

May 9, 1933.

J. W. STEVENSON

1,907,458

AUTOMATIC STACK DUMPER

Filed May 19, 1930

3 Sheets-Sheet 1

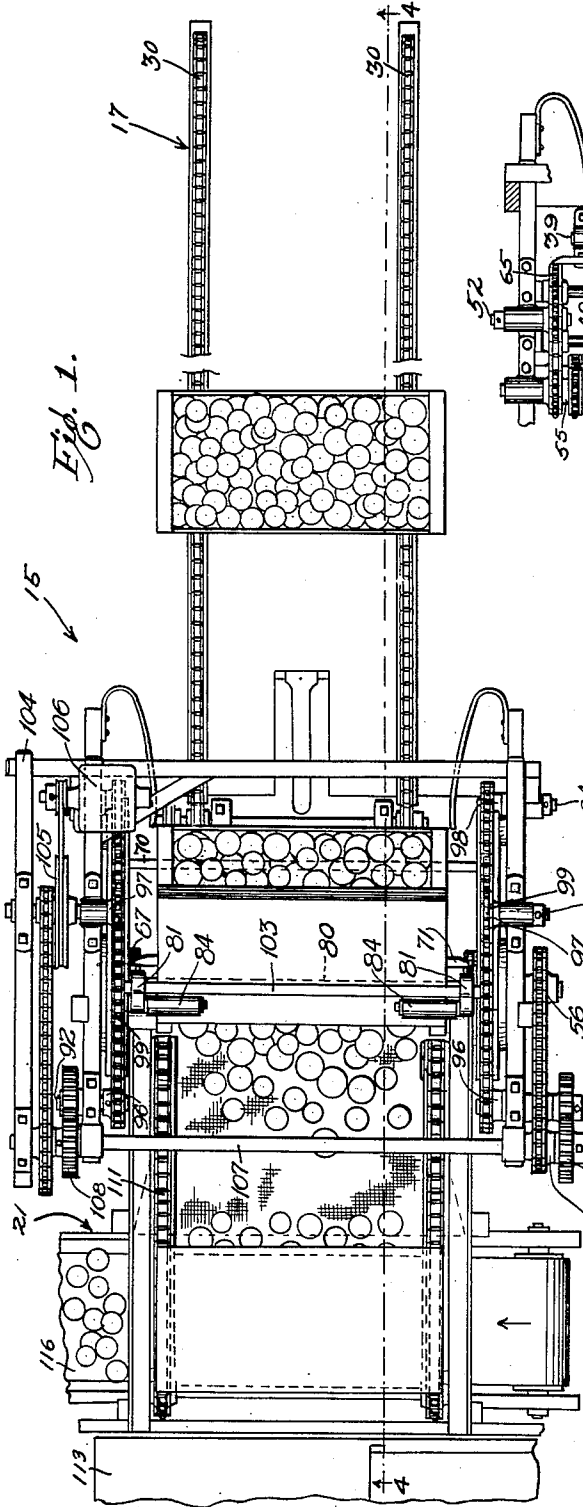


Fig. 1.

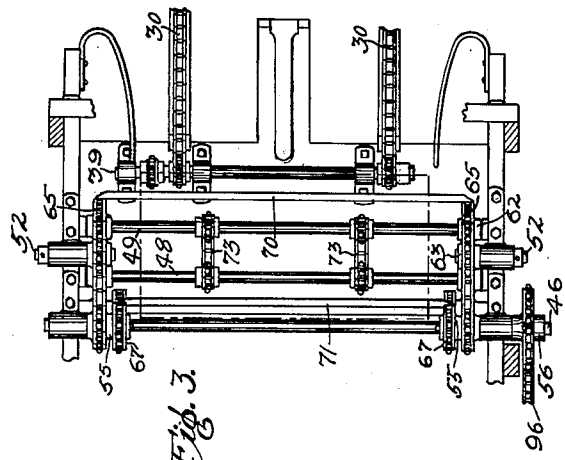


Fig. 3.

