Jan. 5, 1960 P. K. BEEMER ET AL 2,919,560

CAR ICING MACHINE

Original Filed Feb. 17, 1955 8 Sheets-Sheet 1

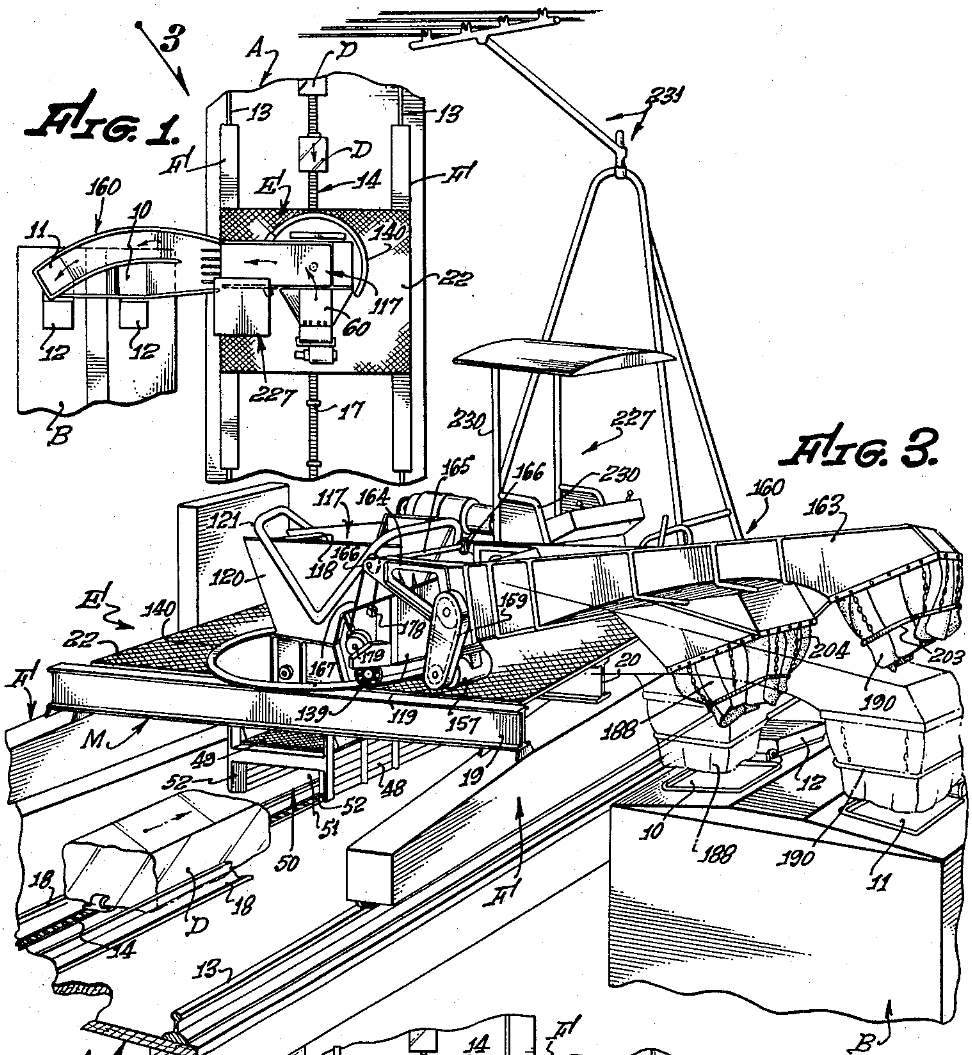

FIG. 1. FIG. 3.

