(No Model.) 3 Sheets—Sheet 1.

T. L. RANKIN.

ICE MACHINE.

No. 332,361. Patented Dec. 15, 1885.

Fig. 1.

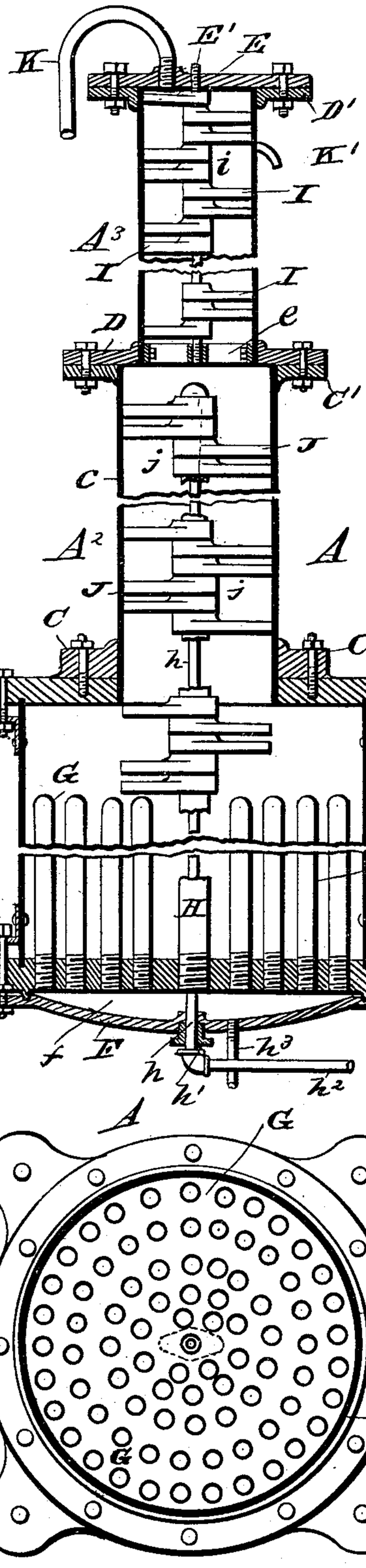

Fig. 3.

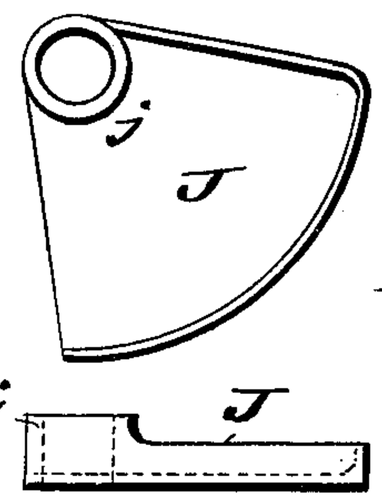

Fig. 5.

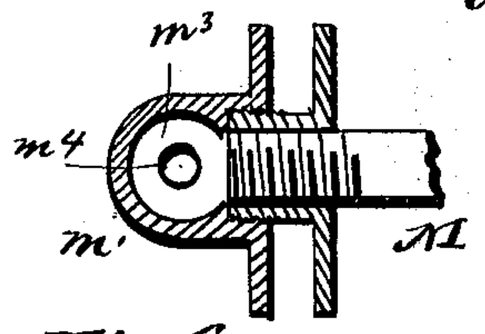

Fig. 6.

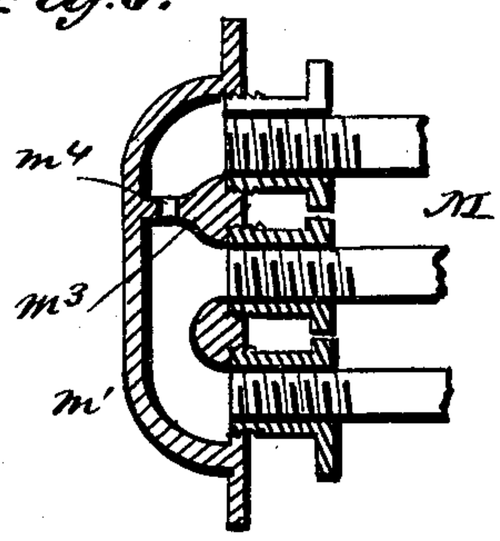

Fig. 2.

WITNESSES

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ICE MACHINE.

