

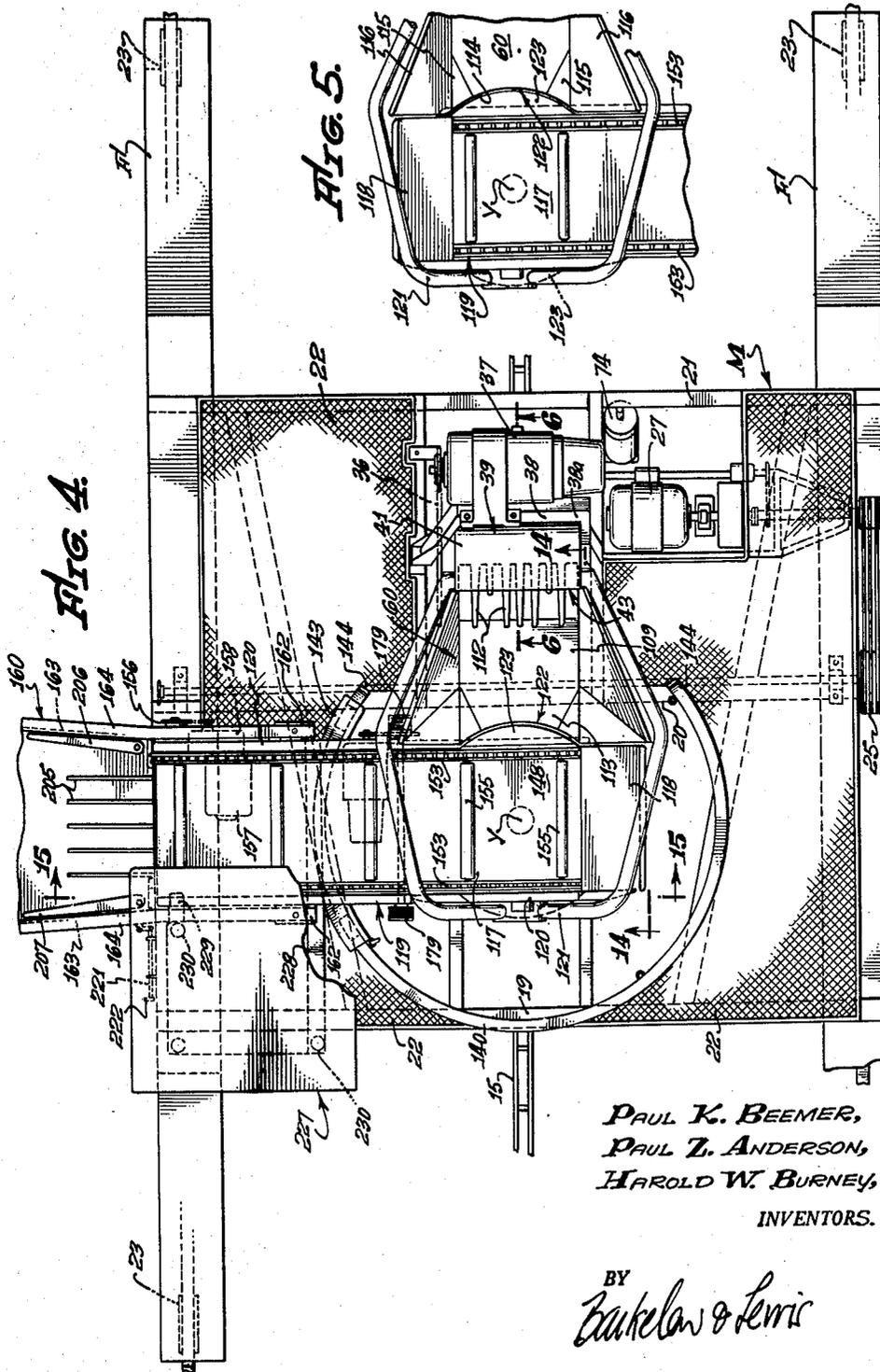
Jan. 5, 1960

P. K. BEEMER ET AL
CAR ICING MACHINE

2,919,560

Original Filed Feb. 17, 1955

8 Sheets-Sheet 2



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2,919,560

CAR ICING MACHINE

Original Filed Feb. 17, 1955

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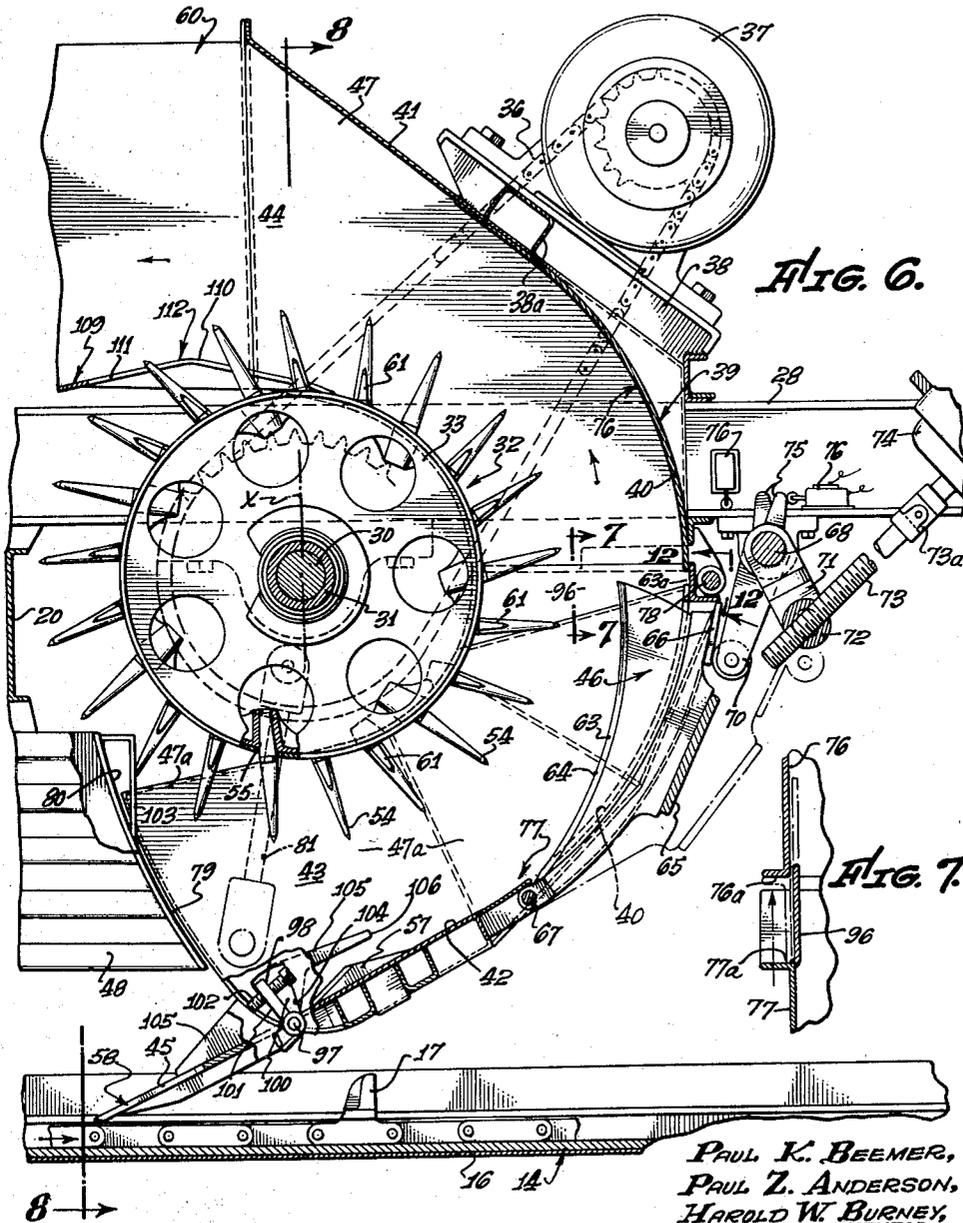