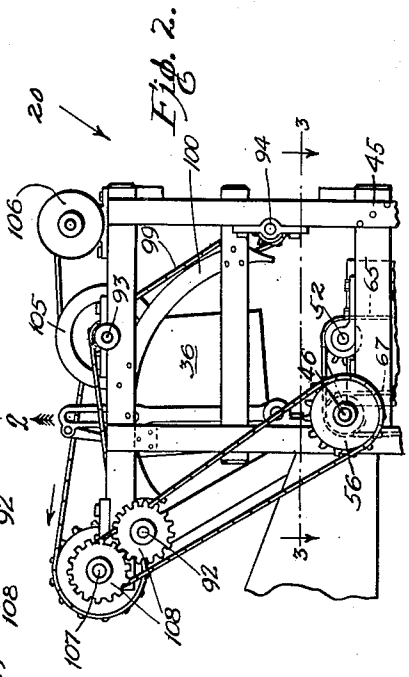


Fig. 2.

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3 Sheets—Sheet 2

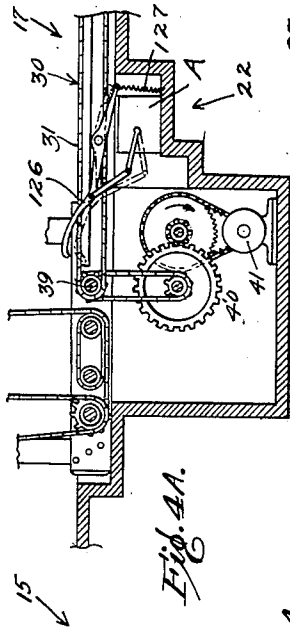


Fig. 4A.

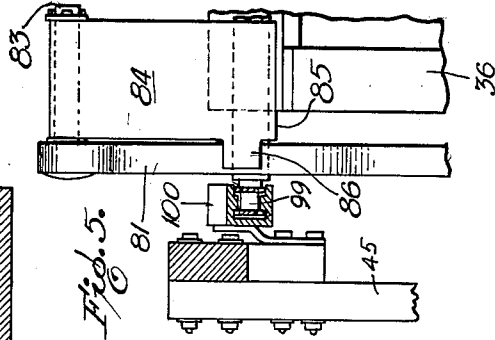


Fig. 5.

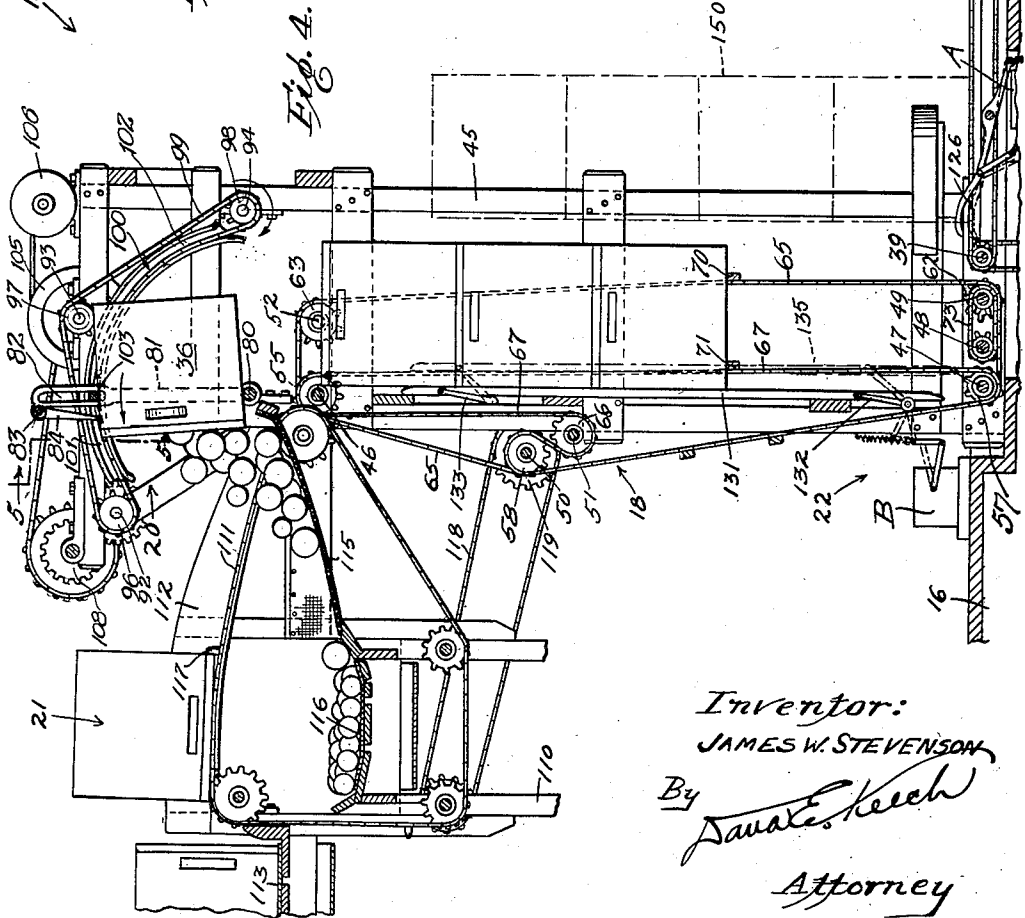


Fig. 4.

