May 5, 1931. G. LANGE 1,804,220

ICE MANUFACTURING APPARATUS

Filed Aug. 10, 1928 5 Sheets-Sheet 1

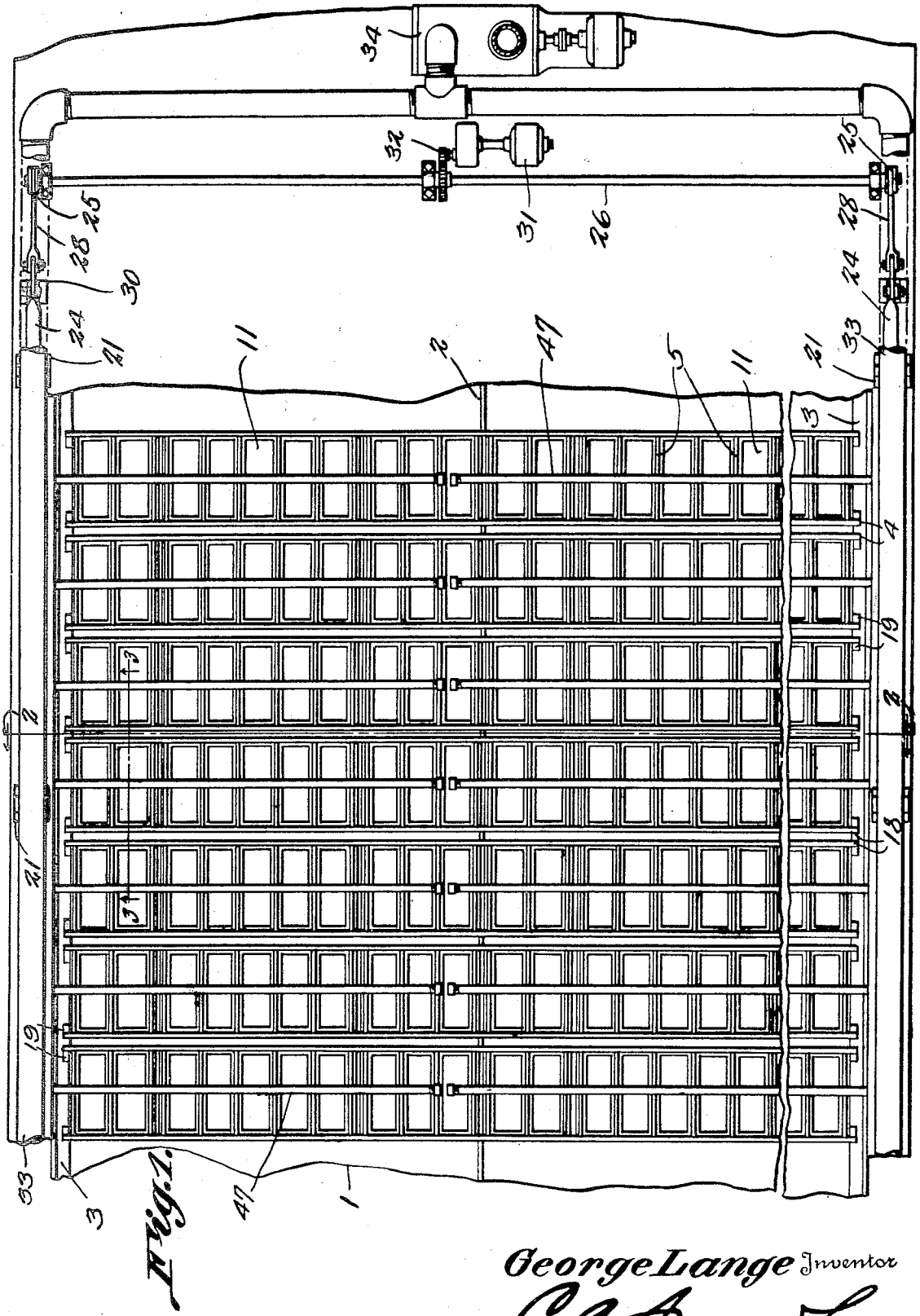


Fig. 1.

George Lange Inventor

By Cachow & Co.

Attorneys.