FIG. 6.

FIG. 7.

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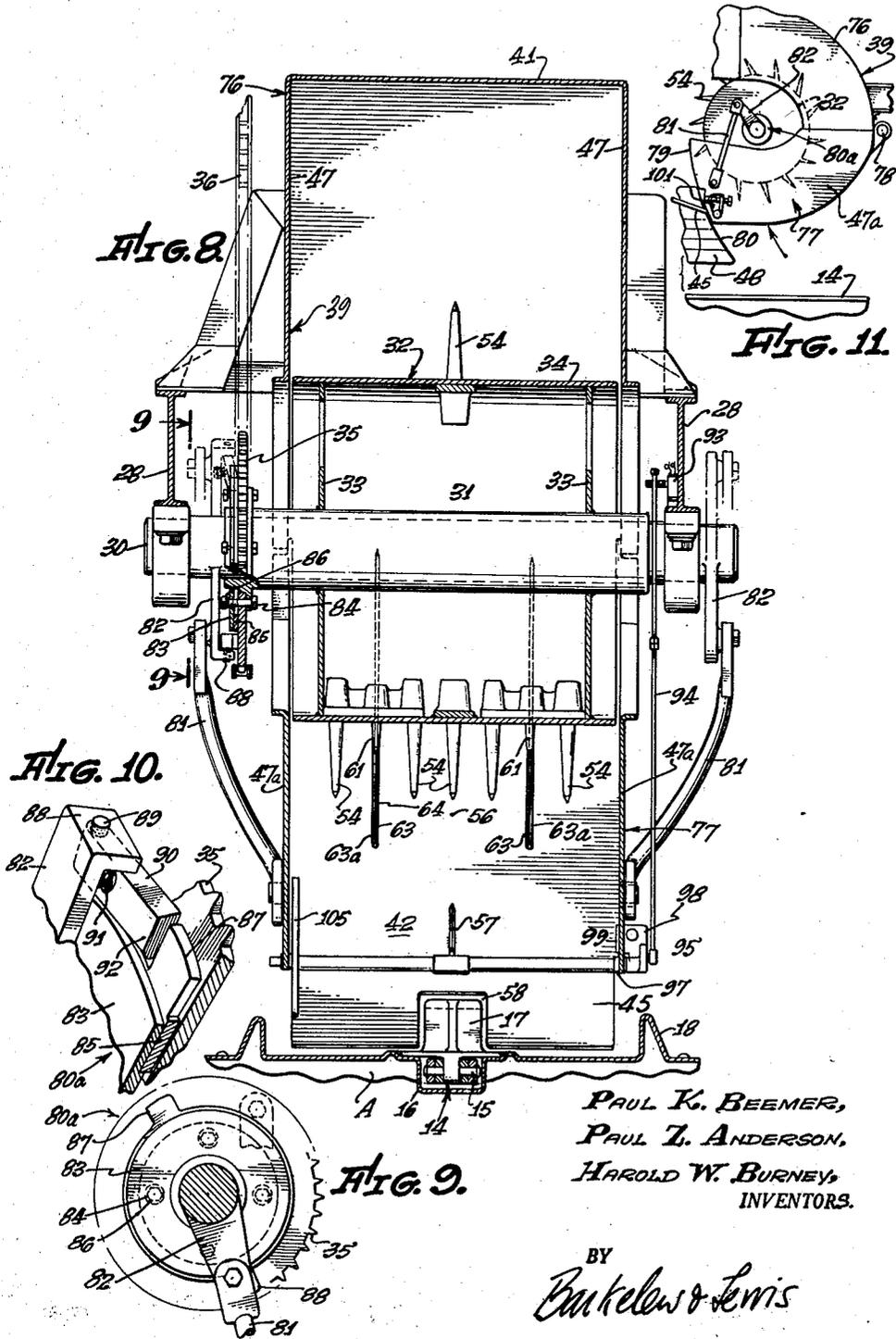
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FIG. 14.

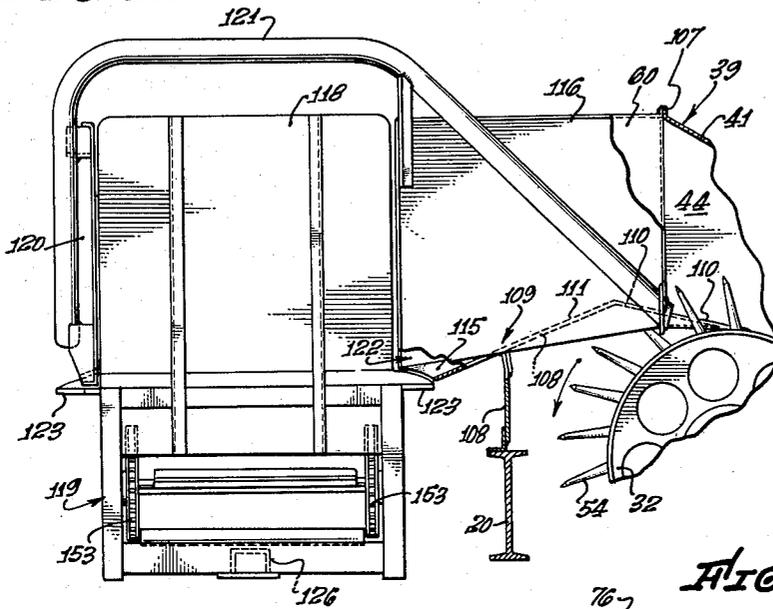


FIG. 12.