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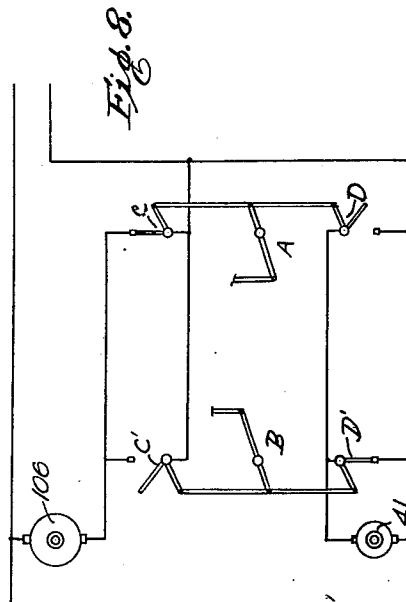
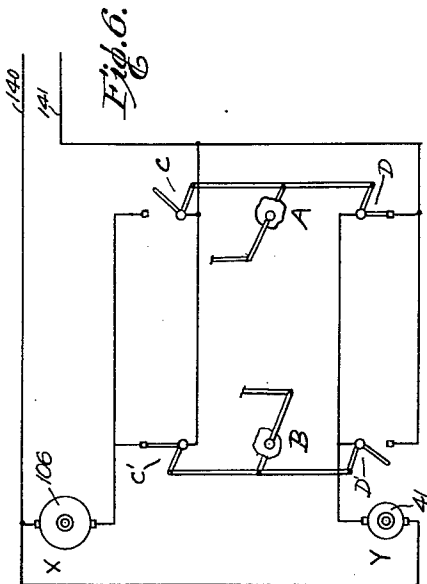
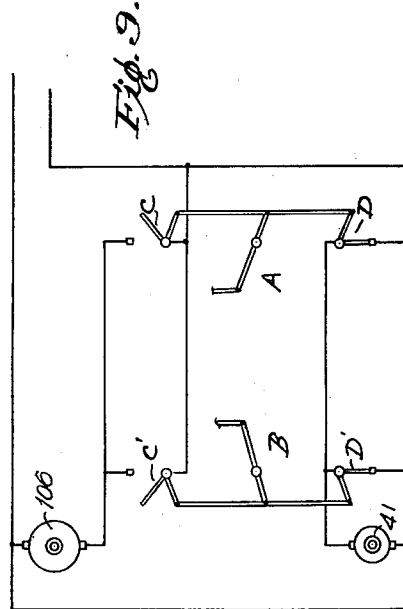
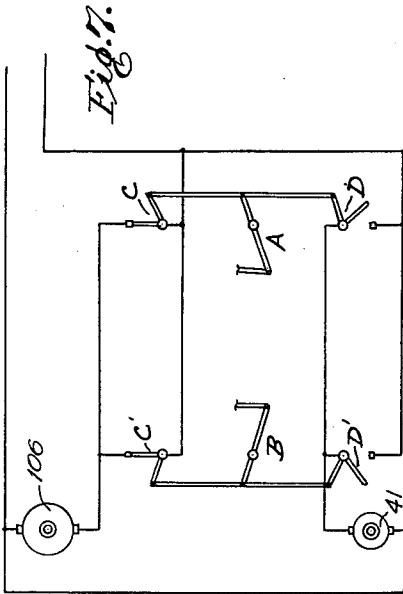
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Filed May 19, 1930

3 Sheets-Sheet 3



Inventor:
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UNITED STATES PATENT OFFICE

JAMES W. STEVENSON, OF RIVERSIDE, CALIFORNIA

AUTOMATIC STACK DUMPER

Application filed May 19, 1930. Serial No. 453,839.

My invention relates to receptacle dumping devices and particularly to automatic box dumps.

Although adapted, with slight modification, for use in a variety of industries, the preferred embodiment of my invention hereinafter described is designed particularly for use in the citrus industry for the handling of oranges.

