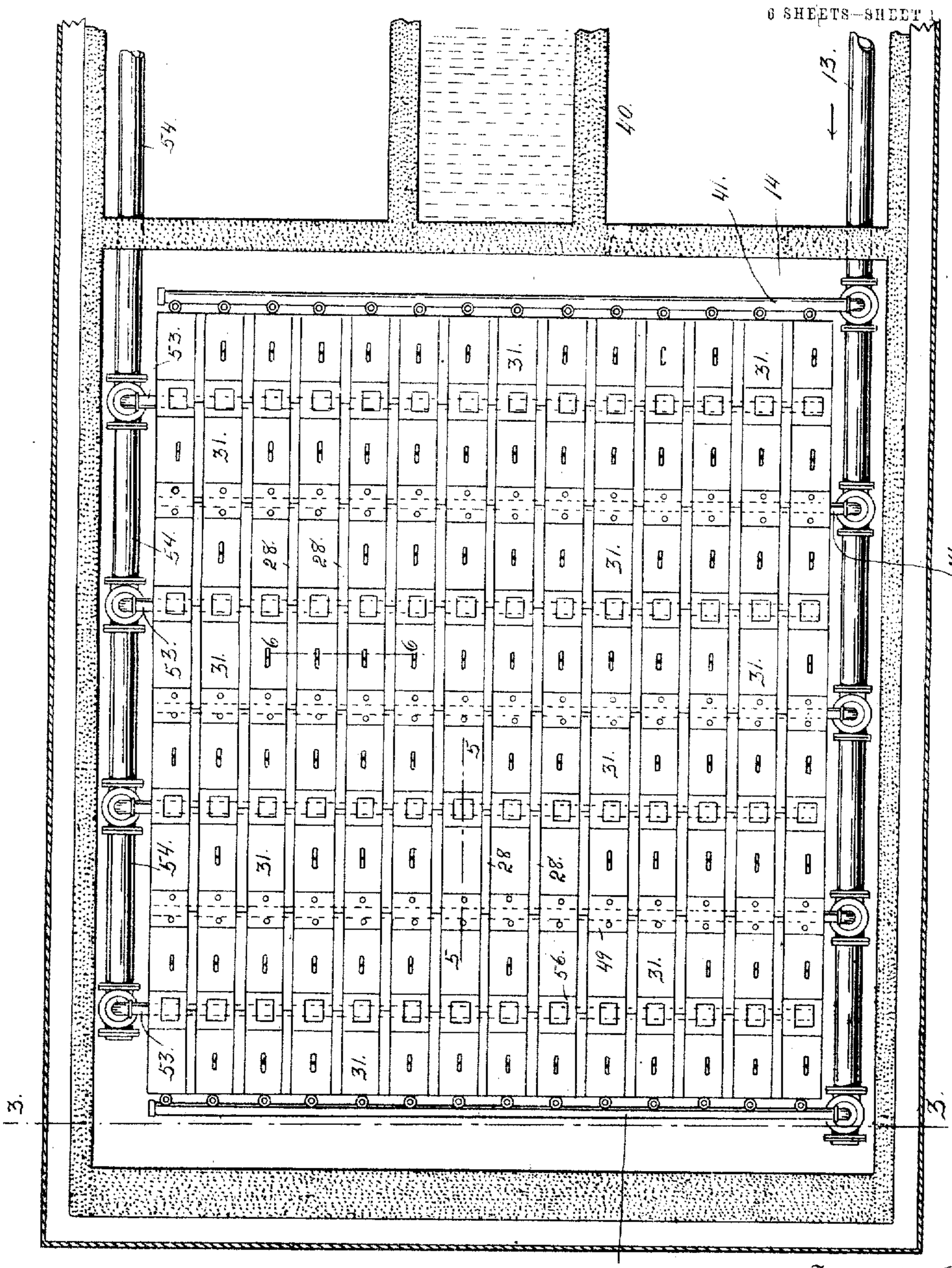
No. 812,360 PATENTED JAN. 29, 1907.

G. L. VAIL.

ICE MAKING SYSTEM.

APPLICATION FILED SEPT. 7, 1904.

6 SHEETS—SHEET 1.



Witnesses
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6 SHEETS—SHEET 2.

