March 9, 1943. A. NEJA 2,313,478

BOX STACKING AND CONVEYING MECHANISM

Filed April 28, 1941 7 Sheets-Sheet 1

Fig. 1

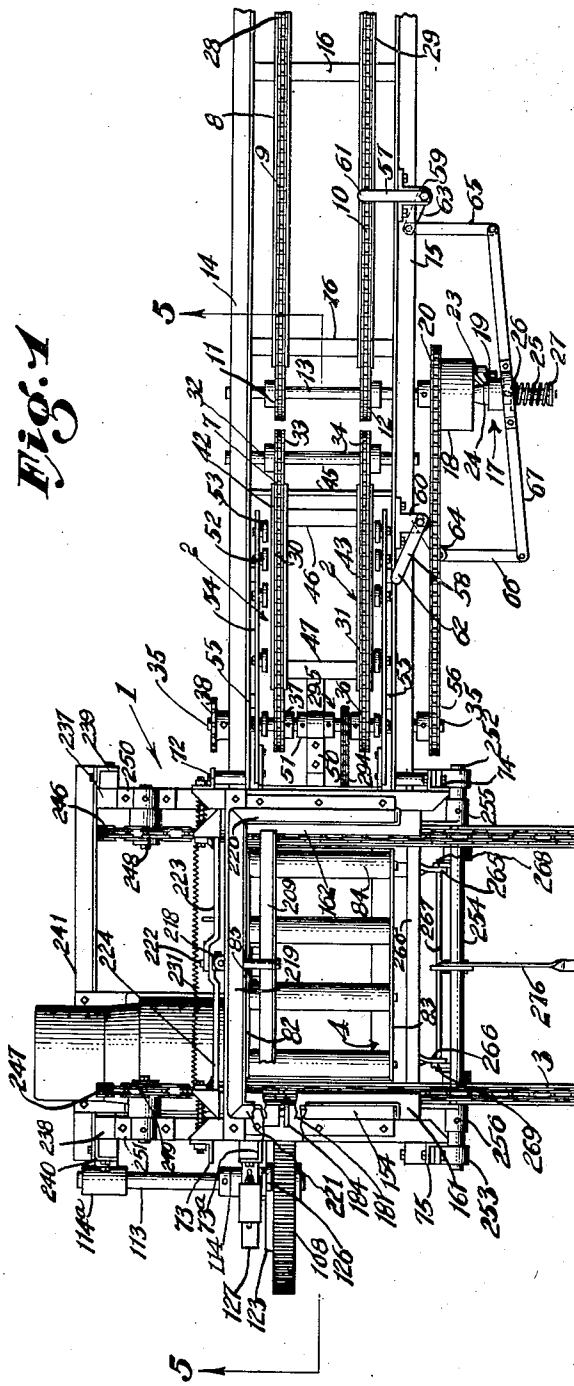
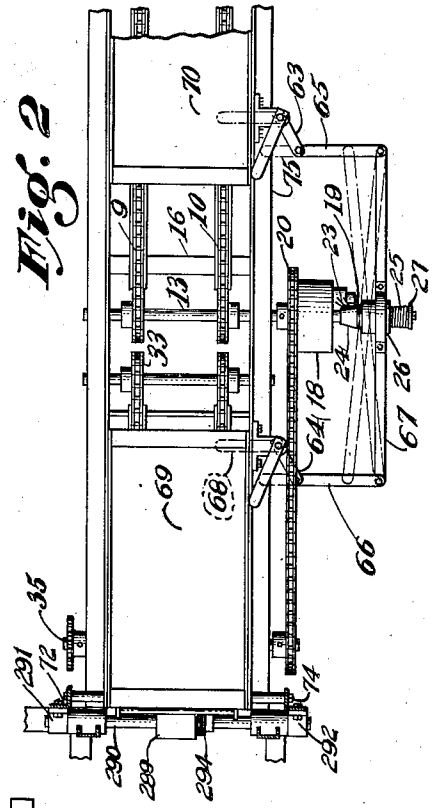


Fig. 2



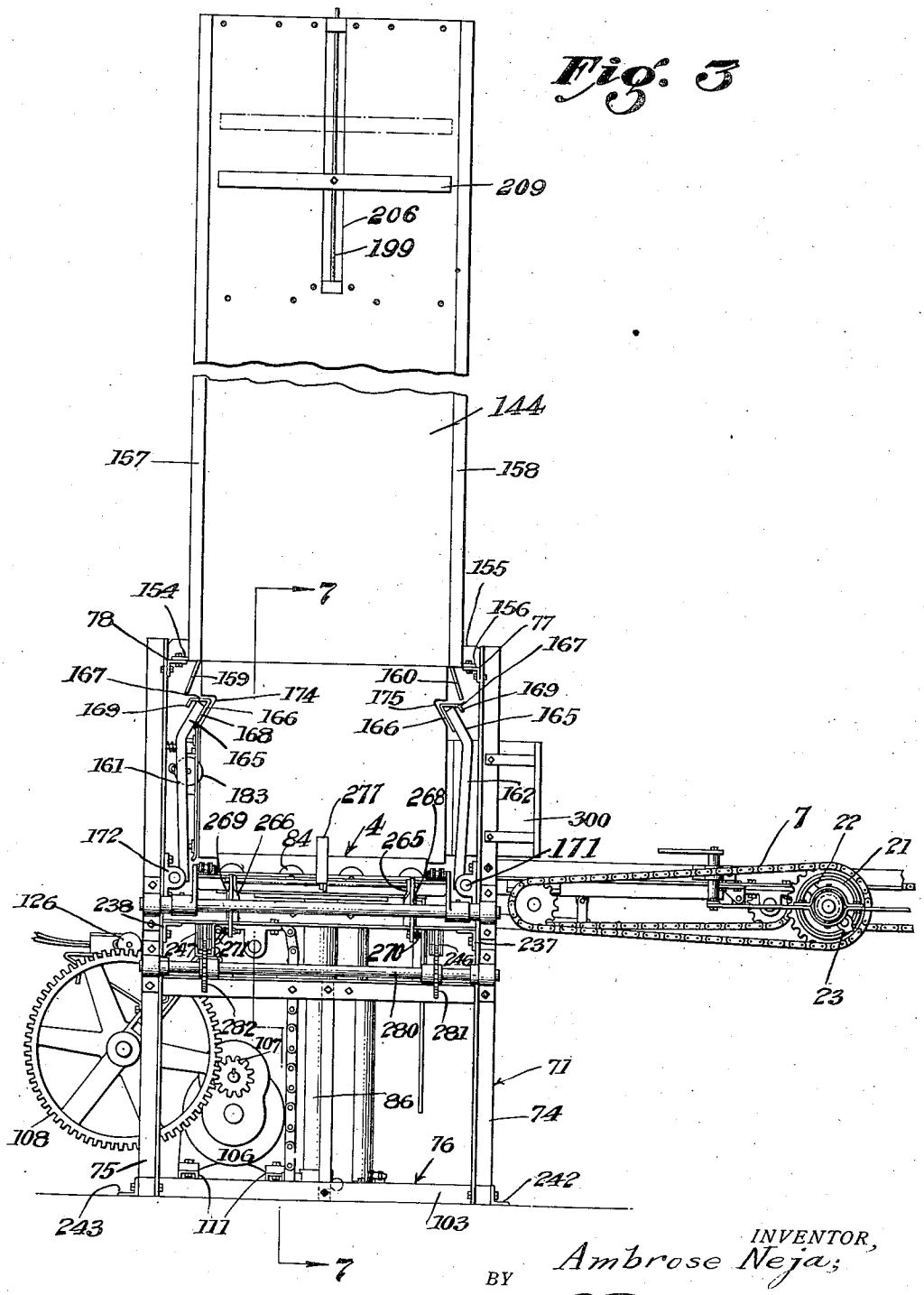
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BOX STACKING AND CONVEYING MECHANISM