At orange packing houses, oranges are received from the groves in field boxes, and are stored in these boxes with the latter stacked up four to six high until the time comes to prepare the fruit for shipment. The latter process is a continuous one which requires the oranges to be dumped from the field boxes at a relatively uniform speed throughout the day.

Box dumping machines are in general use at present, to which machines, boxes are fed one at a time from a horizontal conveyer. The receiving end of this conveyer extends close to where the boxes are stacked and it is necessary for a man to "break down" these stacks and place the boxes one by one on the conveyer. In doing this work the men must be very careful not to drag the bottoms of some of the boxes across top fruit in the boxes therebeneath as this would injure the top fruit causing it to decay prematurely. This work is sufficiently difficult, however, that the men get tired and neglect to take the care necessary to protect the fruit. This causes large losses in the decaying of fruit enroute to markets.

It is accordingly an object of my invention to provide a stack dump which will successively dump the boxes in a stack without these being manually "broken down."

Stacks of boxes are handled by hand trucks and one man can usually truck up these stacks considerably faster than it is desired to dump them. In order to conserve the time of the man delivering such stacks to the stack dumper, I conceived the idea of providing means onto which this man could deliver a number of stacks and which would feed these stacks to the dumper as they are needed.

It is a further object of my invention to provide a stack dumper having means capa-

ble of receiving a row of stacks of boxes from hand trucks and feeding these stacks one at a time into the dumper.

The manner in which the above objects are accomplished as well as further objects and advantages will be made manifest in the following description and the accompanying drawings in which:

Fig. 1 is a plan view of a preferred embodiment of my invention.

Fig. 2 is a fragmentary side elevational view taken in the direction of the arrow 2 of Fig. 1.

Fig. 3 is a fragmentary horizontal sectional view taken on the line 3—3 of Fig. 2.

Figs. 4 and 4A are sectional views taken on the line 4—4 of Fig. 1, Fig. 4A being a fragmentary view complementary to Fig. 4.

Fig. 5 is a fragmentary sectional detail view taken on the line 5—5 of Fig. 4.

Figs. 6, 7, 8, and 9 are diagrammatic views illustrating the operation of a control mechanism of my invention.

Referring specifically to the drawings, the illustrated embodiment of my invention comprises a box stack dumper 15 which is supported upon a floor 16 and which includes a receiving and stack feeding mechanism 17, a stack elevating mechanism 18, an individual box dumping mechanism 20, a fruit and empty box receiving mechanism 21, and an automatic control means 22 for controlling the mechanisms 17 and 18.

The stack receiving and feed mechanism 17 includes a pair of spaced roller chains 30 mounted in the floor 16 so that upper flights 31 of the chains 30 travel upon rails 32 whereby the upper flights 31 are positioned just above the surface of the floor 16. A stack 35 of filled boxes 36 may be set down upon these upper chain flights so that when these chains are placed in motion this stack will be conveyed along the floor 16. At their opposite ends, the chains 30 pass over sprockets on shafts 38 and 39 which are suitably journaled in bearings supported on the floor 16. The shaft 39 is connected through a suitable gear and chain reduction drive system 40 to an electric motor 41 as clearly shown in Fig. 4A.

The stack elevating mechanism 18 is mounted upon a frame 45 and includes a drive shaft 46 suitably journaled upon an upper portion of the frame 45, idle shafts 47, 48 and 49 suitably journaled on the lower portion thereof, and intermediate shafts 50 and 51 suitably journaled on a middle portion of said frame. Also suitably journaled on the frame close to and on about the same level as the shaft 46 are stub shafts 52.

Mounted on the shaft 46 is a pair of spaced double sprockets 55 and on one end of this shaft a drive sprocket 56. Mounted on the shafts 47 and 50 are pairs of spaced double sprockets 57 and 58 respectively. The sprockets 55, 57 and 58 are in alignment respectively with each other. Mounted on the shafts 49 and stub shafts 52 are single sprockets 62 and 63 respectively, these single sprockets being in alignment with the outermost wheels of the aforementioned double sprockets 55, 57 and 58 so that the sprockets thus aligned carry a pair of chains 65. Provided on the shaft 51 are a pair of single sprockets 66 which are in vertical alignment with the inner wheels of the aforementioned double sprockets 55, 57 and 58 so that the sprockets thus aligned carry a pair of chains 67. The chains 67 are of the same length as the chains 65. Owing to the chains 67 passing over a shorter course within the frame 45 the unused portion to their length is taken up by the manner in which they pass around the sprockets 58 and 66. Secured between the respective pairs of chains 65 and 67 are cross bars 70 and 71.

