

Aug. 29, 1933.

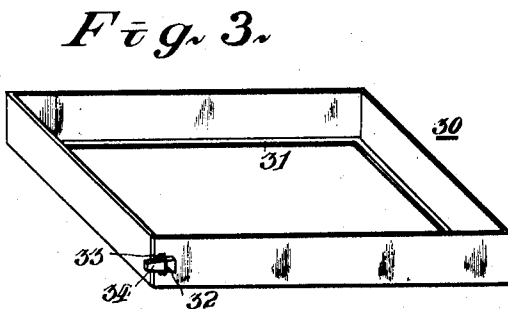
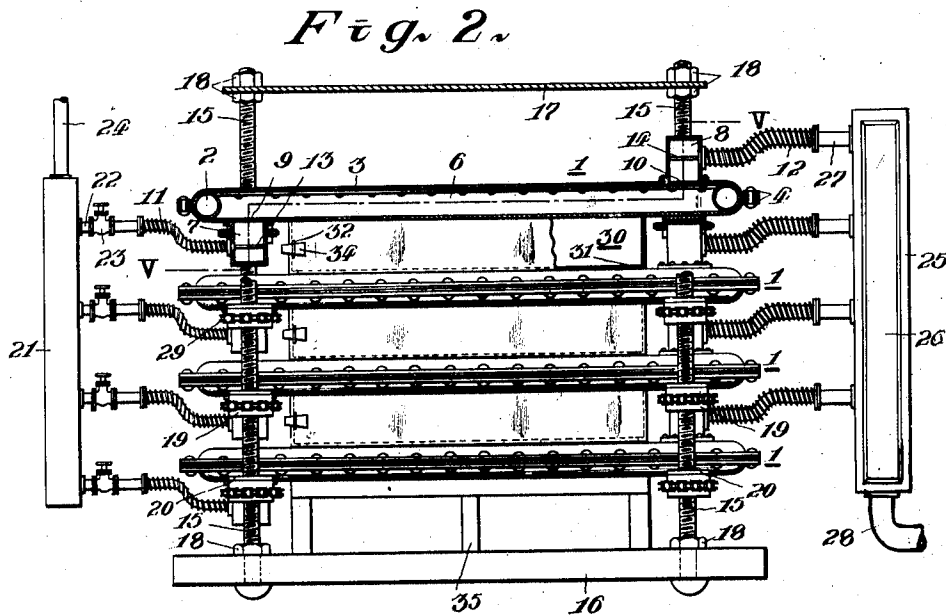
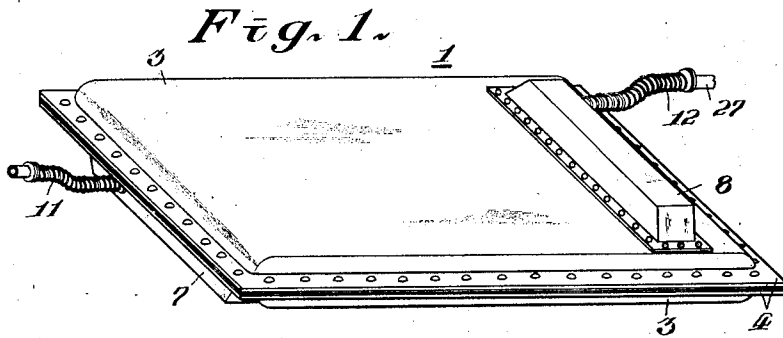
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1,924,225

REFRIGERATOR OF BRINE CIRCULATION SYSTEM

Filed Jan. 16, 1933

2 Sheets-Sheet 1



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Fig. 4.

