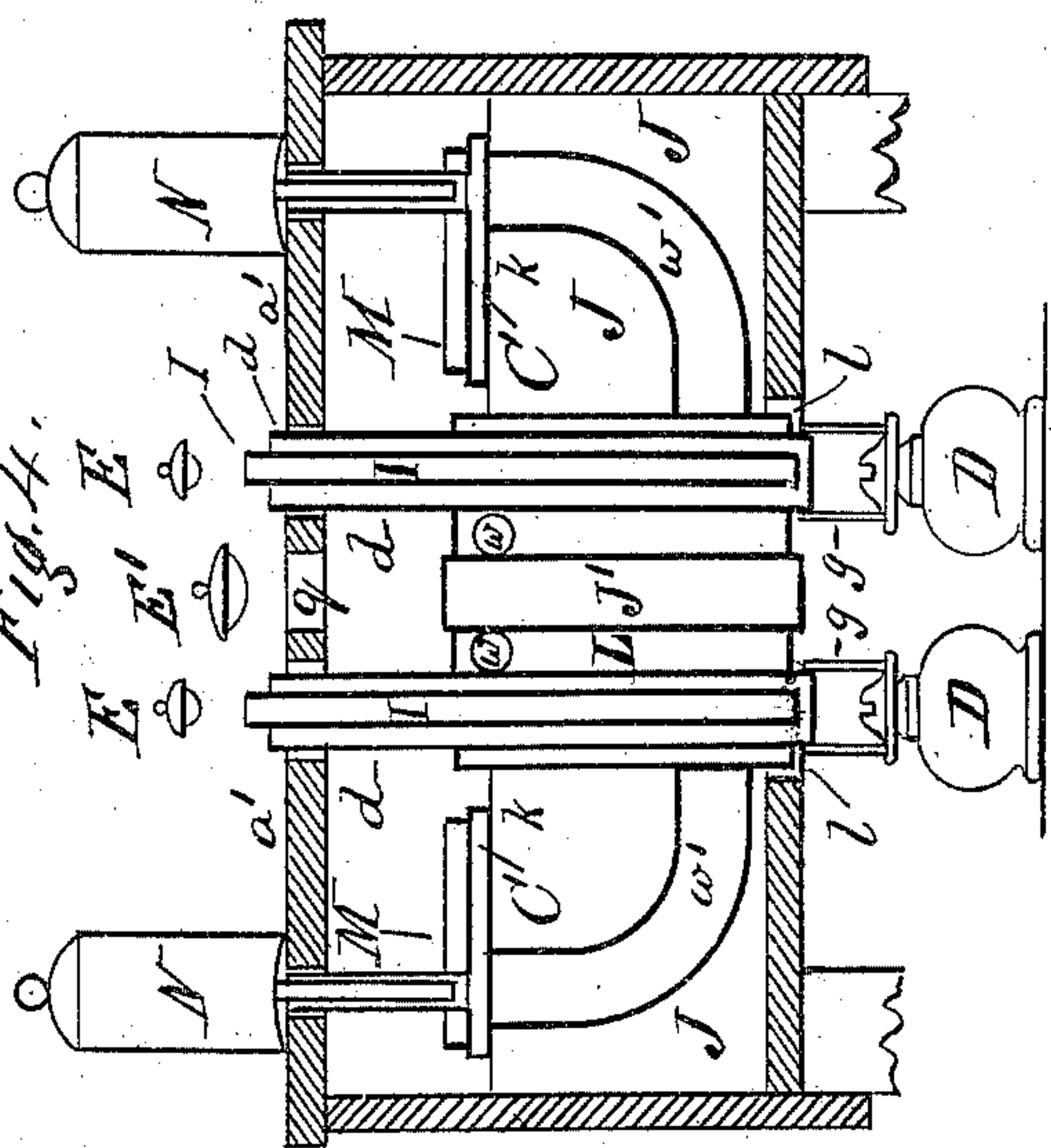