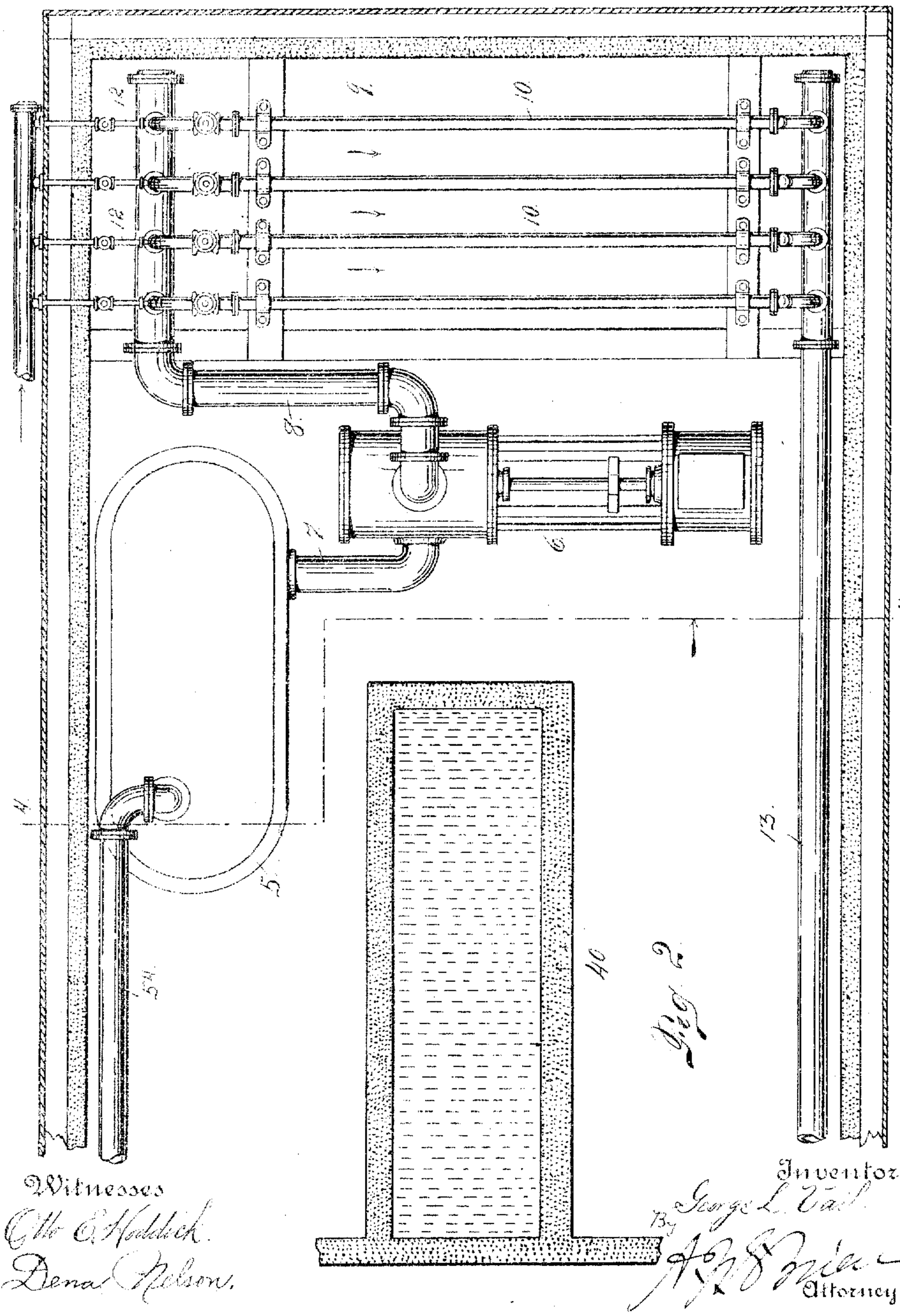

Fig. 2.

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6 SHEETS—SHEET 3.