Extending around suitable small sprockets provided on the shafts 48 and 49 in alignment with the roller chains 30 of the stack receiving and feeding mechanism 17 is a pair of short chains 73 which are driven by the shaft 49 whenever this is rotated.

The dumping mechanism 20 includes a fulcrum shaft 80 which is pivotally mounted on the frame 45 just above the shaft 46. Rigidly secured to the shaft 80 near the opposite ends thereof are dumping arms 81. Each of the dumping arms 81 is provided at its ends with a longitudinal slot 82. Extending inwardly from the outer ends of each of the arms 81 is a pin 83 upon which is pivotally mounted a latch member 84 having a sharp edge 85 at its lower end and a projection 86, these projections being adapted to engage the arms 81 to limit the rearward movement of these latches.

The dumping arms 81 are disposed far enough apart so as to permit ample clearance when one of the boxes 36 passes between these arms.

Pivotally journaled on opposite sides of the frame 45 are pairs of stub shafts 92, 93 and 94, the shafts in each of these pairs being in axial alignment with each other. Upon

the inner ends of these pairs of stub shafts are fixed pairs of sprockets 96, 97 and 98 respectively, the group of these sprockets on each side of the frame 45 being disposed in the same plane so that one of a pair of endless roller chains 99 extends around and meshes with each of these groups of sprockets. The lower flights of the chains 99 are guided in arcuate guides 100 which are secured to the frame 45. Upper portions 101 of the guides 100 are formed concentrically with the shaft 80 while lower portions 102 of these guides extend from the shaft 80 a slightly greater distance than the radius from which the portions 101 are formed. The purpose of this will be explained later on. Secured to corresponding links in the chains 99 is a cross bar 103 which extends through the slots 82 of the arms 81 as clearly shown in Fig. 4.

Included in the frame 45 is a horizontal outboard member 104 which is rigidly supported upon the frame 45 in any desired manner. One of the shafts 93 extends outwardly and is journaled on the member 104. Disposed around this shaft and freely rotatable thereon is a combined pulley and sprocket member 105. The member 105 is driven through suitable belt connection by an electric motor 106 and in turn through a suitable chain connection drives a drive shaft 107, which is suitably journaled on the frame 45 and which, through pairs of gears 108, positively drives the stub shafts 92. When the drive shaft 107 is rotated by the motor 106 so as to drive the shafts 92 and rotate the endless chains 99, it also drives the elevating mechanism 18 from a sprocket 109 which is connected by a suitable chain to the sprocket 56 which is provided on the shaft 46.

The fruit and empty box receiving mechanism 21 includes a frame 110 upon which are provided suitable means for supporting a pair of box carrying chains 111 as clearly shown in Figs. 1 and 4, there being side boards 112 to retain boxes in place upon the chains 111 and a conveyor belt 113 carrying away boxes discharged from the chains 111. Also supported upon the frame 110 is a fruit receiving chute 115 which is preferably formed of pliable fabric from which fruit is adapted to roll onto a conveyor belt 116 for conveying the fruit to a washer. The chains 111 may have lugs 117 for keeping boxes 36 straight thereon. These chains are driven in synchronism with the elevator 19 and dumper 20 as through a chain 118 which connects to a sprocket 119 provided on the shaft 50.

The manner in which the elevating and dumping and empty box receiving mechanisms coordinately operate is as follows:

The mechanism for driving the elevating mechanism 18 and the dumping mechanism 131

20 is timed so as to cause a complete single revolution of the chains 99 about their respective sprockets 96, 97 and 98 in the interval during which a stack of boxes 36 on the elevator 18 is raised the height of a single box. The drive mechanism is also timed so that the bar 103 is brought around the sprockets 98 in the direction of the arrows in Fig. 4 just as the upper end of the uppermost box in a stack on the elevator 18 is lifted above the level of the fulcrum shaft 80. As the bar 103 moves on the chains 99 the arms 81 are carried thereby so as to be swung back and forth between opposite extremities of the sprockets 96 and 98.

As the bar 103 passes around the sprockets 108, therefore, the arms 81 pass downwardly alongside the ends of the uppermost box 36 so that the latches 84 drag over an upper portion of the outer side of this box. As the bar 103 starts upwardly from the sprockets 98 it lifts the arms 81 so that the latches 84 pinch this box 36 and lift and swing the box with the shaft 80 as a fulcrum.