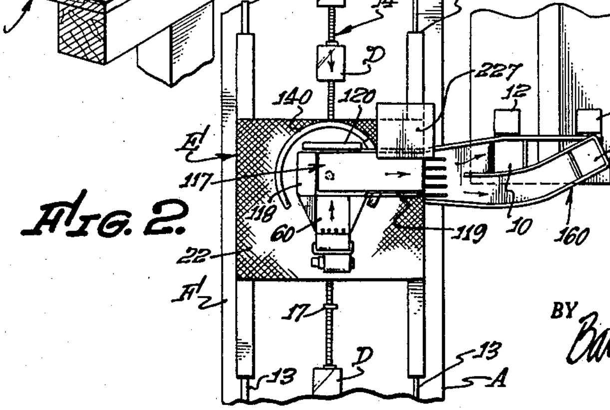

FIG. 2.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY Barkelew & Lewis

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CAR ICING MACHINE

Original Filed Feb. 17, 1955 8 Sheets-Sheet 2

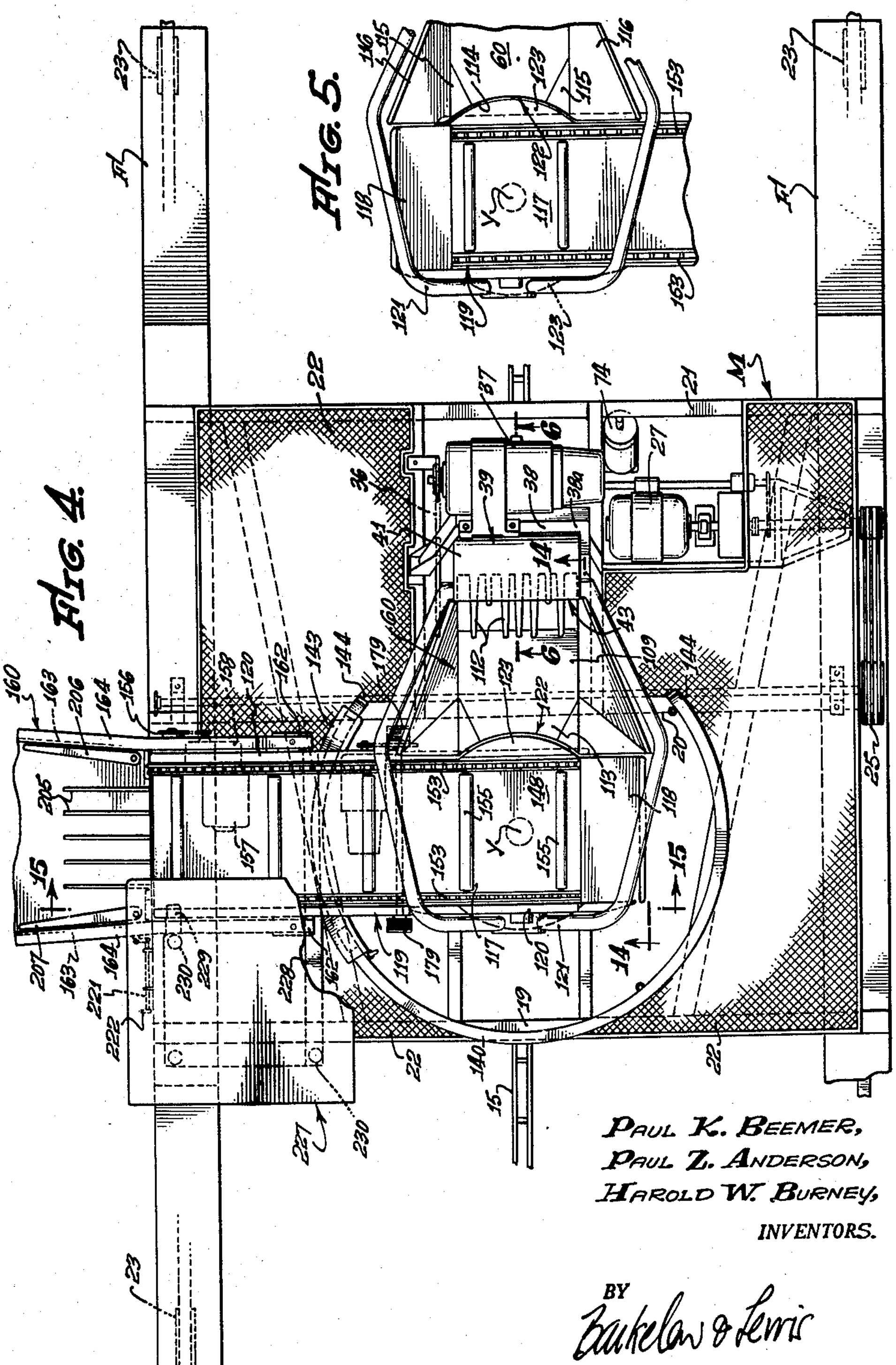

FIG. 4.