May 5, 1931. G. LANGE 1,804,220

ICE MANUFACTURING APPARATUS

Filed Aug. 10, 1928 5 Sheets-Sheet 2

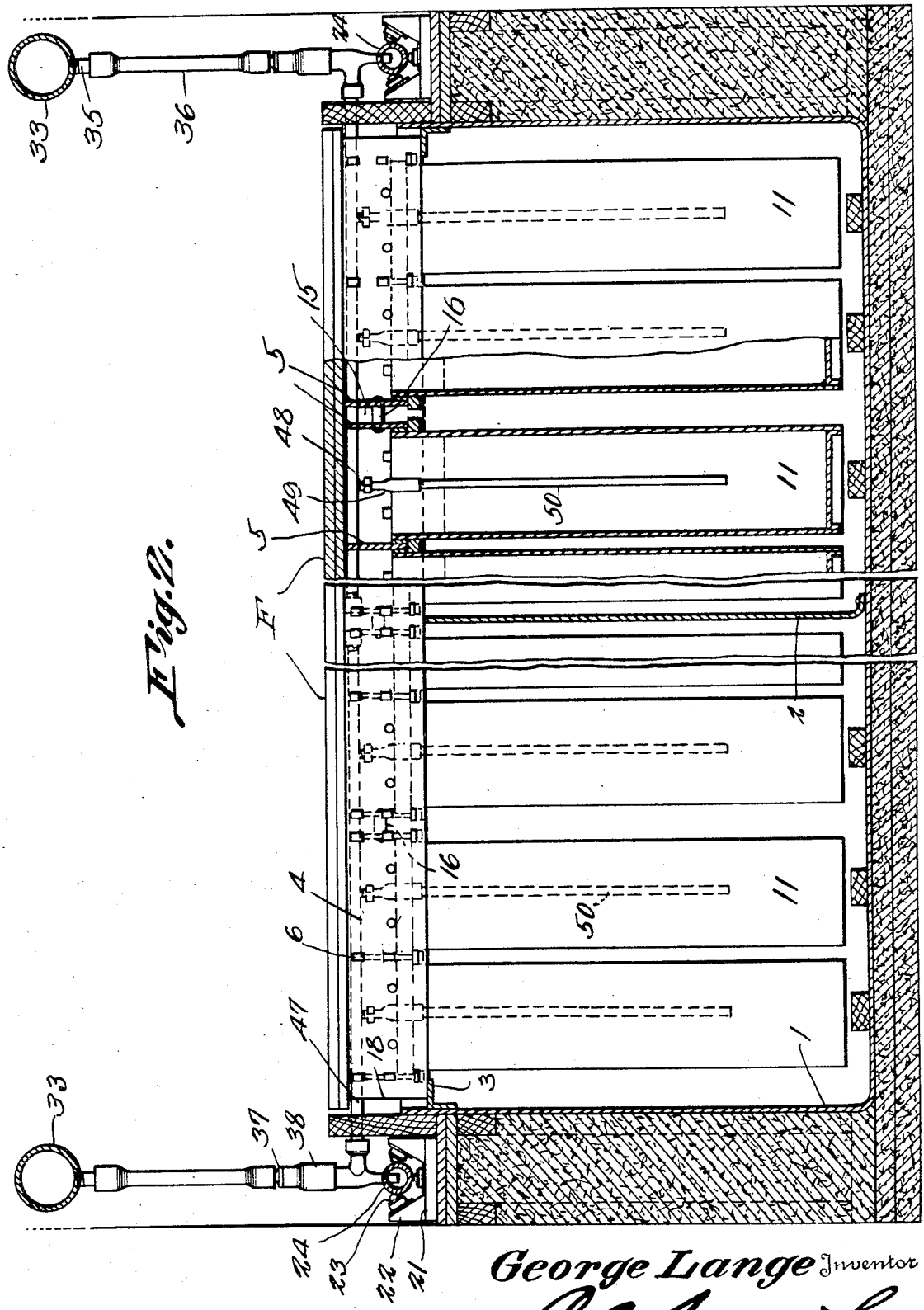


Fig. 2.

George Lange Inventor

By C. A. Snow & Co.

Attorneys.

