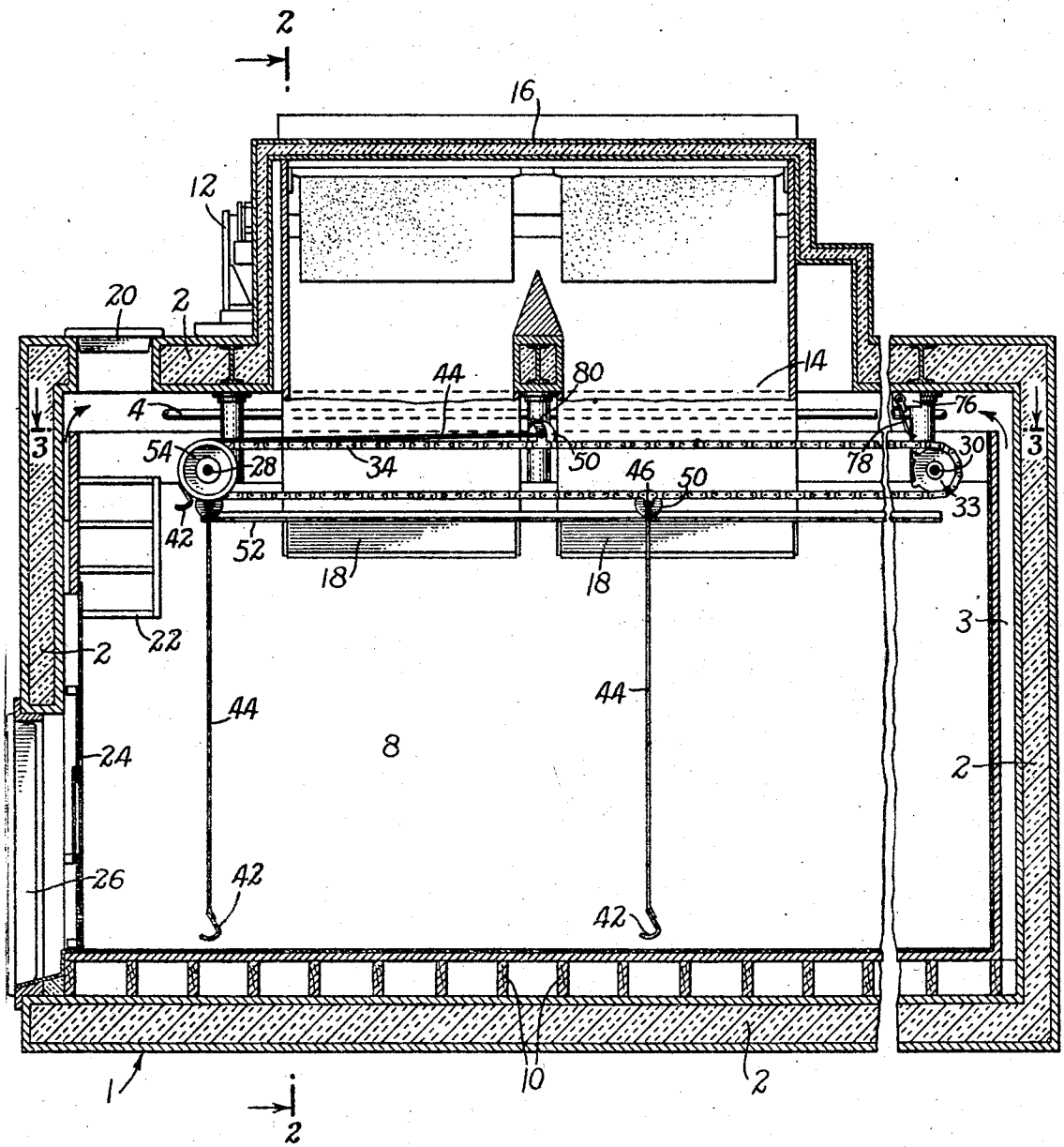
Nov. 19, 1940. C. FIELD 2,222,024

ICE STORAGE BIN

Filed Jan. 22, 1937 3 Sheets-Sheet 1

Fig. 1.