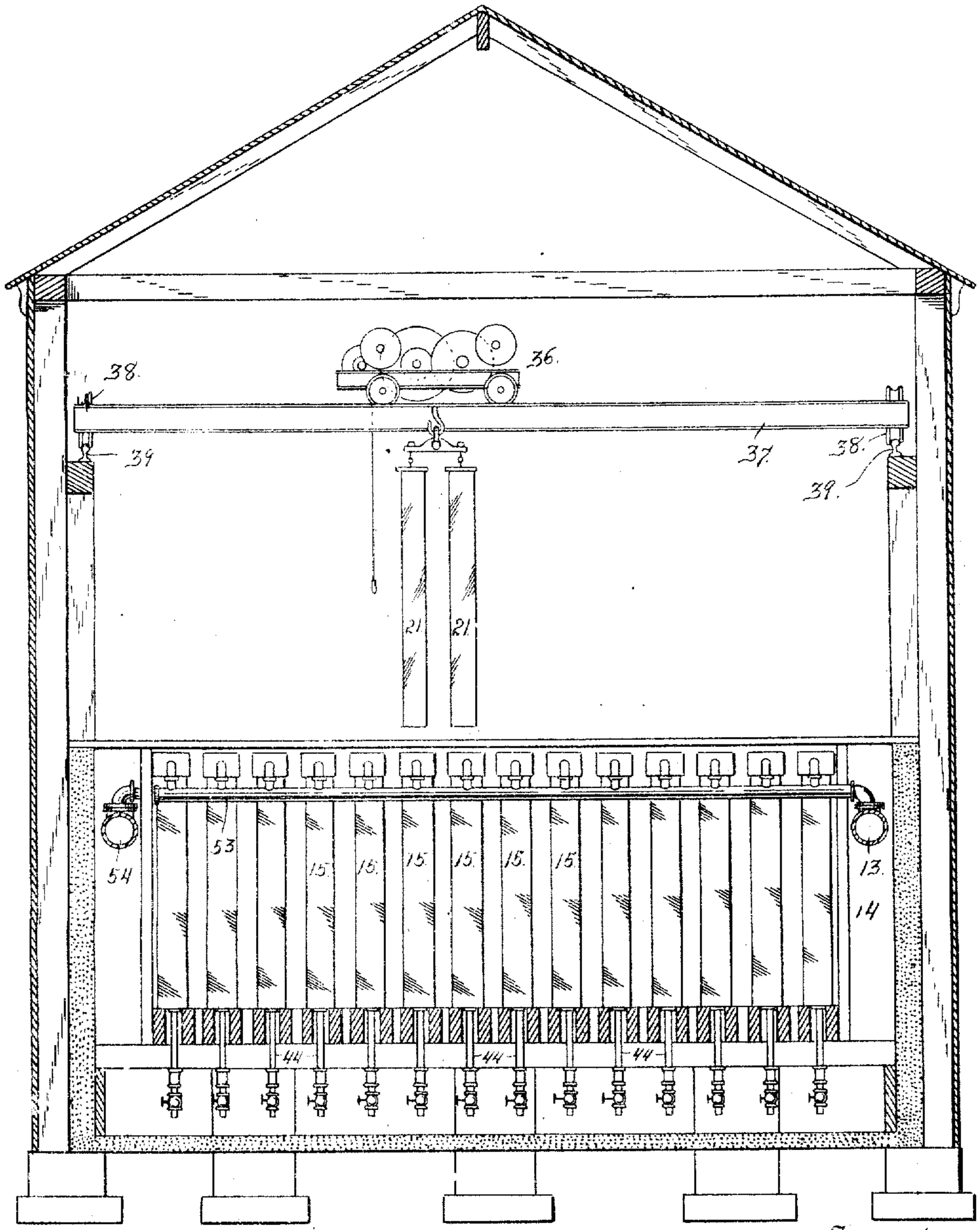

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Fig. 3.

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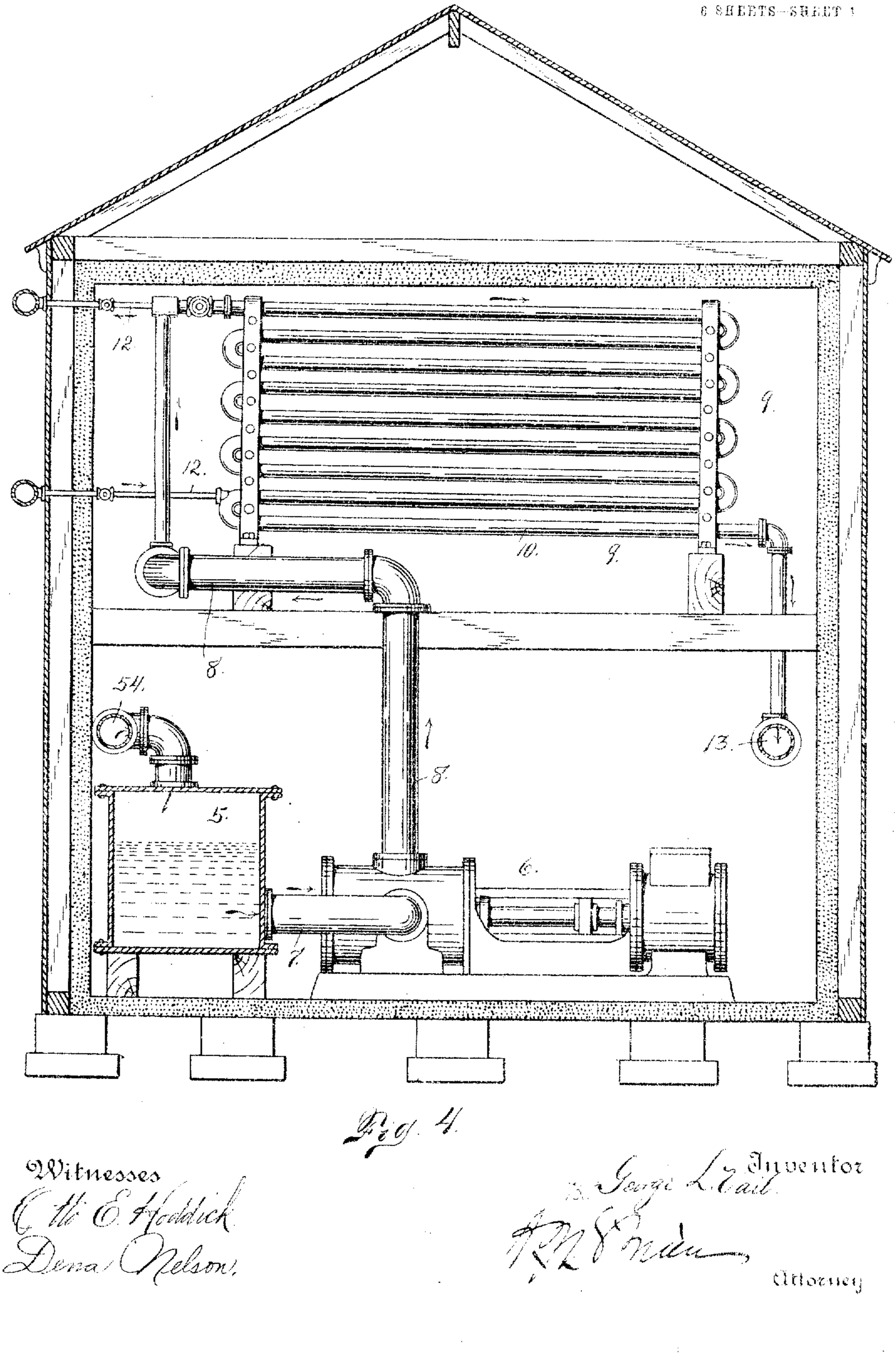