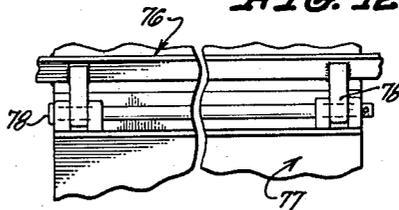


FIG. 13.

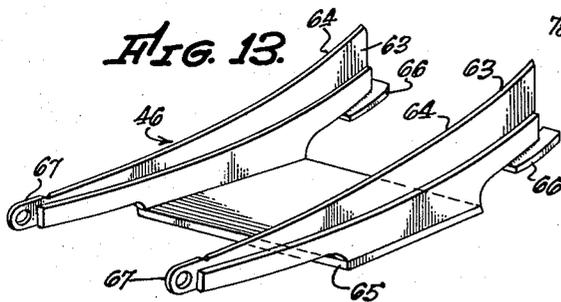


FIG. 23.

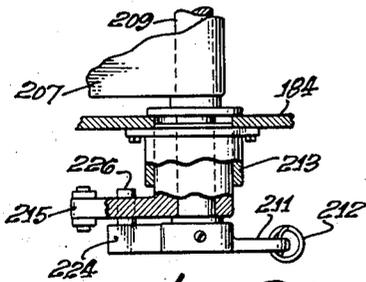
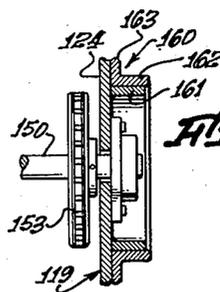


FIG. 25.

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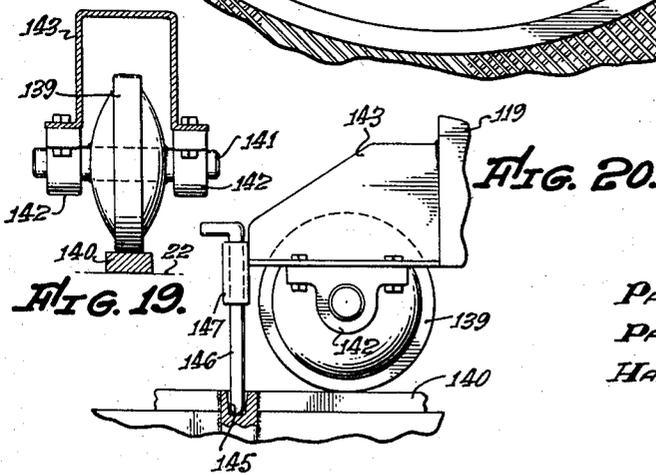
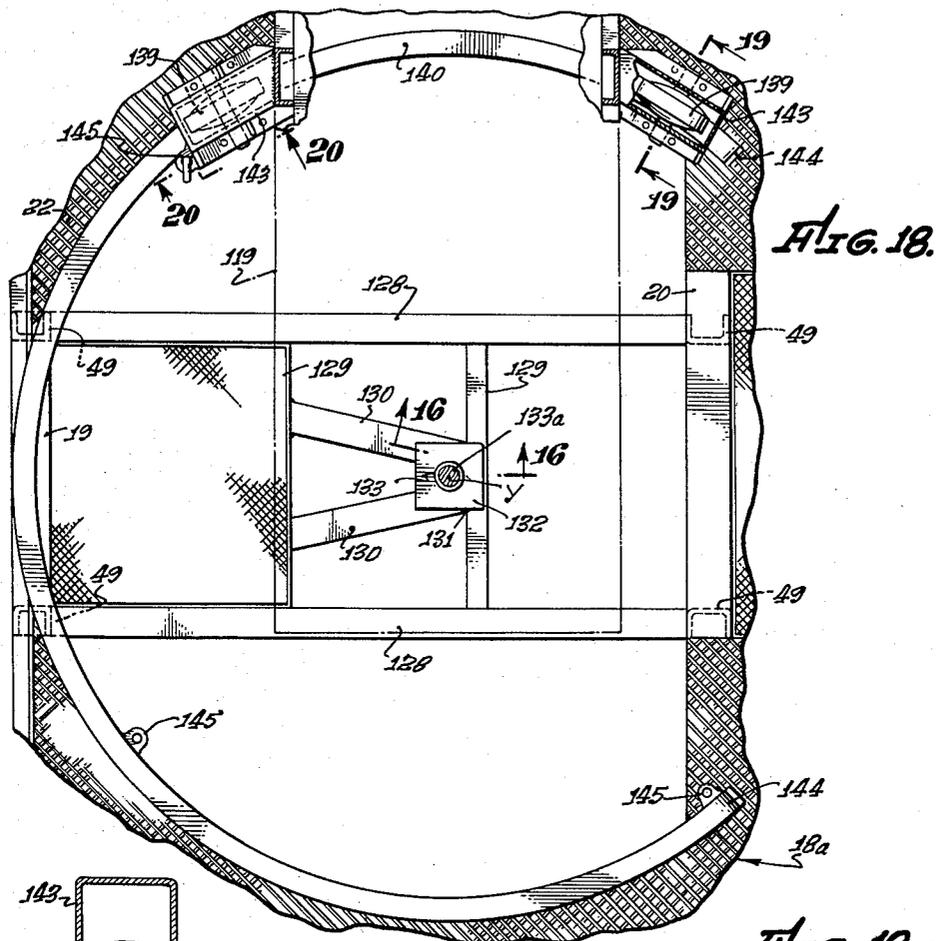


FIG. 18a.



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2,919,560

CAR ICING MACHINE

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Original application February 17, 1955, Serial No. 488,942. Divided and this application July 1, 1957, Serial No. 669,275

10 Claims. (Cl. 62—321)

This invention has to do generally with apparatus for handling ice; for instance apparatus for icing refrigerator cars or the like. Though not limited thereto, it is particularly well adapted for use in connection with an icing machine of the mobile type wherein the machine is moved along an icing platform or dock at car-top height to progressively ice the bunkers of a string of refrigerator cars spotted alongside the dock.