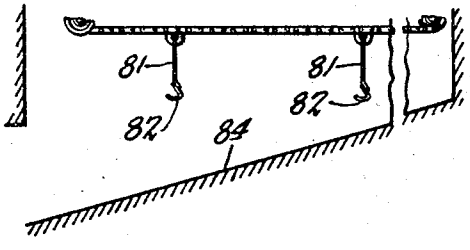


Fig. 1A.

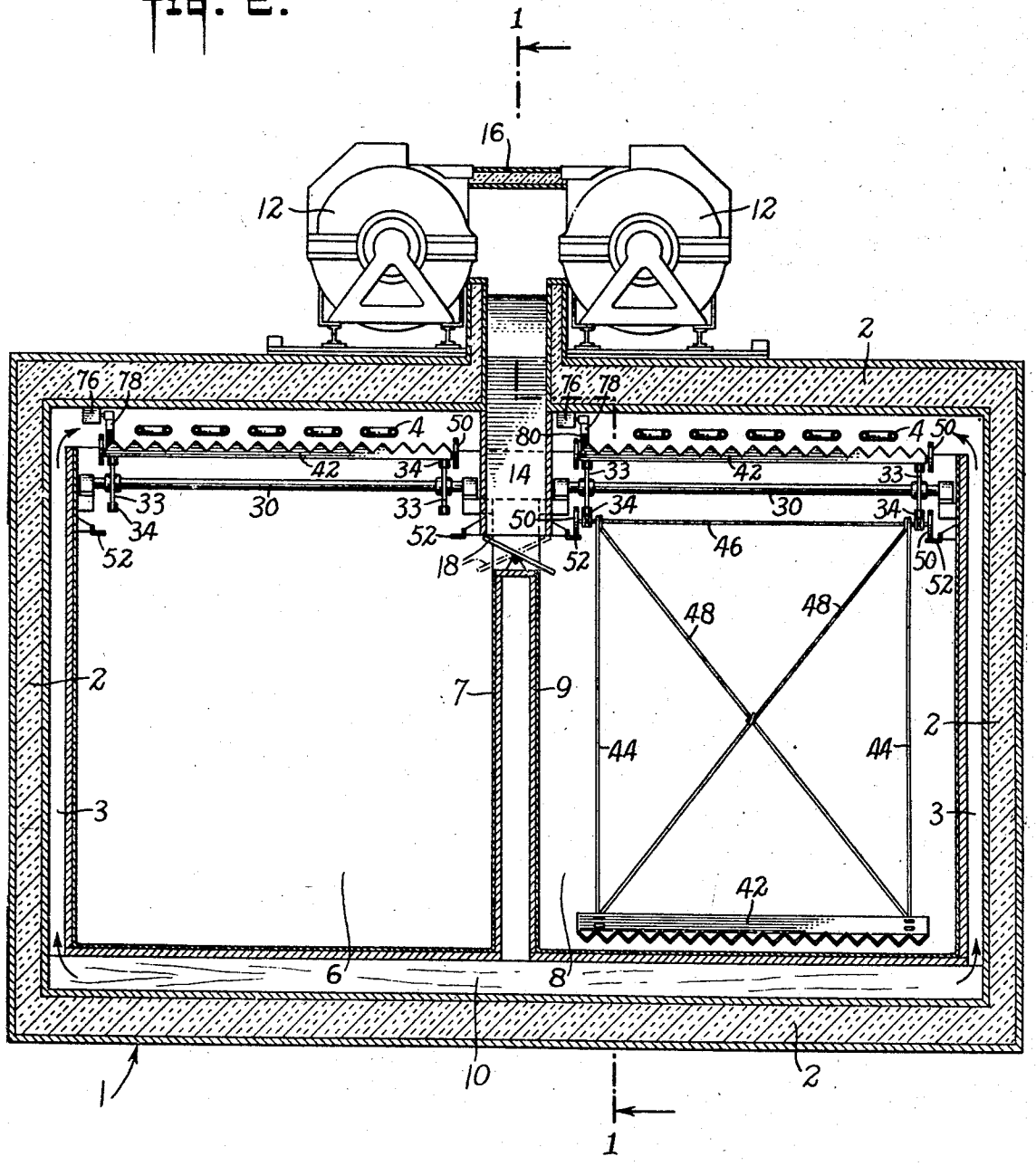
INVENTOR
Crosby Field
BY
Blair, Curtis, Dunne & Hayward
ATTORNEYS

Nov. 19, 1940. C. FIELD 2,222,024

ICE STORAGE BIN

Filed Jan. 22, 1937 3 Sheets-Sheet 2

Fig. 2.