As the arms 81 reach vertical position the bar 103 passes from the portions 102 of the chain guides 100 and into the portions 101 thereof. This results in pressing the bar 103 against the box 36 so that the box is firmly gripped between the bar 103 and the shaft 80 until the bar 103 moves upwardly around the sprockets 96. As the box 36 is swung upwardly around the shaft 80, fruit rolls therefrom onto the fabric 115 and thence onto the belt 116 and is carried away. As the bar 103 passes upwardly around the sprockets 96 the box is released and falls downwardly empty onto the chains 111. As the empty box rests downwardly on the chains 111 and is carried away by these, the bar 103 is returned by the upper flights of the chains 99 and carries the arms 81 with it until the latter come into position to receive the next box in the stack being elevated, so that this is dumped in the same manner as just described.

In order for the elevating, dumping and empty box receiving mechanisms to operate in the manner above described as nearly continuously as possible, the control means 22 coordinately controls the drive motors 41 and 106.

The control means 22 includes an electric switch A adapted to be actuated by depression of a lever 126 but which is normally held in non-actuated position by a spring 127 which halts the lever 126 in its erect or full line position in which it is shown in Fig. 4A. The control means 22 also includes a switch B which is shown in actuated position in Fig. 4. This switch is operated by a bar 131 which is hung upon pivoted arms 132 and 133 as clearly shown in Fig. 4 and which tends to drop into its broken line position 135 when disengaged by the lowest box of a stack 35 of boxes carried on the cross bars 70 and 71.

With the bar 131 in its position 135, the switch B is in its non-actuated position shown by broken lines in Fig. 4.

The detailed construction and operation of the control means 22 is diagrammatically illustrated in Figs. 6 to 9 inclusive. Each of switches A and B is seen to be a compound switch having switches C and D, and C' and D' respectively. In switch A, switches C and D are alternately opened as is also the case with switches C' and D' of switch B. Electricity is supplied to the motors 41 and 106 through electric conductors 140 and 141. The conductor 140 is connected direct to one side of these motors and the conductor 141 is connected to the other side of the motor 106 through switches C and C' disposed in parallel and to the other side of motor 41 through switches D and D' in parallel.

Four different conditions which exist in the operation of the stack dumper 15 are illustrated in Figs. 6 to 9 inclusive. In Fig. 6 switch B is actuated and switch A is non-actuated. The condition here illustrated diagrammatically is shown concretely in Fig. 4 where a stack 35 of boxes is being elevated and dumped while no stack 35 on the receiving mechanism 17 is disposed so as to contact and depress the lever 126. Switches C' and D are thus closed with the result that motors 41 and 106 are both running. Thus the stack in the elevator continues to be dumped and the receiving and feeding means 17 continues to operate so as to convey the stacks 35 resting thereon towards the elevator 18.

Fig. 7 illustrates the situation which would exist if, while a stack 35 is still being dumped as shown in Fig. 4, another stack should arrive in the broken line position 150 so as to actuate switch A. Both switches A and B would now be actuated at the same time with the result that the connection of the conductor 141 to the motor 41 would be broken by the opening of both switches D and D'. The motor 41 would thereupon be cut out and motor 106 continue to operate. Thus a stack 35 would be stopped in the position 150 in readiness to be fed into the elevator 18 when the stack already therein had been disposed of.

Fig. 8 illustrates the condition which follows that shown in Fig. 7 when the lowest box in a stack being elevated and dumped in the stack dumper 15 so that switch B is returned to nonactuated position and where at the same time there is no stack resting in position 150 on the receiving and feeding mechanism 17. Both switches A and B are therefore free or unactuated, switches C and C' are both thrown out, switches D and D' both thrown in. This results in motor 106 being dead and in the motor 41 continuing to drive the receiving and feeding mechanism 17 so as to advance any stacks 35 carried thereon towards the elevator 18.

Conflict is thus prevented in the operation of my invention as operation of the elevator and dumper is discontinued if the stack is not ready to be delivered at once into the elevator and remains discontinued until a stack is thus positioned in readiness. Furthermore, if the elevator is ready to receive such a stack the receiving and feeding mechanism 17 continues to convey this stack into the elevator 18 and this is assisted by the chains 73 which recommence operation with the elevator 18 when the stack being fed to the elevator passes through the broken line position 150. Also, as previously pointed out, the receiving and feeding mechanism 17 is halted when a stack carried thereon moves into the position of readiness 150 while another stack is being dumped in the stack dumper 15 and before the lowest box thereof has cleared the switch actuating bar 131.