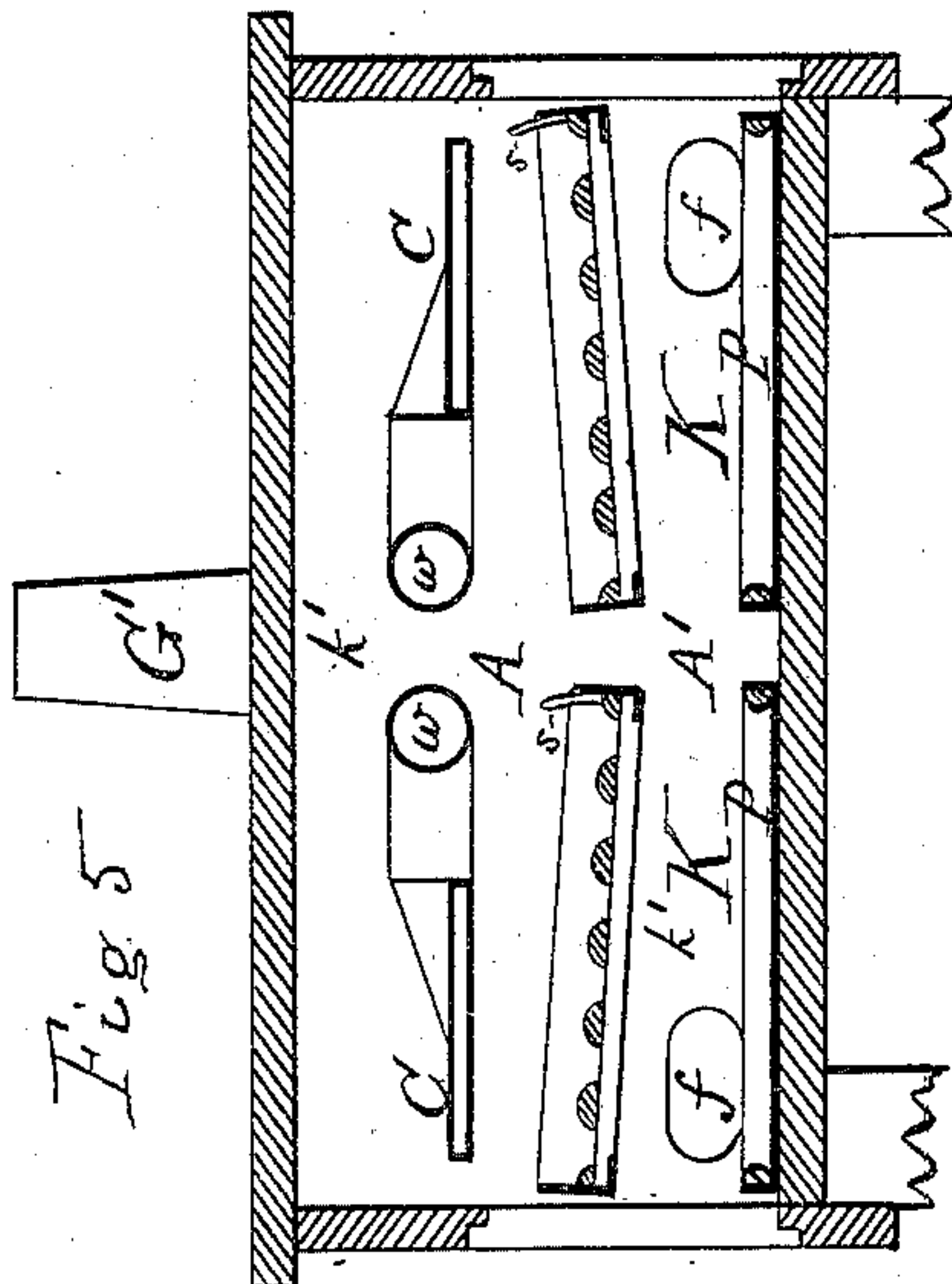