FIG. 5.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

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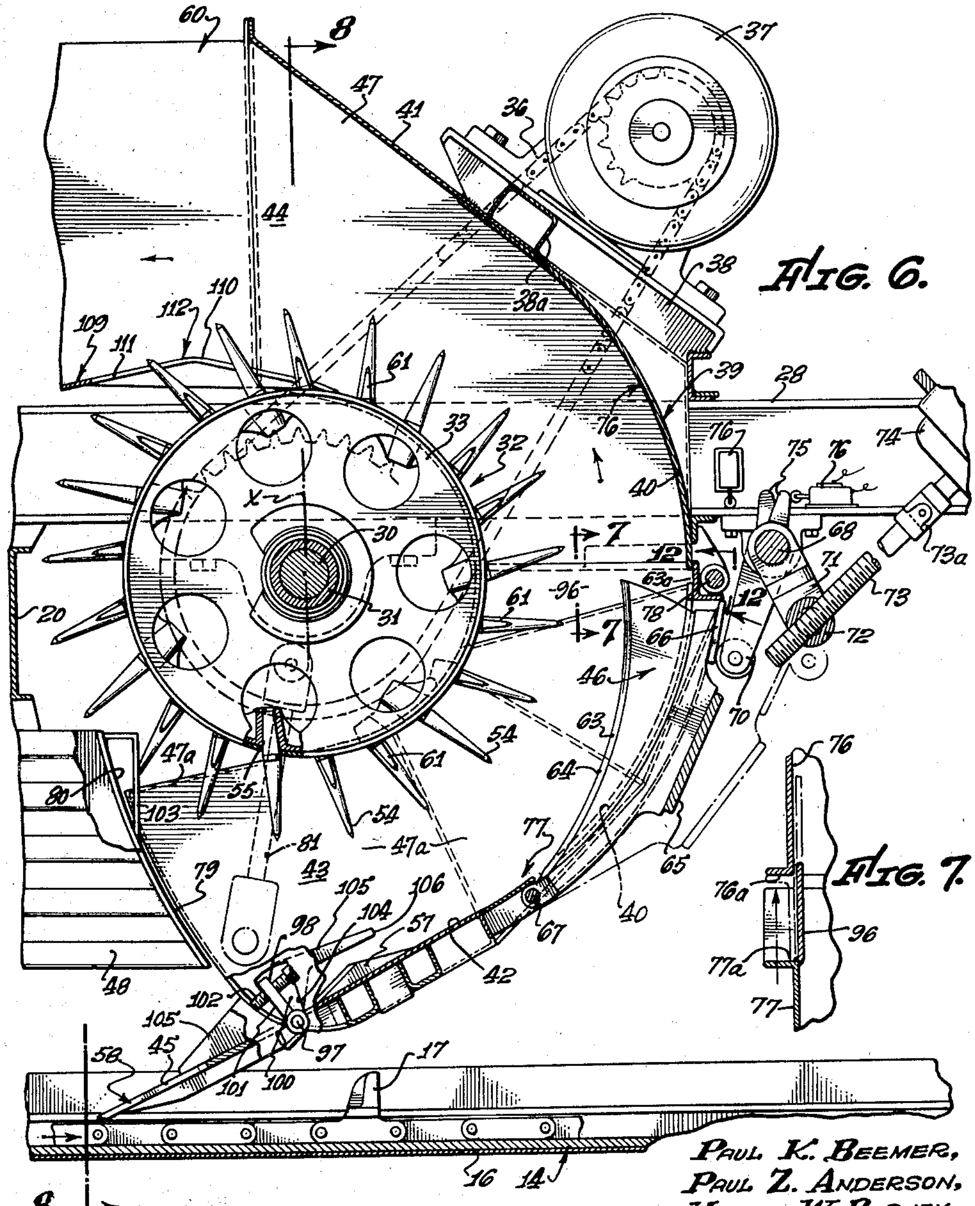

FIG. 6.