It will thus be seen that I have provided a very simple and efficient stack dumper which will automatically receive and dump a large number of stacks of boxes trucked thereto at a single time before further attention by an attendant will be necessary. Particular attention is also directed to the dumping mechanism 20 in which the complete operation of removing each box from the stack and dumping it is accomplished by unitary means which does not injure the box in any way. Stack dumpers have been built having such a unitary means but in none of these was the box dumped without being engaged at the ends by jaws which stuck into the ends of the box and as the boxes repeatedly went through the dumper, would cause considerable damage to the box ends.

While but a single embodiment of my invention is illustrated herein, it is to be understood that a number of modifications might be made in this without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In a box dumping mechanism, the combination of: means for elevating boxes successively to a dumping position; a pair of endless chains disposed on opposite sides of said position; a dumping fulcrum; means for guiding portions of said chains in arcuate paths relative to said fulcrum; means for rotating said chains in unison; and means actuated by said chains for dumping boxes as they arrive in said position.

2. In a box dumping mechanism, the combination of: means for elevating boxes successively to a dumping position; a pair of endless chains disposed on opposite sides of said position; means for rotating said chains in unison; a bar connecting said chains; and means carried by said bar for successively gripping the boxes and dumping same as they arrive in said position.

3. In a box dumping mechanism, the combi-

nation of: means for elevating boxes successively to a dumping position; a pair of endless chains disposed on opposite sides of said position; a dumping fulcrum; means for guiding portions of said chains in arcuate paths relative to said fulcrum; means for rotating said chains in unison; and means actuated by said chains for dumping boxes as they arrive in said position, said means including a bar connecting said chains, said bar gripping each such box against said fulcrum member during a portion of the dumping of said box.

4. In a box elevator, the combination of: an outer double endless chain elevator; an inner double endless chain elevator disposed within the path traversed by said outer elevator; a flight of said inner elevator being cooperatively spaced from a corresponding flight of said outer elevator; box supports provided upon said elevators so that when on said flights said supports cooperate in pairs, one support of each pair being on one of said elevators, each pair being adapted to handle a box; means for fixing the paths traversed by said elevator chains so that the aforesaid cooperative relation of said supports is maintained when said chains are caused to travel along said paths, the chains of said inner and outer elevators being of equal lengths; and means for taking up a certain length of chain in said inner elevator to permit it to remain within said outer elevator.

5. In an automatic box dump, the combination of: endless chain and sprocket means for elevating a series of open, loaded boxes along a substantially straight path to a dumping position; a fulcrum member of relatively small diameter disposed close to said path and below the upper edge of a box in dumping position so that a side of a box in dumping position may be brought into contact with said fulcrum member while said box remains substantially in said path; and means to dump each of said boxes as it arrives opposite said fulcrum by rocking it over said fulcrum.

6. In an automatic box dump, the combination of: endless chain and sprocket means for elevating a series of open, loaded boxes along a substantially straight path; a fulcrum member of relatively small diameter disposed close to said path so that a side of a box being elevated may be brought into contact with said fulcrum member while said box remains substantially in said path; and a swinging reciprocating box trap pivotally mounted concentrically with said fulcrum member to dump boxes over said fulcrum member.

7. In an automatic box dump, the combination of: an elevator including a plurality of spaced chain and sprocket means for elevating a series of open loaded boxes along a substantially straight path to a dumping position, the path along which said boxes are

elevated lying between said chain and sprocket means; guide means for said boxes disposed to the rear of said path; a fulcrum member of relatively small diameter disposed close to said path and below the upper edge of a box when in dumping position so that a side of a box in said position may be brought into contact with said fulcrum member while said box remains substantially in said path; and means to dump each of said boxes as it arrives in dumping position by rocking it over said fulcrum.

8. In an automatic box dump, the combination of: an elevator including a plurality of spaced chain and sprocket means for elevating a stack of open, loaded boxes along a substantially straight path, the path along which said boxes are elevated lying between said chain and sprocket means; guide means for said boxes disposed to the rear of said path; a fulcrum member of relatively small diameter disposed close to said path so that a side of a box being elevated may be brought into contact with said fulcrum member while said box remains substantially in said path; and a swinging, reciprocating box trap pivotally mounted concentrically with said fulcrum member to dump boxes over said fulcrum member.