Fig. 4.

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6 SHEETS—SHEET 5.

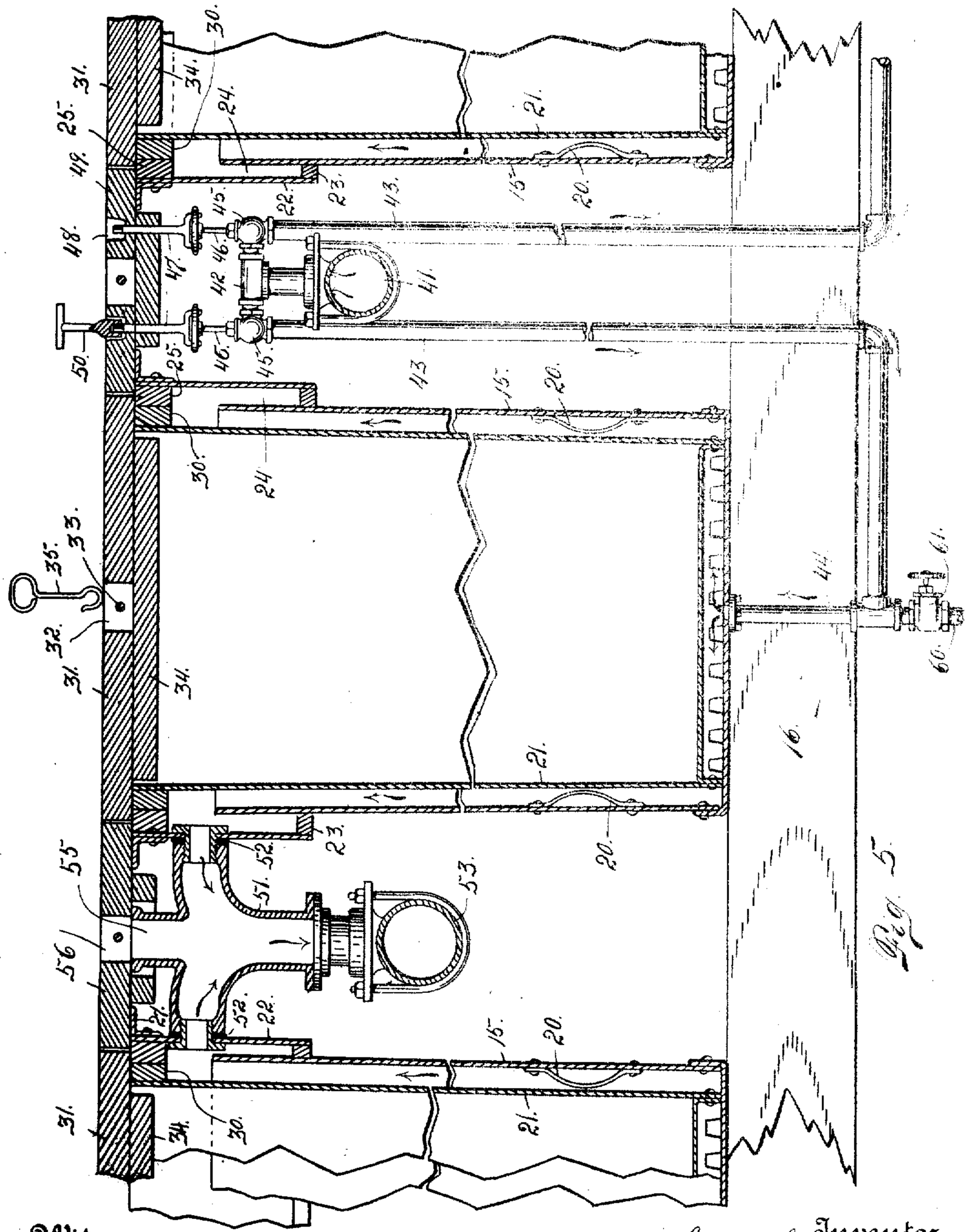

Fig. 5.