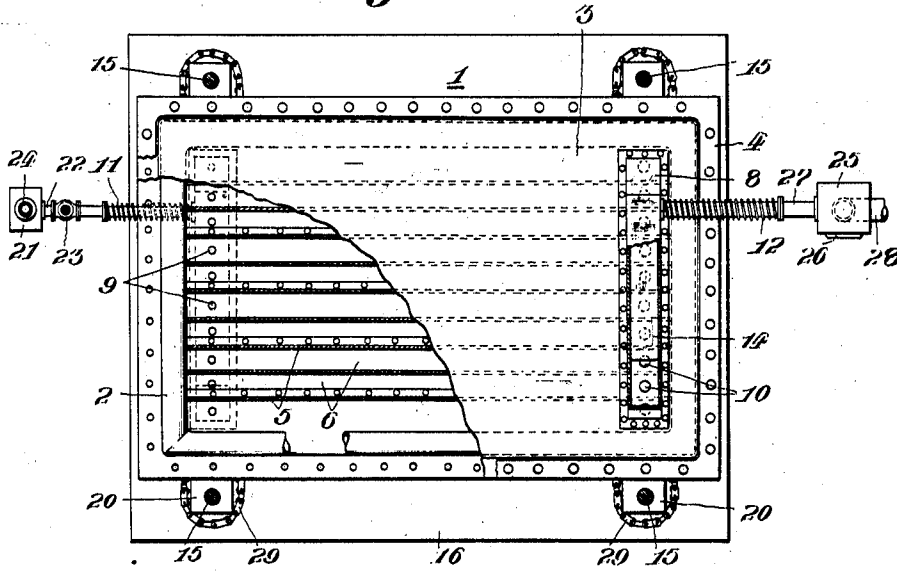
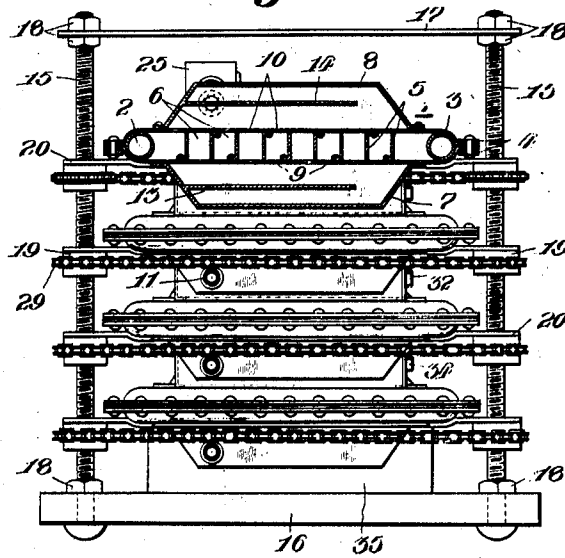


Fig. 5.



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1,924,225

REFRIGERATOR OF BRINE-CIRCULATION SYSTEM

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Application January 16, 1933, Serial No. 652,052,
and in Japan August 16, 1932

2 Claims. (Cl. 62—114)

This invention relates to refrigerators of brine-circulation system, more particularly comprising a number of tanks arranged in various stories for circulating cold brine and has for its object to provide an efficient refrigerator of this kind, light in weight and simple in construction.

The refrigerator of the above-said kind adapted to put the articles to be refrigerated between the tanks has hitherto been constructed with a considerable difficulty, as the same is essential to be as flat as possible in shape, in view of weight and efficiency.

According to my invention, the refrigerator of the above-said kind may be easily constructed in a light weight and so as to adapt to work with a high efficiency.

The invention will be better understood by reference to the accompanying drawings in which:—

Fig. 1 is a perspective view of an elemental tank adapted to be circulated with cold brine therein, of a refrigerator according to the invention.

Fig. 2 is a front view, partly in section, of the refrigerator.

Fig. 3 is a perspective view of a frame of a container for the articles to be refrigerated.

Fig. 4 is a plan view, partly in section, of the refrigerator.

Fig. 5 is a side view, partly in section on the line V—V of Fig. 2, of the refrigerator.

