

No. 702,856.

Patented June 17, 1902.

A. O. FRICK.

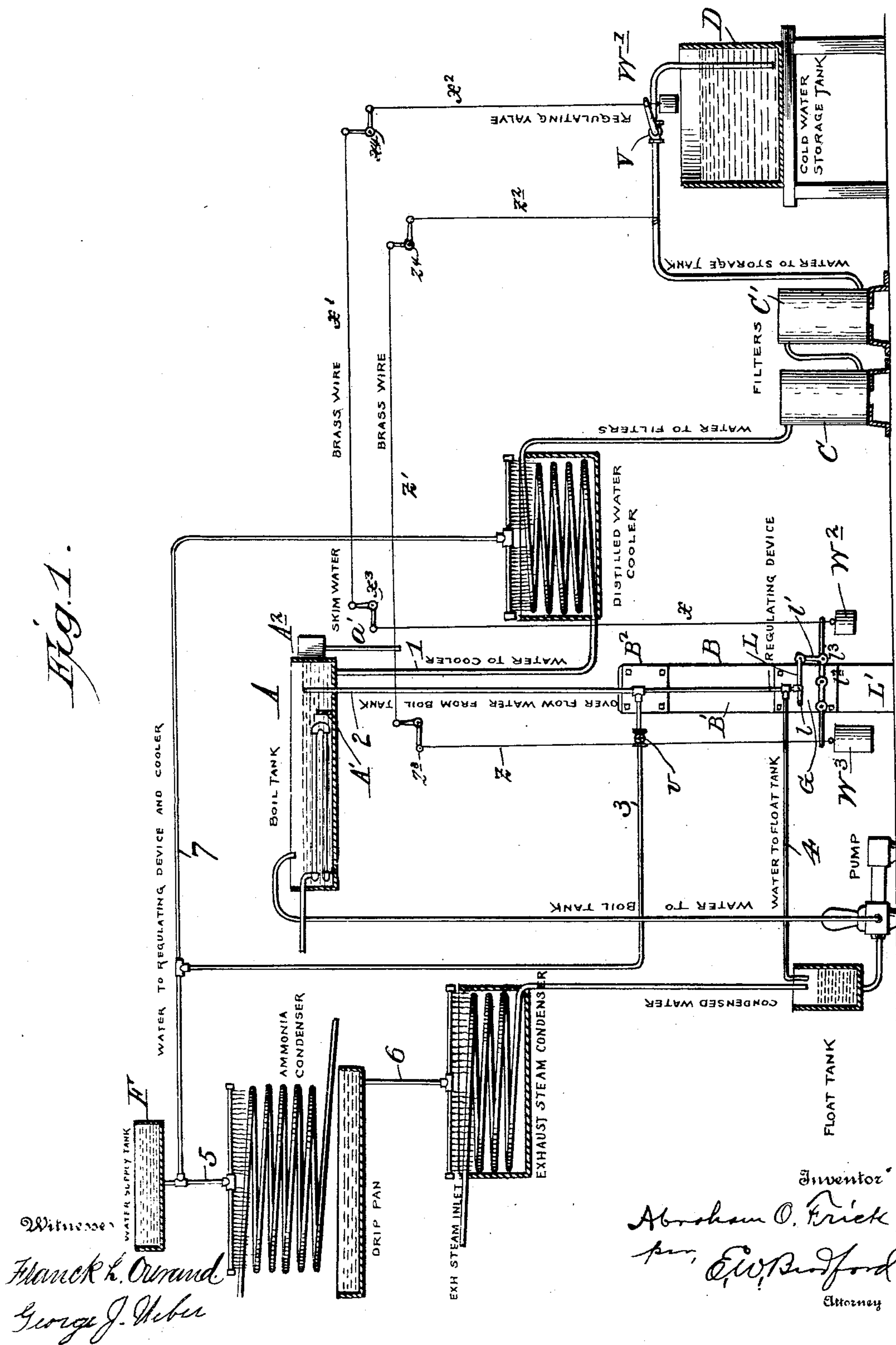
AUTOMATIC SKIMMING REGULATOR FOR ICE MAKING APPARATUS.

(Application filed Mar. 19, 1898.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



