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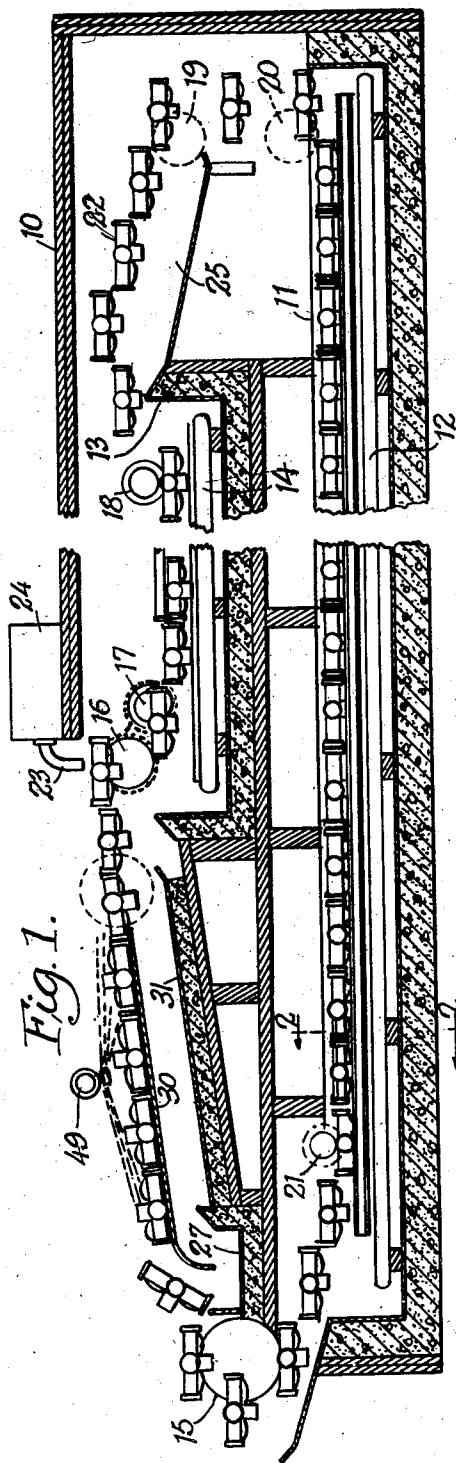
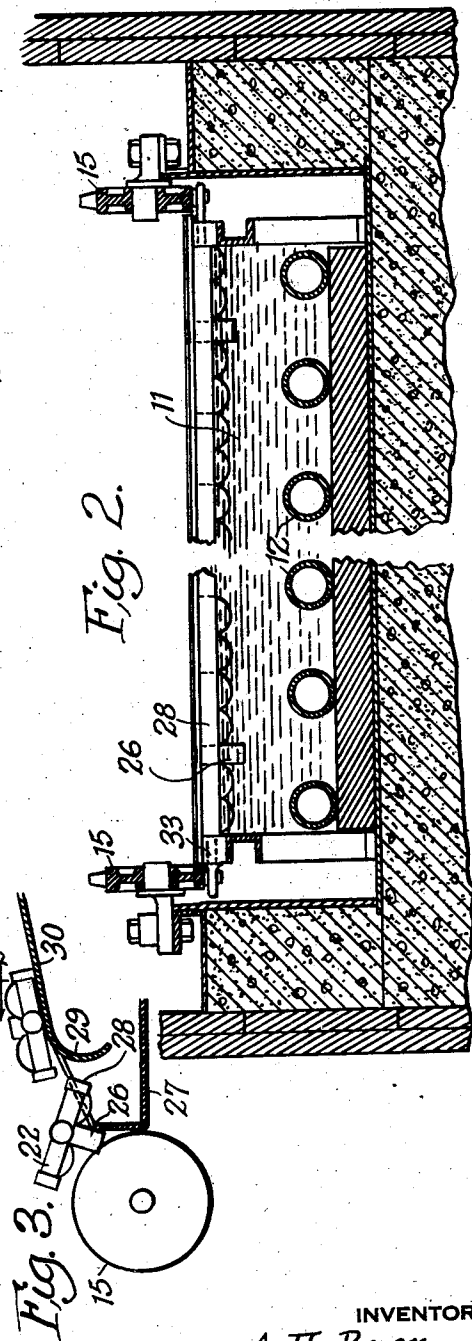
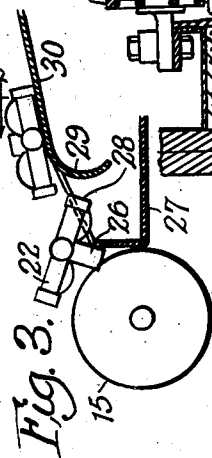
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2,259,920