May 5, 1931. G. LANGE 1,804,220

ICE MANUFACTURING APPARATUS

Filed Aug. 10, 1928 5 Sheets-Sheet 3

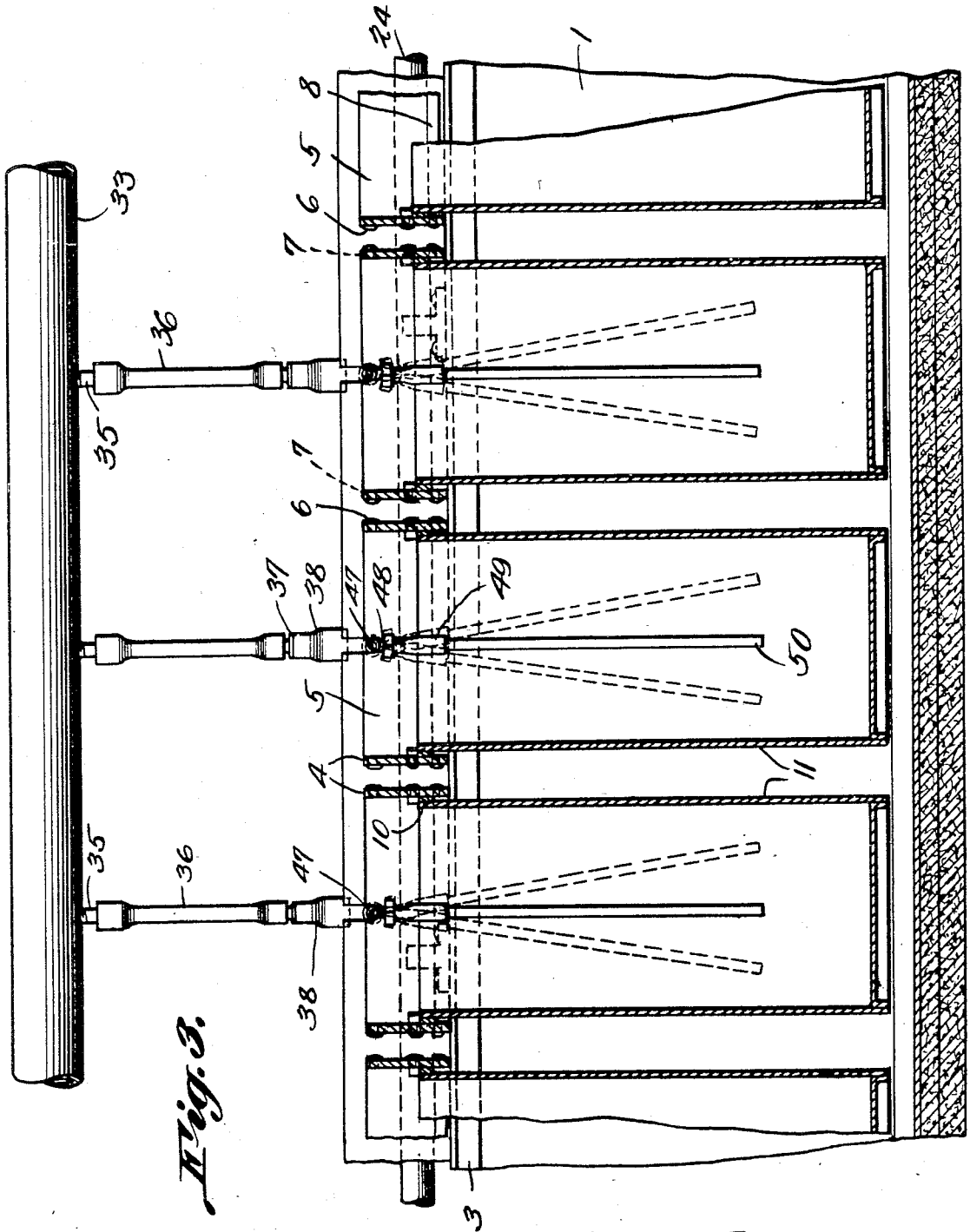


Fig. 3.

George Lange Inventor

By C. A. Snow & Co.