No. 332,361. Patented Dec. 15, 1885.

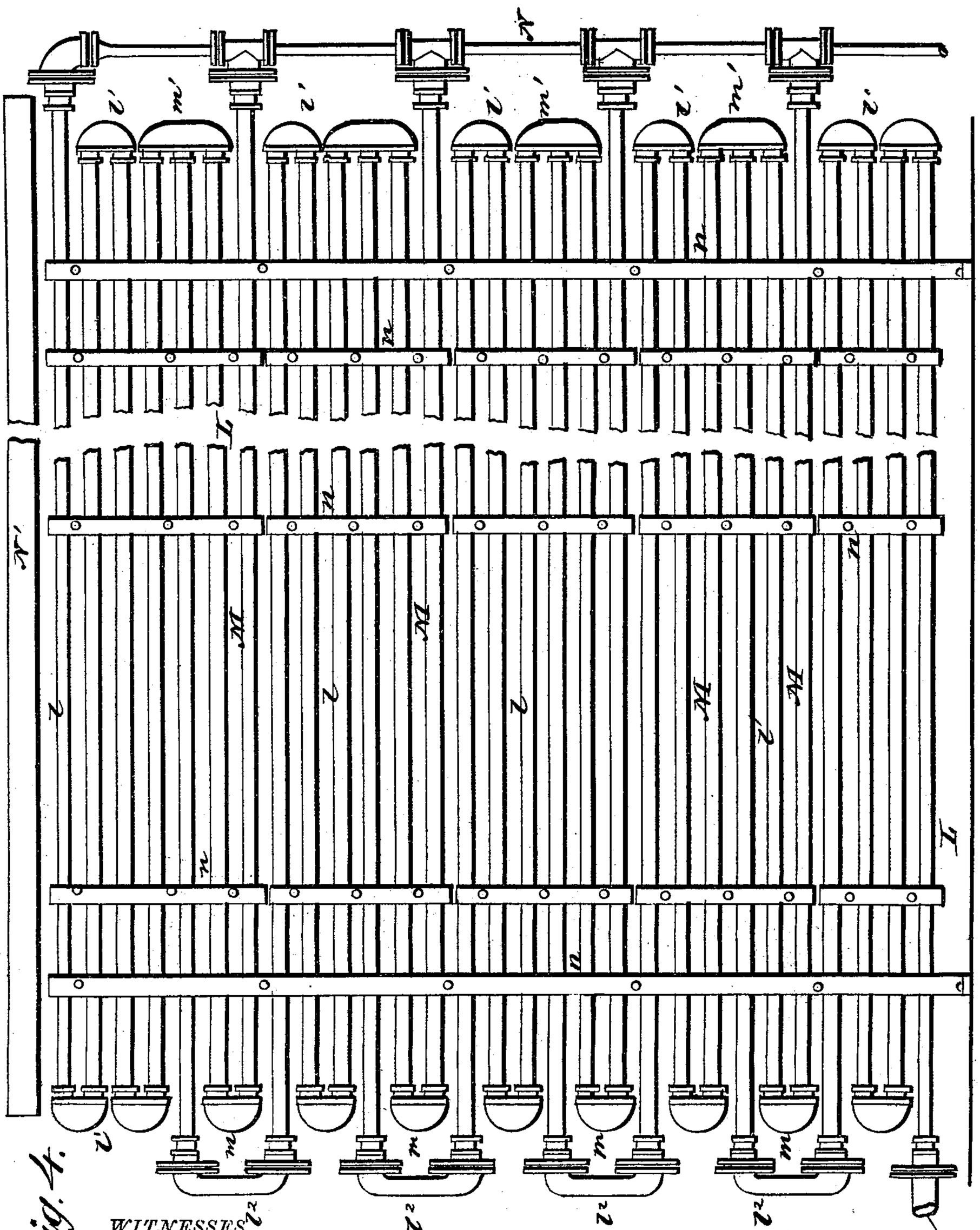

Fig. 1.