Witnesses
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6 SHEETS—SHEET 6.

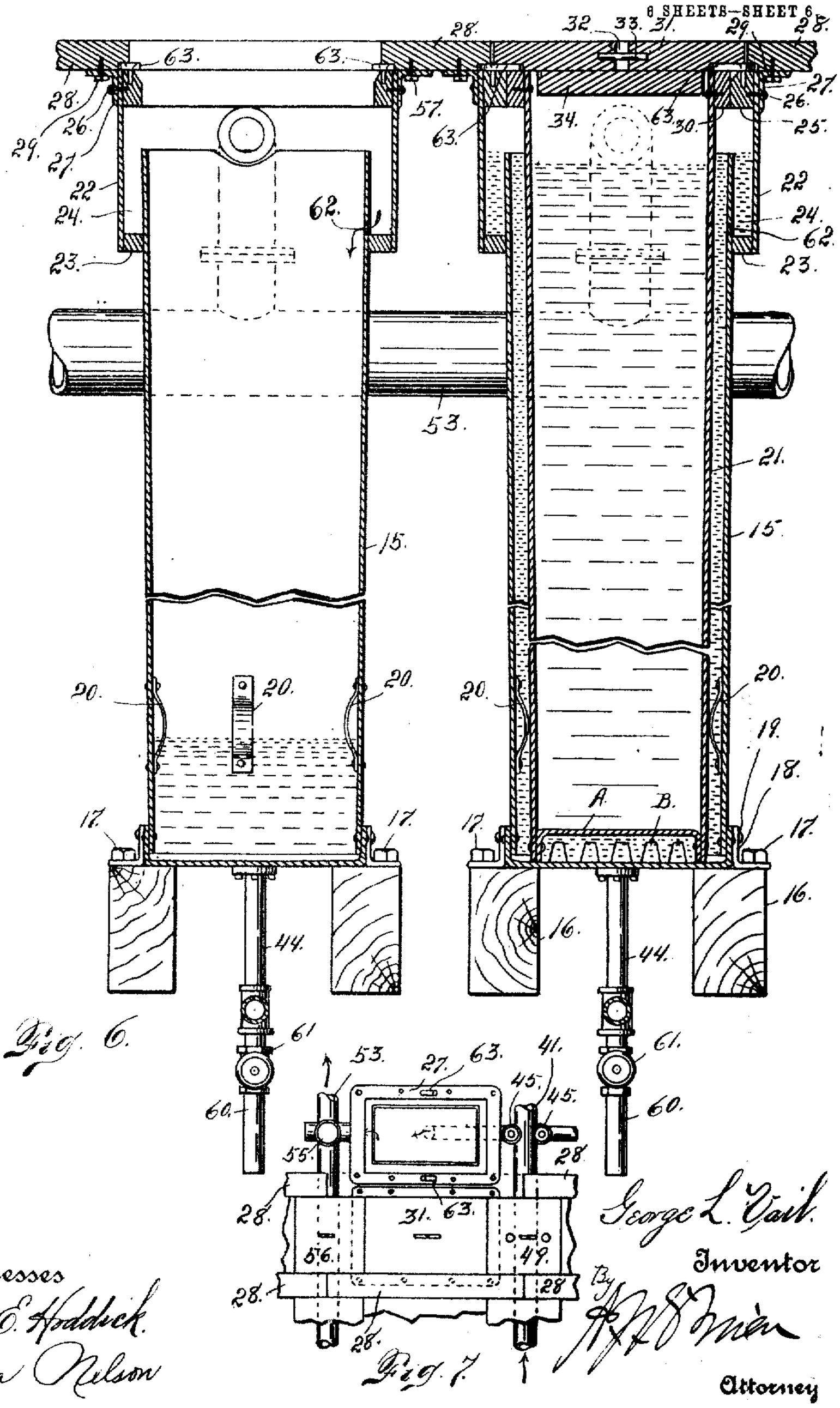

Fig. 6.

Fig. 7.

Witnesses
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By
Attorney

UNITED STATES PATENT OFFICE.

GEORGE L. VAIL, OF DENVER, COLORADO.

ICE-MAKING SYSTEM.

No. 842,360. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed September 7, 1904. Serial No. 223,619.

To all whom it may concern:

Be it known that I, GEORGE L. VAIL, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Ice-Making Systems; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to a novel system of ice-making whereby a series of outer cans are located in a dry chamber, whereby the cans are accessible individually for purposes of removal and repair. The cooling liquid, as brine, is introduced separately to each outer can and caused to circulate upwardly around the inner can and overflow at the top, whereby a perfect circulation is obtained for ice-freezing purposes. The heat-absorbing liquid is pumped through a cooler located outside of the can-chamber, and it is carried by a conduit to the chamber in which the cans are located and thence conducted by branch pipes to the bottom of the various outer cans, where it is introduced as aforesaid.