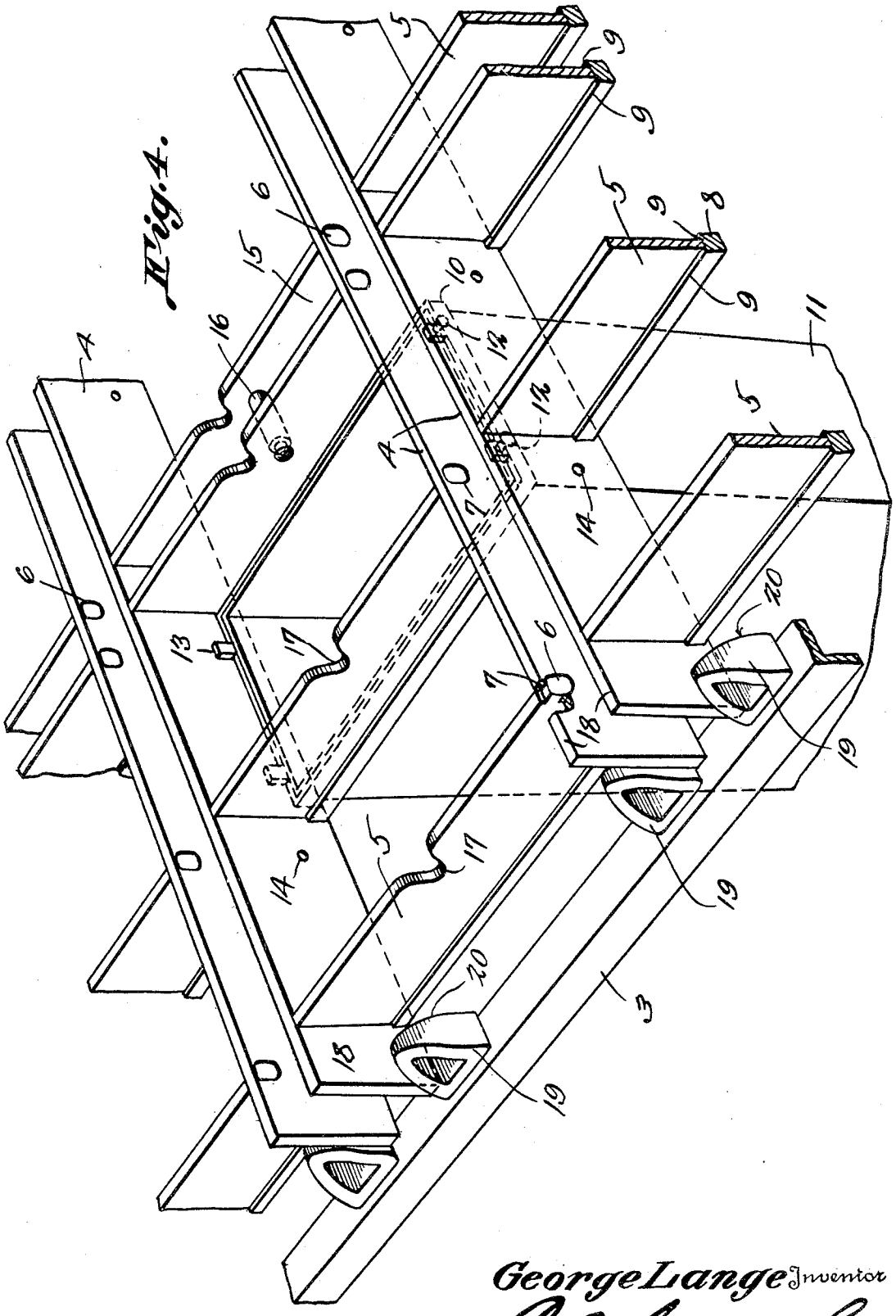
Attorneys.

May 5, 1931. G. LANGE 1,804,220

ICE MANUFACTURING APPARATUS

Filed Aug. 10, 1928 5 Sheets-Sheet 4

Fig. 4.



George Lange Inventor

By Cashow & Co.

Attorneys.

May 5, 1931. G. LANGE 1,804,220

ICE MANUFACTURING APPARATUS

Filed Aug. 10, 1928 5 Sheets-Sheet 5

Fig. 5.

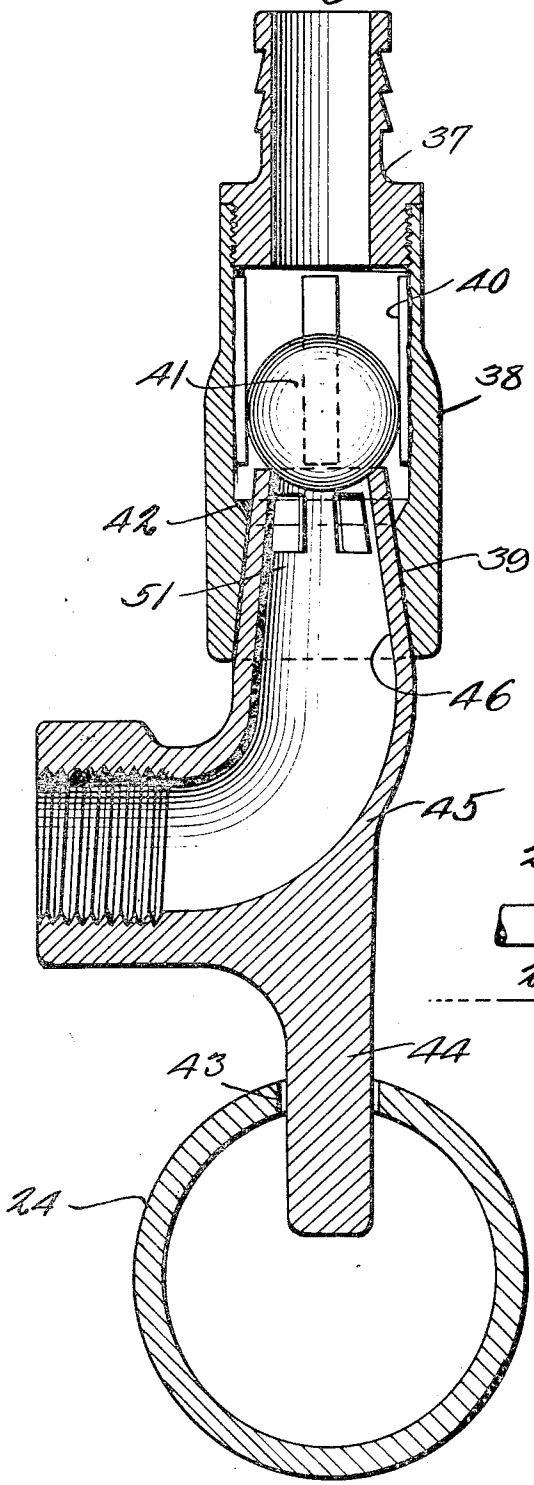


Fig. 6.