Witnesses

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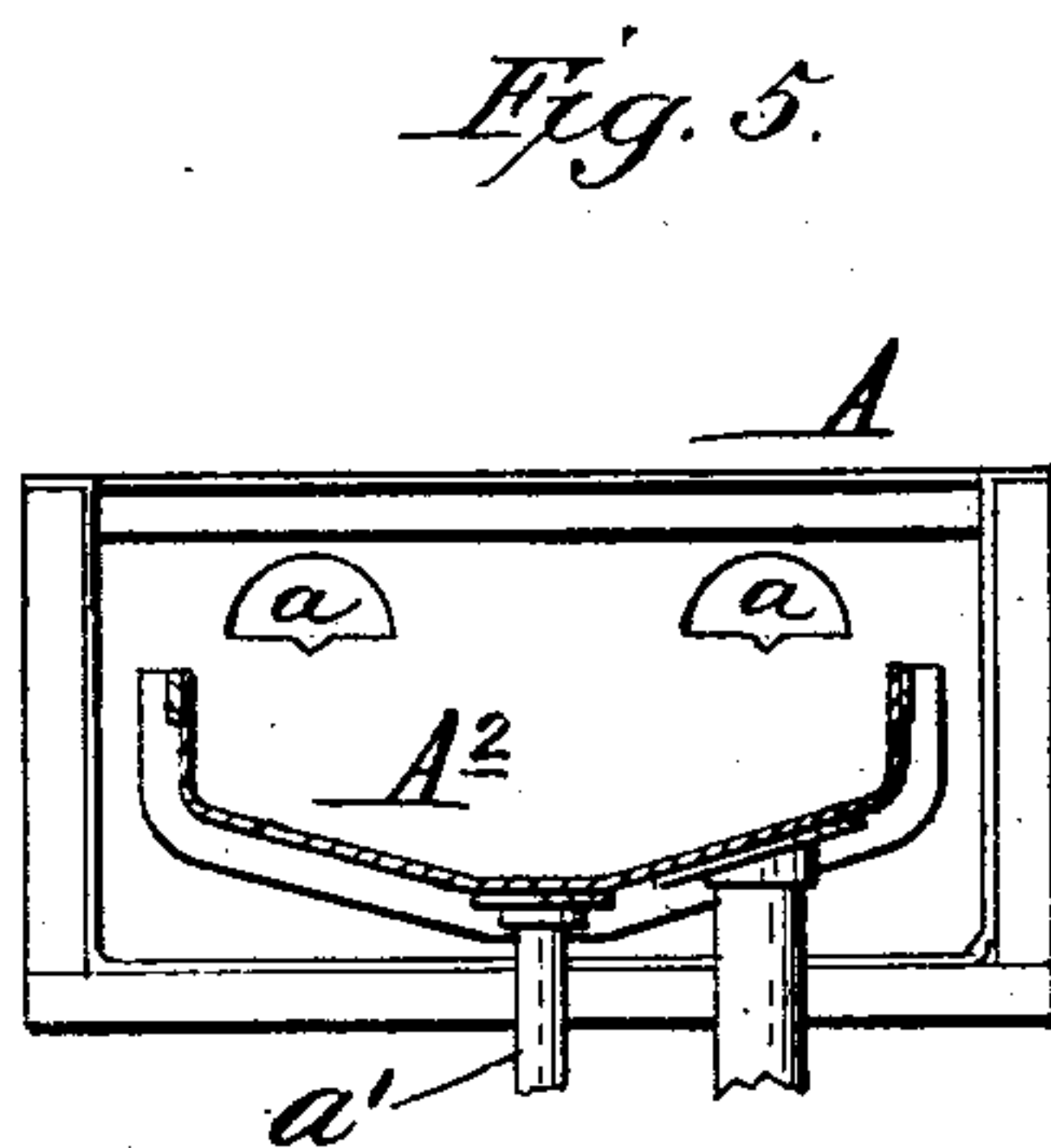
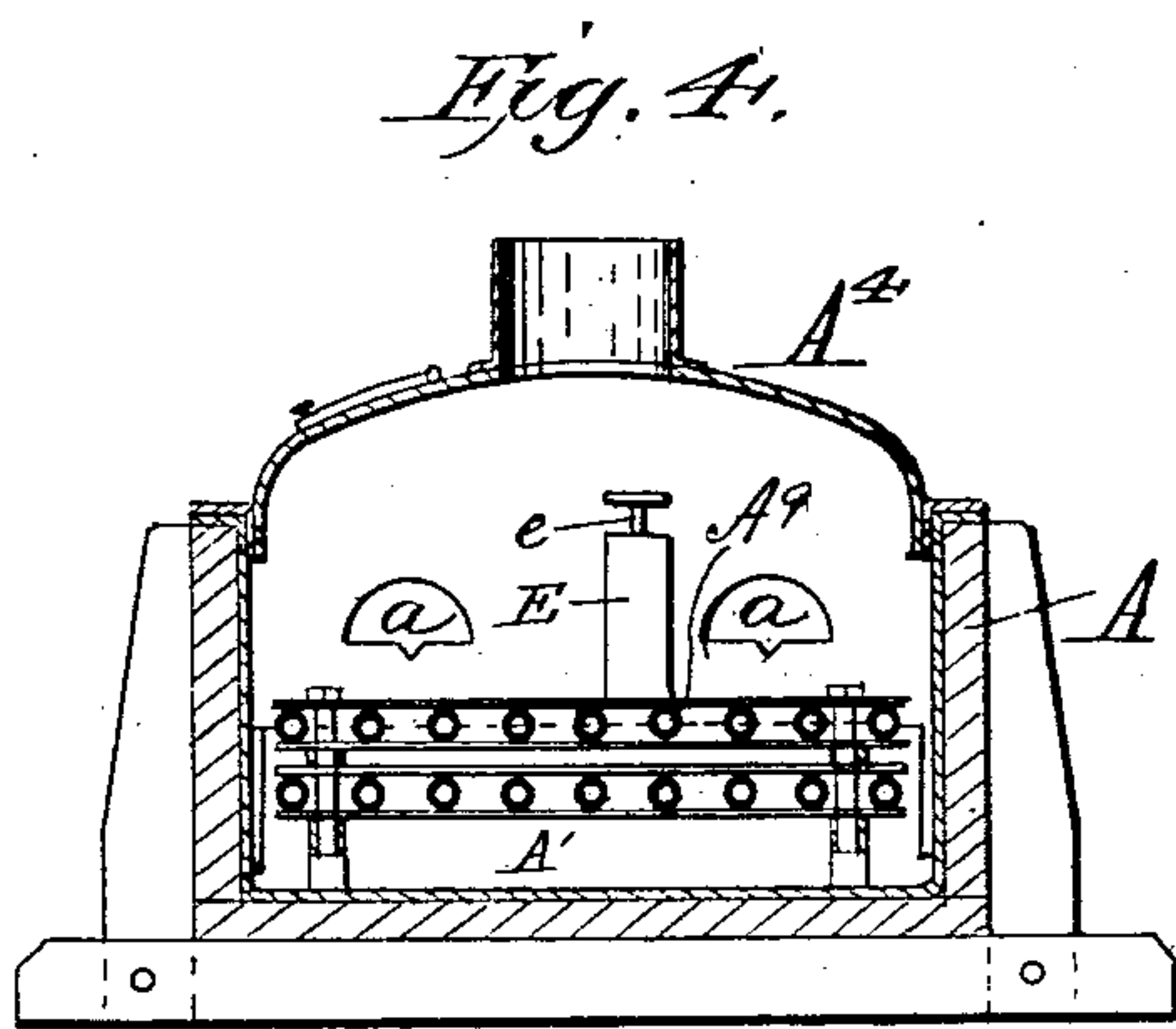