ICE MAKING APPARATUS

Filed Jan. 3, 1939

4 Sheets-Sheet 1



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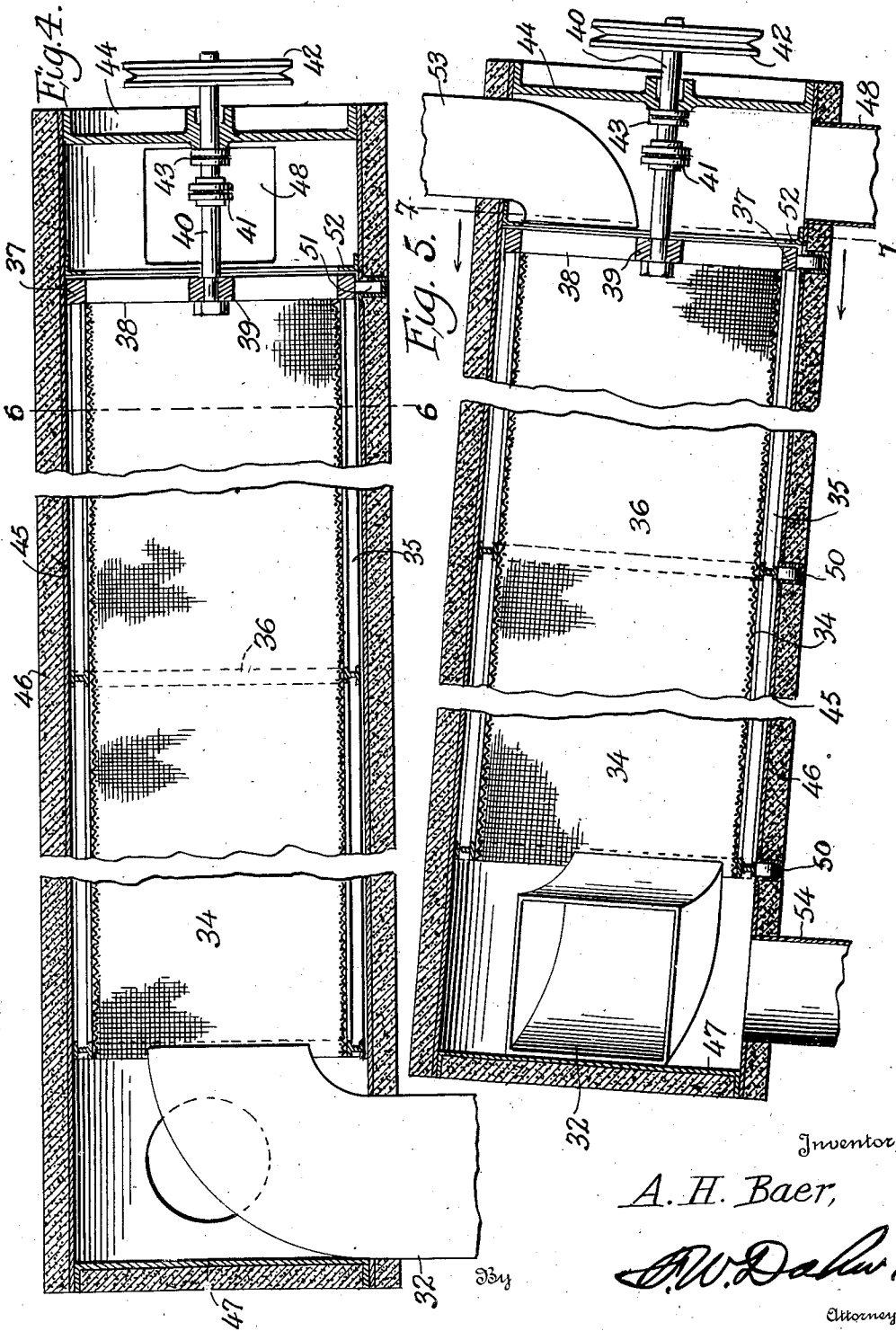
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Fig. 6.