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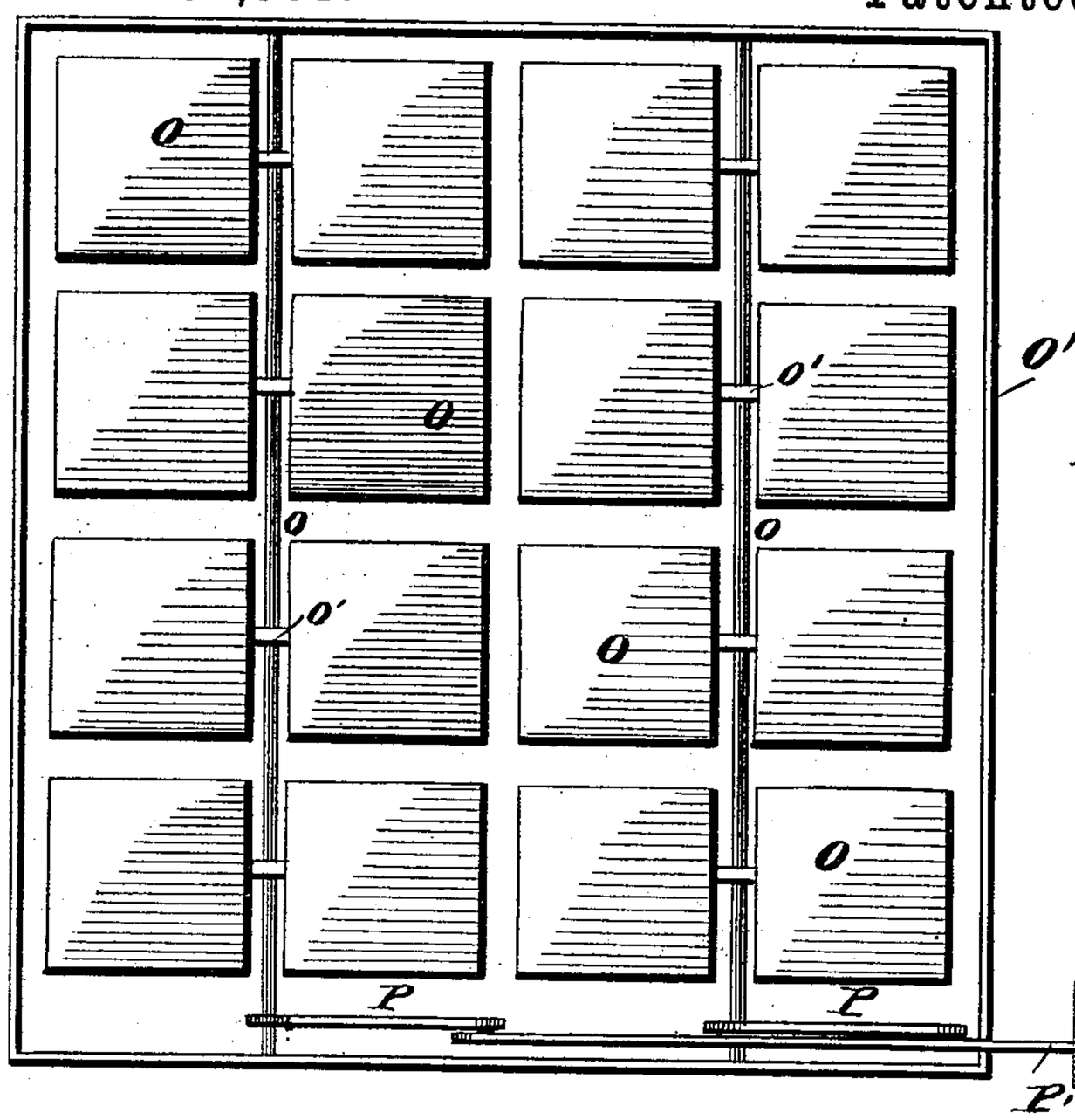
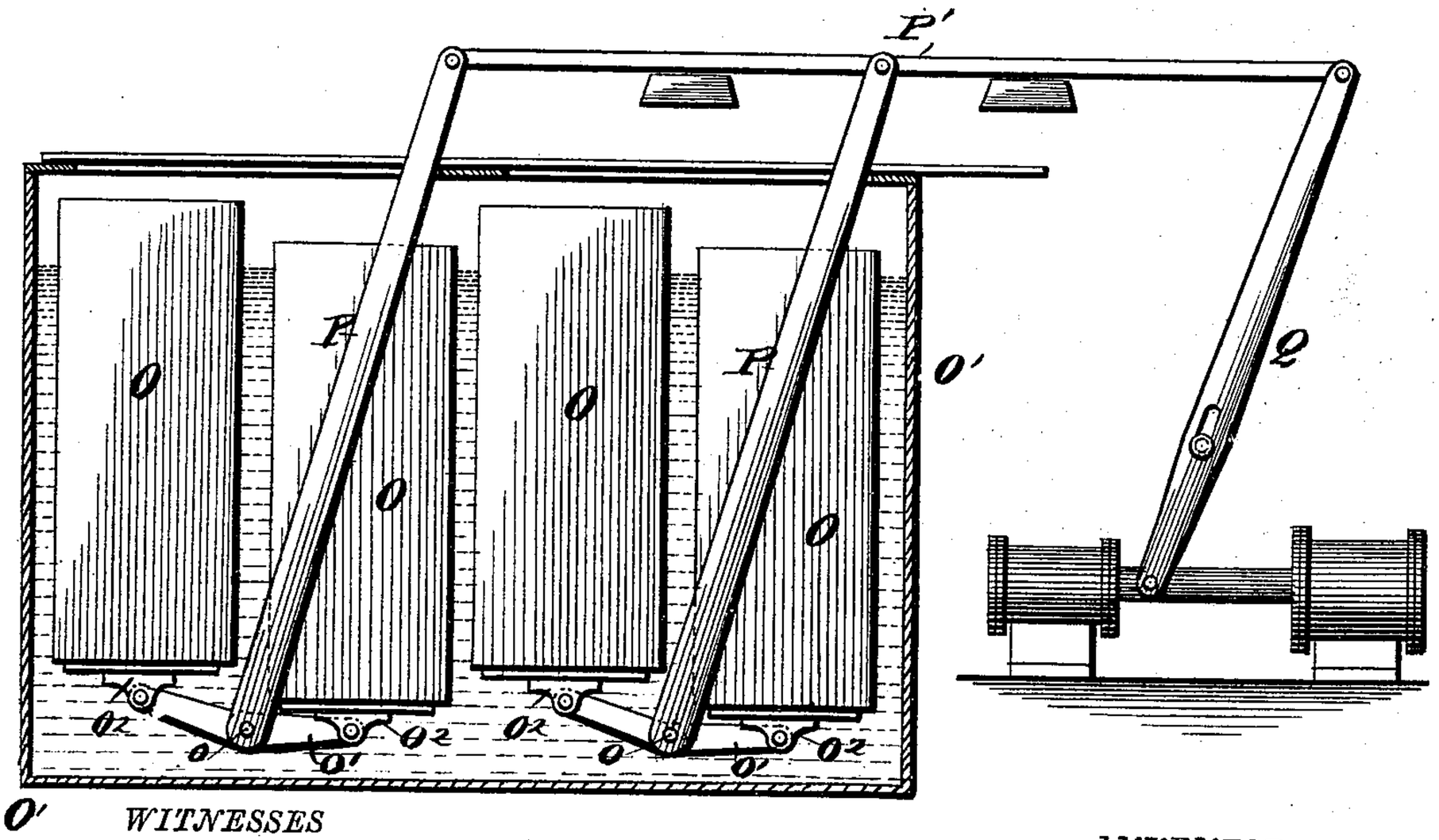