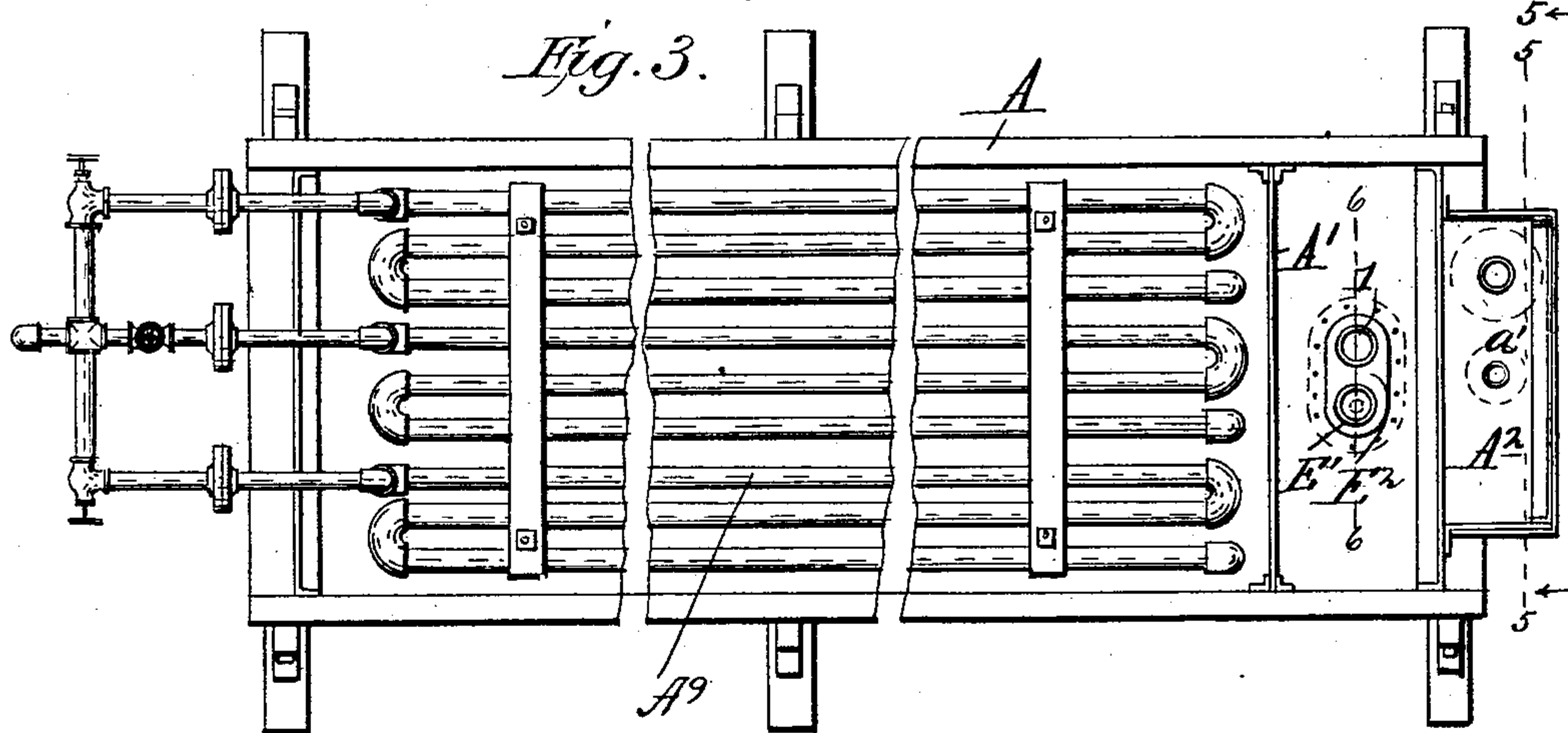
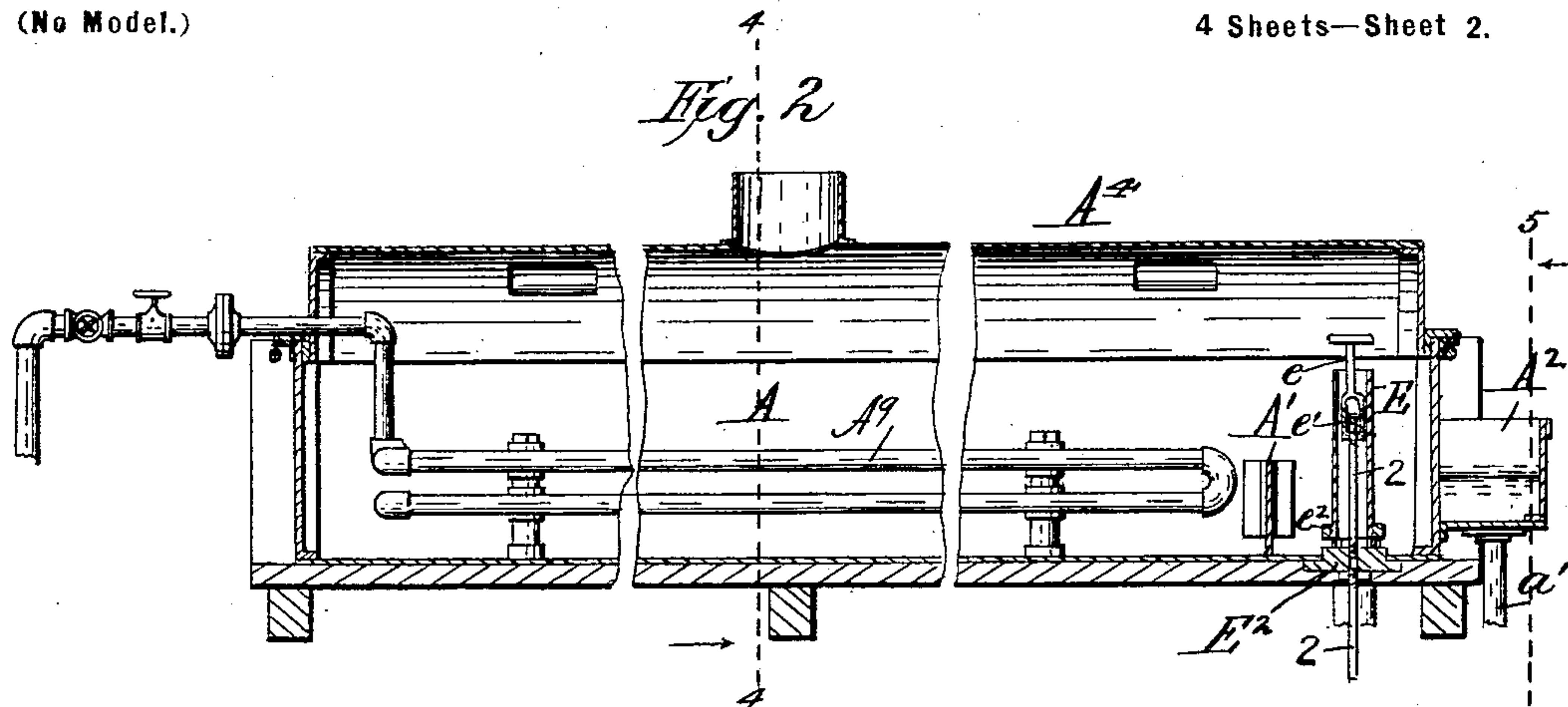
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(No Model.)