9. In an automatic box dump, the combination of: endless chain and sprocket means for elevating a series of open, loaded boxes along a substantially straight path; and dumping means operating on boxes as they arrive in a given position and including a fulcrum disposed close to one side of a box traveling along said path and mechanism to apply pressure to the opposite side of said box to grip the same against said fulcrum and concurrently swing said box upwardly and rearwardly out of said path to dump its contents therefrom.

10. In an automatic box dump, the combination of: endless chain and sprocket means for elevating a series of open, loaded boxes along a substantially straight path; a fulcrum member having a radius of approximately one-quarter the height of a box or less, said member having a fixed position close to said path so that a side of a box being elevated may be brought into contact therewith while said box remains substantially in said path; and means to dump each of said boxes as it arrives opposite said fulcrum by rocking it over said fulcrum.

11. In an automatic box stack dump, the combination of: a continuously operating endless chain elevator; box stack lifting cradles fixed to said elevator and moving continuously therewith, said elevator being adapted to lift stacks of boxes resting on said cradles along a substantially straight path and withdraw said cradles from said path with a substantially rectilinear movement at the upper point of travel of said cradles;

a fulcrum member disposed close to the rear side of said path adjacent the uppermost point of travel of said cradles; and reciprocating means for applying pressure to the opposite side of said box from the side thereof which is disposed next to said fulcrum and in such a direction as to swing said box upwardly and rearwardly over said fulcrum to dump the contents therefrom.

12. In an automatic box stack dump, the combination of: a continuously operating endless chain elevator; box stack lifting cradles fixed to said elevator and moving continuously therewith, said elevator being adapted to lift stacks of boxes resting on said cradles along a substantially straight path and withdraw said cradles from said path with a substantially rectilinear movement at the upper point of travel of said cradles; a fulcrum member disposed close to the rear side of said path adjacent the uppermost point of travel of said cradles; a pair of arms pivotally mounted concentrically with said fulcrum member; latches provided on said arms; means for reciprocating said arms to cause said latches to move over and engage each of said boxes as it arrives opposite said fulcrum and then swing the same upwardly and rearwardly to dump the contents therefrom; means for receiving the contents of said boxes; and means for conveying away the empty boxes.

13. In an automatic box dump, the combination of: means for feeding a box into dumping position; a fulcrum member disposed close to one side of said position; means for applying pressure to the opposite side of said box from the side next to said fulcrum member to press said box against said fulcrum member and swing said box upwardly about said fulcrum member and over the same to dump the contents from said box; means for receiving the contents of said box; and means for conveying away the empty box.

14. In an automatic box dump, the combination of: means for feeding a box into dumping position; means coming into pressurable engagement with opposite side faces of said box when so positioned to grip said box, lift it, and dump it about an axis disposed alongside one of said faces; said means including a box side engaging member adapted to travel in an arcuate path about said axis; means for receiving the contents of said box; and means for conveying away the empty box.

15. In an automatic box dump, the combination of: means for feeding a box into dumping position; means coming into pressurable engagement with opposite side faces of said box when so positioned to grip said box, lift it, and dump it about an axis disposed alongside one of said faces; said dumping means being reciprocable and rotatable

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about said axis; means for receiving the contents of said box; and means for conveying away the empty box.

16. In an automatic box dump, the combination of: means for feeding a box into dumping position; a fulcrum member disposed along one side of said box when in said position; a pair of arms pivotally mounted concentrically with said fulcrum member; latch means on the outer ends of said arms; means for bringing said arms downwardly over said box so that said latch means come into engagement with the opposite face of said box from the face next to said fulcrum, said arm operating means being adapted to then swing said arms upwardly to grip said box between said fulcrum and said latch means to rock said box over said fulcrum and dump the contents therefrom; means for receiving the contents dumped from said box; and means for conveying away the empty box.

17. A combination as in claim 16 in which said latch means is released from said box when the latter has been dumped so that said box passes bodily between said arms to said empty box removing means.

18. In an automatic box dumper, the combination of: means for feeding a box into a dumping position; fulcrum means disposed adjacent one side of said box when the latter is in dumping position; and means for engaging the opposite side of said box in substantially the planes of the ends thereof, pressing said box against said fulcrum means, swinging said box over said fulcrum means, and dumping the contents of the box therefrom.

19. In an automatic box dumper, the combination of: means for feeding a box into a dumping position; and means for gripping opposite sides of said box in substantially the planes of the ends thereof and swinging said box about an axis adjacent one of the gripped sides.

In testimony whereof, I have hereunto set my hand at Riverside, California this 8th day of May 1930.

JAMES W. STEVENSON.

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