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Fig. 3



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BOX STACKING AND CONVEYING MECHANISM

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Fig. 9

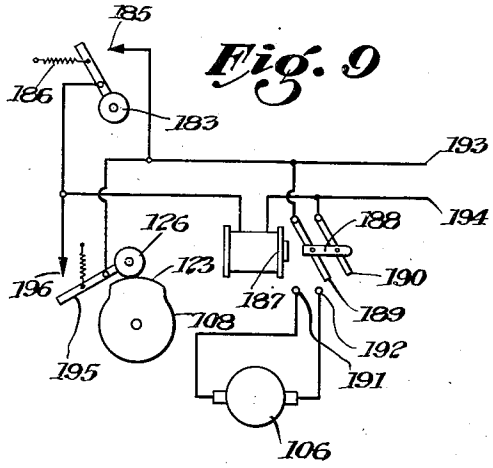


Fig. 4

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BOX STACKING AND CONVEYING MECHANISM

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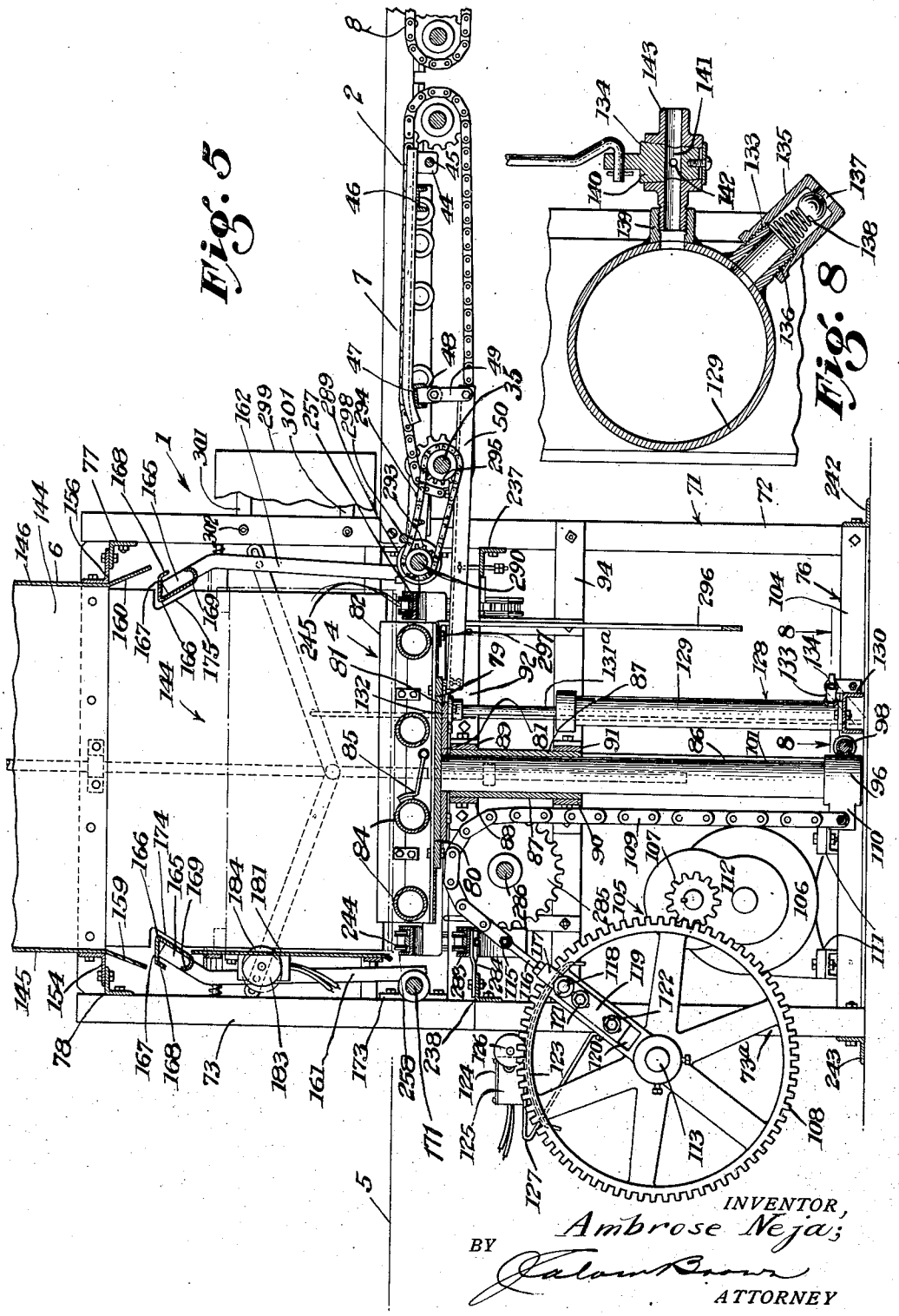


Fig. 5

Fig. 8

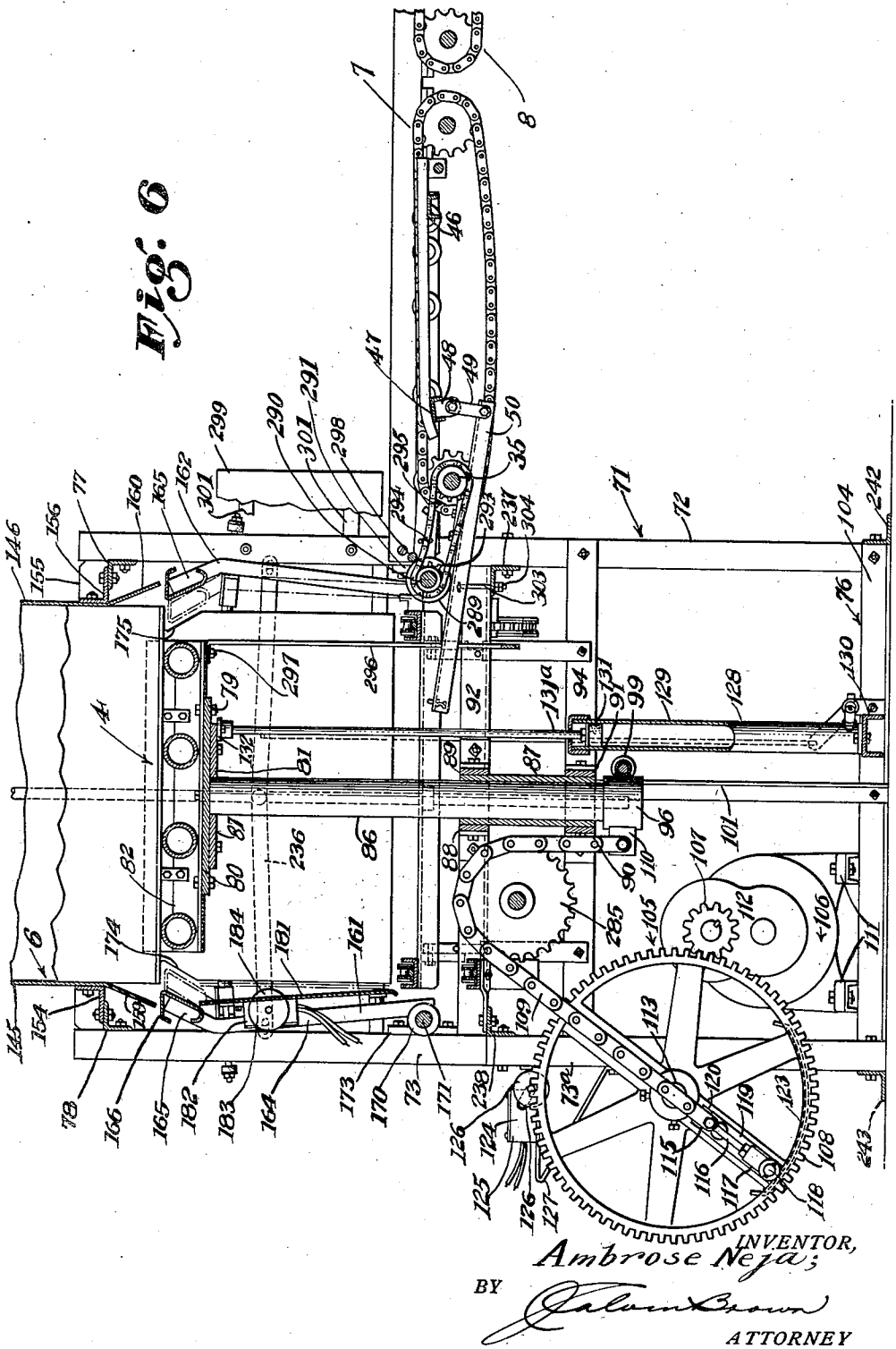
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BOX STACKING AND CONVEYING MECHANISM