4 Sheets—Sheet 2.



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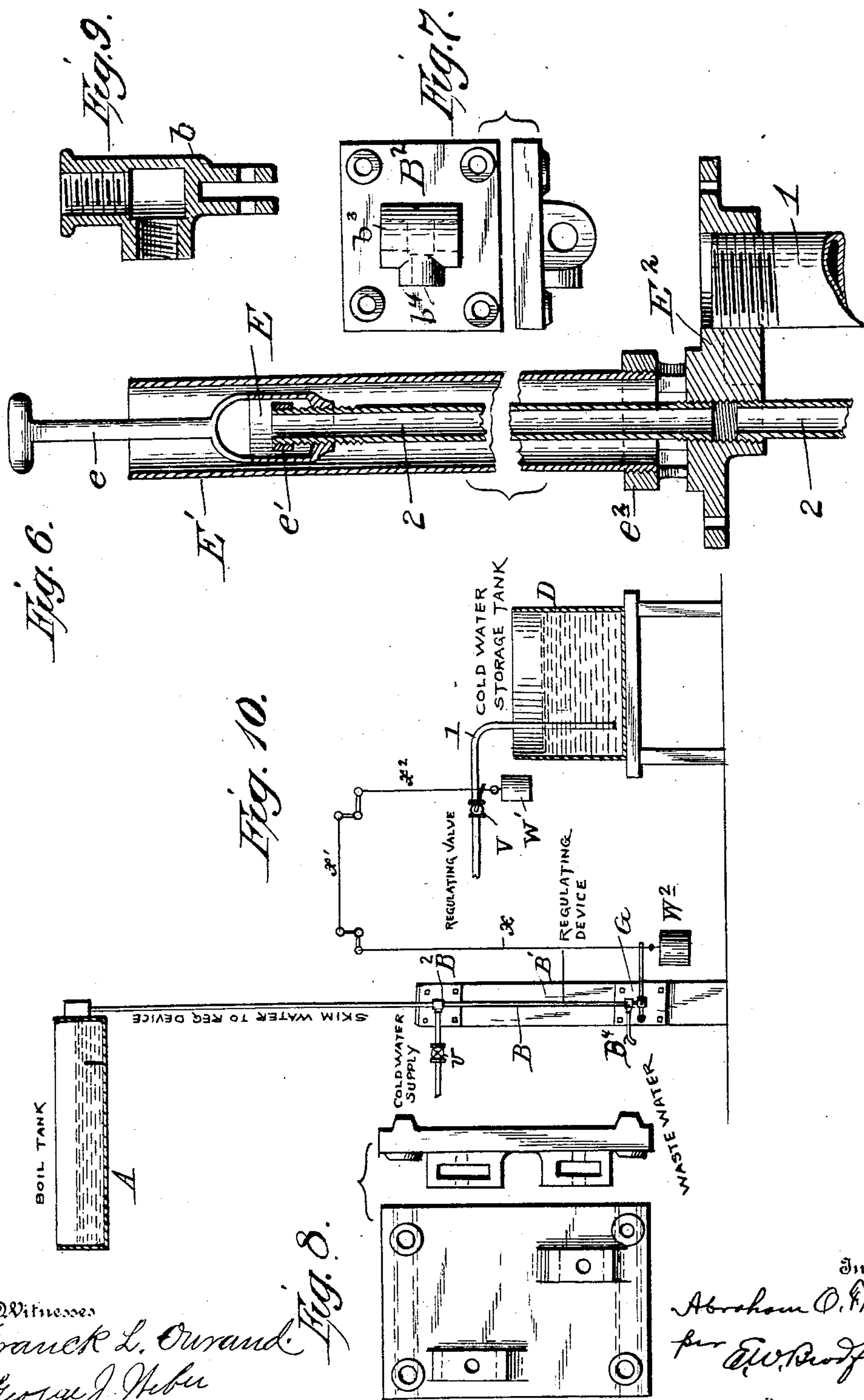
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AUTOMATIC SKIMMING REGULATOR FOR ICE MAKING APPARATUS.

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(No Model.)