Under the old system, as is well known, the cans containing the water to be frozen are located in a large tank of heat-absorbing liquid, as brine and ammonia pipes are placed in this tank, through which ammonia is circulated for the purpose of keeping the brine cool. There are many difficulties in connection with the old system which my improved system entirely overcomes. First, if in the old system there is a leak in any part of the ammonia-pipe system within the brine-tank it is necessary to draw off all the brine from the tank in order to find this leak and repair it, the brine being thus wasted. With my improved system a workman can go into the chamber and move around among the outer cans and by loosening a few bolts or screws any outer can may be removed for purposes of repair without interfering in any way with the other cans of the system. Moreover, with my improved system it becomes practicable to freeze much larger cakes of ice, since the empty inner cans are allowed to settle nearly to the bottom of the outer cans, being only slightly buoyed up, since there need be only a small quantity of brine in each individual outer can. Hence it becomes practicable for a man of ordinary height to place the filler within these empty inner cans when the cans are much higher than can be done in the old system, since in the latter the empty cans in which the water is to be frozen are greatly buoyed up by the brine in the tank in which the said cans are placed, whereby the cans are caused to project upwardly into the room a considerable distance, making it impossible to place the fillers within the cans by ordinary means. It is evident that when the empty can is placed in the brine-tank that the can is buoyed up by a volume of brine equal to the size of the can, whereas in my improved system a quantity of brine within the outer can which acts to buoy up the inner can or that in which the water is to be frozen may be regulated at will, and hence the degree to which the inner can is buoyed up is under perfect control.

In practice I am able to use cans ninety-five inches in height, since when these are placed within the outer cans containing a small quantity of brine they only project a short distance upwardly into the room when they are empty, thus making it practicable for the man handling the filler to place it easily within the said cans when empty.

My improved system is much more efficient and economical than the old system for a number of reasons. First, a cake of ice weighing eight hundred pounds can be frozen in my improved system in thirty-six hours, while a cake weighing six hundred pounds requires sixty-six hours in freezing under the old system. Furthermore, a better quality of ice is frozen by my improved system than by the old. Under the old system there is a considerable quantity of what is called "white" ice, which extends upwardly from the bottom of the cake through the center thereof. This is undesirable from a merchantable standpoint. Ice frozen by my improved system is much superior in this respect and is practically "coreless" or devoid of this white-ice characteristic, since there are only slight streaks of white in the center of the cake. These advantages are attributable to the practically perfect circulation obtained under my improved system.

In addition to the foregoing advantages it may be stated that my improved system is exceedingly economical from the standpoint of the quantity of brine required, since it is only necessary to use a comparatively small quantity, as it is in continuous circulation from the tank through the pump, thence through the cooler, thence to the outer cans, and thence back to the brine-tank.

Having outlined my improvement, as well as the function it performs and the advantages which it has been found to possess in actual practice, I will proceed to describe the same in detail, reference being made to the accompanying drawings, from an inspection of which the invention will be fully understood.

In the drawings, Figures 1 and 2, taken together, constitute a top plan view illustrating my complete system, two views being required to illustrate the same for want of room on a single sheet of Patent Office drawing. Fig. 3 is a section taken through the system on the line 3 3, Fig. 1. Fig. 4 is a section taken on the line 4 4, Fig. 2, viewed in the direction of the arrow. Figs. 5 and 6 are sections taken on the lines 5 5 and 6 6, respectively, of Fig. 1, the parts being shown on a larger scale. Fig. 7 is a plan view illustrating the manner of connecting the individual outer cans with the removable platform.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the brine-tank, from which the brine passes to the pump 6 by way of a conduit 7. From the pump the brine passes by way of a conduit 8 to the cooler 9, which consists of a series of brine-pipes 10, through which ammonia-pipes 12 pass, whereby the brine is cooled while passing through the pipes 10. From the cooler the brine passes to a main conduit 13, which leads to the insulated chamber 14, in which the individual cans 15 of the system are located. Each can 15, as shown in the drawings, is supported on two separated timbers 16, to which the can is secured by bolts 17, which pass through the horizontal flange of an angle-clip 18, secured to the bottom of the can by suitable fastening devices, as shown at 19. These cans 15 are provided with bow-shaped projections 20, attached to their interior walls and which form guides for the inner can 21, whereby the outer surface of the latter is kept equally distant from the inner surface of the outer can at all points, whereby a practically uniform space for the cooling liquid is maintained entirely around the inner can. To the top of each outer can is attached a part or wall 22, which is suitably connected therewith at a short distance below its upper extremity, as shown at 23, whereby a trap 24 is formed around the top of the can 15. This part 22 projects upwardly above the top of the can 15 proper and its upper extremity is provided interiorly with a stiffening-band 25, which is secured thereto by fastening devices 26, which also passes through an angle-clip 27, secured to a stringer part 28 by a bolt 29, which bolt may be removed when it is desired to remove the outer can 15 for any purpose.