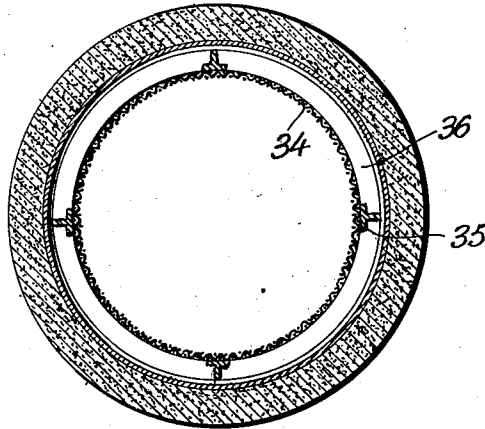
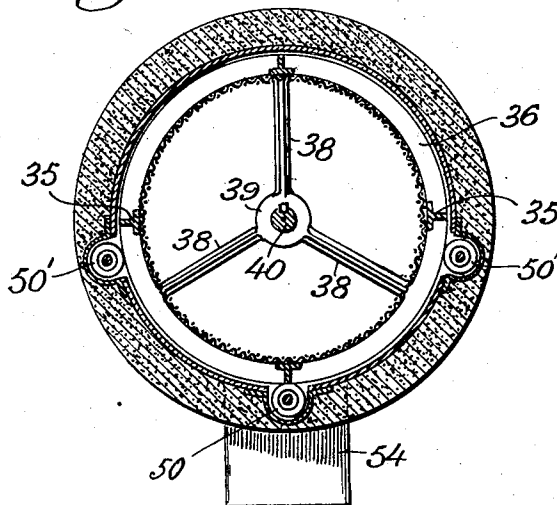


Fig. 7.



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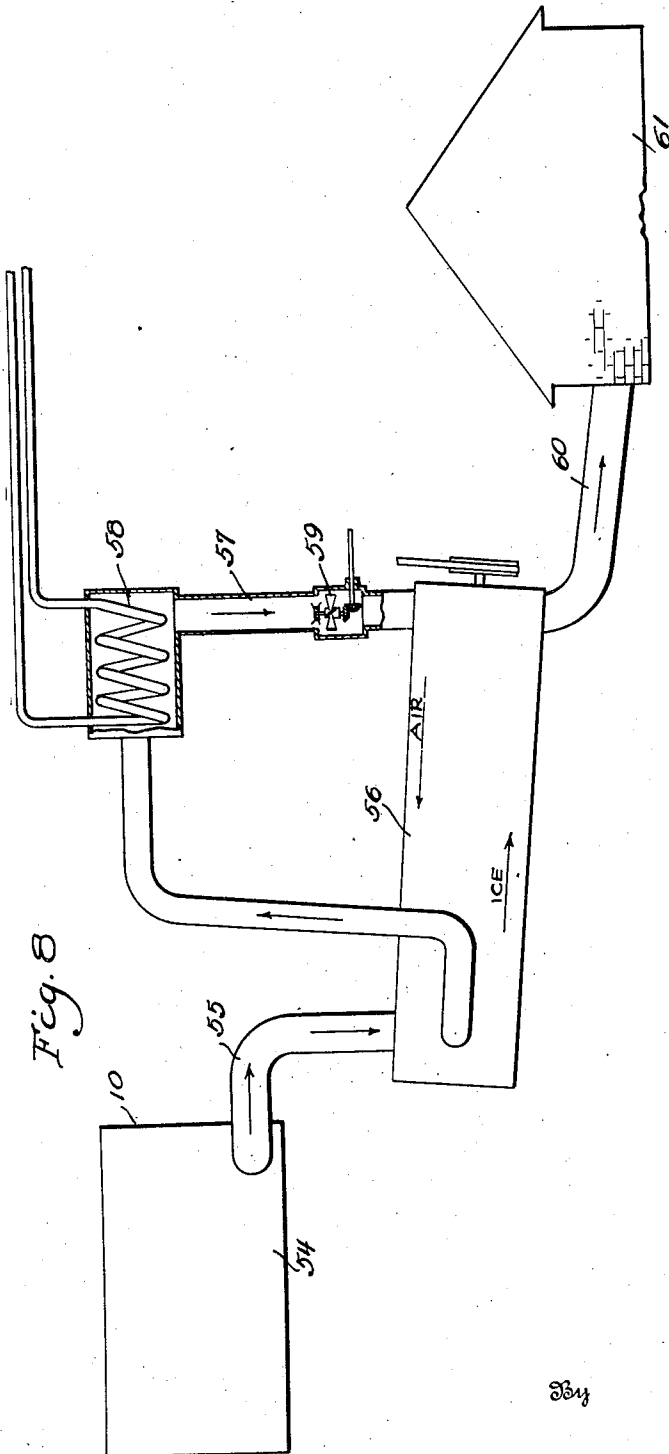
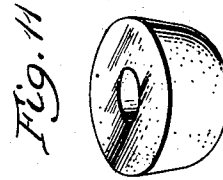
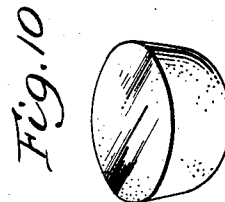
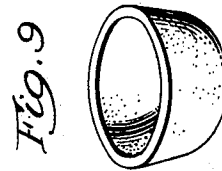
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,259,920