Fig. 5



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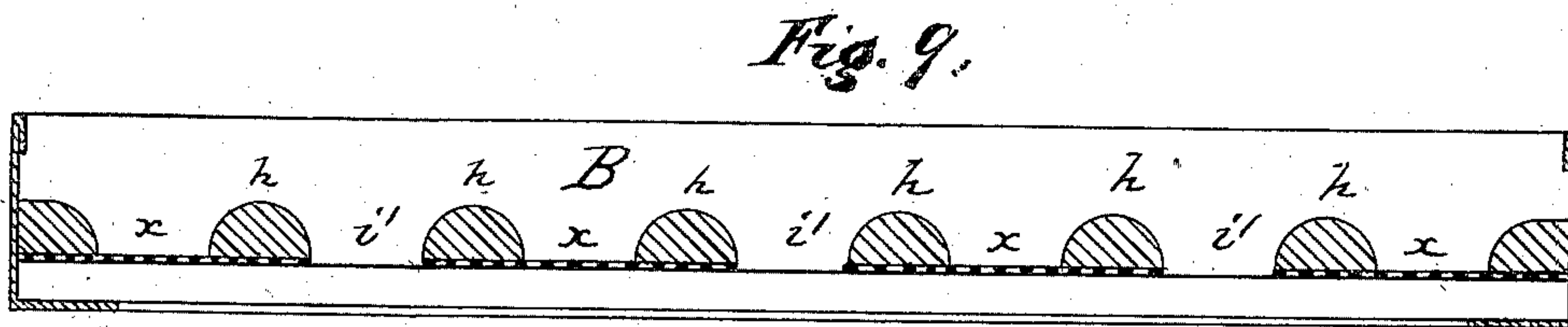