4 Sheets—Sheet 3.



Witnesses  
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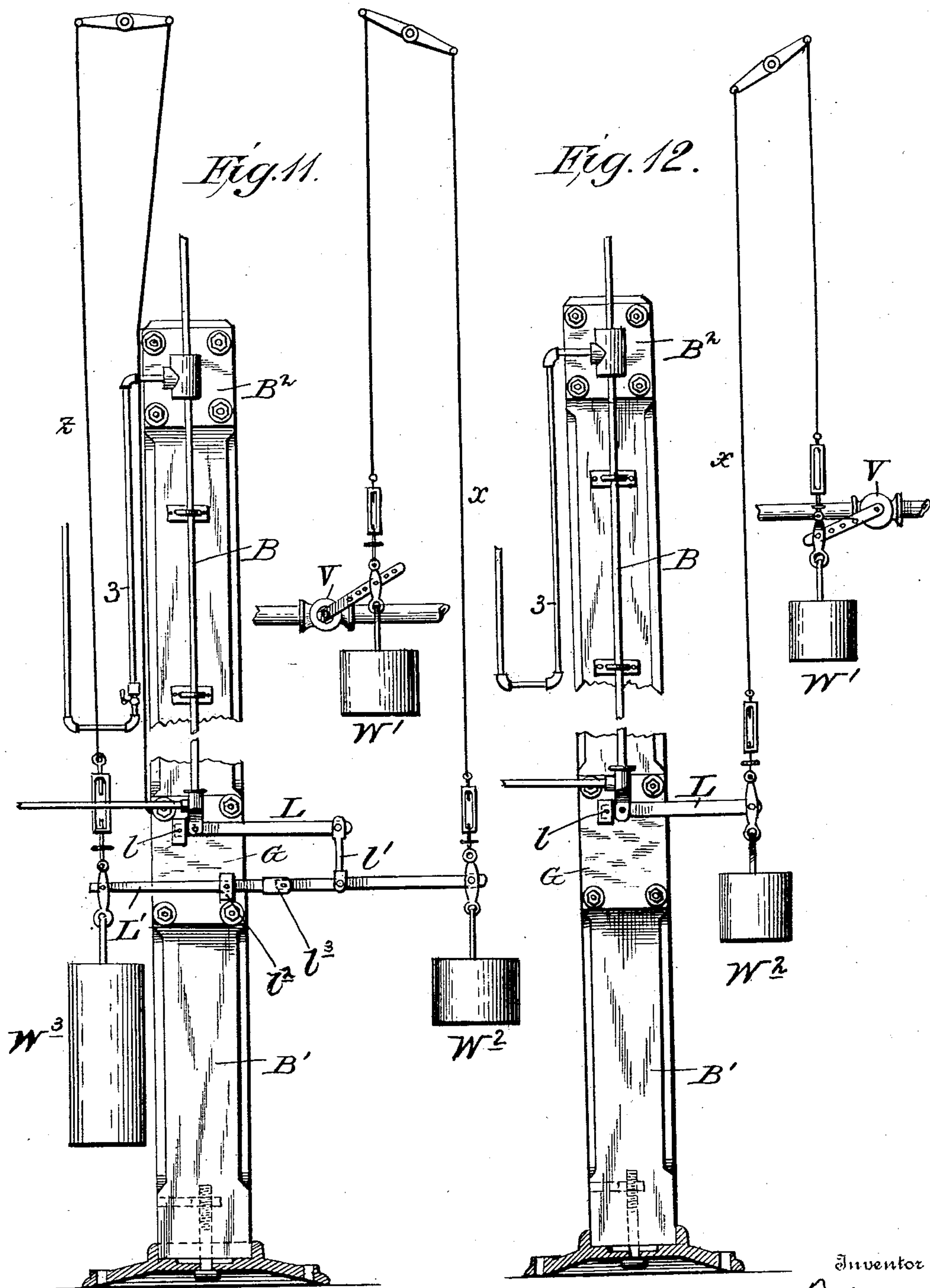
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(No Model.)

4 Sheets—Sheet 4.



Witnesses  
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 Attorney



# UNITED STATES PATENT OFFICE.

ABRAHAM O. FRICK, OF WAYNESBORO, PENNSYLVANIA, ASSIGNOR TO THE FRICK COMPANY, OF WAYNESBORO, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## AUTOMATIC SKIMMING-REGULATOR FOR ICE-MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 702,856, dated June 17, 1902.

Application filed March 19, 1898. Serial No. 674,445. (No model.)

*To all whom it may concern:*

Be it known that I, ABRAHAM O. FRICK, a citizen of the United States, residing at Waynesboro, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Skimming-Regulators for Ice-Making Apparatus, of which the following is a specification.

My said invention consists in certain improvements in the skimming apparatus forming part of an ice plant, particularly in the means for automatically regulating the flow of the distilled and skimmed water from the boil-tank; so that the amount of water allowed to escape with the floating impurities is reduced to a minimum and may be regulated to the exact degree required or found desirable under the varying conditions of water, location, or results desired, all as will be particularly described hereinafter and the novel features then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a view showing the general arrangement of the apparatus, a diagram of such parts as seem necessary to illustrate the invention most clearly; Fig. 2, a longitudinal section through the boil-tank; Fig. 3, a top plan of said boil-tank with the cover removed; Fig. 4, a cross-section through said tank on the dotted line 4 4 in Fig. 2; Fig. 5, a cross-section through the skim-dish on the dotted line 5 5 in Figs. 2 and 3; Fig. 6, a detail sectional view, on an enlarged scale, through the overflow-pipe on the dotted line 6 6 in Fig. 3; Fig. 7, a detail view of the front and edge of the coupling-plate at the top of the post; Fig. 8, a similar view of the plate at the bottom of the post to which the devices are attached; Fig. 9, a sectional view through the coupling at the bottom of the regulating-pipe at the lower end of the post, and Fig. 10 a view showing a modified arrangement of parts; Fig. 11, a view of another modification in the arrangement of the parts of the regulating apparatus, and Fig. 12 a view of still another modification.

In said drawings the portions marked A represent the boil-tank; B, the operating part

of the regulating device; C C', filters, and D the tank for the storage of the cold distilled water ready for freezing.

The general arrangement of the main portions of the apparatus may be any usual or suitable arrangement found the most advantageous for the situation where it is to be used. That shown in Fig. 1, while a desirable arrangement, is shown merely for the purpose of illustrating the use and operation of the skimming-regulator, which constitutes the leading feature of this invention.