INVENTOR
Crosby Field
BY
Blair, Curtis, Dunne & Hayward
ATTORNEYS

Nov. 19, 1940. C. FIELD 2,222,024

ICE STORAGE BIN

Filed Jan. 22, 1937 3 Sheets-Sheet 3

Fig. 3.

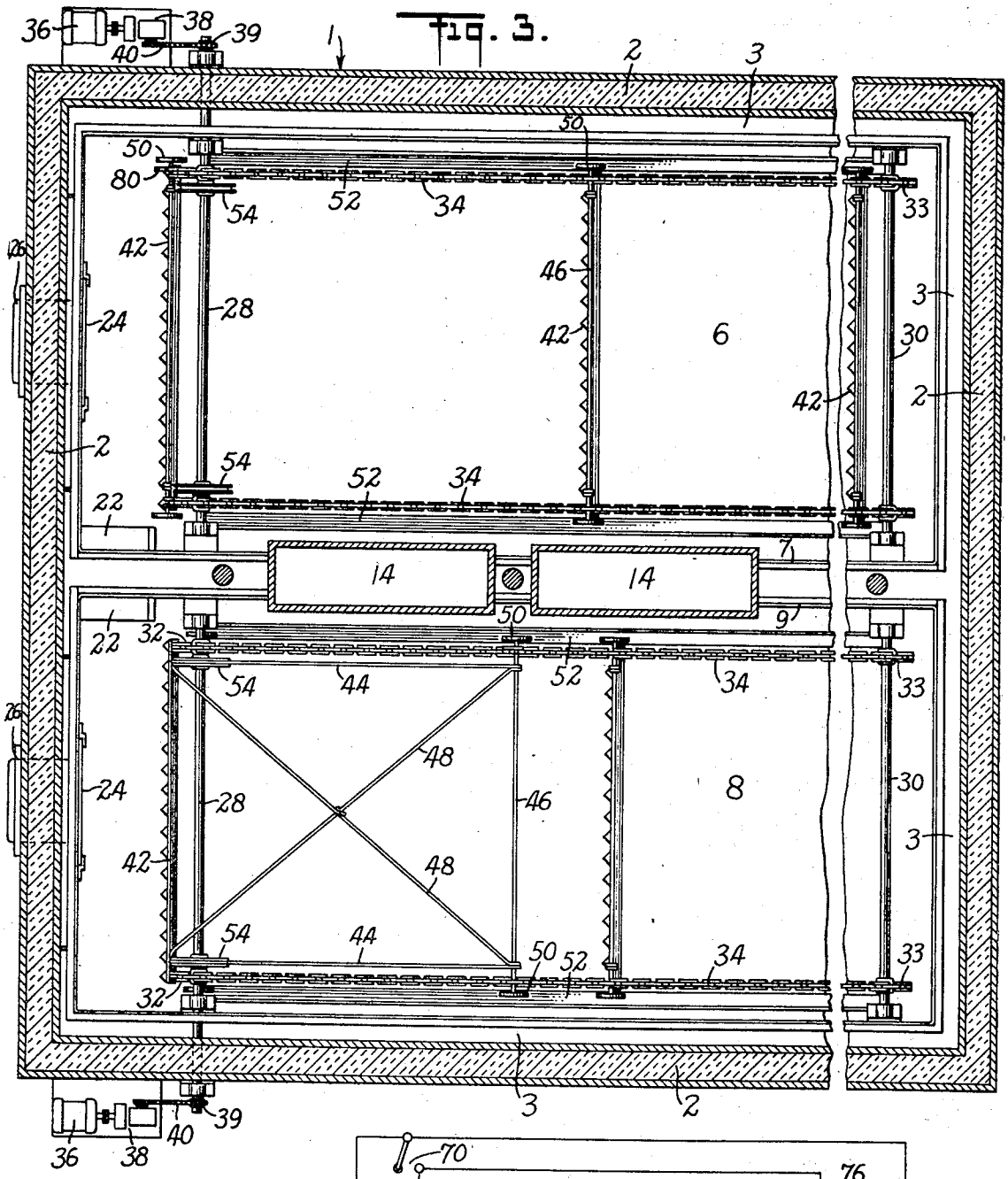
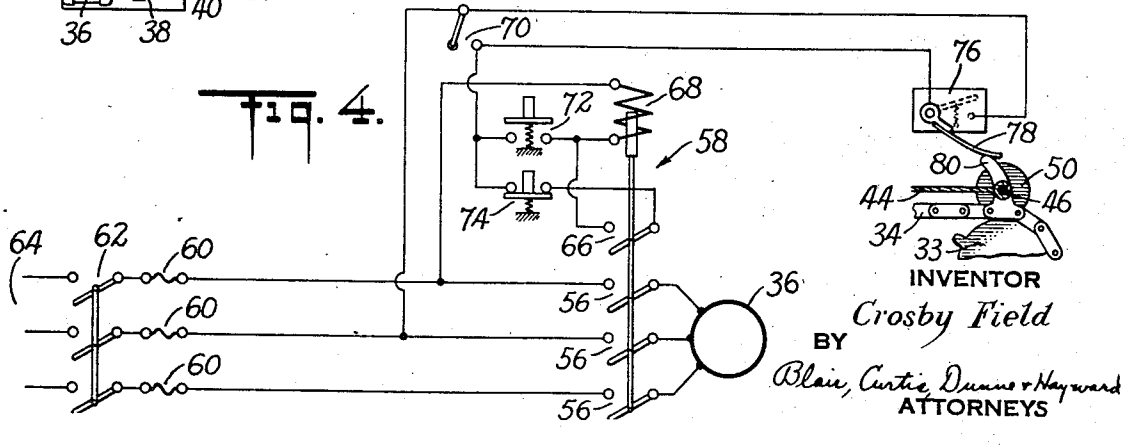