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Fig. 6



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BOX STACKING AND CONVEYING MECHANISM

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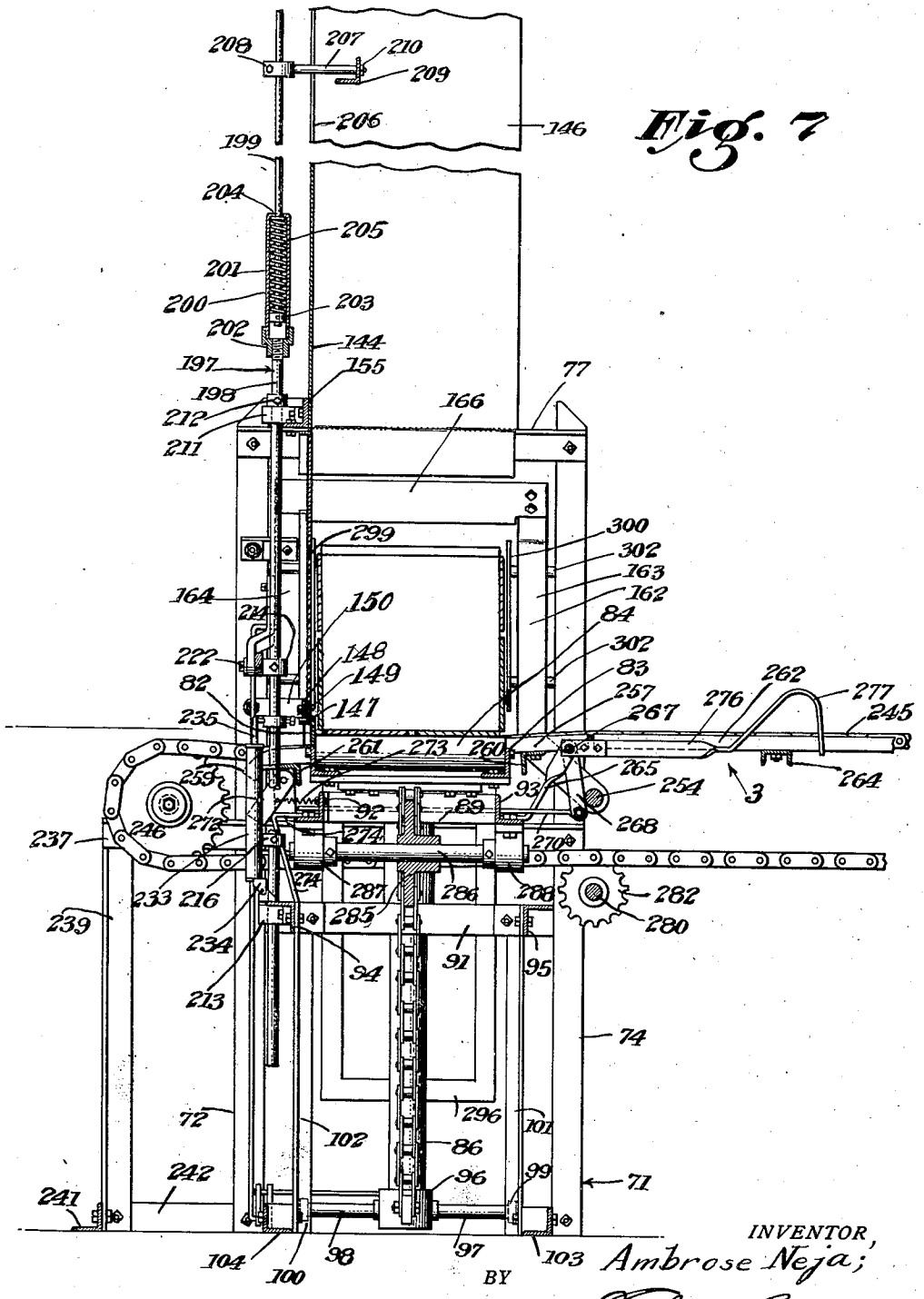


Fig. 7

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BOX STACKING AND CONVEYING MECHANISM