Referring now to the drawings, first the construction of tanks arranged in various stories to be circulated with cold brine therein will be described. However, a description of the construction of a tank will suffice, since the tanks are all constructed in the same manner. 1 represents a tank, which is shown herein as being substantially rectangular in its general outline, and generally comprises an inner frame 2 (Fig. 4) and outer walls 3, 3. The frame 2 is formed by bending a pipe of a suitable size in any suitable manner to a shape conforming with the inner sides of the body of the tank and by welding or soldering two ends together (Fig. 4). The outer walls 3, 3 are each made of a thin sheet-metal, and are extended over two sides of the frame 2 with their marginal portions brought together along an outer half of the circumferential surface of the pipe forming said frame by halves from both sides, so as to snugly enclose said frame, and are secured together in water-tight by suitable means, such as rivets or bolts and nuts, by disposing the marginal portions between two fastening members 4, 4. It will be apparent

that the space between two walls, or the depth of the tank will be determined by the diameter of the pipe forming the frame 2.

A number of stiffeners 5 having a width corresponding to the depth of the tank and a length sufficient to extend throughout the inner width of the tank are longitudinally secured on the inner sides of the walls 3, 3 in equally spaced but staggered relation by suitable means, so that a number of longitudinal conduits 6 substantially having the same width may be formed in the tank, as seen in Figs. 4 and 5.

An inlet casing 7 and an outlet casing 8 are transversely attached to the tank near the different ends of its different sides by suitable means. The casings 7 and 8 are transversely arranged to extend substantially throughout all of the respective ends of the conduits 6 and to communicate with said conduits through inlet and outlet holes 9 and 10 provided in the walls of the tank respectively. A flexible inlet and an outlet pipe 11 and 12 for brine are connected with the inlet and the outlet casing 7 and 8 respectively.

With this arrangement of the tank, it will be apparent that cold brine is admitted into the inlet casing 7 through the pipe 11 and thence is admitted into every conduit through the inlet holes 9 and then will be delivered into the outlet casing 8 through the outlet holes 10, wherefrom said brine will be discharged to the outlet pipe 12, so that an efficient refrigerating effect may be obtained.

The outlet pipe 12 is preferably made to have a considerably larger diameter than that of the inlet pipe 11. The aggregative area of the outlet holes 10 is preferably made somewhat larger than that of the inlet holes 9 and also than the sectional area of the outlet pipe 12.

In order to secure the uniform circulation of brine throughout the conduits, divisional guide plates 13 and 14 may be provided in the inlet and the outlet casing 7 and 8 respectively as shown in Fig. 5.

The refrigerator unit comprises a number of the tanks mounted in various stories on a rack, as shown in Figs. 2 and 5. The rack is built up in general by four threaded columns 15, a base-plate 16 and a top-plate 17 secured in position by means of nuts 18. A number of nut members forming chain wheels 19 are screwed in pairs on the respective threaded columns 15. On each transverse pair of the nut members is transversely mounted a supporting plate 20 which is provided near its either end with holes adapted to pass on the threaded columns 15. On each longi-

tudinal pair of the supporting plates 20 is longitudinally mounted a tank 1, the inlet casing 7 being connected to a branch 22 with a regulating valve 23 of a stand-pipe 21 connected to a delivery pipe 24 led from a source of cold brine (not shown) by means of the flexible inlet pipe 11, while the outlet casing 8 being connected to a branch 27 of a collector 25 with a sight glass 26 for the observation of the condition of brine flow and connected to a return pipe 28 led to the source of cold brine, by means of the outlet flexible pipe 12.

With this arrangement it will be appreciated that the tanks 1 may be moved upward and downward by means of the nut members 19. In order that the nut members 19 in each transverse pair may be driven simultaneously, they are connected with each other by means of an endless chain-belt 29 put over the chain wheels comprising the nut members, so that the chain-belt when driven by means of a suitable tool will drive the nut members simultaneously.