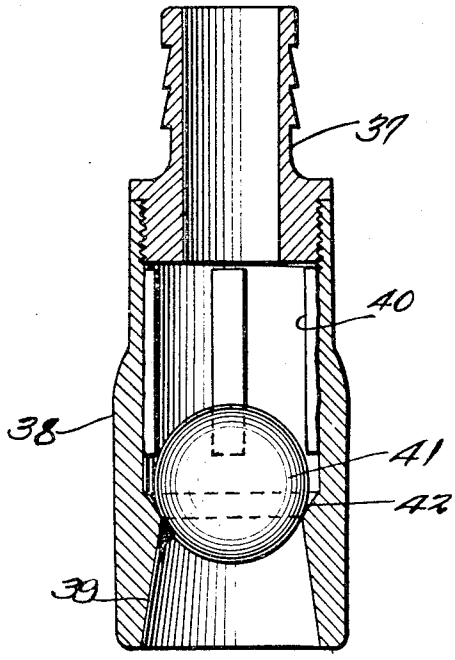


Fig. 7.

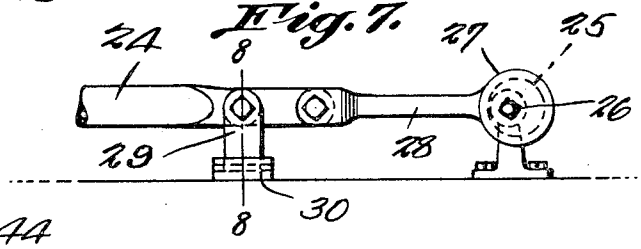


Fig. 8.



George Lange Inventor

By Cachow & Co.

Attorneys

Patented May 5, 1931 1,804,220

UNITED STATES PATENT OFFICE

GEORGE LANGE, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN ICE COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY

ICE MANUFACTURING APPARATUS

Application filed August 10, 1928. Serial No. 298,784.

This invention relates to apparatus for the manufacture of ice and is designed primarily for use in connection with systems utilizing brine tanks.

One of the objects is to provide a can support or grid for holding a number of ice cans of any commercial sizes, each can being so supported that it is prevented from bulging under the weight of the contents.

A further object is to provide a can holding grid which constitutes a means for supporting the can covers whereby a smooth floor is formed over the tank without requiring the usual tank framing of wood commonly employed which is costly to install and maintain.

Another object is to provide a grid constituting a support for rocking headers through which air under low pressure is supplied to tubes supported within the several cans in the grid.

A still further object is to provide a grid so constructed as to permit cans to be quickly inserted and removed without interference one with the other, novel means being employed for fastening the cans in the grid.

Another object is to provide efficient means for centering the grid when it is lowered to position across the tank, this means being simple and durable and serving to properly center the grid both transversely and longitudinally.

Another object is to utilize headers above the respective grids all of which have means whereby they are simultaneously rotated back and forth, there being air tubes flexibly connected to each header and extending into all of the cans adjacent to the header whereby a swift movement of water along the forming ice surface is created with the result that ice of a clear and brilliant texture is produced while all white ice is eliminated.

A still further object is to provide air tubes so mounted and constructed that they can be used in the cans until all but about three per cent. of the water is frozen after which they can be removed and the core of unfrozen water, which is of minimum size, can be withdrawn.

Another object is to provide efficient means whereby all of the cans in a tank can be simultaneously supplied with air if so desired or any selected number of them can be so supplied, any one of the headers with the tubes extending therefrom being easily removable from those cans with which it is associated.

A still further object is to provide novel means for controlling the flow of air at those points where the headers are removed from the grids and tank, thereby to eliminate waste of air under pressure, a novel form of connection and valve being utilized for this purpose.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings,

Figure 1 is a top plan view of a portion of a tank having several grids mounted thereacross, cans being supported by the grids and the air distributing headers being extended over the cans and grids.

Figure 2 is an enlarged section on line 2—2, Figure 1, the middle portion of the tank and contents being broken away.

Figure 3 is an enlarged section on line 3—3, Figure 1.

Figure 4 is a perspective view of portions of three grids and the means at one end for supporting and centering the same.

Figure 5 is a section through one of the valved connections between a header and its air supply pipe.

Figure 6 is a section through the valve casing detached from the nozzle portion of the coupling.

Figure 7 is a detail view of one form of

operating means that can be employed for oscillating the headers.

Figure 8 is a section on line 8—8, Figure 7.