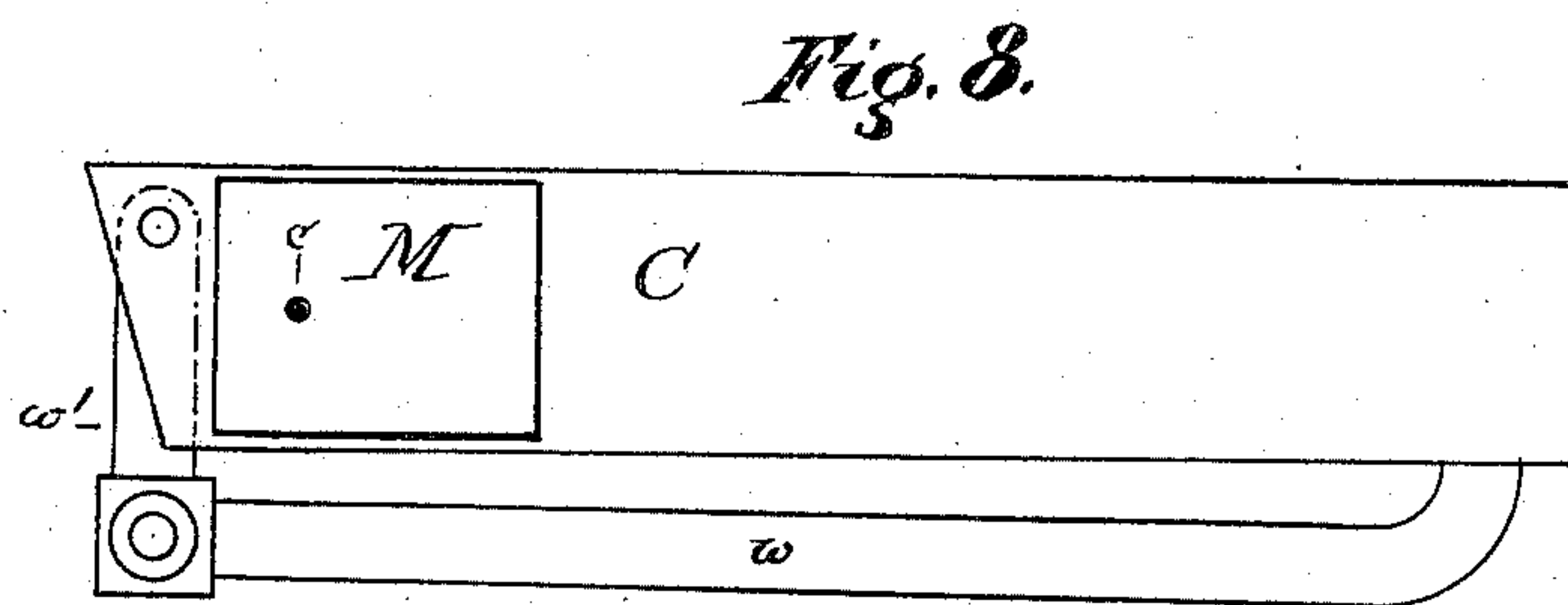
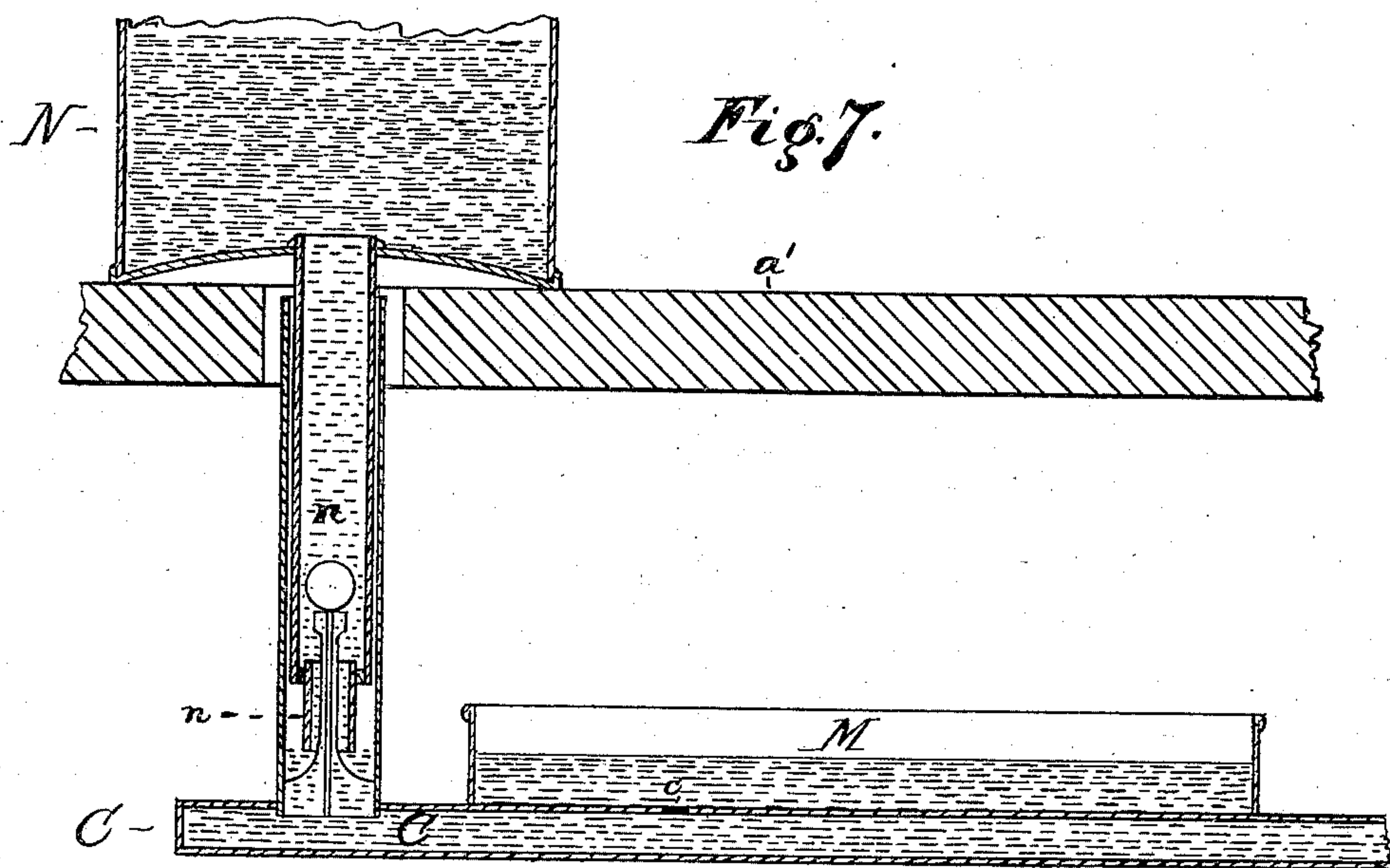
(No Model.)