Fig. 4.



INVENTOR
Crosby Field
BY
Blair, Curtis, Dunne & Hayward
ATTORNEYS

Patented Nov. 19, 1940

2,222,024

UNITED STATES PATENT OFFICE

2,222,024

ICE STORAGE BIN

Crosby Field, Brooklyn, N. Y., assignor to Flakice Corporation, Brooklyn, N. Y., a corporation of Delaware

Application January 22, 1937, Serial No. 121,770

16 Claims. (Cl. 221—120)

This invention relates to bins for storing small pieces of ice and to apparatus for handling ice in the bin.

In recent years apparatus has been developed for manufacturing ice in small pieces such as crushed block ice, ice in ribbon form, briquettes of compressed slush, ice cubes, etc. The introduction of such apparatus has given rise to the problem of storing quantities of such small pieces of ice in their original form for a considerable time without appreciable loss. The solution of this problem has been difficult because of the tendency of the smaller pieces to freeze together into a more or less solid mass which prevents their ready removal from the storage compartment for distribution and use. This difficulty is overcome, in accordance with this invention, by placing the small ice pieces in a refrigerated bin as soon as they are produced, where they are maintained at a temperature below their melting point and away from moisture which might cause them to freeze together.

The ice is usually drawn off from the bins through an opening provided in the front wall, and to aid in drawing all of the ice out of the bin the floor may be sloped toward the opening. But sloping the floor for this purpose decreases the capacity of the bin.

It is an object of this invention to provide an improved storage system for such ice pieces and to provide means for automatically removing the ice from a bin having either a flat or sloping floor.