FIG. 7.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

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Bakelaw & Lewis

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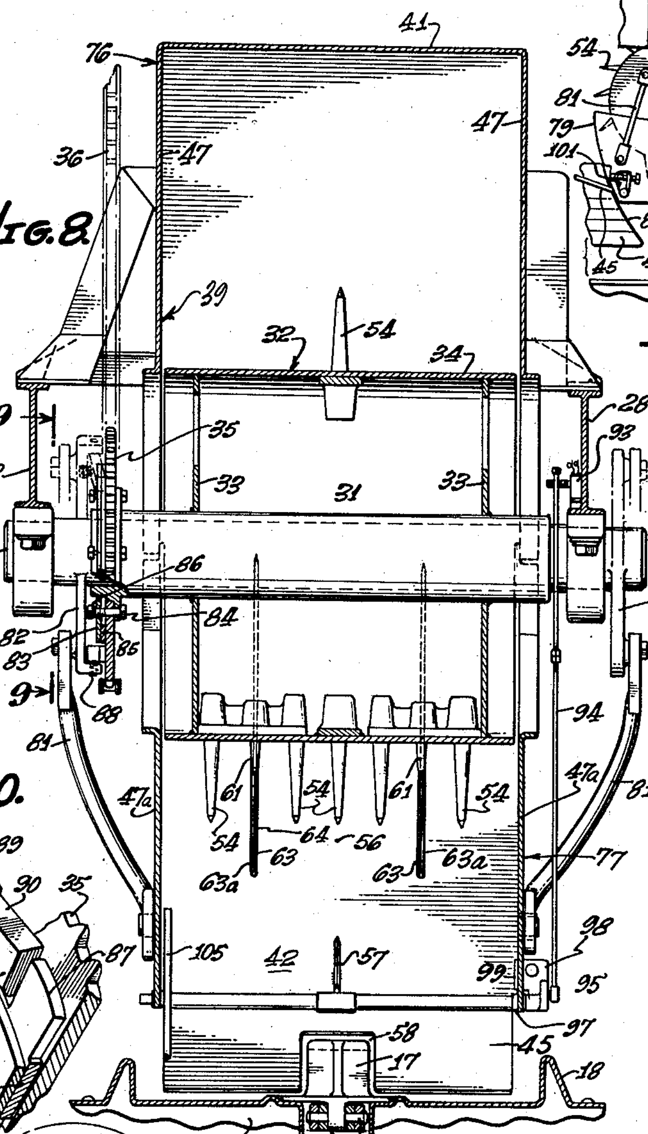
FIG. 8.



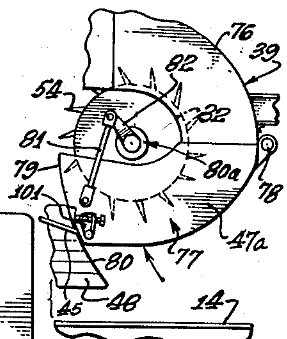
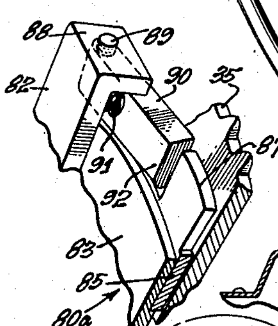


FIG. 11.

FIG. 10.



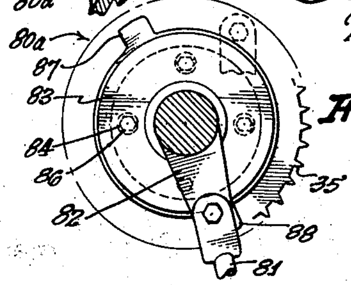


FIG. 9.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY
Berkelew & Lewis

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FIG. 14.