3 Sheets—Sheet 3.

E. S. RENWICK.
INCUBATOR.

No. 335,961.

Patented Feb. 9, 1886.



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J. E. Tanner
Emil Horster

Inventor.
Edward Sabine Renwick

UNITED STATES PATENT OFFICE.

EDWARD SABINE RENWICK, OF MILLBURN, NEW JERSEY.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 335,961, dated February 9, 1886.

Application filed April 15, 1884. Serial No. 127,945. (No model.)

To all whom it may concern:

Be it known that I, EDWARD SABINE RENWICK, of Millburn, in the county of Essex and State of New Jersey, have made an invention of certain new and useful Improvements in Incubators; and I do hereby declare that the following, in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

The invention consists of improvements upon the incubators described in previous patents granted to me; and the objects of the invention are the more efficient distribution of heat and supply of moisture in an incubator having a descending ventilation through the egg-trays and incubating chamber, the removal of the chickens from the egg-trays as soon as the chickens are hatched, the prevention of overheating when a descending ventilation is employed, and the more easy reversal of turning egg-trays.

The improvements consist of certain combinations of mechanical devices, which are set forth in the claims at the close of this specification, and they may be used jointly or separately, but I prefer to use them simultaneously, in the same incubator.

In order that the said invention may be fully understood, I have represented in the accompanying drawings, and will proceed to describe, an incubator embodying my invention in the best form thus far devised by me, it being understood that the invention may be embodied in other forms, and that parts of it may be used without others, as circumstances or the views of different users or manufacturers render expedient.

Figure 1 of said drawings is a side view of said incubator. Fig. 2 is a plan of the same with the top and one of the circulators removed. Fig. 3 is a central vertical section thereof. Fig. 4 is a transverse vertical section thereof through the center of the heater. Fig. 5 is a vertical transverse section thereof at the line *xx* of Fig. 2. Fig. 6 is a transverse section of a portion of the incubator, drawn on a larger scale than that of the preceding figures. Fig. 7 represents, upon a larger scale than Figs. 1 to 5, inclusive, a section of the water-fount with its valve opened by the pin. Figs. 8 and 9 represent views of modifications of my incubator as hereinafter described.

The incubating-chamber *A A'* of the said incubator is fitted in this example with four egg-trays, *B*, which can be applied and removed through openings in the sides *a* of the incubator, which are closed by movable flaps *b b*. The incubating-chamber is indirectly heated in this case by means of two lamps, *D D*, and the heat is circulated through the incubating-chamber partly by a water-circulation and partly by the air which is used for ventilation. Gas-burners may be used in place of lamps to supply the heat.

In order that the water for the water-circulation may be heated, the upright heater *L* is provided. It consists of an upright vessel through which the two heat-flues *d d* are passed, the said flues communicating at the bottom with the short chimneys *g* of the lamps, and extending through the top of the incubator, so as to permit the products of combustion to escape into the air. The said lamp-flues are fitted with internal waste-heat chimneys, *I I*, as described in my previous patents, and the upper ends of these waste-heat chimneys are fitted with drop-valves *E E*, by which the heat is controlled, as described in my Patent No. 193,616. The said upright heater *L* is connected at its upper end with two circulators, *C C*, which are arranged in the upper part of the incubating-chamber *A*, above the egg trays or holders *B*, which hold the eggs. These circulators are connected by direct pipes *w* with the upper part of the heater *L*, and by return-pipes *w'* with the lower part of the heater *L*, so that the warm water from the heater may circulate through the circulators and return to the heaters for reheating.

In order that the requisite amount of moisture may be supplied to the incubating-chamber, a water-tray, *M*, is constructed upon each circulator and is connected with it by an opening, *c*, made in the top of the circulator, said circulator thus acting as a pipe to connect and combine the water-tray with the heater, so that the said tray may be partially filled with warm water, which is kept warm by heat from the circulator upon which the tray is mounted. The moisture from the tray is diffused by evaporation into the air in the upper part of the incubating-chamber.

In order to supply water as it evaporates from the trays, a fount, *N*, is provided for

each water-tray or evaporating-tray M, the said fount being fitted with a tube, *n*, which descends down to the level at which the water is to be maintained in the tray.

5 For convenience of removing and replacing the fount, its tube is fitted with a ball-valve, which is opened by a stationary pin in the circulator when the fount is lowered to its place, as represented in section in Fig. 7.