In the accompanying drawings:

Figure 1 shows a vertical section of an embodiment of the invention taken on line 1—1 of Figure 2;

Figure 1A shows a modified form of the invention;

Figure 2 shows a vertical section taken on line 2—2 of Figure 1;

Figure 3 shows a horizontal section taken on line 3—3 of Figure 1; and

Figure 4 illustrates schematically the wiring diagram of the embodiment herein described.

Referring to Figures 1, 2, and 3, two bins 6 and 8 are mounted in a rectangular compartment 1 provided with suitably heat-insulated bottom, side and top walls 2. The bins are preferably made of sheet metal suitably supported by framework 10 away from the walls of the compartment and from each other, the framework being so laid as to permit circulation of air down between the bins out to the sides underneath the bins and then up the outer sides of the bins to the top, as indicated by the arrows.

The compartment is refrigerated by a series of coils or pipes 4 mounted above each bin. Experiments have shown that air between the outer bin walls and the compartment walls indicated at 3 warms more rapidly than air in the other parts of the storage bin construction, the warmer air creating a flow upward between the bin walls and the outer compartment wall. This air, flowing upward, circulates air over the cooling coils 4 and the air thus cooled falls to the top level of the ice in the storage bin as shown by the arrows, maintaining it sufficiently cool. The flow up passage 3 also reduces the pressure beneath the bin sufficiently to permit cold air to flow down the central passage between the two bins so that a consistent flow of cold air down this central passage pushes out the warm air in passage 3.

Thus the air space between the walls of the bin and the outer compartment not only provides better heat insulation but aids in maintaining the walls of the bin at a uniform temperature.

Around the top, back, front, and outer side walls of the bins, galvanized screening is preferably provided to screen off the bins from material that might be otherwise carried up into the bins.

Two machines 12, such as those described in U. S. Patent No. 2,005,734 to Crosby Field for producing ice strips or ribbons, are mounted lengthwise on the top wall of the compartment on each side of a long rectangular shaft 14 through the top wall above the adjoining walls 7 and 9 of the two bins 6 and 8. The ice-making machines 12 are heat-insulated and the space between them is also covered by a wall 16 of insulation material to prevent the ingress of warm or moisture-ladened air through the shaft 14. As the ice ribbons leave the ice machines 12, they fall through the shaft 14 onto deflectors 18 by which they are deflected into one or the other of the bins. These deflectors are pivotally mounted so that they may be tilted to deflect the ice into either bin as desired, and are preferably made of rectangular metal frames covered with a flexible material such as sheet rubber in order to prevent too much shattering of the ice ribbons when they strike the deflectors.

A covered hatchway 20 and a ladder 22 permit access to the bins through the top wall when desired.

Referring to Figure 1, an opening is provided in the front of each bin normally covered by

sliding gates 24 running in vertical channels on either side of the openings. These gates are made in the form of a series of rectangular metal panels mounted one above the other in such a manner that they may be selectively raised to permit the ice to be unloaded from the bin from the top down in successive stages so as to prevent the weight of the upper layers from binding the lower layers and thus preventing the free movement which would be necessary if an opening were provided only at the bottom of the bin for removal of the ice.

Outer heat-insulated doors 26 normally cover the outside of the openings.

In the present embodiment the ice pieces are kept flowing toward the openings by means of several rakes extending the width of each bin and suspended from endless belts or chains in the top of the bins. As the chains travel they drag the rakes over the ice toward the removal gates 24, and subsequently lift the rakes up and carry them back to the back of the bin where they drop onto the ice again to repeat the operation.

The chains 34 travel over sprockets 32 and 33 mounted on shafts 28 and 30, respectively, extending across the bin. Shaft 28 is suitably journaled at the walls of the bin and sprockets 32 are rigidly attached thereto. Shaft 30 is stationary and the sprockets 33 are bushed or journaled to ride thereon. Shaft 28 extending beyond the wall of the bin is provided with a sprocket 39 adapted to be driven by a motor 36 connected through a reduction gear train 38 and a chain 40.