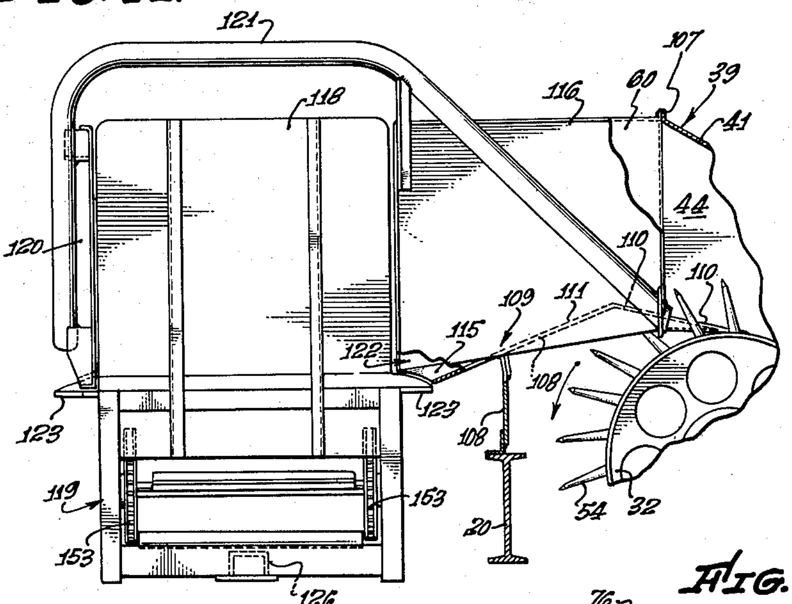


FIG. 12.

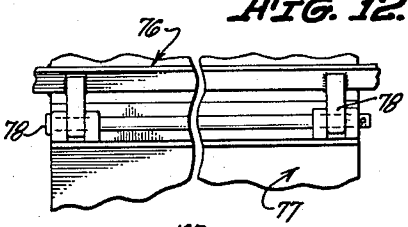
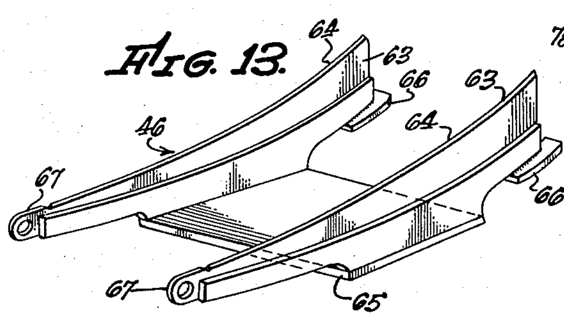


FIG. 13.



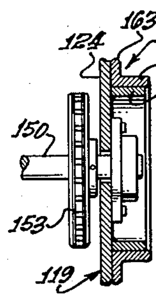


FIG. 23.