The ice cakes are advanced along the dock by a chain-and-lug drive, the machine, in effect, straddling the path of advancing ice and, of course, being bodily immobilized during the actual loading of the bunkers. As soon as one bunker is loaded, the machine is rapidly moved to the next adjacent empty bunker, whether it be at the other end of the same car or at the next adjacent car.

It is among the objects of our invention to provide novel means for transferring the ice from the chain drive to the intake end of the icing machine and utilizing drum-carried "picks" for both advancing the ice cakes into the breaker housing and, at least in part, for dividing the cakes into "chunk ice"—that is, into "chunks" that are each about one sixth of an original 300 lb. block. However, this statement is in no way to be considered as limiting the invention to any specific sizing of the chunks.

As a matter of fact, the invention also contemplates the use of novel means for sizing down the chunks into what is known as "coarse" ice, wherein each 50 lb. chunk is divided in two.

A particular feature of the invention involves the arrangement of a spiked drum within a vertically arranged, substantially arcuate or semicircular breaker housing. The ice is admitted at the lower end of the housing and discharged to a hopper located at the upper end of the housing, being "chunked" in its transit from lower to upper end. This results in a very simple, though exceedingly efficient, transfer and breaker assembly, having the inherent advantage of a unitary mechanism for both chucking the ice and for elevating it toward an elevation proper for chuting it into the ice bunkers.

The drum is of novel construction, the spikes or picks being arranged in such a pattern that the transfer and breaking functions are carried out with full effectiveness.

We also provide novel means for elevating the lower portion of the breaker housing when it is desired to "bypass" ice on the travelling chain or to clear platform obstructions when the machine is being shifted bodily along its track. We provide a hinged ramp on the forward edge of the housing, and also means automatically hingedly moving the ramp, during elevation of the lower part of the housing, thus reducing the extent to which the movable housing-portion has to be bodily elevated to clear the entire transfer mechanism from the ice blocks or platform dock. We have provided a novel drive connection whereby the reversible motor, which drives the spiked drum, accomplishes the raising of the lower part of the housing and the ramp to clearance positions, it merely being necessary to reverse the motor, from its normal direction of rotation, to accomplish this end.

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From the hopper at the discharge end of the breaker, the chunked ice is delivered to a conveyor which is swingable about a vertical axis so it may be shifted to ice cars at either side of the icing platform, or shifted to a median, idle position. The conveyor inclines upwardly and outwardly and delivers the ice to the upper end of a downwardly inclined chute. This chute, carried by the conveyor, is pivotally movable about a horizontal axis to change its effective discharge inclination, to adjust its delivery end to accommodate different car heights, to change its horizontal "aim" (by reason of the horizontal component of its movement) and to move it to positions of full clearance.

The chute has a central partition dividing it into two channels, there being a "down-spout" at the far end of each, whereby delivery may be made simultaneously to the two hatches at the opposite ends of each bunker. As a special feature, we have provided movable diverters whereby all the ice may be diverted to a single channel, or whereby different proportions of the total delivery may be selectively directed into the channels.

We have also devised novel down-spouts at the ends of the channels, and have taken into account the expected trajectories of the flow path from the channels into the down-spout; but these features, as well as many others, may be better discussed in connection with the following detailed description.

This application is a division of our application Serial No. 488,942, filed February 17, 1955. Said application deals with the general combination herein described, including the conveyor and chute mechanism that delivers the ice from the hopper. This divisional application has particularly to do with the ice pick-up, dividing and elevating means referred to hereinabove and described in detail in preferred form below. Reference is had to the accompanying drawings, in which:

Fig. 1 is a schematic plan view of the icing machine in the environment of an icing dock and a car being iced;

Fig. 2 is a view similar to Fig. 1, but showing the disposition of the conveyor and loading chute arranged to ice a car at the opposite side of the dock;

Fig. 3 is a perspective of the icing machine, loading dock and car, as viewed from the position of arrow 3 in Fig. 1, but with the delivery chute elevated out of operative position;

Fig. 3a is a schematic view of the truck and truck drive;

Fig. 4 is a fragmentary plan view of the icing machine, with the loading chute at the side indicated in Fig. 3;

Fig. 5 is a fragmentary plan view, showing the loading chute at the side indicated in Figs. 2 and 3;

Fig. 6 is an enlarged fragmentary section on line 6—6 of Fig. 4;

Fig. 6a is a developed view of the breaker drum, showing the pattern of the "picks";

Fig. 7 is an enlarged detail section on line 7—7 of Fig. 6;

Fig. 8 is a section on line 8—8 of Fig. 6;

Fig. 9 is a detail section on line 9—9 of Fig. 8;

Fig. 10 is a fragmentary, enlarged perspective of the clutch shown in Fig. 9;

Fig. 11 is a reduced-size, fragmentary elevation of the breaker housing, in which the movable part thereof and the attached ramp are in "clearance" positions;

Fig. 12 is a detail section on line 12—12 of Fig. 6;

Fig. 13 is a perspective view of the splitting blade assembly shown in Fig. 12;

Fig. 14 is a section on line 14—14 of Fig. 4;

Fig. 15 is a slightly enlarged section on line 15—15 of Fig. 4;

Fig. 16 is an enlarged detail section on line 16—16 of Figs. 15 and 18;

Fig. 17 is an enlarged fragmentary section on line 17—17 of Fig. 15;

Fig. 18 is an enlarged section on line 18—18 of Fig. 15;

Fig. 18a is a fragmentary detail of Fig. 18, as viewed from the position of arrow 18a on Fig. 18;

Fig. 19 is an enlarged section on line 19—19 of Fig. 18;

Fig. 20 is an enlarged section on line 20—20 of Fig. 18;

Fig. 21 is a detached, partly broken away, elevation of the chute;

Fig. 22 is a top plan view of the left hand portion of Fig. 21;

Fig. 23 is an enlarged section on line 23—23 of Fig. 21;

Fig. 24 is a section on line 24—24 of Fig. 21;

Fig. 25 is an enlarged section on line 25—25 of Fig. 24;

Fig. 26 is a section on line 26—26 of Fig. 22;

Fig. 27 is a section on line 27—27 of Fig. 22; and

Fig. 28 is a section on line 28—28 of Fig. 22.

Referring to Figs. 1, 2 and 3, we have illustrated fragmentarily an icing platform or dock A arranged alongside and paralleling a single railroad track, or between a pair of tracks, upon which are spotted refrigerator cars B and C. The cars may be considered as representing single cars or as a train of cars, dock A normally being of a length to accommodate a fairly long train. Each car has a pair of hatches 10, 11, opening to the ice bunkers provided at the opposite ends of the car, the openings being normally closed by lids 12.