The boil-tank A is, in main, of a common construction with a live-steam coil A<sup>9</sup> in its bottom, by which the boiling is effected. A transverse partition A' extends across near one end, of a height sufficient to prevent any violent agitation due to the boiling of the water by the steam-coil at skimming end of the tank. On the outside of this end of the tank is the "skim-dish" A<sup>2</sup>, overflow-openings a being formed in the end of the tank at a point near its top, through which the skimmings discharge into said dish. The bottom edge of said openings is straight and horizontal except that a shallow notch is preferably cut in the center of each to facilitate the overflow and prevent the skimmings from banking on said edge and then breaking over in considerable volume, as might be the case were a continuous straight edge used. This form insures that the overflow shall take place the instant the water in the boil-tank reaches a certain level therein. A discharge-pipe a' leads from said skim-dish to any point where it is desired to discharge its contents. Between the partition A' and the end on which the skim-dish is mounted are arranged a pipe 1 for drawing off the purified water and a pipe 2 for supplying the pipe which operates the regulating device. Said pipe 1 is coupled to the bottom of the tank, as best shown in Figs. 6 and 1, and takes the water from the bottom of the portion of the tank between the partition A' and its end and conducts it to the distilled-water cooler, (indicated in Fig. 1,) thence to the filters, and then to the storage-tank, all of which portions of the apparatus are of any suitable form and arrangement, that shown in said Fig. 1 being com-



mon. Pipe 2 projects up through the bottom of the tank to a point so that its top edge will be substantially on a level with the edge of the openings leading into the skim-dish, so that no water will come into this pipe until it begins to overflow into said dish. As best shown in Figs. 2 and 6, said pipe is formed with a screw-threaded upper end and has an adjustable top E in the form of a cup with a screw-threaded perforation in its bottom, which fits on said screw-threaded end of the pipe and is provided with a handle *e*, which extends up above the water-line to a point within convenient reach. Said part E forms practically an extension of the top of the pipe, and the adjustment of its top edge is thus provided for to regulate the overflow and skimming to suit the condition of the work being done, as will be hereinafter more fully explained. A ring or nut *e'* is mounted on the extreme top of the pipe 2 above the connection with the part E to prevent said part from being inadvertently disconnected. A larger pipe E' preferably surrounds that portion of the pipe 2 which is within the tank, and it extends to a point above the water-line and the top of said pipe, openings *e''* being provided around its bottom, through which the water comes within it and raises up to a level with the water in the tank. As best shown in Fig. 6, the preferable mechanical construction and arrangement of these parts includes a metal plate E<sup>2</sup>, which is set into the bottom of the tank and has screw-threaded perforations therein for said pipes 1 and 2, which are fitted therein in the usual manner of making pipe-fittings. With such arrangement the pipe 2 is in two sections, the part within the tank being screwed into said fitting from the top and the outside part from the bottom. A ring *e''*, supported on legs, is also formed around the fitting for the pipe 2, which ring is internally screw-threaded to receive the lower end of the pipe E'. I find this arrangement to be suitable for the purpose; but it can be varied, of course, without in any manner departing from the invention. By the use of said pipe E' any of the surface water containing the floating impurities is kept out of said pipe 2, the water which flows therein coming from the bottom of the tank and being suitable to mingle with the water to be used for freezing. Said pipe 2 extends down to a coupling-plate B<sup>2</sup>, secured on the side of a supporting-post B', which consists of a plate with a suitable projection on its front side, having a vertical perforation *b*<sup>3</sup> extending therethrough and a transverse perforation *b*<sup>4</sup> leading from one side into said vertical perforation, the ends of said perforations being tapped to receive the screw-threaded ends of the pipes. Said plate is shown on a large scale in Fig. 7. The pipe 2 is connected with the top of the vertical perforation, and a pipe B, of brass or other metal sensitive to heat and cold, which constitutes the operating part of the regulator, is connected with

the bottom of said perforation, said pipe B, in so far as its function as a conductor is concerned, being a continuation of said pipe 2. A pipe 3, communicating with the cold-water-supply tank, is connected to the horizontal perforation *b*<sup>4</sup> of said coupling B' and is provided with a valve *v*, by which a stream of cold water of the desired volume may be turned into said pipe B, as will be presently more fully explained. To the lower end of said pipe B is secured a coupling *b*. (Best shown in Fig. 9.) Said coupling is closed at the bottom, but has a horizontal opening *b*<sup>5</sup> in its side, to which the pipe 4 is attached for carrying off the water. The lower end of said coupling is bifurcated, and between its members is pivoted a lever L, one end of which is hinged to the post B<sup>2</sup> on a pin *l* and the other end of which is connected by a link *l'* to a second lever L', which is pivoted to the post *l*<sup>2</sup> and formed with a joint *l*<sup>3</sup>. A plate G, (shown in Fig. 8,) containing fittings *g* and *g'* for the pivots and levers, is preferably attached to the post, and on this said several parts are mounted. One end of said lever L' is connected to the operating-lever of the valve V in the pipe 1, near where it discharges into the storage-tank, by wires *x*, *x'*, and *x*<sup>2</sup> and bell-crank levers *x*<sup>3</sup> and *x*<sup>4</sup>, as shown in Fig. 1, and its other end is connected to wires *z*, *z'*, and *z*<sup>2</sup> and levers *z*<sup>3</sup> and *z*<sup>4</sup>, of corresponding material and length, which preferably run parallel to the wires which connect with the valve, the end being shown as attached to the pipe 1 at a point near said valve V. The purpose of this arrangement will be presently explained. The water coming through the pipes 2, B, and 4 is discharged into the "float-tank" with the water coming from the exhaust-steam condenser and with it is pumped back into the boil-tank and used to make ice.

The water-supply tank F contains a supply of cold water, supplied from any convenient source, for use in the various condensing and cooling operations. A pipe 5 runs therefrom to the ammonia-condenser and the water runs from the pan thereof through the pipe 6 to the exhaust-steam condenser. A branch pipe 7 supplies the distilled-water cooler, and the branch 3 supplies a stream to the brass pipe B, as before stated. With the exception of said pipe 3 and the parts relating to the regulating device the general arrangement shown forms no part of the present invention, however, and may be modified to suit the various situations where plants are to be erected and the character of work to be performed. The several parts are shown that the invention may be more clearly understood and fully explained.