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Fig. 10

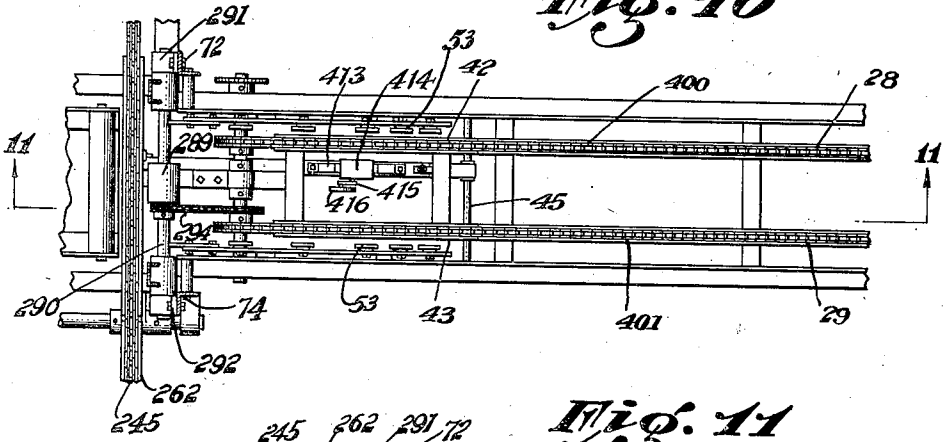


Fig. 11

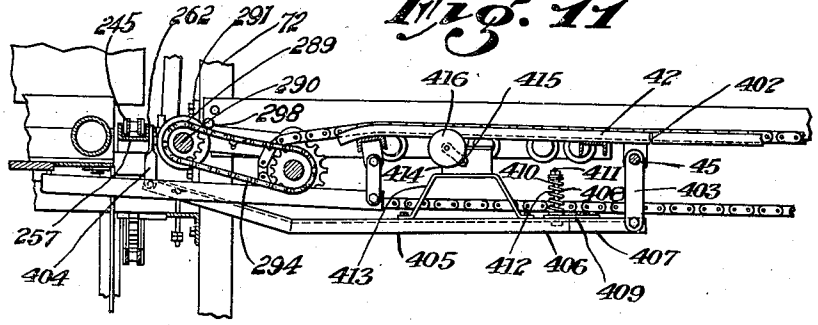


Fig. 12

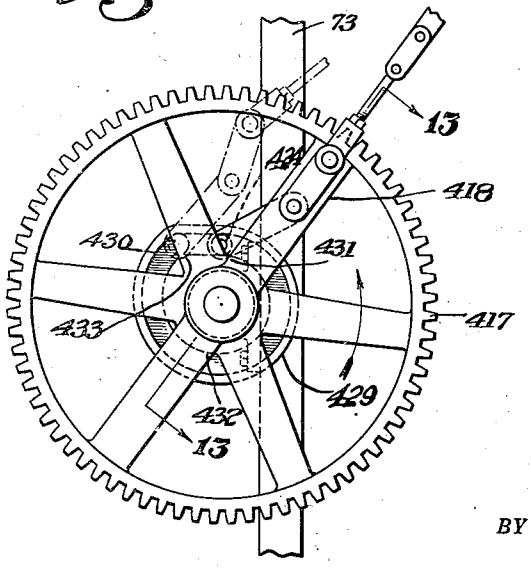
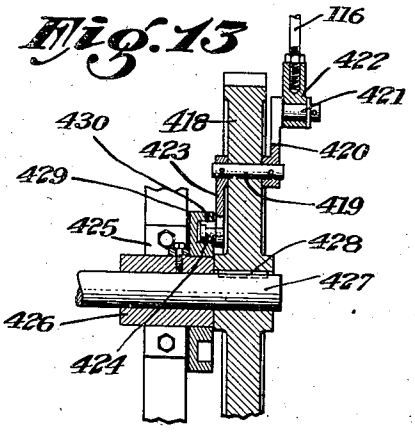


Fig. 13



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Patented Mar. 9, 1943 2,313,478

UNITED STATES PATENT OFFICE

2,313,478

BOX STACKING AND CONVEYING MECHANISM

Ambrose Neja, Anaheim, Calif.

Application April 28, 1941, Serial No. 390,737

18 Claims. (Cl. 214—6)

This invention relates to box stacking and conveying mechanism.

At the present time, it is customary in warehouses after a box has been packed with fruit, or other objects, but for the present assuming fruit, to stack the boxes one upon the other to a given height and thereafter to move the stack to selected locations within the warehouse for further distribution.

An object of the present invention is to mechanically stack the boxes to any predetermined height, and thereafter, through suitable conveying means, to move the stacked boxes to any given location.

Another object is the provision of mechanism adapted to stack boxes wherein boxes are sequentially placed upon a conveyor and fed by said conveyor into stacking mechanism, whereby the boxes are stacked one upon the other for any selected number, and after a stacking of the selected number, to move said boxes by suitable mechanism, automatically functioning, to any designated location.

Another object is the provision of suitable conveying mechanism adapted to feed boxes to a stacking mechanism, and after proper stacking, to provide further mechanism which carries said boxes from the stacking mechanism, so that the sequence of conveying and stacking is carried on at a rapid rate.

Another object is the provision of mechanism which is simple in character, with the number of working parts reduced to a minimum, which is capable of operating rapidly, and which stacking of boxes or similar objects to a given height or number is accomplished without the already stacked boxes dropping during stacking, which might result in injury to any object or objects within the boxes.

With respect to the last named object, it may be stated that fruit, as a rule, is closely packed within its boxes, and if the boxes are roughly handled, the surface of the fruit is often injured, with the result that rot takes place or the fruit is rendered unsalable on the market. It, therefore, is essential in any type of box stacking mechanism, and constitutes an object of the present invention, to provide stacking mechanism which produces minimum jar during a stacking operation of one box upon the other. It is likewise essential that after the boxes have been stacked, that they be lowered to the conveying mechanism with a minimum of jar, and for the reasons stated.

In the simplest embodiment of my invention, I provide a suitable conveyor termed a feeding conveyor, upon which may be placed boxes which have been filled with various commodities say, for instance, oranges. This feeding conveyor will deliver the boxes filled with fruit to the stacking mechanism in such a manner that the boxes are sequentially stacked as they are fed by the conveyor. After a given stack height has been reached, the stacking mechanism becomes inoperative, and a secondary conveying system will then move the stacked boxes from the stacking mechanism for further distribution.

In the machine, I have provided suitable means whereby improper feeding of the boxes to the stacking mechanism is effectively prevented so that the mechanism functions efficiently and properly at all times.

Other objects of the invention consist in a box stacking mechanism which is inexpensive in cost of manufacture, and capable of producing superior results.

With the aforesaid objects in view, the invention consists in the novel and useful provision, formation, construction, association and relative arrangement of parts, members, and features, all as shown in a certain embodiment in the accompanying drawings, described generally, and more particularly pointed out in the claims.

In the drawings:

Figure 1 is a plan view of the improved stacking and conveying mechanism,

Figure 2 is a fragmentary plan view of certain features of the invention shown in a changed relationship from that of Figure 1,

Figure 3 is a rear elevation of the improved box stacking and conveying mechanism,

Figure 4 is a rear elevation of the box stacking and conveying mechanism, and looking in the direction of the arrow 4 of Figure 1,

Figure 5 is a sectional view on the line 5—5 of Figure 1,

Figure 6 is a fragmentary vertical sectional view, similar to that of Figure 5, but showing certain parts in a changed relationship from that of Figure 5,

Figure 7 is a side elevation, partially in vertical section, on the line 7—7 of Figure 3,

Figure 8 is a sectional view on the line 8—8 of Figure 5, and on an enlarged scale of said figure,

Figure 9 diagrammatically illustrates a wiring diagram for controlling motor operation for the box stacking and conveying mechanism,

Figure 10 is a fragmentary, transverse sectional and plan view of a modified form of the conveying mechanism,

Figure 11 is a sectional view on the line 11—11 of Figure 10,

Figure 12 is a modified form of a member of the elevating mechanism, and,

Figure 13 is a fragmentary sectional view on the line 13—13 of Figure 12.

Referring now with particularity to the drawings, and as a brief statement of the invention, I provide suitable feeding mechanism whereby boxes which have been filled with some commodity, say oranges, are directed to a stacking trough. At the stacking trough, I provide an elevator which receives a box, elevates the box to a given position, whereupon suitable means holds the box elevated, the elevator descending to its initial position and another box may be received thereon, again raised to contact the already elevated box within the stacking trough, and the first and second boxes are then held elevated, the elevator again descending to a lower level, and so on, until a given number of boxes have been stacked one upon the other in the trough.

While any number of boxes may be stacked, still for convenience it is assumed, in the present invention, that stacks of seven boxes are desired. When the seventh box is to be elevated, suitable mechanism which contacts with the uppermost box of the stack is operated, upon elevation of the last box, to-wit, the seventh. This mechanism is so timed with relation to the elevation of the seventh box that practically no jar occurs when the seventh box is brought into contact with the elevated stack of six boxes. The arrangement is such that the elevator will then descend with the stack of seven boxes, to its lowermost level, and at this time, the stack is deposited on a conveyor for convenience called the discharge conveyor, and which conveyor will move the stack to a desired location. This desired location may be situated some distance from the mechanism just described, say some place in a warehouse. The discharge conveyor is so constructed and arranged that a length of the same is normally below the level of the top of the elevator during all the time that boxes are being stacked and until a designated number of boxes have been stacked, whereupon through suitable mechanism, this discharge conveyor is elevated for contact with the lowermost box of the stack.