Dock A is elevated to be approximately level with the tops of the cars and is provided with rails 13 near its outer edges. Midway between rails 13 is the conveyor 14 comprising a travelling chain 15 running through a channel 16 recessed into dock A (Figs. 6 and 8), the chain carrying the lugs 17 which project above the dock to engage and propel ice cakes, such as D, along the center of the dock and in the direction indicated by the arrows. The cakes are normally, though not necessarily, of the usual 300 lb. variety, and guide flanges 18 (Figs. 1 and 8) secured to the dock may be provided to hold them against lateral shift or rotation with respect to the chain, though this provision is not always essential, especially since most docks have metal runners extending along both sides of the chain and the tendency of these runners to slightly melt the overlying ice forms grooves in the ice which guide the cakes sufficiently well.

The icing machine, proper, and as generally indicated at E, includes a pair of trucks F riding, one each, on rails 13, the trucks being connected by I-beams 19, 20 and 21 of main frame M. A platform 22 overlies and is welded to the I-beams, the platform being omitted in the areas clearly indicated in Fig. 4. The trucks are schematically indicated in Fig. 3a. They are each shown as including four traction wheels, the two end wheels 23 being flanged, and the intermediate wheels 24 being unflanged. The wheels are sprocket-and-chain connected, as schematically illustrated at 25, taking their drive from a countershaft 26 which, in turn, is driven from reversible motor 27 on frame M. Thus, by control of motor 27, the icer E may be driven to and fro over rails 13 to line up the delivery ends of the icer with hatches 10, 11 of the cars, as will later appear.

Longitudinal and horizontally spaced I-beams 28 extend between and are secured to I-beams 20, 21, and they carry depending bearings 29 which support shaft 30. Journalled on this shaft is the central sleeve or through-hub 31 of drum 32, the disks 33 (Figs. 8 and 9) connecting the sleeve 31 and the annular shell 34 of the drum and maintaining them in concentric relation. Secured to drum sleeve 31 is a sprocket 35 which is driven by chain 36 from the reversible motor 37. More will be said later about the drive from motor 37, but for the time being it will suffice to say that during the ice breaking operation of the machine, the motor will drive drum 32 in a counter-

clockwise direction as viewed in Fig. 6. Motor 37 is supported on an inclined base 38 secured to I-beams 28.

The ice breaker housing, generally indicated at 39, may be described generally as a vertically arranged, generally arcuate and approximately semi-circular member of channel cross section. The central portion 40 is concentric with drum 32 while the upper and lower portions 41 and 42, respectively, are tangential, giving the effect, with the drum, of a convergent mouth 43 at bottom of the housing, and a divergent mouth 44 at the upper end thereof. These mouths lie approximately in the vertical axial plane X of the drum, or a little to the left thereof, as in Fig. 6.

Hingedly connected to the lowermost end of the lower housing portion 42 is the ramp 45. We will later fully discuss the ramp mounting and actuation, but for the time being we will regard it as though it were held in the operative position of Fig. 6, that is, coplanar with tangential portion 42. Likewise we will, for the present, disregard the fact that the lower section of housing 40 is selectively movable with respect to the upper half thereof, and we will also assume that the ice-dividing unit generally indicated at 46 is in its inactive position, indicated by dotted lines in Fig. 6. However, it is to be noted that the housing includes side walls 47 and that these walls approximately line up with the vertical inlet guide walls 48, preferably of corrugated metal, which are supported by structure 49 depending from I-beams 19 and 20 (Fig. 15). The entrance mouth 50 (Fig. 3) of the passageway 51 which is defined by walls 48, is preferably flaring, as at 52, so, as the ice cakes travel toward the machine, they are guided smoothly into that passageway, even if they are not quite centered on the conveyor chain.

Now referring particularly to Figs. 6 and 6a, we have illustrated preferred, but not limitative, forms of picks and pick patterns. The relatively large picks 54, removably held in drum sockets 55 as by taper fit, are of a length to extend almost half way to the arcuate central portion 40 of housing 39, and they have a slight forward rake so they are approximately normal to the lower, tangential portion 42 of the housing. There is a center row 56 of closely spaced picks which is in vertical alignment with a scoring spur 57 (Figs. 6 and 9) which upstands from the leading edge of housing portion 42. There are also angularly spaced rows 59 of picks 54, the spacing being such that they will divide a normal ice cake into three substantially equal parts. As the chain 14 drives an ice cake up the ramp 45, which is notched at 58 to avoid interference with chain lugs 17, picks 54 take hold of the cake and move it into and through housing 39. But at the same time they pierce the ice to increasing depth as the cake travels up tangent 42, pressing the cake against the reaction wall represented by housing 39 and, before the ice has been delivered at mouth 44, the center row of picks, acting in conjunction with spur 57, divides the cake in two with a longitudinal cut, and rows 59 transversely divide each half-cake into three substantially equal parts. Of course there will be some smaller fragments, but, in the main, the ice will have been broken into "chunk" size, namely, into 50 lb. chunks. However, it will be understood that the specified chunk size and pick pattern are not at all limitative on the broader aspects of the invention.

The drum picks continue to act as transfer members, for they carry the chunks up and over the drum and through the divergent mouth 44 into hopper chute 60, of which more will be said later.

It is often desirable to further divide the chunks so as to produce what is known as "coarse" ice, namely, chunks of ice weighing about 25 lbs. This effect is gained by thrusting the dividing unit 46 into the full line position of Fig. 6 and utilizing the relatively short picks 61 on drum 32. These short picks may be carried in the drum at all times, but they have relatively little effect when the unit 46 is retracted, for they are so short that

they do not always engage an ice cake as it enters housing 39. Picks 61 have about the same rake as picks 54, and they are arranged in rows 62 which are substantially in line with the spaced blades 63 (Figs. 6 and 13) of unit 46.

Unit 46 comprises the two scimitar-shaped splitting blades 63, each having a curved, sharpened edge 64. The blades extend through slots 63a (Fig. 8) in housing 39 and are connected by a bridging plate 65, external of the housing, at their rearward edges, and pressure pads 66 are provided at the rearward sides of their swinging ends. (See Fig. 13.) The blades are pivotally connected at 67 to housing 39, the point of connection being approximately at the junction of central and lower housing portions 40 and 42. A shaft 68 is journaled beneath beam 28 and carries a pair of crank arms provided with rollers at their swinging ends, which rollers engage pads 66. Only one such arm 69 with its roller 70 is shown, but the location of the other set will be immediately apparent.