Fig. 7.

Fig. 8.



WITNESSES

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UNITED STATES PATENT OFFICE.

THOMAS L. RANKIN, OF QUENEMO, KANSAS.

ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,361, dated December 15, 1885.

Application filed June 3, 1885. Serial No. 167,489. (No model.)

To all whom it may concern:

Be it known that I, THOMAS L. RANKIN, of Quenemo, in the county of Osage and State of Kansas, have invented certain new and useful Improvements in Ice-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to ice-making or refrigerating apparatus, having especial reference to the still and condenser thereof; and its main object is to provide means whereby the ammoniacal gas may be driven off from the liquor ammonia and condensed more quickly and efficiently than has heretofore been accomplished. A second object is to so construct the refrigerator that the water will be frozen therein more quickly than in refrigerators of ordinary construction. To effect this the still is made upright, and no return-bend coils, with their numerous coupling-joints, are used in its construction, these joints being likely to leak and stop the working of the still until the leaks are properly closed.

The invention consists, mainly, in the construction and novel arrangement of the parts of the still, condenser, and refrigerator hereinafter described, and pointed out in the appended claims.

The equalizer, absorber, condensed-gas receiver, and other parts necessary to an ice-machine are all of common construction, similar to those shown and described in the patent granted to me on the 28th day of April, 1885, No. 316,824, and need not be further illustrated or described herein.