I have also provided on the feed conveyor suitable mechanism whereby boxes to be fed to the elevator to be stacked in the trough are prevented from bunching, or from an attempted feeding to the elevator when the elevator is raised or moving upwardly or downwardly. To this end, I have provided two types of feed conveyors, one of which is constantly in operation, and the other of which operates depending upon the position of a box to be fed to the elevator. A clutch arrangement is provided, said clutch being operated by suitable levers, whereby the clutch is either engaged or disengaged, dependent upon the position of the boxes upon the two feed conveyors. If, for instance, the elevator is in the act of moving upwardly to lift a box, the continuously running feed conveyor has the upper reach thereof dropped below certain supporting rollers for the box, whereby this feed conveyor does not move the box. On the other hand, if two boxes are too closely placed together upon the conveyors, then through suitable lever arms adapted to contact with the boxes, the clutch is disengaged, which will stop movement of the intermittently operated feed conveyor, the continuously running conveyor at all times being in operation to feed one of the boxes onto the elevator.

I have provided a novel arrangement of switches for controlling the operation of an electric motor, which motor in turn drives through suitable mechanism for raising and lowering the elevator. The arrangement is such that the elevator will always assume a correct downward position at all times, a feature of importance, as any tendency of the elevator to lower and then slightly raise again might change the timing arrangement in such a manner as to directly affect the discharge conveyor. In other words, the discharge conveyor mechanism might not sufficiently raise the same above the top surface of the elevator so that a stack of boxes could be moved from the stacking trough.

Further refinements of the invention consist in suitable pneumatic means for assisting in lowering of the elevator with the filled boxes stacked thereon.

The device for initially feeding boxes, stacking the same, and discharging the same after being properly stacked is designated as an entirety by 1; and said device may have its constituent members, such as the feed conveyor designated as an entirety as 2, the discharge conveyor designated as an entirety by 3, positioned relative to stacking mechanism for the boxes, including an elevator 4, arranged at or below floor level 5. Thus, in the embodiment, boxes already on the floor and packed with a commodity, may be placed upon the feed conveyor 2 to be ushered into the stacking mechanism and particularly upon the elevator 4, raised by the elevator a selected distance so as to sequentially build up a pile or stack of boxes in substantial parallelism within a stacking trough 6. As has been stated in the brief outline of the invention, the boxes, after being stacked to a given number, are moved from the trough by the discharge conveyor 3 at the floor level 5, to a given designated location in a warehouse.

The feeding conveyor 2 (see Figure 1) includes in the present adaptation of the invention any number of chains, in the present instance two pairs of substantially parallel and spaced apart continuous chains, one of which pairs is adapted to run continuously when the device as an entirety is in operation and is designated as continuous feed conveyor 7, and the second pair of which may run intermittently or continuously, dependent upon the proper feeding of boxes by both said feed conveyors, and designated as intermittent feed conveyor 8. The conveyor 8 has spaced apart substantially parallel chains 9 and 10 passed over sprockets 11 and 12, the sprockets being mounted upon a shaft 13, the shaft being carried in journals secured to angle type, substantially parallel and spaced-apart guide frame members 14 and 15, which may rest upon the floor. These guide frame members are braced and held in substantial parallelism in any suitable manner, such as by cross brace pieces, of which there may be a plurality and here designated as 16.

Secured to the shaft 13 is a clutch 17. The clutch is in two parts 18 and 19. The part 18 constitutes a drum having secured thereto a sprocket 20. This sprocket is adapted to be driven, as hereinafter described. Within the drum is a split brake shoe 21. A cross piece 22 is secured to the shaft 13 and to the brake shoe, to the end that when the brake shoe is in engagement with the inner surface of the drum

and the drum is being rotated, the shaft 13 will be rotated. To expand the brake shoe into drum engagement, a lever 23 is adapted for engagement with the cam surface 24, of member 19 to rock the same and expand the split brake shoe into drum engagement when the member 19 is in the position shown in Figure 1. The member 19 floats upon the shaft 13 and is normally urged into lever engagement so that the shoe is expanded against its drum by a spring 25. This spring is interposed between a collar 26, forming a part of the member 19, and a stop washer 27 secured to the end of the shaft 13. When the spring 25 is compressed, as shown in Figure 2, the brake shoe is out of engagement with the inner surface of the drum, with the result that the shaft 13 is not rotated, irrespective of rotation of the drum 18. No invention is claimed in this clutch, per se, as it is of an ordinary type readily purchasable upon the market.

The upper reaches or lengths of the feeding conveyor chains 9 and 10 are preferably received in channel members 28 and 29, which act as supports for the chains while the chains are carrying a load. The length of the chains is immaterial and will, of course, depend upon the number of boxes adapted to be loaded thereon for movement toward the stacking mechanism.

The continuously running feed conveyor includes, in the present instance, a pair of spaced apart chains 30 and 31, the chain 30 being in substantial alignment with the chain 9, and the chain 31 in alignment with the chain 10. An idler shaft 32, received in suitable journals beneath the guide frame members 14 and 15 carries thereon sprockets 33 and 34, over which the chains are trained. A drive shaft 35 for the chains 30 and 31 is suitably journaled beneath the frames 14 and 15, the shaft carrying thereon sprockets 36 and 37, over which said chains 30 and 31 are trained. One end of the shaft 35 carries a sprocket 38, this sprocket having a continuous chain 39 trained thereabout, the said chain in turn being trained about a second sprocket 40 secured on a shaft of a suitable reduction gear, not illustrated, the gear in turn being driven by a motor 41. This drive mechanism is illustrated in Figure 4 as above the floor line, and for clarity of the views, the motor and chain are not shown in the remaining drawings. As is obvious, the motor may be placed at any other desired location. The upper reaches of the chains 30 and 31 are adapted to be guided as to movement and likewise held within guide channels 42 and 43. Said guide channels at the zones adjacent the sprocket wheels 33 and 34 are rockably mounted by providing lugs 44 for each guide channel beneath the same and carried upon a cross bar 45, the bar being secured between the guide frames 14 and 15. A pair of cross braces 46 and 47 are interposed between the guide channels and secured to the cross brace 47 is a depending lug 48, the lug in turn having rockably secured thereto a link 49. Rockably secured to the link and at one end thereof is a lever 50. This lever is secured to a boss 51 carried on the shaft 35 between the sprockets 36 and 37 (see Figure 1). This lever is of extended length and is adapted to be rocked relative to the shaft 35, dependent upon movement of an elevator for the stacking of the boxes, and as hereinafter more fully detailed. For the present, it may be said that the lever when rocked, will raise and/or lower the channel members 42 and 43, for instance to the position shown in Figure 5, or to the position shown in Figure 6. It is intended that the chain conveyors 30 and 31 should be trained loosely about the sprockets so that the upper reach of said chains may assume the position shown in Figure 5, or the position shown in Figure 6. It is obvious that this would occur for the reason that the ends of the channel guides adjacent the idler sprockets are rocked about cross bar 45 by the movement of the link 49.

Interposed between guide channels 42 and 43 and the guide frame members 14 and 15 are means designated generally as 52, the said means constituting a plurality of rollers 53, suitably carried in frames 54. These frames are held by brackets 55 to the guide frames 14 and 15. When the upper reach of each chain is in the position shown in Figure 5, each chain is spaced slightly above the periphery of the rollers, but when the link 49 has been actuated through movement of the lever 50, the upper reach of each chain is below the periphery of the rollers, as shown in Figure 6.