Shaft 68 carries another crank arm 71, and this arm supports a swivel nut 72, common to such a type of connection, which threadably takes a screw shaft 73, shaft 73 being driven through a universal joint 73a by reversible motor 74.

When the unit 46 is in the full line position of Fig. 6, the shaft 73, nut 72, crank 71 and shaft 68 hold arms 70 in such positions that they back up unit 46 in a manner to prevent clockwise swinging of that unit, and thus solidly hold blades 63 in their projected or operative positions. The blades then curve in towards picks 61 in a convergent manner and the ice, as chunked by picks 54, is further broken up by blades 63 and picks 61 to yield "coarse" ice.

Upon energizing motor 74 in a manner to thread nut 72 back on screw 73, arms 70 are swung in a counter-clockwise direction, as viewed in Fig. 6, and unit 46 will either follow back or be pushed back by the advancing ice, until it occupies the dotted line or inoperative position of Fig. 6. Shaft 68 carries tappets 75 which are adapted to cooperate with limit switches 76 interposed in the motor circuit (not indicated) in order that the motor may be automatically de-energized when unit 46 reaches either of its limits of movement.

Since it is occasionally desirable to by-pass ice cakes—that is, to let the ice continue to travel uninterrupted beneath the machine without being scooped up—and since there are other reasons for sometimes clearing the scoop from the dock, we have provided novel means for elevating the ramp 45 and a portion of housing 39. To this end, housing 39 is sectionalized, the upper half or section 76 being stationarily mounted on member 28 or, in effect on main frame M, while the lower section or half 77 is pivotally connected to the upper section at 78 (Figs. 6, 11 and 12). The side wall members 47a of section 77 have arcuate leading edges 79, with their centers of curvature at pivot 78, and guide walls 48 have complementary edges 80.

Housing section 77 is held from dropping below the position of Fig. 6 by links 81 (Figs. 6, 8 and 9) which depend from cranks 82, the latter being non-rotatively connected to shaft 30. The ring plate 83 of clutch 80a, is axially spaced from sprocket 35 but is drivingly connected thereto by bolts 84, there being a concentric friction ring 85 interposed between the two. Plate 83 is spring-loaded by virtue of springs 86 which surround bolts 84 and press the ring plate towards the sprocket in a manner to frictionally drivingly engage the sprocket with ring 85, regardless of the direction in which sleeve 31 is rotating.

Friction ring 85 has a radial lug 87 which extends outwardly beyond the periphery of ring 83. Crank 82 has an returned end 88 which pivotally supports, at 89, a latch bar 90. Spring 91 normally yieldingly holds the latch so its swinging end 92 lies in the rotative path of lug 87.

When motor 37 is rotating drum 32 in an operative or counter-clockwise direction as viewed in Fig. 6 (which means that sprocket 35 is rotating in a clockwise direction as viewed in Figs. 9 and 10) each time lug 87 strikes latch bar 90 it cams said bar out of its path. However, if the direction of motor drive is reversed, lug 87 will strike the end of bar 90 and will drive crank 82 and shaft 30 in a counter-clockwise direction, as viewed in Fig. 9, thus pulling up on both the links 81 and elevating the lower housing section 77 to the position of Fig. 11, where it will clear any ice cakes being transported by the dock chain. A limit switch 93 in the circuit (not shown) to motor 37 is actuated by rod 94 secured to section 77 at 95.

When the direction of the motor is again reversed, ring 85 and its lug 87 will rotate in a clockwise direction, as viewed in Figs. 9 and 10 (but counter-clockwise as viewed in Fig. 11) whereupon the section 77 is free to be gravitationally returned to operative position. To accommodate the relative movement between sections 77 and 76, the opposed edges 77a and 76a of the side walls of those sections are, in some positions of the sections, spaced apart as shown in Fig. 7, but the gap between them is closed by the plates 96 secured to the inner faces of the lower section and slidingly engaging the inner faces of the upper section.

We have devised means whereby the movement of ramp 45 is compounded as section 77 is elevated to a position of clearance, thus materially lessening the overall extent to which section 77 has to be bodily moved in order to secure full clearance of the scoop. Ramp 45 is pivotally connected to the leading edge of section 77 (or tangential portion 42) by hinge pin 97. This pin, which rotates with the ramp, carries at one end a crank arm 98 (Figs. 6 and 8) which is provided with a lateral tongue 99 extending through the sectorial opening 100 in a side wall 47. The engagement of tongue 99 with the forward defining wall 101 of that opening, establishes the down or operative position of the ramp.

As section 77 is moved up towards clearance position, the ramp, of course, moves bodily upwardly with it, the co-planar relation of the ramp and tangential extent 42 remaining until the adjustable bolt 102, threaded through crank 98, strikes cam 103 on guide member 48, whereupon further upward movement of section 77 gives independent movement to ramp 45 and causes it rapidly to move to the position of full clearance indicated in Fig. 11. The rearward defining wall 104 of opening 100 coacts with tongue 99 to limit the extent to which ramp 45 may be folded, but to insure that this limit may not be exceeded even under extreme conditions, we prefer to provide a positive stop 105 at the other side of the ramp, this stop being in the nature of a plate welded to the ramp and having a relatively long tongue 106 which will engage housing wall 42 at a point well spaced from pivot 97 when the ramp is folded to its full intended extent.

The previously mentioned hopper chute 60 is secured to housing 39 at 107 (Fig. 14) and is further supported by member 108 which extends from frame beam 20. The bottom 109 of the hopper has portions 110 and 111 which incline oppositely and downwardly the portion 110 extending through housing mouth 44 into close proximity with the drum, reaching a little to the right, as viewed in Fig. 6, of the central axial plane X of drum. Bottom 109 is notched at 112 to allow the passage of picks 54 and 61, which latter drive the ice chunks up the incline 110, whence they slide down the incline 111. The left hand end of bottom 109 is cut arcuately, as at 114, the arc being struck about the axis Y (to be later located) as a center. Preferably, the opposite sides of the free end of bottom 109 are bent up slightly as at 115 (Figs. 5 and 14) to meet the side walls 116 of the hopper chute 60, said side walls diverging, as viewed in plan, from mouth 43 and inclining upwardly and outwardly from bottom 109.