10 In order to supply warm air for ventilation, the heater L is arranged in an air-supply pipe, J, which is formed by the end wall, *e*, of the incubator, the partition *k*, and parts of the sides *a a* of the incubator. The air enters this
15 supply-pipe through the opening *l* in the bottom of the incubator, the said opening being made larger than the end of the water-heater L, so that there is a space around the lower end of the said heater for the admission of air.
20 The air which enters at this opening is warmed by radiation from the heater as it rises through the air-supply pipe J. A further supply of warm air is obtained by constructing the heater L with a central air-supply pipe, J', which
25 receives the air at its lower end and permits it to discharge at its upper end. The warmed air enters the incubating-chamber at the upper edge of the partition *k*, where it comes in contact with the vapor exhaling from the water-
30 trays of the circulators C, so that the air is supplied with moisture in the upper part of the incubating-chamber.

In order that the warmed and moistened air may pass downward, the circulators C are
35 smaller in breadth than the horizontal area of the incubating-chamber, so that the air may descend at their outer edges and between them to the egg-trays B beneath. The circulators are by preference flat vessels, but, if preferred, they may consist of pipes which are
40 suitably connected with the heater for circulation, and which have evaporating-trays formed upon them.

In order that the foul air may escape from
45 the incubating-chamber, a ventilating chimney or flue, G, is constructed at the end of the incubator which is farthest from the lamp or other source of heat, the said chimney or flue being formed by the end wall, *e'*, the partition
50 *k'*, and parts of the sides *a a* of the incubator. A hole, *r*, is made through the top of the incubator for the escape of the foul air, and a chimney-head, G', is fitted to it. The chimney may be extended by applying a pipe to
55 this chimney-head, so as to increase the draft, if necessary. A pasteboard pipe two feet long is a convenient pipe for this purpose. The air from the incubating-chamber enters the lower part of the ventilating-chimney through
60 openings *f f* in the partition *k'* below the level of the egg-trays B; hence the air for ventilation, which enters the incubating-chamber near its top at one end from the supply pipe or flue J, is compelled to pass downward
65 through the egg-trays and to enter the ventilating chimney or flue G through the openings *f* at the other end of the incubating-chamber.

The ventilation is thus a descending ventilation, with the advantages attendant upon that system, as set forth in my previous patents, 70 and the air before it passes to the egg-trays is supplied with moisture from the evaporators, which supply moisture to the warm air in the upper part of the incubating-chamber. As these vessels are supplied with hot water from 75 the heater, they evaporate the water freely and insure a supply of moisture. In place, however, of connecting them with a heater common to both, each may be connected with a separate heater, as represented at Fig. 8, in 80 which case the combinations recited in the sixth and seventh claims at the close of this specification will not be used.

In order that the eggs may be supported in the trays B, they are fitted with egg-supports, 85 which may be rollers or rails, (as the user may prefer,) or slats *h*, upon which the eggs are laid.

In order that the chickens when hatched may escape immediately from the egg-trays, 90 the spaces *i'* between the egg-supports of said trays are made wide enough for the passage of the young chickens, a space of about one and one-eighth inch in breadth being sufficient for the purpose. There is also no wire- 95 cloth, perforated metal, or other obstruction at the bottom of the trays to the passage of chickens; hence as soon as the chickens escape from the shells they may pass downward into the chicken-chamber K, formed by 100 the lower part of the incubating-chamber A'.

In order that the chickens may be readily removed and prevented from fouling the bottom of the incubator and falling upon the circulating pipes, which are used in some incubators, chicken-trays P are provided, and the 105 flap-holes and flaps *b* at the sides of the incubator are extended downward sufficiently to permit the chicken-trays to be readily applied to and removed from the chicken-chamber K, or holes lower than those for the egg- 110 trays may be made in the sides of the incubator, and may be provided with suitable flaps or other shutters. I prefer to construct these chicken-trays of pasteboard stiffened at their 115 front and rear sides by a wooden rail, *p*, as shown in section on a larger scale in Fig. 6; but they may be made of sheet metal, wood, or other material.

In order to prevent the chickens in the 120 chicken-chamber from escaping through the ventilating-holes *f*, the latter are guarded by wire guards formed of wire-cloth, that of half-inch mesh being well adapted to the purpose.

To prevent possible overheating, a supplementary intermittent escape for hot air is 125 provided, a ventilating-opening, *q*, being formed in the top *a'* of the incubating-chamber, and by preference over the air-supply pipe J', and being fitted with a valve, E', 130 which is operated, by preference, by the same valve-engine which controls the heat-valves E.