ICE MAKING APPARATUS

Alvin H. Baer, South Orange, N. J.

Application January 3, 1939, Serial No. 249,103

6 Claims. (Cl. 62—102)

My invention relates to a method of ice making and an apparatus used in connection therewith and it is an object of the same to provide means in connection with ice making apparatus which delivers pieces of ice in wet condition, whereby to remove such wetness as quickly as possible and so to avoid adhesion of pieces to one another due to the freezing of the liquid on contacting pieces. This is troublesome, especially in cases where the pieces are relatively flat or with but slight curvature, resulting in the formation of masses that are awkward to handle and may be difficult to separate. In the process of separation such pieces also become broken and so are less desirable for use, both because of awkward shapes and because of undesirable appearance in the case of cubes and the like.

Another object of my invention is to provide a method which combines the steps of drying and freezing as applied to wet pieces of ice, so as to expedite the process as much as possible and permit direct passage of the ice pieces from the producing machine to the dryer and then to the storage with the minimum of waste.

Another object of the invention is to provide a simple, durable and economical apparatus for carrying out the process above referred to without labor for intermediate handling and without space and facilities for this purpose.

Referring to the drawings, which are made a part of this application, and in which similar reference characters indicates similar parts:

Fig. 1 is a vertical longitudinal section of congelation apparatus such as may be used to supply ice to drying apparatus of the type herein described,

Fig. 2, a section on line 2, 2 of Fig. 1,

Fig. 3, a fragmentary view of parts shown in Fig. 1 but on an enlarged scale,

Fig. 4, a horizontal, longitudinal section of dry freezing mechanism forming a part of my invention,

Fig. 5, a vertical longitudinal section of the same,

Fig. 6, a section on line 6, 6 of Fig. 4,

Fig. 7, a section on line 7, 7 of Fig. 5,

Fig. 8, a diagrammatic side elevation of a plant for carrying out the process described herein, and

Figs. 9, 10, 11 and 12, perspectives of typical ice blocks such as may be made by my machine.