The hopper, proper, into which chute 60 dumps, is indicated at 117. As will later appear, the end wall 118 of the hopper is carried by the conveyor structure 119, which latter is rotatable about axis Y. On the other hand, hopper wall 120 is stationarily supported from housing 39 and the casing of chute 60 by an overhead yoke 121, which has sufficient resiliency to be an efficient impact-taker. Thus, whether the conveyor 119 be in the position of Fig. 4 or of Fig. 5, member 120 serves as a hopper wall positioned in spaced opposition to the discharge mouth 122 of chute 60; conveyor 119 including arcuate lips or aprons 123, one or the other of which lips will complement the arcuate end 114 of bottom 109, depending upon the direction of conveyor extension. This capacity of the conveyor to be swung through 180° and to be fully operative in either of its extreme positions, permits the icing of cars on either side of dock A.

Conveyor 119 inclines upwardly and outwardly from hopper 117 and comprises an elongated structure having side walls 124 tied together by cross bars 125 and a cross beam 126, the latter member supporting the pivotal connection 127 whereby the conveyor is pivotally mounted on the main frame M for movement about vertical axis Y. We will describe this mounting before proceeding further with a description of the conveyor. We have previously mentioned members 49 which are connected to and depend from cross beams 19, 20 and 21. Connected to these members 49 are horizontal members 128 extending longitudinally of the machine and, in turn, connected by cross members 129. Angularly extending members 130 connect members 129 and, at their juncture 131 (Figs. 16 and 18) there are welded top and bottom plates 132 which support a sleeve 133. The sleeve, in turn, supports a king-pin 134a and a self-aligning bearing 134, which is held by nuts 135 to member 126, the latter, as has been said, being a part of conveyor structure 119. The king-pin head 137 and nut 133 hold the pivotal connection in assembly. It will be apparent that connection 127 mounts the conveyor for horizontal swinging movement about axis Y and with respect to main frame M.

In order to support the outboard end of the conveyor 119 in the movement of the latter about axis Y, we provide that conveyor with wheels 139 which are adapted to roll on arcuate track 140 secured on platform 22 or, more broadly, on frame M. The wheel axles 141 are supported by bearings 142 which depend from housings 143, which, in turn, are welded to the frame of conveyor 119. While it is apparent that the conveyor may be swung about axis Y by applying any suitable drive to one of the wheels 139, such an expedient is not fundamentally necessary since the conveyor may be swung about by hand when the relatively infrequent occasions arise for so moving it. The ends 144 of track 140 are arcuately upturned (Fig. 19a) to form safety stops limiting the extent of conveyor-swing, though, when the conveyor is in either of the active positions of Figs. 4 or 5, the wheels are still a little short of reaching the stops. Any suitable indexing means may be provided for accurately holding the conveyor against swinging movement when the conveyor is in either of its active positions or when it is swung to a median position. For instance, suitable sockets 145 (Figs. 18 and 20) may be provided alongside track 140, the sockets being selectively enterable by a retractable locking pin 146 which is slidable through a sleeve 147 carried by one of the housings 143.

Extending from side wall to side wall of the conveyor structure 119, is a bottom 148, said bottom projecting below the downwardly opening mouth 149 of hopper 120 and extending forwardly to the outboard end of the conveyor. The side walls also support shafts 150 and 151, the latter being adjustable longitudinally of the conveyor, which shafts carry sprockets 152 over which the conveyor chains 153 are trained, the upper courses of the chains being above bottom 148. Said upper courses ride on tracks 154 which extend along bottom 148 and cross bars,

in the form of rollers 155 connected at their opposite ends to the chains, are thus held vertically spaced above the bottom 148 (Fig. 17). Shaft 151 carries an exterior sprocket 156 which is driven by motor 157 through reduction gear 158 and chain 159 (Fig. 15).

It will be apparent that by driving conveyor chains 153, ice chunks within hopper 120 will be carried upwardly and outwardly through conveyor 119, whence they will be dumped into delivery chute 160 which, in operative position, inclines downwardly, as clearly indicated in Fig. 21. However, it is desirable that one be able to raise and lower the free end of the chute to meet various operating conditions, and we will therefore describe such means before turning to the details of the chute. For instance, in Fig. 1, chute 160 is lifted to about the position it will occupy when it is to be swung from one side of the dock to the other.

Chute 160 is mounted for pivotal movement about the horizontal axis represented by shaft 150 (Figs. 15, 21 and 23). The mounting is by way of rings 161 secured to the outer faces of conveyor side walls 124, said rings being centered with respect to shaft 150. Having rotational bearing on these circular bands 161 are rings 162 which are secured to the side walls 163 of chute 160. To these side walls are also secured arms 164 which extend upwardly and toward hopper 120. The arms at opposite sides of the chute are connected by a cross shaft 165 which supports pulleys 166, the latter being positioned at the outer sides of the arms. Cables 167 are dead-ended on the conveyor at 178, trained over pulleys 166, and then brought down to reels or drums 179 mounted on conveyor 119 and driven by a reversible motor 180.

It will be obvious that by operating the reels to take up or pay out the cables 167, arms 164 will be acted upon in a manner to swing the free end of the chute upwardly or to allow it to descend.

Referring particularly to Figs. 21 to 28, it will be seen that side walls 163 diverge as they leave the intake end of the chute, such divergent portions being indicated at 181 and 182, there being a substantially central divider 183, having a pointed leading end 183a, rising from the floor 184 of the common entrance mouth 184a, to divide the chute into two passageways 185 and 186. Channel 186 leads to outlet 187, represented by the entrance mouth of down-spout 188, of which more will be said later.

Channel 185 curves around, as viewed in plan (see Fig. 22) and leads to outlet 189, represented by the entrance mouth of down-spout 190, the curvature of the channel being such that the line 191, common to the centers of outlets 187 and 189, is approximately parallel to the longitudinal axis of conveyor 119, so, when that axis is approximately normal to the longitudinal axis of frame M, the two outlets will register with two hatches such as 10 and 11.

The floor 192 of channel 186 curves rather sharply downwardly, following the trajectory of the ice-chunk flow, as determined from the inclination and length of the main portion of floor 192; and an inclined plate 194, substantially parallel to floor section 192, prevents any ice from over-running outlet 187. The floor of channel 185 is banked as at 194 and 195 (Fig. 27) in the zone 196, and is banked at 197 (Fig. 28) in the adjacent zone 198. At its outer end, the floor of channel 185 curves downwardly, as at 199, following the expected trajectory of the ice-chunk flow. The inclined end wall 200 prevents ice from over-running outlet 189.