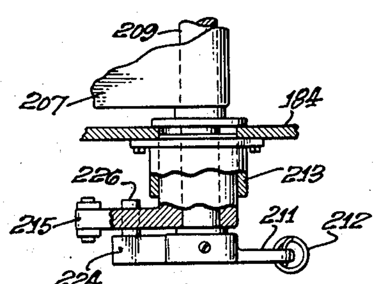


FIG. 25.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY Berkelew & Lewis

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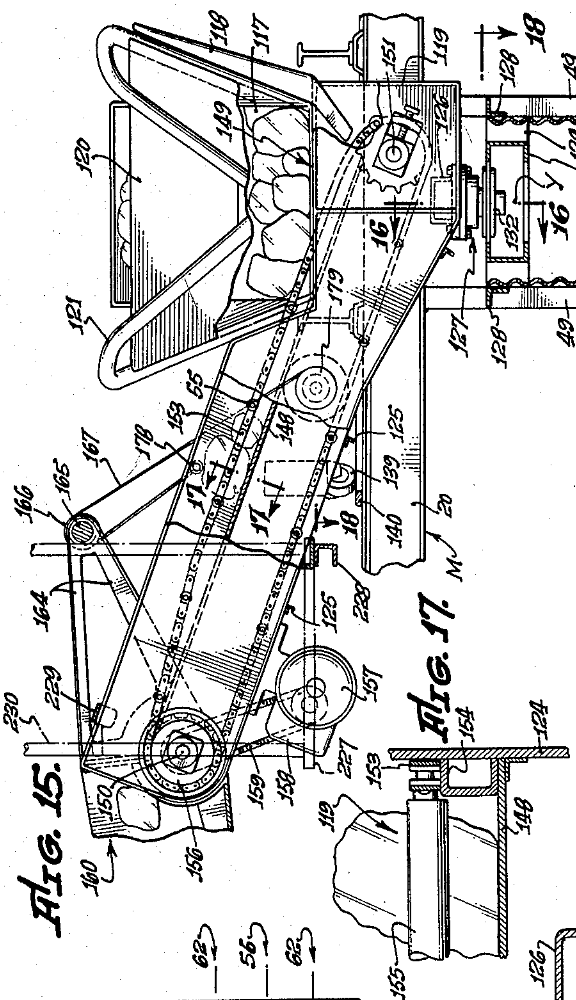


FIG. 15.

FIG. 17.

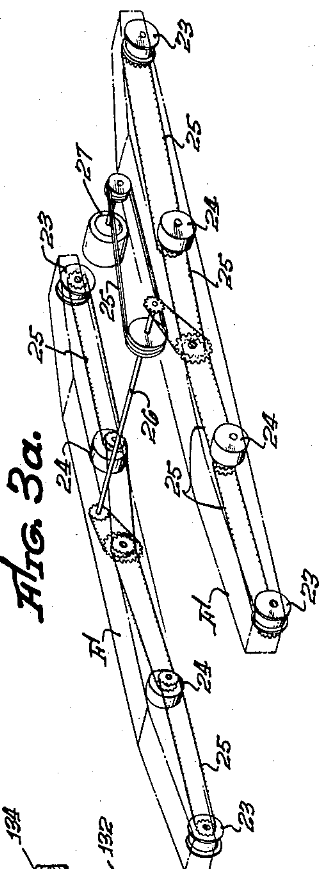


FIG. 3a.

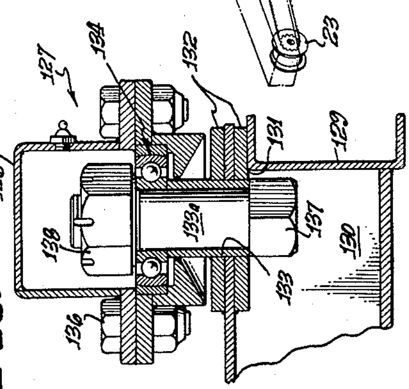


FIG. 16.