Referring to the figures by characters of reference 1 designates a brine tank which, in the structure illustrated, is divided by a partition 2 into separate channels whereby a circulation of the brine can be set up back and forth within the tank in the usual way. Along the top of the tank are secured angle strips 3 and these constitute supports for the end portions of the grids.

Each grid consists of parallel heavy plates 4 extending throughout the length of the grid and constituting the sides thereof. Heavy connecting plates 5 are extended transversely between the side plates and are formed at their ends with lugs 6 extending through openings 7 in the sides plates and upset or riveted in place as shown. Each of the cross plates 5 is extended along the top of an angular bar 8 the thickness of which is greater than that of the plates 5 thereabove so that each bar thus provides two projecting ledges or shoulders 9 extending longitudinally of the plate 5 thereabove. The plates 5 are spaced apart a sufficient distance to receive between them the flanged upper end 10 of an ice can 11, the opposed portions of the flange on each can being adapted to rest on the adjacent shoulders 9 while the remaining sides of the can are adapted to come against the side strips 4.

Rivets 12 formed preferably with angular heads 13 are inserted into openings 14 formed in the side plates and are held in place by upsetting the ends thereof. The heads of these rivets are adapted to engage the top edges of the can so as to hold it against displacement relative to the grid after it has once been positioned therein.

At desired points between the ends of the grids the cross plates 5 are arranged close together as shown at 15 in Figure 4, these plates being connected adjacent their centers by a pin 16. All of the cross plates 5 are provided at the centers of their upper edges with rounded notches 17.

The ends of the side plates 4 project beyond those cross plates 5 adjacent the ends of the grids, thereby to form projecting wings 18. Arranged on the angle strip 3 are centering cams or blocks 19 which can be welded or otherwise attached to the strip 3. These cams have their sides rounded upwardly toward each other as shown particularly in Figure 4 while those faces of the cams nearest the cans, are rounded upwardly and outwardly as indicated at 20. The cams are arranged in pairs, each pair being so spaced that, when a grid is properly positioned adjacent thereto the wings 18 of the grid will engage the outer sides of the two cams. Excessive longitudinal movement of the grid will be prevented by these cams, it being understood that as the grid is lowered to position, the rounded faces 20 of the cams will engage the adjacent strips 5 and shift the grid longitudinally until it is properly centered.

As shown in Figure 1 the tank 1 has a large number of grids extending thereacross so as practically to cover the tank, these grids being arranged close together and each grid being proportioned to hold any desired number of cans. In practice from ten to twenty cans, more or less, can be suspended from each grid. As the tops of the grids are all flush, they constitute durable and efficient supports for the floor sections F which constitute the tank covers and also the closures for the cans. Thus it becomes unnecessary to employ a supplemental wooden structure for holding up the sections of the floor and, consequently, the cost of installation is materially reduced. For the purpose of maintaining agitation of water in the various cans during the freezing operation, there is provided along one or both sides of the tank a series of anti-friction bearings and guides. These can be of any preferred construction although in the apparatus used each bearing consists preferably of a base 21 having upstanding lugs 22 which diverge. On the diverging faces of these lugs and also on the base between the lugs are ball bearings 23 adapted to support a drive rod 24 formed preferably of pipe and extending throughout the length of the tank. Any desired number of bearings can be provided for each drive rod and they all cooperate to hold the rod in proper line while it is being reciprocated by means of mechanism provided for that purpose. As shown in Figures 7 and 8 this mechanism can include an eccentric 25 rotatable with a transverse shaft 26 and adapted to transmit motion through a strap 27 and rod 28 to one end of the rod 24. Any suitable means, such as a slide 29 connected to the rod 24 and mounted in a guide 30 can be provided for holding against displacement that end portion of the rod 24 to which the eccentric rod is attached.

Obviously when shaft 26 is rotated by any suitable means, such as a motor 31 which drives the speed reducing mechanism 32, the eccentric will be rotated slowly and a slow reciprocation will be imparted to the rod 24. Where one of these rods is located along each side of the tank as shown in Figure 1, both of them will be actuated simultaneously because the eccentrics provided for the two rods are connected to and driven by the same shaft 26 as shown in said figure.

Supported adjacent to each of the rods 24 is an air pipe 33 which can be constantly supplied with air under low pressure (approximately 2 pounds) from a blower indicated generally at 34. Each pipe is provided

near each of the grids, with a depending nipple 35 having a flexible tube 36 extending downwardly therefrom provided with a coupling member 37. This coupling member has a valve casing 38 screwed thereon and provided, at its free end, with a flared outlet opening 39. Spacing ribs 40 are formed within the valve casing or housing 38 and serve to guide a ball valve 41 which is loosely mounted in the casing 38 and adapted normally to rest on a tapered seat 42 formed at the inner end of the flared outlet 39. This position of the valve has been shown in Figure 6.