The shaft 35 carries a sprocket at 56, and a continuous chain is trained between this sprocket and the sprocket 20 secured to the drum 18. As before stated, when the shaft 35 is being driven, it is evident that the chains 30 and 31 will be continuously moved and that if the clutch is engaged, that the chains 9 and 10 will likewise be continuously moved. The intermittent movement of the chains 9 and 10 will depend upon operation of the clutch through mechanism which constitutes a pair of bell cranks 57 and 58, fulcrumed to brackets 59 and 60, the brackets in turn being secured to the guide frame member 15. One lever of each bell crank, to wit, the levers 61 and 62, is adapted to be positioned so as to overlie a reach of the conveyor chains 10 and 31 or to be moved from such overlying position, as illustrated in full lines in Figure 2. The other levers 63 and 64 of the bell cranks are secured to links 65 and 66, the links in turn being secured to ends of a lever 67. The lever 67 is intermediately rockably trunnioned to the collar 26. When the levers 57 and 58 are moved to the full line position of Figure 2, the lever 67 is in the position shown in Figure 2, and the clutch is disengaged. The lever 58 may assume the position shown in Figure 1, with the lever 57 in the full line position, or the lever 58 may assume the dotted line position at 68, the lever 57 being in the full line position of Figure 2 and the clutch will remain engaged. In other words, until both levers are in the full line position of Figure 2, the clutch is at all times engaged. However, when the clutch is disengaged, it is evident that the conveyor chains 9 and 10 will not be moved, whereas the conveyor chains 30 and 31 will be continuously moved.

As hereinafter more fully detailed, the exact position for mounting the bell cranks will depend upon the length of the boxes to be moved by said conveyor chains. Thus, in the showing of Figure 2, we have two boxes, 69 and 70. As long as the boxes are properly spaced and the elevator mechanism, to be described, is not in operation, the conveyor chains will move continuously. However, if the elevator mechanism is in operation, the lever 50 will be rocked upwardly for one end and downwardly where the link 49 connects with the same to lower the guide channels 42 and 43, to permit the box 69 to rest upon the rollers 52. When this occurs, it is necessary that the box 70 not continue onto the chains 30 and

31, which conveyor chains are, of course, continuously moving. Hence, the bell crank 58 is so positioned that the lever 62 will be rocked to the position shown in Figure 2 by engaging the side of the box 69. As the box 70 is following, upon engagement with the lever 61, said lever will be moved from the position of Figure 1 to that shown in full lines in Figure 2, and in so doing, will disengage the clutch, whereupon the conveyor chains 9 and 10 will cease movement, the box will now remain in the position shown in Figure 2 until the elevator has assumed correct position for receiving the box 69, whereupon the lever 50 will be rocked to move the link 49 and raise the channel guides in the upper reaches of the conveyor chains 30 and 31 above the peripheries of the rollers 52, at which time the box will move onto the elevator. When the lever 62 escapes from the rear edge of the box, the bell crank will rotate and the clutch will again engage, which will reestablish movement of the conveyor chains 9 and 10, to thereby move the box 70 onto the continuously operating conveyor chains 30 and 31.

The guide frame members 14 and 15 are secured to a framing structure, designated as an entirety by 71. This framing structure includes side uprights 72, 73, 74 and 75. Secured between the side uprights are base framing members, designated generally as 76, and upper transverse bracing members 77 and 78, respectively, extending between the uprights 72 and 74, and uprights 73 and 75. Other bracing members are provided intermediate the top and bottom transverse braces, as hereinafter set forth. The frame uprights extend above and below the floor line 5, as shown in the figures.

The elevator 4 is so carried by the framing as to lie in the path of the feeding conveyor so as to receive and have boxes deposited thereon, and likewise to raise the said boxes within the stacking trough 6, the elevator to this end being disposed to be received within said stacking trough.

The elevator 4 includes a base 79 reenforced by plates 80 and 81, and side members 82 and 83, with spaced-apart rollers 84, interposed between said side members. The rollers are transverse to the path of movement of the feeding conveyor chains 30 and 31 so that a box may be readily received upon the elevator. However, one of the rollers has a braking device 85, which tends to restrict rotation thereof. This braking device includes an arm carrying a brake shoe bearing against the periphery of the roller, and the roller selected in the present instance is the one adjacent the last roller, that is to say, a roller removed from the feeding conveyor. It is intended that movement of the box upon the conveyor while free to move upon the first two rollers, nevertheless is restricted as to movement by the next roller so as to retard movement of the box as it finally positions itself upon the elevator.

Secured to the base 79 is an elongated tube 86 passed through a guide sleeve 87 positioned adjacent the base of the elevator when the elevator is in its lowermost position. This guide sleeve is suitably held in position by spaced pairs of transverse bracing members 88, 89, 90 and 91, secured by means of angle pieces to front and rear pairs of transverse brace members 92, 93, 94 and 95 (see Figure 7). The brace members 92 and 94 are held to the uprights 72 and 73 in any suitable manner, and the brace members 93 and 95 are secured to the uprights 74 and 75. The lowermost end of the tube 86 has secured thereto a collar 96 provided with a pair of diametrically disposed arms 97 and 98, the ends of which carry rollers 99 and 100. These rollers are adapted to ride upon rails 101 and 102. The rails are secured in substantial parallelism at their upper ends to the members 94 and 95, and at their lower ends to certain members of the base framing 76, to wit, the members 103 and 104. When the tube of the elevator is adapted to be moved by suitable means which is secured to the collar, any tendency of the tube to bind within the guide sleeve 87 is prevented by the roller contact with the rails. Thus, easy operation of the tube is assured.

To raise and lower the elevator 4, I have provided means designated as 105. This means includes a motor 106, which through the medium of a reduction gear 107, is adapted to drive a large gear wheel 108. This gear wheel has secured thereto one end of a chain 109, the opposite end of the chain being secured to a lug 110 formed on the collar 96. The motor 106 may be secured by a suitable mounting 111 attached to the base framing 76. This motor has its shaft driving reduction gearing within a housing 112, with the gear 107 on one of the driven shafts. The gear 108 has its shaft 113 suitably journaled in blocks 114 and 114a secured to the uprights 73a and 240 of the framing. The end 115 of the chain 109 carries a swiveled bolt 116, the bolt being secured to a stud 117 journaled on a trunnion 118, this trunnion 118 being carried upon a slide 119 received in a groove 120 of one of the spokes of the gear. The slide 119 is provided with a pair of elongated slots, and bolts 121 and 122 (Fig. 5) pass through the slots and through openings in the spoke of the gear, whereby the slide may be adjusted radially of the gear spoke. The gear 108 carries an arcuate strap 123. A switch, designated as an entirety by 124, is adapted to be actuated to open the same when contacting the arcuate strap. Said switch includes a housing 125, and a rotatable wheel 126 secured on the end of a switch arm in such a manner that when the wheel is engaging the arcuate strap, the arm is moved to open the switch, and when the wheel is out of strap engagement to allow the switch arm to close an electrical circuit. The housing is carried on a bracket 127 secured to the framing upright 73a. It is to be noted that when the elevator is in its lowest position, as shown in Figure 5, that the roller 126 of the switch is in engagement with the arcuate strap 123.