While I have shown and described the regulator-operating device B as a pipe, it will be readily understood that any other conductor or suitable part, of the required material, sensitive to heat and cold, may be substituted therefor without departing from my said invention.



The operation of the regulating apparatus is as follows: The distilled water as it comes from the exhaust-steam condenser may contain some impurities which boiling will cause to rise to the surface, from which they can be drawn off or "skimmed" by the apparatus shown. The water is pumped into said "boil-tank" and boiled by the live steam circulating in the coil in the bottom thereof. Such impurities as are usually found in the water after passing through the previous steps in the process are brought to the surface, and when the water in the tank reaches the lower edge of the openings *a* the skim begins to discharge into the 'skim-dish *A*<sup>2</sup>. Until this time the valve *V* in pipe 1 is closed, and after the apparatus is in operation said pipe is full of water, its extreme end being immersed in the storage-tank, thus preventing any air-bubbles in the water and ice formed therefrom. The cup-shaped top *E* of the pipe 2 is so adjusted that its top edge will be substantially in the same plane as the lower edge of the discharge-openings *a*. Thus as said skimmings begin to discharge or as the tank begins to "boil over" pure boiling water from the bottom of the tank begins to flow into the top of said pipe 2 and down through the brass pipe *B*, discharging through the pipe 4 into the float-tank. As soon as said boiling water begins to flow through the pipe *B* (or over any conductor used) it begins to expand and forces down the free end of lever *L*, the end of the lever *L'* to which it is connected, and, through the connecting-wires and bell-crank levers, operates to raise the lever of valve *V*, open said valve, and permit the water to flow through pipe 1 to the storage-tank *D*. This soon lowers the water in the boil-tank to below the point where water will flow into pipe 2, when a stream of cold water flowing through pipe *B* from pipe 3 operates to cool said pipe quickly, contract it, and reverse the operation of the lever *L* and connecting parts and permit valve *V* to be closed by the weight *W'*, which is attached to the outer end of the lever to said valve and normally holds it closed. A weight *W*<sup>2</sup> is also attached to the end of lever *L'*, this being somewhat heavier than weight *W'*, so that as soon as the expansion of pipe *B* permits the end of the lever *L* to drop, the weight causes the operation of the parts to open the valve. The contraction of pipe *B* will lift said weight, which but for weight *W'* would slacken the wires; but said weight falls as weight *W*<sup>2</sup> is lifted and the valve *V* thus closed. Said weight thus keeps the wires taut and insure that the valve shall respond instantly to every contraction or expansion of pipe *B*. By means of the valve *v* in pipe 3 the stream of cold water running into pipe *B* is made of the size required. When once properly adjusted, this stream is left to flow continuously, the boiling water when coming down the pipe acting to also heat this water and effecting the expansion required, not-

withstanding its presence; but immediately upon the flow of boiling water ceasing the stream of cold water operates to quickly cool and contract the pipe and cause valve *V* to close, as described.

Where the storage-tank is located at some distance from the boil-tank, as is often the case, in which situations the wires running from lever *L'* to the valve *V* are necessarily of considerable length, it has been found that the expansion and contraction in said wires caused by the varying temperatures through which they pass will effect the operation of the regulating device. Thus when the wires are expanded, the weight *W*<sup>2</sup> being supported on the end of lever *L'*, the weight *W'* will operate to pull down the lever of the valve *V* a distance equal to said expansion. The expansion of pipe *B* may not then be sufficient to operate said valve. So, also, the contraction of said wires may sometimes be sufficient to open said valve and prevent its closing by the means described. To overcome this difficulty is the object of the jointed lever *L'* and the wires *z*, *z'*, and *z*<sup>2</sup> and a weight *W*<sup>3</sup>, attached to its end opposite its end to which the weight *W*<sup>2</sup> and the wires *x*, *x'*, and *x*<sup>2</sup>, running to the valve *V*, are connected. Said weight *W*<sup>3</sup> is heavier than either of the weights *W'* or *W*<sup>2</sup>, and the two sets of wires are of corresponding length and run through the same atmosphere, thereby being subject to the same influences. Thus as wires *x*, *x'*, and *x*<sup>2</sup> contract and expand so do wires *z*, *z'*, and *z*<sup>2</sup>. The distance between the point at which lever *L'* is pivoted and the joint therein is the same as the distance between said joint and the point at which the link *l'* is connected thereto, and the distance from said link connection to the point of connection with the wire *x* is the same as the distance from the pivot of the lever to the connection of wire *z* to the opposite end. It will thus be seen that any movement of said lever on its pivot will result in a uniform movement of its opposite ends, and the point of connection between the lever and link *l'* will remain normally stationary in line with the pivot. Thus as the several wires expand weight *W*<sup>3</sup>, because of its greater weight, will pull down the end of the lever to which it is attached a distance equal to the expansion, permitting its opposite end to fall an equal distance, which takes up the expansion in the wires *x*, *x'*, and *x*<sup>2</sup>, which must be the same. By this means the wires are kept taut, and all the movement is at the end of attachment with lever *L'*, and no movement of the lever of the valve *V* is permitted. When the wires contract, the reverse operation results without in any way affecting said valve, as will be readily understood. At the same time any movement of the lever *L* caused by contraction and expansion of the regulator *B* is at once transmitted to said valve *V*, as before described, as such movement lifts or lowers the end of lever *L'* to which wire *x* and weight *W*<sup>2</sup> are attached without affecting the



opposite end thereof at all, the movement being on the pivot in the joint between the two parts. By this arrangement I have found that after the apparatus is properly adjusted it will operate automatically for a long time without any further attention to this portion of the apparatus, regardless of atmospheric changes. In situations where the "storage-tank" D is located near the regulating device, however, this compensating apparatus may be omitted, as the contraction and expansion in a short piece of wire will not be sufficient to affect the operation of the regulating device materially. I have shown such an arrangement in Fig. 10. In this view I have also shown the discharge-pipe of the skim-dish as running to the regulator B, the water being conducted therethrough to a waste-pipe B<sup>4</sup>. If preferred, such an arrangement can be used and will operate as does the arrangement before described, and shown in Fig. 1, except that the skimming is not as finely regulated as by the use of the arrangement shown in Fig. 6 within the tank, and more or less of the distilled water is wasted, which might be saved by the use of said preferred form.