Figure 1 represents a central vertical section of the machine, broken in parts to reduce the length of the view. Fig. 2 is a plan view of the base-plate of the lower section with attached and accompanying parts. Fig. 3 represents a plan view and an edge or side view of the evaporating-dishes for the ammonia-water. Fig. 4 is a plan view of the condenser. Figs. 5 and 6 are detail sectional views of the coupling of the main and supplementary coils of the condenser. Fig. 7 is a plan view of the freezing-tank containing cans and mechanism to agitate the cans, and Fig. 8 is a side view of the parts shown in Fig. 7.

Referring to the accompanying drawings by letter, A designates the still, divided into the three sections A', A^2, and A^3, each about ten feet long, which have lesser diameters as they ascend, as shown. The lower or base section, A', is composed of a horizontal base-plate, B, a horizontal top plate, B', and a cylindrical shell, *b*, surrounded on its edges by angle-irons, by means of which it is bolted to the top and bottom plates. The diameter of this section is preferably about thirty inches. The base-plate B has made upon it the lugs *b'*, upon which the still is supported above the ground by legs or supports of suitable construction. The central section, A^2, of the still is of about fourteen inches in diameter, and is bolted down on the top plate, B', the bolts engaging through a flange, C, on the lower end of its cylindrical shell *c*. The flange C' on the upper end of said section is bolted to the flange D, surrounding the lower end of the highest or third section, A^3. The top of the still is closed by the plate or cap E, bolted to the flange D', around the upper end of the third section.

d is the shell of the section A^3.

E' is a vertical rod standing in the axis of the third section, A^3, and having its upper end screwing into the plate E, its lower end being supported by a circular frame, *e*, bolted within the lower end of the section A^3. The rod E' serves a purpose hereinafter explained.

F is a circular dish-shaped plate bolted by its edge with its convexity downward to the lower surface of the base-plate B, and forming a chamber, *f*, thereunder.

G G are tubes, about four and one-half feet long in practice, with their upper ends sealed or closed, and their lower ends screwing into openings in the base-plate B and communicating with the chamber *f*. In practice as many as one hundred and twenty of these tubes may be used.

H is a tube of larger diameter than the tubes G, having its lower end screwed into a central opening in the plate B, so as to open into the chamber *f*, and its upper end, which is sealed or closed, rising to near the top of the second section, A^2, of the still.

h is a tube of smaller diameter than and standing in the axis of the tube H. The upper end of the former tube is open, and rises to

near the top of the latter tube. The tube *h*, at its lower end, passes through a stuffing-box, *h'*, in the center of the plate F, and couples to a horizontal steam-pipe, h^2, coming from any proper source of supply. The steam passes up through the tube *h*, then down on the outside of the same through the tube H to the chamber *f*, whence it rises in the tubes G, which, together with the base-plate B, furnish a large amount of heating-surface. The water of condensation is allowed to flow out through the pipe h^3, which is properly trapped.

I I are horizontal quadrant-shaped shallow dishes, which are provided with perforated bosses *i* at one corner, through which bosses passes the rod E', upon which the dishes are held with their bosses in contact, their curved edges against the inner surface of the shell *d*, and their concavity upward, as shown. The dishes are arranged on the rod E' so as to form a spiral within the section A^3, and so as to have one side edge, which is not as high as the opposite side edge, of each dish overhang the concavity on the next lower one.

J J are dishes in all respects similar to the dishes I, but arranged by means of their perforated bosses *j* on the steam-tube H from near the top of the same to just above the tops of the tubes G.

K is the pipe by which the water of ammonia is pumped into the still above the dishes I, and K' is the pipe through which the gas freed from said water passes out of the still to the condenser. The ammonia-water, as it flows in, first fills the highest disk I, which is arranged below it, and flows thence over the side overhanging the next lower disk to the latter. The ammonia-water thus descends in the still until all the dishes J and I are filled, and it is well exhausted of its gas by the time it reaches the lowest dish, as it is exposed in thin sheets and in drippings to the heat from the steam-pipe H in its descent, besides the heat rising from the tubes G and the base-plate of the still. One great advantage of this construction of still is, that it does away with the return-bend tubes and their numerous couplings, which are so likely to leak and stop the working of the apparatus until repaired. Should any one of the tubes G begin to leak, the plate F can be detached and the tube plugged without interrupting the working of the apparatus more than a few minutes.

L is the condenser, made of the return-bend coils *l*, the pipes of which are united at the ends by the two-pipe-coupling pieces *l'*, the coils themselves being connected by the long coupling-pieces l^2.