Each of the rods 24 is provided at a point substantially in line with the longitudinal center of the adjacent grid, with an opening 43 in the top portion thereof. Each of these openings is adapted to receive a finger 44 extending downwardly from an elbow 45 one end of which is tapered to provide a nozzle 46. This nozzle is extended upwardly from the elbow. The other arm of the elbow has a small air distributing pipe or header 47 screwed thereinto and adapted to extend longitudinally of the adjacent grid. This header is detachably supported in the notches 17 in the cross plates 5 and can extend throughout the length of the grid or over a portion of the length thereof. Where two air pipes 33 are mounted adjacent opposite sides of the tank and two reciprocating rods 24 are employed, two sets of headers are used, each header being extended over approximately one half the length of the grid. Such an arrangement has been shown in the drawings. Each of the headers has a nipple 48 extending downwardly therefrom directly over the center of each can receiving space adjacent thereto and each nipple 48 has a short length 49 of rubber tubing or other suitable flexible material for connecting it to a drop pipe 50 suspended thereby within the central portion of the adjacent can. Pipe 50 does not extend entirely to the bottom of the can but is supported with its lower end approximately twelve inches from the bottom of the can.

It will be obvious that when the rods 24 are slowly reciprocated, the fingers 44 engaged thereby will be oscillated slowly to cause the headers 47 to rotate back and forth within the notches 17 provided therefor. Consequently the drop pipe 50 will be swung back and forth within the cans.

All of the cans are to be filled with water in the usual or any preferred manner. It is preferred to simultaneously fill the cans in one grid while the grid is being suspended by a hoist with the cans out of the tank 1. When the grid is thus supported the hooks of the hoist will engage the connecting pins 16. Before the grid and the cans are thus held in raised positions, the headers are of course removed from the grid and this is done by pulling the casings 38 off of the nozzles 46 connected to the headers to be removed. As soon as the casings 38 are thus withdrawn from the nozzles the ball valves 41 will drop to their seats 42 so as to prevent air under pressure from escaping through the outlets 39.

With the elbow 45 disengaged from the valve casings 38 as heretofore described, the fingers 44 can be lifted out of the openings 43 and said elbow, with the headers 47 and the depending drop pipes 50 can be placed to one side until ready to be used. The filled cans are lowered into the tank by means of a hoist which will act to gradually lower the grid on to the angle strip 3. As the grid approaches these strips the wings 18 will come against the centering cams 19 in the paths thereof which will act to deflect the wings and the adjacent cross strips 5 so as to center the grid properly across the tank. Thereafter the headers 47 are placed in the notches 17 in the lowered grid with the drop pipes 50 extending downwardly into the respective cans in the grid. The finger 44 is inserted into the opening 43 provided therefor in rod 24 and thereafter the adjacent valve casing or sleeve 38 is forced downwardly on to the nozzle 46 so as to wedge tightly thereon. This will result in the unseating of valve 41 and as the nozzle has ports 51 in the end portion thereof, the valve 41, when unseated, will allow air under pressure to flow through casings 38 into ports 51 and thence through the elbow 45 to the header 47. Consequently the air will be distributed to all of the drop pipes and will flow from the lower ends thereof. While the air is thus escaping upwardly through the water in the can, the headers are slowly rotated back and forth and at the same time the drop pipes are caused to swing slowly back and forth. The constant agitation of the water will result in the formation of a clear crystal-like ice and the freezing will continue until a very small core consisting of approximately three per cent. of the water in the can, is left. Should the oscillation of some of the drop pipes be stopped by the ice in the cans before the header has completed its movement in either direction, the connections 49 would flex so as to prevent injury to those pipes being held under restraint. Thereafter the header is removed so as to withdraw the drop pipes from the cores in the cans thereunder, the elbow 45 is disengaged from the rod 24 and from the valve casing or sleeve 38, and said header with its drop pipes laid aside. The cores are then sucked from the respective cans, the cavities being filled with clear water. Thereafter the cans are left until the cores are completely frozen and it has been found, in practice, that the

block of ice thus produced in each can is clear and absolutely free of white or "snow" ice. Following the freezing of the cans carried by one grid, said grid with the cans depending therefrom, is hoisted until the cans are completely out of the tank after which the grid and cans can be conveyed to a warming tank, thereafter raised and partly or entirely inverted, the ice blocks delivered from the cans, and said cans again refilled and brought back to the tank. The operation described can then be repeated.

Importance is attached to the fact that by providing the valves 41 and the particular connections associated therewith, there is practically no loss of air while the ice is being handled. During the removal of one or more grids with the cans depending therefrom air can be supplied to the cans in any or all of the remaining grids. Consequently a continuous operation can be carried on in an ice plant properly equipped with the apparatus herein described.