The top of the inner can 21 when the latter is at its lowest position within the can 25 is in the same plane with the top of the part 22 of the outer can. The top of the inner can 21 is provided exteriorly with a stiffening-band 30, which is secured thereto by suitable fastening devices. The two bands 25 and 30, attached to the outer and inner cans, respectively, fill up the space between the part 22 of the outer can and the top of the inner can. The function of the trap 24 is to trap the heat-absorbing liquid which slops over the top of the body of the outer can and prevents it from reaching the interior of the inner can when the latter is inserted. Usually there is about enough cooling liquid in the outer can to fill the intervening space between the two cans, and if it were not for the trap 24 some of this liquid might pass over the top of the inner can into the water to be frozen, which of course would be undesirable. The stringer parts 28 are removable, as heretofore explained, whenever it is desired to remove the outer can. Each inner can is closed by a removable cover 31, composed of two main parts having a recess 32 between them. Passing through this recess is a pin 33, which is inserted in recesses formed in the two parts before they are connected. After the pin is put in position, the bottom member 34 is secured to the two upper members, whereby they are securely connected. The object of the pin is to facilitate the removal of the cover by the use of a hand-hook 35. (See Fig. 5.)

The inner cans are lifted from the outer cans in the ordinary manner. Two cans are usually lifted at a time, as shown in Fig. 3, through the instrumentality of a lifting apparatus 36, which is mounted on a track 37, whose wheels 38 engage rails 39, suitably supported above the chamber in which the freezing process is carried on. After these inner cans are lifted out they are placed for a short time in a warm-water tank 40 until the cakes of ice are loosened sufficiently to slide readily out of the cans.

Leading from the inlet-conduit 13 is a number of branch conduits 41, which extend transversely across the chamber 14 and are provided with fittings 42, each of which connects the conduit with two vertical pipes 43 when the branch conduit 41 is located between two rows of cans. It will be understood that the conduits 41 at each end of the chamber will only be provided with fittings, each of which connects the branch conduit with a single pipe 43. The pipes 43 lead

downwardly and each is connected with a pipe 44, which leads upwardly and is connected with the center of the bottom of the outer can 15. The upper extremity of the pipe 44 registers with an opening in the bottom of the can 15 and is detachably connected with the can to facilitate its removal. As shown in the drawings, the upper extremity of the pipe 44 is provided with a flange, which is bolted to the bottom of the can.

At the upper extremity of each pipe 43 is located a valve 45, whose stem 46 is connected with a wrench 47, whose upper extremity enters a recess 48, formed in a removable cover 49. The upper extremity of the stem of the wrench 47 is fashioned to receive a socket-key 50, inserted from above, whereby the valves 45 may be opened and closed at will. By reason of this arrangement the flow of brine to any can 15 may be shut off as soon as the water in the inner can is frozen, thus economizing in the use of brine and refrigeration. This is another point of advantage over the old system, since in the latter the same amount of brine and the same amount of ammonia is employed, regardless of the number of cans in the brine-tank. Moreover, in the old system when a considerable number of cans is removed from the tank the brine is appreciably lowered in the tank, thus interfering with the freezing process. On the other hand, in my improved system each can 15 is controlled independently of every other can, and the removal of the inner can from any outer can interferes in no way with the depth of the heat-absorbing liquid of the other cans.

Each inner can is provided with a bottom A, having notches B to allow the brine as it enters from the pipe 44 to pass outwardly freely into the space between the two cans.

When the system is in use for freezing purposes, each outer can containing an inner can having water to be frozen is constantly supplied with brine from the pipe 44, whereby the brine is caused to circulate upwardly around the inner can. The top part 22 of each outer can is connected with a fitting 51 by a bushing 52, whereby the overflow from the outer can passes to a branch conduit 53, from which the brine returns to the outlet or return conduit 54, which leads to the brine tank or reservoir 5. Each outlet-conduit 53, as shown in the drawings, is located between two rows of cans 15, whereby the cans on opposite sides of the said conduit overflow into the latter. The fitting 51 also has a top opening 55, through which the overflow of the branch conduit 53 may be observed by removing a cover 56, located directly above the said fitting. It will thus be seen that all of the branch return-conduits 53 lead to the main return-conduit 54.

In case it is desired to remove an outer can 15 from the chamber 14 the bolts 17 may be readily removed by a person who is allowed to enter the chamber 14, whereby he is given free access to these bolts. There is room between the cans 15 for an operator to work. The pipe 44 is also detached from the bottom of the can. Top bolts 57 are then removed from the angle-clips 27 at the top of the outer can, after which the parts 28 on opposite sides of the can are removed and also the cover directly above the can. The latter may then be lifted out for repairs or for any other purpose. From the foregoing description it will be understood that the entire platform covering the top of the chamber in which the cans are located is sectional and capable of being removed as circumstances may require.