M M are supplementary cooling-coils, each composed of two tubes united at one end by the coupling-piece *m*. One of the said tubes connects at the other end by the three-pipe-coupling piece *m'* to the two nearest tubes of the second coil *l* from the tube m^2, receiving the gas from the pipe K' of the still. A partition, m^3, in the coupling-piece *m'* separates the tube of the coil M from the nearest tube of the coil *l*, and this partition has through it a very small opening, m^4, as shown. The tube of the coil M does not connect with the three-pipe coupling *m'*, but connects by a suitable coupling with a pipe, N, that runs from the last tube of the coil *l* farthest from the gas-entrance to a proper receiver for condensed gas. All the tubes are held together by a proper framing, *n*, and the cold-water trough N' is situated along the side of the condenser opposite the gas-entrance, so that the water, when it reaches the side on which the entrance is, has received a certain amount of heat from the part of the condenser passed over. The coils M and three-pipe coupling *m'* are all alike, and are similarly connected with the coils *l* and pipe N. The gas entering the pipe m^2 very hot, and the water from the trough N' being hottest in the vicinity of said pipe, no condensed gas will be formed until the first three-pipe coupling *m'* is reached. Any liquid formed will drop through the small opening m^4 into the coil M. The said opening will also admit into the coil M no more gas than the coil can cool as it passes through to the pipe N. All of the coils M acting in the same manner, the gas is cooled and condensed in small quantities and received into the pipe N, the last portion of gas coming from the last coil *l*.

The equalizer, absorber, and receptacle are all similar to a patent issued to me, No. 316,824, and need not be described.

The freezing-cans are designated by the letter O. These cans are arranged so as to stand vertically in rows in a tank, O', containing the brine cooled by and coming from the apparatus.

o o are transverse shafts journaled in the sides of the tank O', and having secured to them the central parts of the double-armed levers *o' o'*, the arms of which are pivoted to brackets o^2, secured to the bottoms of opposite cans, O, in adjacent rows.

P P are levers, having their lower ends secured to the shafts *o*, and their upper ends attached to the longitudinally-reciprocating bar P', actuated by the slotted lever Q and engine Q'. As the levers P vibrate, the shafts *o* oscillate, and the levers *o'* make the cans filled with water move up and down in opposite directions in the brine. By this agitation the water in the cans is frozen more rapidly than if the cans were still.

Having described my invention, I claim—

1. The combination, in the still of an ice or refrigerating apparatus, of the steam-pipes closed at top and opening through the base-plate of the still into a steam-space thereunder, the central steam-pipe rising in the axis of the still having its top closed and opening into the steam-space below the base of the still, the steam-pipe running centrally through said space and former steam-pipe and having its top open, and the dish-shaped quadrants arranged on the central steam-pipe and adapted to receive the water of ammonia from the upper part of the still and allow it to drip

gradually downward from one to the other, substantially as specified.

2. In a still for an ice-machine, the combination, with the section A′, base-plate B, and dish-shaped plate F, of the steam-space *f*, steam-pipes G, central steam-pipes, H and *h*, and means, substantially as described, to cause the ammonia-water to descend slowly around the central steam-pipe.

3. In a still for an ice-machine, the combination, with the casing A, made in three sections, A′, A², and A³, respectively, and provided with the base-piece B, ammonia-water inlet K, and gas outlet K′, of the dish-shaped plate F, forming a steam-space below the base-plate, steam-pipes G, H, and *h*, and quadrant-shaped shallow dishes I and J, arranged substantially as described, to cause the water-ammonia to drip gradually from one to the other as it descends, substantially as described.

4. In ice-making apparatus, the combination, with a proper still, of the condenser L, composed of the return-bend coils *l*, the supplementary cooling-coils M, connecting with the coils *l* and with the pipe N, the three-pipe couplings *m′*, provided with the diaphragms m^3, having the small openings m^4, and the water-trough N′, situated on the opposite side of the condensing-coil to the gas-entrance pipe m^2, substantially as specified.

5. In ice-making apparatus, the combination, with the brine-tank O′ and water-cans O, arranged to stand vertically and move freely therein, of the oscillating shafts *o*, double-armed levers *o′*, and levers P, vibrated by means substantially as described.

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

THOS. L. RANKIN.

Witnesses:
D. J. RANKIN,
GEO. C. PRÉOT.