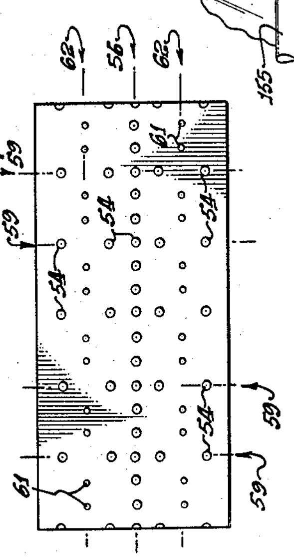


FIG. 6a.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY Barkelew & Lewis

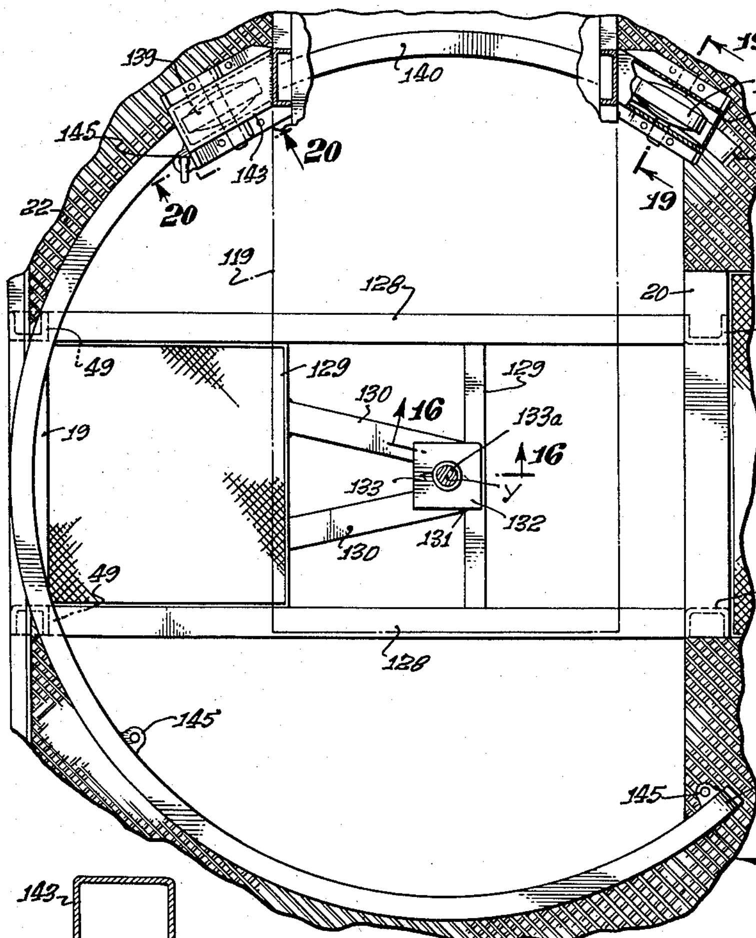
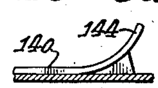


FIG. 18.

FIG. 18a.



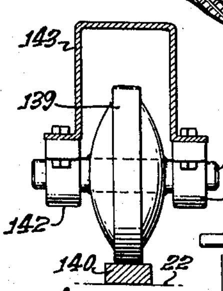


FIG. 19.

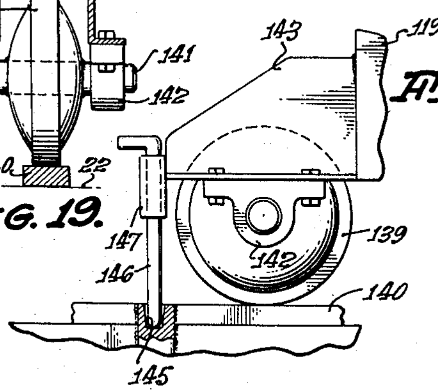


FIG. 20.