When the incubating-chamber is combined

both with the ventilating-chimney G, communicating with it below the egg-supports, and with the supplementary ventilating-opening in its top, a downward circulation of air may be maintained, with an intermittent escape of heated air at the top to prevent possible overheating.

The regulation of heat is effected, by preference, by means of a tension-thermostat—such as is described in my previous Patent No. 281,397—the said thermostat being combined by multiplying levers with a valve-engine which is driven by a weight or by a spring, and which operates the valves E E.

In place of having the spaces between the egg-supports of uniform width throughout the entire length of said supports, there may be occasional spaces for the downward passage of chickens from the egg-trays, as represented in section at Fig. 9, the other spaces, *x*, being closed by wire-cloth; but this construction is not as good, in my opinion, as that first described.

In order that the egg-trays may be reversed with facility, for the purpose of turning the eggs upside down, as is daily practiced with incubators, each egg-tray is fitted at its diagonally-opposite corners with a small post, *s*; hence when an empty egg-tray is set upside down over a full one the ends of the posts of one tray enter the unoccupied corners of the other tray, and the two trays are thereby locked laterally to each other, so that there is no risk of the trays slipping apart laterally when they are simultaneously turned upside down for the purpose of turning the eggs.

The arrangement of the heater at the end of the incubator is a practical necessity, because of the difficulties attending the application of heat elsewhere, and the central arrangement of the heater at one end of the incubator, in combination with the lateral circulators connected with the said heater by direct pipes *w*, which are outside the circulators in the upper part of the incubating-chamber and convey the heated water to their farther ends, is advantageous, because the hot water is delivered at once to the farther ends of the circulators, or those ends which are farthest from the source of heat, and are in the cooler portion of the upper part of the incubating-chamber; hence the heated water tends to heat the farther portion of the incubator hotter than it would otherwise be, while the cooling of the water by radiation of heat as it returns through the lateral circulators to the heater causes the part of the incubating-chamber nearer the heater to be cooler than it would be if the heated water passed directly from the heater to the nearer ends of the circulators. This combination therefore tends to equalize the heat in the incubating-chamber. In practice the direct-flow pipes *w* are jacketed with a non-conductor of heat—such as pasteboard—separated from the flow-pipe by an air-space,

so as to prevent the central portion of the incubating-chamber from being overheated, and to retain the heat of the water as much as possible until at or about its entrance into the farther ends of the circulators.

I claim as my invention—

1. The combination, substantially as before set forth, of the incubating-chamber, the heater, and the evaporating-tray in connection with the heater, whereby the evaporating-tray in the incubating-chamber is supplied with warmed water from the heater.

2. The combination, substantially as before set forth, of the incubating-chamber, the air-supply pipe arranged at the end of said chamber and delivering air to the upper part thereof, the heater arranged within said air-supply pipe, the circulator extended through the incubating-chamber, and the evaporator arranged in the upper part of said chamber and in connection with said heater.

3. The combination, substantially as before set forth, of the egg-trays fitted with egg-supports having spaces between them for the passage of chickens, the chicken-chamber beneath for the reception of chickens which pass downward from said trays, and the body of the incubator having flap-holes for the removal of said chickens.

4. The combination, substantially as before set forth, of the egg-trays fitted with egg-supports having spaces between them for the passage of chickens, the chicken-chamber beneath, and the chicken-tray for holding the chickens.

5. The combination, substantially as before set forth, of the incubating-chamber, the ventilating-chimney connected with said chamber below the egg-trays, the top of said chamber having the supplementary ventilating-opening, and the valve for said supplementary opening.

6. The combination, substantially as before set forth, of the central heater, the two lateral circulators, the direct pipes which are unclosed in said circulators and lead from the upper end of the heater to the farther ends of the circulators, and the return-pipes leading from the nearer ends of the lateral circulators to the lower part of the heater.

7. The combination, substantially as before set forth, of the incubating-chamber, the central heater arranged at the end thereof, the lateral circulator, the direct-flow pipe, which is outside the lateral circulator and leads from the upper end of the heater to the farther end of the lateral circulator, and the return-pipe leading from the nearer end of the lateral circulator to the lower end of the heater.

In testimony whereof I have hereto set my hand this 8th day of April, A. D. 1884.

EDWARD SABINE RENWICK.

Witnesses:

W. L. BENNEM,

J. ELAM WARNER.