The two down-spouts 188 and 190 are similar and therefore we will describe only one in detail. They may be individually described generally as a flexible, downwardly tapering or conical spout which converges the flowing ice into a relatively small-diameter, vertical stream. Each spout is made up of circumferentially overlapping strips of rubber or the like, the upper ends

of the segments being secured to the underside of the chute by ring 202. A floating girth ring 203, made up of a continuous coil spring, is suspended from ring 202 by flexible hangers in the form of chains 204. Ring 203 normally gathers and retains the strips 201 in the general conical configuration illustrated in Fig. 21, the spout preferably belling somewhat above ring 203, but if an unduly large chunk or unduly large quantities of ice unavoidably reach the down-spout, spring ring 203 will yield to allow ice-passage without unduly choking or rupturing the down-spout. The flexibility of the down-spout allows it to be drawn over hatch lids or other obstruction, without danger of harming either the down-spout or the obstruction.

As the ice is delivered from conveyer 119 to chute 160, it falls onto the ramps 205 which are made up of horizontally spaced, wedge shaped plates arranged on edge and welded to floor 184.

In usual operation, the ice slides down ramps 205 and floor 184 through mouth 184a, then dividing into two approximately equal streams and passing thence through channels 185 and 186 and their associated down-spouts. However, it is sometimes necessary or desirable that one or the other of the channels be closed off, either partly or fully, in order to meet particular delivery requirements. To accomplish this end, we provide diverter blades or shutters 206 (for channel 185) and 207 (for channel 186) as shown particularly in Figs. 22, 24 and 25. The shutters 206 and 207 are carried on vertical shafts 208 and 209, respectively, said shafts being, in effect, journaled on side walls 163. It will be noted that members 206 and 207 are arranged with their swinging ends pointing downstream.

Shutter shafts 208 and 209 carry crank arms 210 and 211, respectively, which are connected by coil spring 212, the latter serving normally to yieldingly hold both of said shutters in their full open position, as shown in full lines in Fig. 22. Actually shafts 208 and 209 are journaled in the manner shown in Fig. 25. That is, bearing sleeves 213 depend from chute floor 184 and rotatively take the hubs of cranks 214 and 215, one of which hubs is shown at 216. Shafts 208 and 209 are, in turn, journaled within the bores of the cranks and sleeves. A link 217 connects the swinging ends of cranks 214 and 215, and crank 215 carries an offset crank arm 218 to which a pull rod 219 is applied. Rod 219 is actuated by a crank 220 carried on shaft 221, a control lever 222 on said shaft serving to rock the shaft and thereby rotate crank 215 (and hence, through link 217, also to rotate crank 214) in one direction or the other.

Applied to shafts 208 and 209 are cranks 223 and 224, respectively, they having upstanding lugs 225 and 226, respectively, which lie in the rotative paths of associated cranks 214 and 215. If rod 219 be pulled to the right in Fig. 24, cranks 214 and 215 are rotated in a counter-clockwise direction. This has no effect on crank 224 and hence shutter 207 is not moved. However, crank 214 will engage lug 225 and will swing the associated crank 223 in a counter-clockwise direction, carrying with it the shaft 208 and thus swinging shutter 206 towards or to the dotted line position of Fig. 22, this movement being accomplished against the resistance of spring 212.

On the other hand, if rod 219 be pushed to the left in Fig. 24 the rotation of crank arm 225 will have no effect on the crank 223 or shutter 206, while arm 215 will engage lug 226 and swing crank 224 in a clockwise direction, thus rotating shaft 209 and shutter 207 towards or to the dotted line position of Fig. 22, this shutter movement being against the resistance of spring 212.

To accommodate the operator of the machine, we provide a cab 227 which is carried by the conveyer 119 and moves bodily therewith as it is rotated to and from the positions of Figs. 4 and 5. For instance, the platform may be secured to the beam 228, which latter is carried by the conveyer, and, at another point, may be

suspended by a hook 229 carried by one of the platform posts 239 and engaged with conveyer 119, as shown in Figs. 4 and 15. The cab contains the controls for the various motors and actuating devices heretofore mentioned; the trolley 231, carried on frame M, serving to supply the electric current necessary to the operation of said motors.

From the above, it is believed that it will be apparent that we have devised an icing machine which is light, compact, efficient, and extremely flexible as to control—a machine which allows the very rapid icing of long strings of refrigerator cars, be they at one or the other side of the loading dock. However, it will be understood that various changes in design, structure and arrangement may be made without departing from the spirit and scope of the appended claims.

We claim:

1. In apparatus for supplying ice or the like to refrigerator cars or the like, the combination with an elongate loading dock, of a longitudinally moving pusher conveyor on the dock, longitudinal rails on the dock, a carriage structure movable longitudinally on the rails and straddling the conveyor, a rotatable breaker drum mounted on the carriage on a horizontal axis and provided with projecting picks, a substantially semi-circular housing spacedly surrounding one lateral side of the drum, said housing having a lower intake end below the drum and an upper discharge end above the drum, the lower end of the housing peripheral wall extending substantially to the level of the conveyor to take ice or the like pushed onto it by the conveyor, and means for rotating the drum in a direction to move its picks upwardly in the housing.

2. The combination defined in claim 1 and in which the lower end of the housing peripheral wall has an extension sloping downwardly to substantially the level of the conveyor.

3. The combination defined in claim 2 and in which at least the lower part of the housing is movable upwardly to be raised to an elevation above ice or the like on the conveyor.

4. The combination defined in claim 3, in which the housing is formed of upper and lower parts, and in which the lower part is upwardly movable.

5. The combination defined in claim 2, including reversible driving means for rotating the drum, and means, actuated by virtue of reversed movement of the driving means, to raise the movable part of the housing.

6. The combination defined in claim 3, including reversible driving means for rotating the drum, and means, actuated by virtue of reversed movement of the driving means, to raise the movable part of the housing.

7. The combination defined in claim 1, in which the lower end of the housing peripheral wall has an extension sloping downwardly to substantially the level of the conveyor, in which the housing is formed of upper and lower parts, the lower part being pivotally mounted to swing upwardly with relation to the upper part, and including means for swinging the lower part upwardly.

8. The combination defined in claim 7 and in which said sloping extension includes a pivoted extension ramp, and including means for swinging the ramp upwardly with relation to said extension as the lower part of the housing is swung upwardly.

9. A breaking and elevating unit for the purposes described, in combination a frame, a rotatable breaker drum mounted on the frame on a horizontal axis and provided with projecting picks, a substantially semi-circular housing spacedly surrounding one lateral side of the drum, said housing having a lower intake end below the drum and an upper discharge end above the drum, said housing being formed of upper and lower parts and said lower part being upwardly movable with relation to the upper part.

10. The combination defined in claim 9, and including

reversible driving means for the drum, and means, actuated by operation of the driving means selectively in one direction, to move the lower housing part upwardly.

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