Substantially paralleling the tube 86 is means 128 for arresting downward movement of the elevator. This means includes a cylinder 129, the base of which is secured to a transverse framing member 130. Within the cylinder is a piston 131. The piston arm 131a is, by means of a fitting 132, secured to the plate 81 of the elevator. Secured adjacent the base of the cylinder is an air inlet valve 133 and an air outlet valve 134 (see Figure 8). The air inlet valve includes a cap 135 in threaded engagement with a nipple 136, the cap being formed with an opening 137 with a spring-pressed ball, designated generally as 138, normally seated within the opening 137 and closing the same. The arrangement is such that when the elevator moves upwardly to move the piston upwardly within its cylinder, the spring will allow the ball to open and air to enter through the opening 137 of the cap and into the cylinder. As the elevator commences its downward movement, the spring-pressed ball will close

passage through the opening 137 and outward passage of air from the cylinder is controlled by the valve 134. In this connection, the cylinder is provided with a threaded nipple 139 having connected thereto the valve 134. The plug 140 of the valve has two bores 141 and 142 of different diameters. The bore 141 of the plug is substantially uniform with the diameter of the bore in the valve body 143. When the plug is turned at right angles, the bore 142 is so positioned that air from the cylinder must escape through the small diameter bore of the plug. The rate of escape of the air from the cylinder determines the rate of descent of the elevator. Until the last box of a selected number of boxes for a stack has been received within the stacking trough 6, the plug is not rotated to position the bore 142 in axial alignment with the bore of the valve body. The means for rotating the plug will be hereinafter detailed.

The stacking trough is adapted to be so positioned relative to the elevator that the elevator is central thereof, to the end that a box to be raised by the elevator within the stacking trough may be confined by said trough, and thereby be prevented from dislodgment or movement during a stacking operation of the boxes. The stacking trough includes a rear or back wall 144, and two side walls, spaced apart in substantial parallelism and connected with the rear wall. These side walls are shown at 145 and 146. The construction is such that the side walls 145 and 146 are of lesser length than the rear wall 144, and the rear wall 144 extends downwardly and rearwardly of the elevator, as seen in Figure 7, wherein it will be observed that the rear wall is flanged at 147 with a transverse strap 148 secured to the external surface of said wall in any suitable manner, by means 149, and which strap 148 is provided with end brackets 150 and 151, the brackets in turn being secured by means 152 and 153 to the framing members 72 and 73 (see Figure 4). Thus, the back member of the trough is rigidly held in position to the framing. The sides 145 and 146 have secured thereto elongated angle brackets 154, 155 and 156 (see Figures 3 and 5). The angle brackets in turn are secured to the transverse bracing members 77 and 78 in any appropriate manner, such as by the bolt-nut arrangement shown (see Figure 5). In Figure 7, it will be observed that the angle bracket 155 is secured between the transverse frame members 77 and 78. Brace members 157 and 158 are secured to the sides, for the purpose of giving rigidity to the stacking trough. The sides 145 and 146 of the stacking trough are relatively divergently bent to provide wings 159 and 160. These wings act as guides to assure proper entrance of the boxes within the stacking trough. For instance, if a box is not completely centered upon the elevator and the elevator is raised, one or the other of the guide wings will contact an edge of the box and force the box to center within the confines of the stacking trough.

I have provided means adapted to maintain a lowermost box of a stack, or a single box, at a selected distance above the elevator when the elevator is in its lowermost position, with the said box or boxes confined by the three walls of the stacking trough. In particular, the said means includes members adapted to be actuated by the work to move the same from the path of movement of a box resting upon the elevator during upward movement thereof to permit said box to pass beyond the confines of said means, and thereafter to move beneath said work to engage the work as the elevator again descends to its initial box receiving position. This said means is arranged to cooperate with other mechanism which actuates said means when the last box to be stacked has been raised to a position by the elevator to bring said box into work engagement with the remainder of the stacked boxes. At that time, the said means is held open during descent of the elevator with the stacked boxes thereon. The said means includes a pair of members 161 and 162, each member including a pair of arms 163 and 164 (see Figure 7), a portion of the arms being bent as shown at 165, with a shoe 166 extending between ends of the bent portion of each pair of arms, the shoe being provided with a flat supporting top 167 and a pair of flange portions 168 and 169, the flange portion 168 overlying the parallel pair of arms, the opposite end portions of each pair of arms being provided with lugs 170, the lugs being keyed or otherwise secured on a shaft 171, the shaft of which is carried in bearing blocks 172 and 173, secured to the frame uprights 73 and 75, respectively. The other pair of arms is secured in the same manner to the frame uprights 72 and 74 (see Figures 3 and 4). Thus, the pair of arms is rockably mounted so as to swing inwardly of the stacking trough, which is to say that the shoe members may approach each other or swing apart. Normally, the shoe ends of the arms are urged in one direction, that is, inwardly of the stacking trough. However, the degree of inward movement is controlled by notched, recessed or cut-out portions 174 and 175 in the back wall of the stacking trough. These cut-out portions are adapted to receive the shoe portions of the arms (see Figures 3 to 6, inclusive). The arms are urged into the cut-out portions 174 and 175 through the medium of springs, one of which will be described, the other being identical. A bolt 176 (Figure 4) has coiled thereabout a spring 177. This bolt is passed through an opening in one of the legs of the upright member 72 and a nut-washer arrangement 178 slidably secures the bolt to the leg. The opposite end of the bolt carries a short bracket 179 secured to the arm 161 and a nut-washer arrangement 180 for this end of the bolt secures the bracket, the bolt and the spring in position. The spring is of the compression type, and hence urges the arm 161 to swing about its pivot point so that the shoe is normally received within the cut-out portion 174 of the back wall of the trough.

In order to stop movement of the box which is directed onto the elevator when the elevator is in its lowermost position, a stop plate 181 is provided. This stop plate is secured by means of upper and lower brackets to the member 161 and specifically to the parallel arm members 163 and 164 thereof. Figure 6 illustrates movement that may occur when the member 161 is rocked about its shaft 171. A switch 182 includes a casing secured to the plate 181, a switch actuating portion comprising a wheel 183 projecting through a slot in the plate 181, as shown at 184 in Figures 1, 5 and 6. Movement of this wheel in one direction will close the switch contacts 185 (see Figure 9). The wheel is normally urged in one direction, to wit, forwardly of the front face or box engaging face of the plate through the medium of a coil spring 186 (see Figure 9). The arrangement is such that when a box is received upon the elevator, the elevator being in the position of Figure 5, the switch wheel will be moved to close the contacts 185, which

will complete an electrical circuit through an iron core coil 187 and attract an armature 188 of a switch to move two contact arms 189 and 190 into engagement with contact points 191 and 192 and complete an electrical path through the motor 106. The source of current supply is through the lines 193 and 194, and the switch arms 189 and 190 are connected thereto. The switch 124 is normally "Off" due to the fact that the roller 126 is riding upon the top of the arcuate strap 123, secured to the gear 108. The switch arm 195, when the roller 126 escapes from the arcuate strap 123, completes an electrical circuit through contact 196. The arrangement is such that contacts 185 remain closed while the roller 126 is riding upon the arcuate strap, and at or after the roller 126 escapes from the arcuate strap to close contact between the arm 195 and the contact point 196, the contacts 185 will open. This arrangement maintains the magnetic switch 187 in operation so that the motor 106 continues to operate until the roller 126 again engages the arcuate strap 123 and opens the switch 124, thus stopping operation of the motor by breaking the current path.

I have provided means whereby when a given number of boxes have been stacked one upon the other and received within the stacking trough at a selected elevation therein, that upon the further addition of a box to said stack, certain means will be actuated to move the members 161 and 162 out of box engaging position and at the same time bring into operative position the discharge conveyor 3, so that when the elevator with the stacked boxes thereon is lowered, the discharge conveyor will remove said stack of boxes to any given location, as selected. This means for moving the members 161 and 162 out of box engaging position and for actuating the discharge conveyor, is designated as an entirety by 197.