Referring to the drawings, the congelation apparatus may be such as that described in my co-pending application Ser. No. 147,586, filed June 10, 1937, said apparatus comprising generally a casting 10 supporting a freezing tank 11 contain-

ing brine or other suitable liquid and provided with a coil 12 for the circulation of a refrigerant. A precooling tank 13 is located above the tank 11 and is provided with a coil 14 for the circulation of refrigerant through the brine or other liquid in the tank. An endless conveyor consisting of suitable chains or bands is trained about a series of wheels 15, 16, 17, 18, 19, 20 and 21, shown in Fig. 1, the drawings here showing sprocket chains and sprocket wheels, and this conveyor carries frames 22, each comprising several cup-like containers, as more fully described in my co-pending application, these cups being arranged to receive water or other liquid from nozzles 23 on a tank 24, after which the filled cups pass downward to the precooling tank and then travel upward over a drip collecting trough 25 and downward into the freezing tank 11. After travelling throughout the length of this tank the cups again move upward about the axis of the drive gears 15 and are caused to tilt by engagement of their depending weighted lugs 26 with the rim of a trough 27, which trough serves to collect unfrozen water remaining as a residue in the cups when ice cakes are not solid, it being the intention that sometimes my device will freeze only a part of the liquid in the cups and so to provide shells or cup-like pieces of ice, since such pieces have but little tendency to stick together, they are very easily reduced to smaller fragments when desired, and also because of the relatively greater efficiency with which such thin shells can be frozen as compared with the much time required for freezing all the water in a cup into a solid block.

After being tilted as above described the bar 28 at the forward edge of a frame which unites a plurality of the cups strikes against a downwardly curved member 29 fixed to or forming a part of guide rails 30, so that the frame is inverted and, as shown in Fig. 3, is held in such inverted position while it passes over the rails 30. At this time the bottoms of the cups are subjected to heat, as by a blast of warm air from a pipe 29, for separating the cakes of ice from the cups or pans so that they fall on a chute 31 leading to or forming part of the chute 32 (Figs. 4 and 5). As the empty pans pass beyond the rails 30 they are caused to assume their normal liquid-holding position by reason of the relatively heavy lugs 26 which cause the frames to rotate on their axes 33 (Fig. 2), bringing them into position to receive and hold liquid supplied by nozzle 23, whereupon the cycle of congelation again proceeds as above set forth.

The pieces of ice, preferably in the form of shells or cups, now pass through the chute 32 and into an inclined rotary conveyor, shown in Figs. 4 to 7. This conveyor comprises a cylinder 34 made of perforate material such as a wire screen or a sheet of metal provided with many small holes, as by a punching operation. The screen is here shown as supported by longitudinal T-bars 35 and by rings 36 surrounding the cylinder. At its lower end a ring 37 is provided, which is preferably heavier than the other rings and which has cross bars 38 supporting a hub 39 to which is secured a drive shaft 40 formed in two parts with a flexible coupling 41 connecting them. The shaft 40 is driven by any suitable means, such as a pulley 42, and is held against endwise movement by means of a thrust bearing 43 resting against a disk 44 forming the end of a casing enclosing the parts just described.

The cylinder 34 and connected parts are mounted in a casing 54 which is preferably provided with a heavy layer of heat-insulating material 46, here shown as surrounding the cylindrical portion of the casing and also applied over the end member 47. An outlet for the dry pieces of ice is shown at 48. The casing 45 is provided underneath the rings 36 with rollers 50 or other suitable means for reducing friction and similar rollers may also be provided at other points about the periphery, as for example at 50' in Fig. 7. A stop frame 52 in the form of an annulus which is L-shaped in cross section is fixed to the stationary casing and serves to hold the rotary conveyor against downward movement to the right in Fig. 2. In a preferred operation the mechanism is provided with a conduit 53 adjacent the lower end of the cylinder through which cold air is forced into the cylinder so as to flow in a direction contrary to the movement of the ice therein and thence outward by means of an outlet 54 at the higher end of the device.

It will be evident that as the ice shells leave the pans in Fig. 1 they will be wet and that such wetness is likely to cause them to freeze together in storage. Now as they pass into the rotary inclined cylinder they will be tumbled about during their travel through said cylinder, thus breaking any adhesions that may tend to take place, and the current of air will also aid to dry the shells during their movement. Such air current should always be at a sufficiently low temperature to insure against any thawing of the ice, but preferably it is also at such a low temperature as to continue the freezing operation, thus saving water that would otherwise be wasted and hastening the time when the ice will be fully dry, whereby also the rotary inclined conveyor may be shorter than would otherwise be required to handle the load.