From the foregoing description the use and operation of my improved system will be readily understood. The outer cans 15 are placed in the chamber 14 and suitably secured, since their removal only becomes necessary for purposes of repair. The small quantity of brine necessary in the cans 15 in order to perform the freezing function makes this system especially advantageous, as heretofore explained. The space between the inner and outer cans is comparatively narrow. As soon as an inner can is placed in position and filled the brine is turned on by opening a valve 45, there being a separate valve for controlling the flow of brine to each can 15, as heretofore explained. Again, when it is desired to remove any inner can the flow of brine to the corresponding outer can is cut off by closing the corresponding valve 45. This is readily accomplished from the top of the platform covering the chamber in which the cans are located.

Below each inlet-pipe 44 is located a drain-pipe 60, provided with a valve 61, whereby the brine may be drained from each can independently of the other cans.

In order to drain the brine from the trap 24 after the inner can is removed, the wall of the can at the bottom of the trap is provided with an orifice 62, through which the brine in the trap may run back into the can 15, whereby the brine in the trap is changed every time a cake of ice is frozen.

As a further advantage of my improved system over the old system in which the cans containing the water to be frozen are all placed in a large brine-tank, attention is called to the fact that in case of a leak in any part of the ammonia-pipe system it is not only necessary to draw off and lose all the brine of the tank, but it is also necessary to draw the ice from the cans, whereby the process of ice-making is interrupted for a considerable period of time. In a tank of ordinary size this would probably take a week's time, thus entailing a great loss, whereas where my improved system is installed if any part of the system gets out of repair the individual

or separate parts may be separately repaired without interrupting any other part of the system.

While in my improved system the brine or heat-absorbing liquid used is formed from chlorid of calcium, it is evident that the invention is of sufficient scope to include the use of brine or heat-absorbing liquid of any kind that is found practicable for use.

The term "dry chamber" used in the specification and claims must be interpreted to mean a chamber devoid of a body of brine or heat-absorbing liquid as distinguished from the brine chamber or tank in which the cans containing the water to be frozen are located under the old system. It is merely a suitably closed or insulated chamber or room in which the individual cans are located and supported, making it practicable for the operator to go into the chamber at any time for the purpose of inspecting, repairing, or removing the cans or any part of the apparatus therein.

Pivotally connected with the stiffening-band 25 of each outer can is a button 63, adapted to be turned to engage the stiffening-band 30 of the inner can. Two of these buttons 63 are preferably employed, being located on opposite sides of the can. After the inner can is filled the weight of the liquid therein causes it to settle into the outer can to such an extent that its top is nearly level with the top of the inner can. The operator then presses the inner can down to bring its top or stiffening-band level with the top of the stiffening-band of the outer can. The buttons 63 are then thrown to the position shown at the right in Fig. 6, whereby they hold the inner can tightly in place during the freezing operation.

Having thus described my invention, what I claim is—

1. The combination with a chamber, of a series of outer cans suitably mounted in said chamber, the said cans being suitably separated within the chamber to permit free access to the cans, a pipe connection with each individual can to supply heat-absorbing liquid thereto, a valve connected with each supply-pipe whereby the flow of liquid to each can is controlled independently of the other cans, a platform covering the said chamber, the valves for controlling the supply of liquid to the cans being controllable from above the said platform, inner cans located in the outer cans and separated therefrom to allow the liquid to circulate freely for ice-freezing purposes, each outer can having an overflow-outlet at the top whereby as the liquid is introduced at the bottom of each outer can it is drawn off at the top of the same can.

2. The combination with a dry chamber suitably insulated and closed at the top by a sectional platform, individual cans located in said chamber and suitably supported, a pipe system for conducting brine or other heat-absorbing liquid to the bottom of each individual can, a valve located to control the flow of brine to each individual can independently of the other cans, said valve being accessible from the top of the platform, each individual can being provided with an overflow-outlet, and inner cans located in the outer cans and arranged to leave a space for the circulation of brine thereabout for the purpose set forth.

3. A can provided with a suitable inlet, a wall connected with the upper part of the can below the top thereof and separated therefrom to form a trap, the said wall extending above the top proper of the can, the top of the said wall being provided interiorly with a stiffening-band, an inner can located in the first-named can and projecting above the top of the can proper, the inner can having an exteriorly-located stiffening-band which engages the stiffening-band of the outer can, the two bands together being of a thickness equal to the width of the trap.

4. The combination with a chamber, of cans located in the chamber and suitably separated, an inlet-pipe system located in the chamber and having pipes connected with the individual cans, a valve for controlling the flow to each pipe, a platform covering the chamber at the top, and means for controlling each valve from a point above the platform whereby the flow of heat-absorbing liquid to each individual can is separately controlled.

5. The combination with a chamber of an outer can mounted in said chamber, a platform covering said can, a pipe connection with the can to supply heat-absorbing liquid thereto, a valve for regulating the liquid-supply from the pipe to the can, said valve being controlled from above the platform and an inner can located in the outer can and separate therefrom to allow the liquid to circulate freely for ice-freezing purposes.

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

GEORGE L. VAIL.

Witnesses:
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