In Fig. 11 I have shown a modified arrangement of the compensating apparatus and in Fig. 12 another arrangement of the regulating device without the compensating apparatus. These forms will be readily understood from the foregoing description.

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

1. A regulating device for the skimming apparatus of an ice-making apparatus, which consists of a part of material adapted to be quickly expanded and contracted by heat and cold, a connection between said part and the valve which controls the flow of water from the boil-tank, and means for connecting said part with an overflow from said boil-tank, substantially as set forth.

2. A regulating device for the skimming apparatus of an ice-making plant, which consists in a contractible and expansible part connected with an overflow from the boil-tank, and also with a cold-water supply, and a connection between said part and the valve which controls the flow of water from said boil-tank, substantially as set forth.

3. The combination in an ice-making apparatus, of the boil-tank, the skim-dish, overflow-openings leading from one to the other, a discharge-pipe for the pure water leading from said boil-tank to the storage-tank, a valve therein for controlling the flow of water, another pipe leading from within said boil-tank the top of which is substantially on a level with the overflow-openings and the lower end of which discharges onto the surface of a contractible and expansible part, and a connection between said part and said valve, substantially as set forth.

4. In an ice-making apparatus, the combi-

nation of the boil-tank, the pipe leading therefrom to the storage-tank, a second pipe leading therefrom through which an overflow is adapted to discharge connected to a contractible and expansible pipe, a lever pivoted to its lower end and hinged at one end to an adjacent point and at its other end connected by suitable connections for transmitting motion to the valve for controlling the flow of water from the boil-tank, substantially as set forth.

5. In an ice-making apparatus, the combination, of the boil-tank, the overflow-pipe 2, the part or pipe B of the character described, a lever hinged at one end to the post alongside the lower end of said part or pipe, pivoted to said lower end at a point between its ends, and connected by its other end by suitable means to the operating-handle of the valve which controls the flow of water from the boil-tank, a weight being attached to said handle, and another weight of slightly greater gravity being attached to the outer end of the lever connected with the pipe B, substantially as set forth.

6. In an ice-making apparatus, the combination, of the boil-tank, the skimming apparatus, and the regulating device consisting of a part of contractible and expansible material located in the path of an overflow of hot water from said boil-tank and connected by suitable means to the means for controlling the outflow from the boil-tank, whereby its contraction and expansion caused by the intermitting flow of hot water therethrough will operate said means, substantially as set forth.

7. In an ice-making apparatus, the combination, of the boil-tank, the skimming apparatus, the regulating device, a jointed lever mounted on a fixed pivot between its joint and one of its ends a connection to the regulating device joined thereto between its joint and its other end, a connection of suitable material running from the end of said part connected to the regulating device to the valve for controlling the flow from said boil-tank, a weight also attached to said end, a weight of less gravity attached to the operating-handle of said valve, a connection of similar material and length joined to the outer end of the other member of said lever and running through corresponding space and attached to a fixed point, and a weight of greater gravity than either of said other weights attached to the same end of said lever; substantially as set forth.

8. In an ice-making apparatus, the combination, of the boil-tank, the overflow-pipe 2, the regulating part B, the lever L pivoted to its lower end at a point between its ends, the jointed lever L' mounted at a point between its joint and one end on a fixed pivot, a link connecting the free end of said lever L to said lever L' at a point a distance from the joint equal to the distance from said joint to the pivot, a weight and connecting-wire attached



to the outer end of said member, said wire  
extending to the operating-handle of the  
valve which controls the flow from said boil-  
tank to which it is attached, a weight of less  
5 gravity also attached to said handle, another  
wire attached to the opposite end of said le-  
ver L', and running to correspond with the  
other, a weight of greater gravity than that  
on the other end attached to this end of said  
10 lever, the distance from the connection of  
said link with the one member to its end be-  
ing the same as the distance from the pivot  
of the other member to its end, all substan-  
tially as described and for the purpose speci-  
15 fied.

9. In an ice-making apparatus, the combi-  
nation, of the boil-tank having overflow-open-  
ings at the skimming level, the skimming ap-  
paratus, the overflow-pipe extending up  
20 within said tank to a point substantially  
even with the skimmings-discharge, and an  
adjustable top thereon, whereby the extent  
of skimming may be regulated, and the ap-  
paratus adjusted to waste the least amount  
25 of good water possible, substantially as set  
forth.

10. The combination in an ice-making  
plant, the boil-tank having overflow-open-

ings at the skimming level, the skimming ap-  
paratus, the overflow-pipe 2 connected with 30  
the regulating device and extending up with-  
in the tank to the skimming level, and a  
shell with openings around its bottom sur-  
rounding said pipe and extending to above its  
end in said tank, substantially as set forth. 35

11. The combination in an ice-making  
plant, of the boil-tank having overflow-open-  
ings at the skimming level, the skimming ap-  
paratus, the regulating device arranged to  
be operated by an overflow from said tank, 40  
the overflow-pipe provided with an adjust-  
able top, the edge of which is normally at  
substantially the skimming level, a shell sur-  
rounding said overflow-pipe within said tank  
and extending to a point above the water- 45  
line and formed with openings around its  
lower end at or near the bottom of said tank,  
substantially as set forth.

In witness whereof I have hereunto set my  
hand and seal, at Waynesboro, Pennsylva- 50  
nia, this 1st day of March, A. D. 1898.

ABRAHAM O. FRICK. [L. S.]

Witnesses:

S. W. CUNNINGHAM,  
T. S. CUNNINGHAM.