Suspension chains 44 secured to a crossrod 46 suitably supported near its ends by the parallel drive chains 34 support rake-like members 42, made of heavy metal strips or bars with a series of teeth along one side. Metal rope cross guides 48 guy each rake 42 to its crossrod 46 to prevent lateral movement of the rake. The suspension chains 44 are of such length that the rakes 42 just clear the floor of the bin when they are suspended in operating position in an empty bin, as shown in Figures 1 and 2.

Two guides or tracks 52 are provided parallel to, beneath and slightly outside of the chains 34 to cooperate with guide rollers or small wheels 50 mounted on each end of the crossrod 46 which extends slightly beyond chains 34, to prevent lateral movement of the rake assembly and to prevent its weight from stretching the drive chains 34. Two sheaves 54, of slightly smaller diameters than the sprocket wheels 32, are rotatably but not slidably mounted on shaft 28 at a distance in from the sprocket wheels corresponding to the distance between the chains 34 and the points of attachment of the suspension chains 44 to the crossrod 46. In operation as a crossrod 46 passes over the sprocket wheels 32 and travels toward the rear of the bin pulling its rake member 42 up after it by means of the suspension chains 44, these chains run in the grooves of the sheaves 54, preventing lateral movement of the rake assembly during this operation.

It is necessary for all of the rakes to be held in a position out of contact with the ice when they are not in operation. Should one of the rakes be permitted to remain down as the bin is filled up the rake would soon be buried under a mass of ice, so that the equipment might be stalled. Thus it is apparent that the number of rakes provided in any bin will depend upon the length and depth of the bin and that this number should be equal to or less than the distance between the shafts 28 and 30 divided by the length of the suspension chains 44 so that all of the rakes may lie on top of the chain 34, as illustrated in bin 6, Figure 2, when the raking mechanism is not in operation.

In order to insure that the rakes will always come to rest in such a position without the necessity of looking into the bin to determine their position when stopping the apparatus, a novel automatic control circuit is provided, as shown in Figure 4, for operating the driving motor 36. The driving motor 36, which is shown as a three-phase motor, is connected through the three-pole single-throw switch 56 of an automatic starting box, generally indicated at 58, fuses 60 and a disconnect switch 62 to a three-phase power supply 64. The starting box switch 56 and a single pole "keep alive" switch 66 are actuated by solenoid 68 which is connected through a two-position "start-stop" switch 70, a normally open push-button 72 for starting, and a normally closed "emergency stop" push-button 74, across one phase of the three-phase supply as shown. When switch 70 is placed in the "start" position and the "start" push-button 72 is pressed the solenoid 68 is energized thus closing switches 56 and 66 and starting the motor 36. The closing of switch 66 short-circuits push-button 72 through the "emergency stop" switch 74 and maintains solenoid 68 in an energized condition. Pushing the "emergency stop" push-button deenergizes solenoid 68 thus opening switch 56 and stopping the motor.

A second "stop" switch 76, normally closed, is connected so as to short switch 70. This second switch 76 is mounted in the bin adjacent one of the sprocket wheels 33 on the shaft 30 (see Figure 1) and is actuated by a lever 78 extending downward from the switch toward the chain 34 (see Figure 4) so that it may be raised to open the circuit by a cam-like member 80 mounted on the chains 34 at the point where the crossrod 46 of the first rake is attached.

The operation of this control circuit is as follows: Assuming all of the rakes to be supported on the top of chains 34 in an inoperative position with cam 80 holding switch 76 open, when switch 70 is turned to its "start" position motor 36 may be started by pressing "start" button 72 and the raking mechanism will operate and cam 80 will move past the end of lever 78 thus closing the switch 76. With the switch 70 in "start" position the motor will continue to operate even though switch 76 is opened every time cam 80 passes the lever 78.

When it is desired to stop the apparatus switch 70 is placed in its "stop" position. The rakes will continue to move, however, because switch 76, which is normally closed, is connected in parallel with switch 70 and thus the circuit to solenoid 68 is maintained closed until the first rake reaches its proper stopping position at which point cam 80 will raise lever 78, opening switch 76 and thus deenergizing solenoid 68 which in turn causes the motor switch 56 to be opened and thus stops the motor. Switch 74 acts as an "emergency stop" switch so that the motor may be stopped instantly should an emergency arise without waiting for all of the rakes to assume their proper "stop" positions on top of the chains 34.