PAUL K. BEEMER,
PAUL Z. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY

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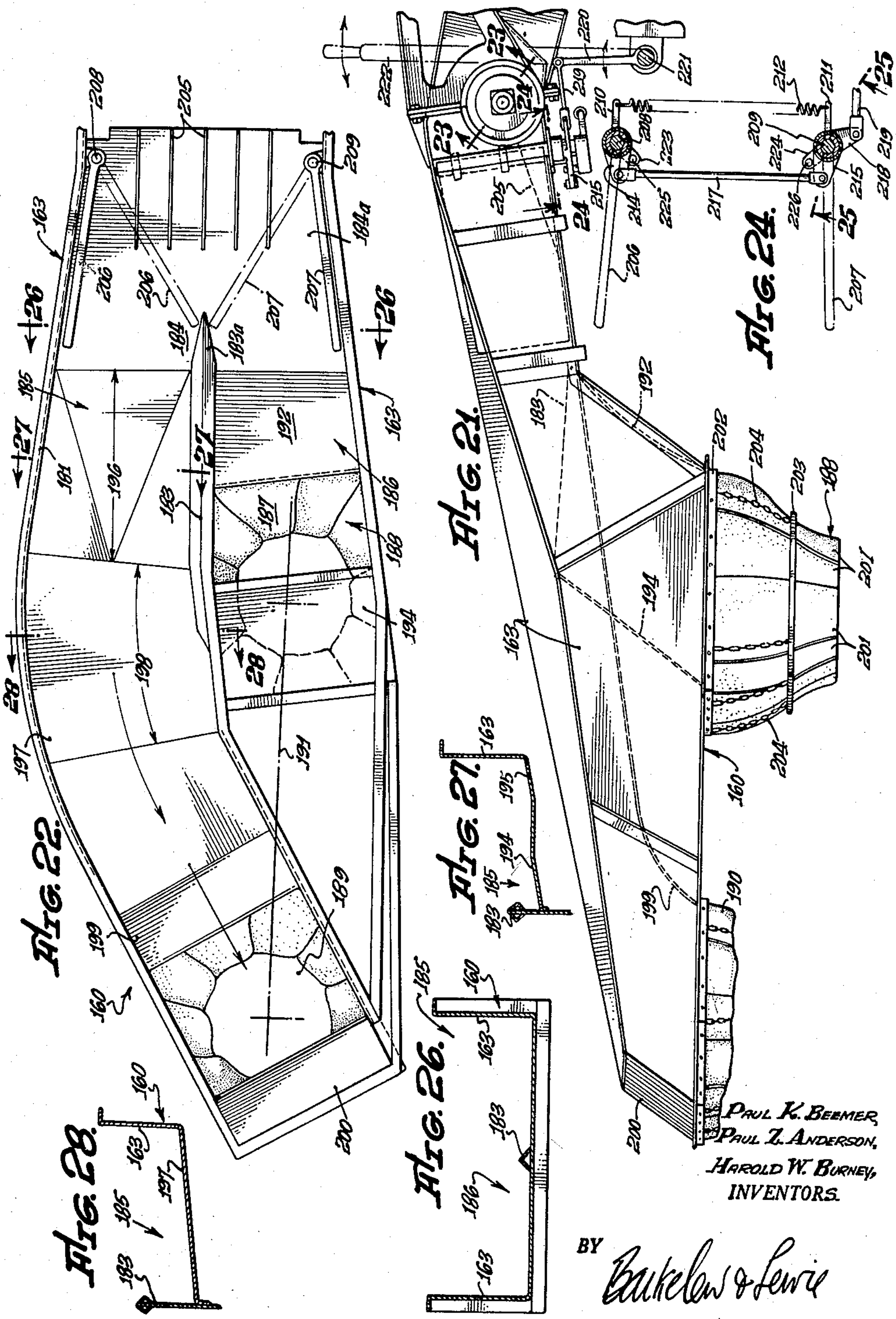

PAUL K. BEEMER,
PAUL L. ANDERSON,
HAROLD W. BURNEY,
INVENTORS.

BY Bakelew & Lewis

United States Patent Office

2,919,560

Patented Jan. 5, 1960

2,919,560

CAR ICING MACHINE

Paul K. Beemer, Laguna Beach, and Paul Z. Anderson, Whittier, Calif., and Harold W. Burney, Hackensack, N.J., assignors to Preco Incorporated, Los Angeles, Calif., a corporation of California

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.

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. 3*a* 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. 6*a* 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. 18*a* is a fragmentary detail of Fig. 18, as viewed from the position of arrow 18*a* 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. 3*a*. 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**. Journaled 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 counterclockwise 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 6*a*, 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 alinement 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 chuck 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 scimiter-shaped splitting blades 63, each having a curved, sharpened edge 64. The blades extend through slots 63*a* (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 73*a* 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 auomatically de-energized when unit 46 reaches either of its limits of movement.

Since it is occassionally desirable to by-pass ice cakes—that is, to let the ice continue to travel uninterruptedly 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 47*a* 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 80*a*, 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 inturned 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 77*a* and 76*a* 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 **134*a*** and a self-alining bearing **134**, which is held by nuts **136** to member **126**, the latter, as has been said, being a part of conveyor structure **119**. The king-pin head **137** and nut **138** 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. 19*a*) 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 **183*a***, rising from the floor **184** of the common entrance mouth **184*a***, 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 **184*a***, 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 conveyor **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 conveyor, and, at another point, may be suspended by a hook **229** carried by one of the platform posts **239** and engaged with conveyor **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, comprising 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 surounding 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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