Fig. 8 illustrates an installation such as may be used, this comprising a housing 54, which may represent a machine such as that shown in Figs. 1 and 2 or any other sort of apparatus for making small pieces of ice, as by cutting or crushing or by congelation of water or other liquids or semi-liquids such as fruit or liquid pulp, agglomerated fruits or vegetables, etc. From this diagrammatic housing the frozen products pass through a conduit 55 to the drier 56, which may be of the rotary type herein disclosed, or of any other suitable type, where they may be acted on by air which is preferably chilled to a point at or below 32° F., the air being here shown as being supplied in a countercurrent by means of a coil 58 containing a refrigerant, said coil chill-

ing the air that is circulated by a fan 59 through a passage 57, then through the drier 56 and back to the coil in a continuous path. The dried frozen products emerging from the drier pass through a conduit 60 to a storehouse 61, or to any other suitable storage or delivery station.

Figs. 9 to 12 show typical products of my congelation apparatus. These may be of various shapes, as will be obvious, and that is particularly true of the hollow shell types of cakes. In many cases the depth or thickness will be less than one-half the length or width of a cake, and that is especially the case with the solid cakes such as shown in Fig. 10 whereby a seamless cake can be made due to the fact that the growth of the ice from the bottom of the container will reach the top of the liquid at the same time, or sooner, than the growth from the sides, therefore no visible seam will be had.

Fig. 9 illustrates such a shell as may be made when only a small portion of the liquid is frozen. The making of such thin shells is the most effective method for production of ice in quantity, since freezing proceeds faster while the shell is thin. But thicker shells, such as that of Fig. 12, can also be made speedily and in a continuous automatic process, if preferred, and the shells may be of any desired thickness. The ice of such shells is clear because any dirt or foreign matter is discarded in the step of separate removal of unfrozen water and slush ice. In cases where the remaining cavity is small, as in Fig. 11, the unfrozen water can be discarded and then the cavity refilled with clean water, which can then be frozen to a clear ice cake even though the depth be more than one-half the width or length.

Of course, shells of clear ice can be made even though the depth of the container is much greater than one-half the width or length, and such relatively deep containers can also be used for making solid cakes where it is not required that the cakes be entirely clear. The different figures illustrate two of the many shapes that may be given to the ice cakes, it being obvious that the containers may be made of various shapes between a circular and a rectangular shape within the scope of my invention.

It will be obvious to those skilled in the art that many changes may be made in the process described and in the mechanism here shown as employed in carrying out the process, all without departing from the spirit of the invention, and therefore I do not limit myself to what is shown in the drawings and described in the specification but only as required by the state of the prior art.

Having thus fully described my invention, what I claim is:

1. Drying and freezing means for wet ice fragments and the like comprising an inclined perforate cylinder, a heat-insulating casing for said cylinder and spaced therefrom, feeding means, means for rotating said cylinder on its axis, and means for supplying a current of cold gas to said cylinder.

2. Drying and freezing means for wet pieces of ice and the like comprising an inclined perforate cylinder, a heat-insulating casing for said cylinder and spaced therefrom, feeding means, means for rotating said cylinder on its axis, and means for supplying a current of cold gas to said cylinder, said current moving oppositely to the travel of the material fed to said cylinder.

3. Drying and freezing means for wet pieces of ice and the like comprising a rotary inclined conveyor of wire screen, a heat-insulating casing therefor, supporting rings encircling said conveyor and secured thereto, and bearings carried by said casing in engagement with said rings.

4. A device for drying wet ice fragments and the like comprising an inclined cylinder, heat insulating means positioned about said cylinder, feeding means at the higher end of said cylinder, means for rotating said cylinder on its axis, and means for supplying a current of chilled gas to the interior of said cylinder.

5. A device for freeze drying wet ice fragments and the like comprising a rotary inclined

cylinder, means for feeding pieces of ice to the upper end of said cylinder, and means for maintaining the interior of the cylinder at a temperature below the freezing point.

6. In a freeze-drying device for treating pieces of frozen products which have wet surfaces, the combination of a cylinder having inlet means at one end and outlet means at the other, means for rotating said cylinder to tumble the pieces about during their passage through said cylinder, and means for causing a freezing current of gas to pass through said cylinder in contact with said pieces simultaneously with the tumbling operation.

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