A container for articles to be refrigerated preferably comprises a frame 30 as shown in Fig. 3 and a thin bottom plate (not shown). The container frame 30 is formed by bending an elastic thin sheet-metal of suitable size in a four-sided shape, its bottom edge somewhat being turned inwardly at right angles to its sides, as indicated at 31, for resting a thin bottom-plate thereon. The junction of two ends of the sheet-metal forming the container frame is detachably arranged by means of a catch 32 attached to its one end by suitable means and adapted to extend outward through a hole 33 provided near the other end and a wedge 34 adapted to engage with said catch, so that the container frame may be allowed to be somewhat expanded when the wedge is removed from the catch, for facilitating the removal of the articles frozen to said frame.

To put articles to be refrigerated in the refrigerator, the articles are put in the container formed by putting a thin bottom-plate in the container frame 30, which preferably put on a suitable supporting plate or board (not shown) for preventing the deformation of the container of thin sheet-metal, and the container with the articles is put on the lowermost tank in suitably adjusted position, together with said supporting plate or board, which is drawn out thereafter to hold the bottom of the container in direct contact with the upper wall of the tank and then the upper tank next the lowermost tank is brought into engagement with the upper edge of the container by adjusting the nut members, on which other container with articles is thereafter put in the similar manner, and then the third tank is brought into engagement with the upper edge of the second mentioned container, and so on, but on the uppermost tank, no container being put. Thus the containers with articles are closely put between tanks, so that the articles are held in an efficient heat exchange relation with cold brine circulated in the tanks.

To remove the containers with the articles refrigerated from the apparatus, first the uppermost tank is somewhat raised to disengage with the container immediately below it by adjusting the nut members 19 and then the container is removed, and other containers may be removed successively in the similar manner. The articles

frozen to the container may be easily removed by removing the wedge 34 from the catch 32 and somewhat expanding the container frame 30.

With this arrangement, it will be appreciated that the lowermost tank will be weighed down with all the upper tanks and the containers with articles on the tanks. A firm support 35 is, therefore, arranged between the base-plate 16 and the lowermost tank.

In operation, cold brine will be circulated from a source through the delivery pipe 24, stand-pipe 21, regulating valves 23, pipes 22, 11, inlet casings 7, tanks 1 by way of the inlet holes 9, outlet casings 8 by way of the outlet holes 10, pipes 12, 27, collector 25 and return pipe 28 to the source.

As the pressure of cold brine circulating in the tanks during the operation is relatively low, the area of the passages in inlet side being smaller than that in outlet side as aforesaid, and the tanks will stand their burden owing to the provision of the stiffeners, the tanks may be manufactured from considerably thin sheet-metal, so that the manufacturing work is very easy and they may be of considerably light weight.

With the apparatus, the articles to be refrigerated are not liable to be crushed by the weight of the tanks or other articles, as the articles are put in the container, and consequently no special means will need be provided for adjusting the pressure exerted on the articles in the spaces between the tanks to prevent the articles from being crushed, as may be the case with the articles to be refrigerated directly placed in the spaces between the tanks.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I claim:—

1. A refrigerator of brine-circulation system comprising a built-up rack, a number of tanks for circulating cold brine therein each of which is made by enclosing a frame made of a pipe with sheet-metals and provided with a number of stiffeners attached alternately to said sheet-metals forming side walls of the tank so as to form a number of conduits in the tank and inlet and outlet casings communicating with said conduits through inlet and outlet holes provided in the side walls of the tank respectively and having divisional guide plates for securing the uniform circulation of brine throughout the conduits, means for adjusting the position of the tanks comprising nut members forming chain-wheels over which chain-belts are disposed, a stand-pipe and connections with said inlet casings and a collector with a sight-glass and connections with said outlet casings.

2. In a refrigerator of brine-circulation system of the kind described, a tank for circulating cold brine therein which is made by enclosing a frame made by bending a pipe in four-sided shape with sheet metals and provided with a number of stiffeners attached alternately to said sheet-metals forming side walls of the tank so as to form a number of conduits in the tank and inlet and outlet casings communicating with said conduits through inlet and outlet holes provided in the side walls of the tank respectively and having divisional guide plate for securing the uniform circulation of brine throughout the conduits.

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