In the modified form of my invention shown in Figure 1A, the bin is provided with a sloping floor 84. The raking devices 82 are suspended on

chains 31 which are shorter than the shortest distance between the lower side of chains 34 and the highest portion of the floor. In this way, the raking devices do not injure the floor when the bin is partially empty.

As many embodiments may be made in the above invention and as many changes may be made in the embodiment above described, it is to be understood that all matter hereinbefore set forth as shown in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. In combination with a bin for storing small ice pieces having an opening near one end thereof, mechanical means for disturbing the surface ice to cause it to move toward said opening, said means including rakes flexibly suspended from points above the surface ice, means adapted to drag said rakes successively over the surface ice from the far end of said bin toward said opening, and means for lifting said rakes above the surface ice while said rakes are returning from said opening to the far end of the bin.

2. In combination with a bin for small ice pieces having an opening near one end thereof, mechanical means for disturbing surface ice to cause it to move toward said opening, said means including rakes adapted to move succesively over the surface of the ice from the far end of the bin toward said opening, means for flexibly supporting said rakes, means for winding up said flexible means to lift the rake above the ice in the bin while it is moving from said opening in the bin to the far end thereof, and electrically controlled means for keeping said rakes above said bin when they are not in use.

3. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising horizontal shafts mounted across each end of said bin at the top thereof, an endless belt passing around said shafts, a plurality of rake members flexibly suspended at intervals from said belt, means to drive said shafts in such direction that the lower side of said belt drags said rake members toward said opening and the upper side of said belt carries said rake members away from said opening.

4. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising an endless belt mounted in the top of said bin, a plurality of rake means suspended from said belt, means to drive said belt so that the lower side thereof drags said rake means toward said opening and the upper side thereof carries said rake means away from said opening, and means to hold all of said rake means out of contact with the ice in said bin at all times when said rake means are inactive.

5. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising an endless belt mounted in the top of said bin, a plurality of rake means suspended from said belt, an electric motor to drive said belt so that the lower side thereof drags said rake means toward said opening and the upper side thereof carries said rake means away from said opening, and means to hold all of said rake means out of contact with the ice in said bin at all times when said rake means are inactive, comprising control means to stop said motor, and means associated with belt to actuate said control means only when said rake means assume such position.

6. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising an endless belt mounted in the top of said bin, a plurality of rake means suspended from said belt, means to drive said belt so that the lower side thereof drags said rake means toward said opening and the upper side thereof carries said rake means away from said opening, said rake means being suspended from said belt only along one side thereof whereby said belt may assume a position in which all of said rake means rest on the upper side thereof out of contact with the ice in said bin.

7. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising an endless belt mounted in the top of said bin, a plurality of rake means suspended from said belt, means to drive said belt so that the lower side thereof drags said rake means toward said opening and the upper side thereof carries said rake means away from said opening, said rake means being suspended from said belt only along one side thereof whereby said belt may assume a position in which all of said rake means rest on the upper side thereof out of contact with the ice in said bin, and means permitting said driving means to be stopped only when said belt assumes said position.

8. In a system for manufacturing, storing, and dispensing small pieces of ice in combination, a refrigerated bin for storing said ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; means in said bin for urging the ice pieces toward said opening, comprising an endless belt mounted in the top of said bin, a plurality of rake means suspended from said belt, an electric motor to drive said belt so that the lower side thereof drags said rake means toward said opening and the upper side thereof carries said rake means away from said opening, said rake means being suspended from said belt only along one side thereof whereby said belt may assume a position in which all of said rake means rest on the upper side thereof out of contact with the ice in said bin, and means permitting said driving means to be stopped only when said belt

assumes said position, comprising control means to stop said motor, and means associated with belt to actuate said control means only when said rake means assume said position.