To insure proper results in the operation of the system described, it is essential that a slow swinging movement of the drop pipes be produced, and that during this movement air, under low pressure, be delivered therefrom. Where air is under approximately two pounds pressure, the agitation of the water will not be too violent but will nevertheless be sufficient to insure desired results. By having the flexible connections between the drop pipes and the nipples on the headers, said drop pipes are free to yield during the beginning of each swinging movement and are also free to yield slightly as the size of the core becomes reduced around the path of the swinging pipes, during the freezing operation.

An extremely important feature of this apparatus is the provision of a number of headers all of which are actuated simultaneously by a common reciprocating rod. This greatly simplifies the mechanism and as all of the parts are light and have properly prepared bearings, the minimum power is required for maintaining operation.

Obviously whenever replacement of a can is necessary the rivets used for holding the can in the grid can be cut and the can withdrawn. This will not disturb continued use of the grid and the remaining cans carried thereby.

As the upper or flanged portions of the cans fit snugly within the grids, it will be obvious that the plates or strips forming the sides and cross connections of the grid will serve to properly reinforce the cans at their upper ends, thereby preventing them from bulging or becoming otherwise distorted while the water is freezing or while the grids and cans are being handled during the emptying and filling operations.

An important feature incident to the use of a grid constructed as described resides in the fact that the completely fabricated grid can be dipped in a galvanizing bath so that every part will be completely coated with a protecting metal without becoming warped. This insures long life as there are no bare metal parts where corrosion could start.

What is claimed is:

1. In apparatus of the class described the combniation with a plurality of cans and means for supporting the cans in a row, of a header mounted for back and forth rotation above the row of cans, drop pipes, flexible connections between said pipes and the header for yieldingly oscillating the pipes with the header, one of said pipes being supported within each can, means for actuating the header, and means for supplying air under low pressure to the header.

2. The combination with a grid and a plurality of cans supported by the grid, of a header mounted for back and forth rotation relative to the grid, drop pipes, flexible connections between said pipes and the header for yieldingly oscillating the pipes during said rotation of the header, said pipes being extended into the respective cans, and means for directing air under low pressure to the header and drop pipes during the oscillation of said pipes.

3. The combination with a tank and a grid removably mounted thereon, of a plurality of cans supported in a row by the grid and suspended within the tank, a header mounted for rotation relative to the grid, means outside of the tank for imparting a back and forth rotation to the header, means for supplying air to the header under low pressure, drop pipes, and flexible connections between said pipes and the header for yieldingly oscillating the pipes within the respective cans during the movement of the header.

4. The combination with a brine tank, of a plurality of closely lying separately removable grids extending over the tank, cover sections supported by the grids and cooperating to provide a floor over the tank, a plurality of cans supported within and extending below each grid, a header detachably mounted on each grid, drop pipes depending from each header and extending into the respective cans thereunder, means for simultaneously rotating all of the headers back and forth thereby to simultaneously oscillate all of the drop pipes, and means for directing air under low pressure to the headers during the oscillation of the drop pipes.

5. The combination with a brine tank, of a plurality of grids extending over the tank and arranged close together, removable covers supported by the grids and cooperating to provide a floor over the tank, a plu-

rality of cans supported by and depending from each grid, a header supported by and liftable from each grid, a plurality of drop pipes extending from each header into the respective cans thereunder, a reciprocating actuating member, means connected to each header and engaged by said member for simultaneously rotating the headers back and forth during the reciprocation of said operating member, thereby to oscillate all of the drop pipes simultaneously, an air supply pipe, and valved coupling connections between said supply pipe and the respective headers.

6. The combination with a tank and a plurality of closely arranged grids separately liftable therefrom, of a plurality of cans supported by and depending from each grid, a header rotatably mounted on and liftable from each grid, drop pipes depending from each header and extending into the respective cans thereunder, an actuating member mounted for reciprocation, means for transmitting motion from the reciprocating operating member to the header to oscillate all of the drop pipes simultaneously, an air supply pipe, a detachable connection between said pipe and each header, and a valve within each connection for cutting off the escape of air from the supply pipe when detached from the header.

7. In apparatus of the class described a detachably mounted grid, a plurality of cans supported by and depending from the grid, a header journaled on the grid and removable therefrom, a drop pipe within each can, a flexible tubular connection between each drop pipe and the header, and means for rotating the header back and forth to oscillate the drop pipes.

8. In apparatus of the class described a movably mounted grid including side plates and connecting plates, said connecting plates having notches in their upper edges, a plurality of cans supported by and depending from the grid, a header mounted for back and forth rotation in the notches and liftable therefrom, drop pipes depending from the header into the respective cans, means for actuating the header, and means for supplying air to the header for distribution to the drop pipes.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

GEORGE LANGE.