9. In a system for manufacturing, storing, and dispensing small pieces of ice, the combination of: a refrigerated bin for storing the ice pieces, means for maintaining said bin at a temperature lower than the melting temperature of said ice pieces, and an opening in said bin for removal of said ice pieces; and means in said bin for urging said ice pieces toward said opening, comprising, an endless belt structure mounted in the top of said bin, a rake drag means, an elongated suspending structure attached at one end to said endless belt structure and at the other end to said rake drag, and means to drive said belt so that said suspending structure pulls said rake drag toward said opening and then upwardly and away from said opening.

10. In apparatus of the class described, the combination of, a storage bin having an opening therein and having a bottom-wall structure and side-wall structure, and means to disturb material within said bin to cause it to flow from said bin through said opening, said last-named means comprising a drag and drag-supporting means, said drag-supporting means including a motive means and a flexible member attached at one end to said drag and at the other end to said motive means, said motive means being adapted to pull said flexible member and move said drag over said bottom structure but out of contact therewith, and said motive means being adapted to wind up said flexible member to lift said drag and move it across said bin, out of contact with the material within said bin.

11. In apparatus of the class described, the combination of, a storage bin having an opening therein and having a bottom-wall structure and side-wall structure, and means to disturb material within said bin to cause it to flow from said bin through said opening, said last-named means comprising a drag and drag-supporting means, said drag-supporting means including a motive means and an extended flexible member attached at one extremity to said drag and at the other extremity to said motive means, said motive means being adapted to pull said flexible member along a definite path and move said drag to disturb the material in said bin.

12. In apparatus of the class described, the combination of, a storage bin having an opening therein and having a bottom-wall structure and side-wall structure, and means to disturb material within said bin to cause it to flow from said bin through said opening, said last-named means comprising a drag and drag-supporting means, said drag-supporting means including a motive means and a flexible member attached at one end to said drag and at the other end to said motive means, said motive means being adapted to pull said flexible member and move said flexible member out of contact with the material and move said drag to disturb the material in said bin, and said motive means having a control mechanism associated therewith to stop its operation when said drag is out of contact with the material in said bin.

13. In a system for dispensing small pieces of ice from a refrigerated storage bin which is maintained at a temperature below the melting temperature of the ice, the combination of, a storage bin having an opening at one end for the removal of ice pieces, and means in said bin for urging the ice pieces toward said opening, said means comprising an endless belt structure horizontally mounted to have a lower side and an upper side, a plurality of rake members flexibly suspended in spaced relationship along said endless belt, and means to drive said endless belt in such direction that the lower side thereof drags said rake members toward said opening and the upper side thereof carries said rake members away from said opening.

14. In combination with a bin for storing fragmented ice having a delivery opening therein to permit the removal of ice from the bin, an ice-disturbing unit for causing the ice to move toward said delivery opening, means for supporting and moving said ice-disturbing unit comprising a motive means and a connecting means, said connecting means being attached to said motive means and to said ice-disturbing unit to provide a flexible connection therebetween, said motive means being operable to move said ice-disturbing unit along the surface of the ice toward said delivery opening by moving the attachment between said motive means and said connecting means along a definite path.

15. In combination with a bin for storing fragmented ice having a delivery opening therein to permit the removal of ice from the bin, an ice-disturbing unit for causing the ice to move toward said delivery opening, means for supporting and moving said ice-disturbing unit comprising a motive means and a connecting means, said connecting means being attached to said motive means and to said ice-disturbing unit to provide a connection therebetween, said motive means being operable to move said ice-disturbing unit along the surface of the ice toward said delivery opening by moving the attachment between said motive means and said connecting means along a definite path, and means to retract said ice-disturbing unit from contact with the ice and to stop the operation of said motive means when said unit is in this retracted position.

16. In combination with a bin for storing fragmented ice having a delivery opening therein to permit the removal of ice from the bin, an ice-disturbing means comprising an element of relatively small body size for causing the ice to move toward said delivery opening, means for supporting and moving said ice-disturbing means comprising a motive means and a connecting means, said connecting means being attached to said motive means and to said ice-disturbing means to provide a flexible connection therebetween, said motive means being operable to move said ice-disturbing means along the surface of the ice toward said delivery opening by moving the attachment between said motive means and said connecting means along a definite path.

CROSBY FIELD.