Means 197 includes two rods 198 and 199 joined together by a coupling 200, the said coupling including a tube 201 threadedly secured by means 202 to the threaded end of the rod 198 while the rod 199 is received within the member 201 and carries a head 203, between which head and end 204 of tube 201 and surrounding the said rod 199, is a coil spring 205. The back or rear wall 144 of the stacking trough is provided with a centrally disposed longitudinal slot 206. Adapted to project through said slot is an arm 207 formed at one end with a fitting 208 whereby it may be adjustably secured on the rod 199. That portion of the arm which is received within the stacking trough carries an angle member 209, and this angle member is substantially at right angles to the length of the rod 199 and in such a position as to be in the path of any box received within the stacking trough, when the box stack reaches a predetermined height within said trough. This angle member may be held to the arm in any approved manner, such as by the nut arrangement shown at 210.

The rod 198 passes through a guide fitting 211 secured to the member 155 and said rod 198 above said fitting 211 is provided with an adjustable collar 212, which acts as a stop means upon engagement with the fitting 211 to limit downward movement of the rod 198. The rod 198 is passed through a further guide fitting 213 secured to brace member 94. The rod 198 is provided with collars 214, 215 and 216, adjustably secured thereon. As shown in Figure 4, the rod 199 is passed through a guide fitting 217 secured to brace 149 and likewise through a further guide fitting 218 secured to transverse bracing member 219 at the top of the rear wall of the stacking trough. Further bracing members for the upper end of the trough are shown at 220 and 221 (see Figure 1). The collar 214 is provided with a stud 222, and a pair of links 223 and 224 have ends thereof journaled on said stud, with the opposite ends of both said links provided with elongated slots 225 and 226. Bolt members 227 and 228 secured to the members 161 and 162 are passed through said elongated slots 225 and 226 so that certain actuation of the links will produce movement of the members 161 and 162. The links are provided with depending arms 229 and 230 and a coil spring 231 is secured to the outer ends of said arms. The arrangement is such that when the parts are in the position shown in Figure 4, the spring is below the pivot point of the links 223 and 224 with the collar 214. The slots in the said links permit the members 161 and 162 to swing a given degree about pivot points without causing appreciable movement of said links. In order to check downward movement of the member 197, considered as an entirety, I have provided the means shown at 232 comprising a cylinder 233 rockably secured at one end by means 234 to member 94. A piston is within said cylinder and a piston stem 235 is secured to the collar 215. The usual air outlet, not shown, is provided for this particular cylinder so that air may be allowed to enter the cylinder behind the piston as the piston rises, and likewise to slowly escape therefrom so that any dropping effect of the member 197 as an entirety is cushioned. When the toggle is in the un-made position as shown in Fig. 4, the pivot 222 is below the center of links 223 and 224 and the spring 231 pulling on arms 229 and 230 tends to force the arms 161 and 162 away from each other, but this tendency is more than overcome by the combined actions of springs 177 and the weight of angle member 209 and rods 198 and 199. When the stack of boxes has reached a certain level within the stacking trough, the further elevation of a box will cause the uppermost box of the stack to contact the member 209 and raise the same, which will move the assembly comprising the rods 198 and 199 upwardly and likewise resiliently, due to the coupling arrangement 200 and cause the links to pass center and be held past center by the spring 231, or in the dotted position shown in Figure 6 at 236. This forms a true toggle and when the parts are moved to this position, it is evident that said links will forcibly separate the members 161 and 162, as shown in Figure 6, and hold the said member separated. When the toggle is in this position, the spring 231 and springs 176 tend to force the arms 161 and 162 toward each other. The weight of rods 198 and 199 and angle member 209 is insufficient to overcome this tendency and the toggle is thus held in "made" position until released by means to be presently described. Furthermore, the piston within the cylinder 233 will be raised so as to provide a pneumatic cushion when the rods 198 and 199 again move downwardly. The collar 216 is forcibly moved upwardly during the stacking of the last box within the trough and this movement is such as to actuate certain members to be presently described, to bring into operative position the discharge conveyor 3, to the end that the stack of boxes, when lowered by the elevator, will rest upon the said conveyor and be moved

from the elevator to a selected location away from the stacking mechanism.

Secured between the uprights 72 and 74 is a transverse bracing member 237, one end of which extends beyond upright 72. A like transverse bracing member 238 extends between uprights 73 and 75. Uprights 239 and 240 are provided for supporting the outer ends of said members 237 and 238, and these particular uprights extend to the supporting base and are secured to an angle piece 241 (see Figures 1 and 7). Also secured between uprights 71, 72 and 239 is a base piece 242, and between the uprights 73, 74 and 240 is a base piece 243.

The discharge conveyor 3 includes a pair of continuous chains 244 and 245 passed around sprockets 246 and 247. These sprockets are mounted upon trunnions 248 and 249, the trunnions in turn being held to the members 237 and 238 by blocks 250 and 251. Further sprockets (not shown) are provided outward from the stacking mechanism and around which the conveyor chains 244 and 245 are passed. Secured to the uprights 74 and 75 are bearing blocks 252 and 253, and extending therebetween is a shaft 254. A pair of arms 255 and 256 are keyed or otherwise secured to said shaft. These arms in turn are secured to channel members 257 and 258, within which channel members a portion of the upper reach of the conveyor chains 244 and 245 are received (see Figure 5). The ends of said channel members adjacent the sprockets 246 and 247 are curved downwardly, as shown for both said channel members at 259. Transversely extending between the channel members 257 and 258, and for the purpose of properly bracing the same, are front and rear angle members 260 and 261. It will thus be seen that the front portion of the channel members is swingingly mounted by being secured to the arms 255 and 256. Further channel members 262 and 263, substantially fixed in position, are in alignment with the movable channel members 257 and 258; that is to say, channel members 257 and 262 are in alignment, and channel members 258 and 263 are in alignment. Transverse bracing or supports 264 may extend between the members 262 and 263.

A pair of spaced twisted brackets 265 and 266 are spacedly secured to a leg of the brace member 93. Extending between the said brackets is a rod 267. Ends of said rod on the outer sides of said brackets have keyed or otherwise secured thereto arms 268 and 269. The outer end of each arm carries an elongated rod 270 and 271, the said rods being passed through openings in the transverse bracing members 92 and 93 (see Figures 3 and 7). Carried by the angle member 261 is a pair of spaced, swingingly mounted dogs or short levers 272. One of the dogs is shown in Figure 7. Both dogs are urged in one direction, to wit, to swing toward the brace 92, through the medium of tension springs 273. Both dogs are in alignment with the ends of the rods 270 and 271. Adapted to be placed immediately below the dogs and particularly the foot portions thereof, are a pair of spaced apart supporting brackets, one of which is shown at 274 in Figure 7. Both supporting brackets are fastened to the brace 94. As rod 198 is raised, the collar 216 engages the angle member 261 and thus the channel guides 257 and 258 are swung relative to the pivot bearing shaft 254 and the upper reach of the conveyor chains will be raised above the level of the rollers 84 of the elevator when the elevator is in its lowered position. When the upper reach of both said conveyor chains is above the rollers of the elevator, the foot portions of the dogs 272 will be resting upon the platform portions 275 of the supporting brackets 274, and through the medium of the tension springs 273, the dogs will hold the channel guides in a substantially horizontal position with the chains above the periphery of the rollers of the elevator. Positioned substantially intermediate the channel guides 262 and 263 and secured to the rod 267 is a trip lever 276. This lever is provided with an upwardly and downwardly bent portion, as shown at 277. The arrangement is such that when a stack of boxes is conveyed beyond the confines of the elevator and strikes the portion 277, that this lever will be swung downwardly, which will rotate the rod 267, move the arms 268 and 269 to push the knock-out rods 270 and 271 against the dogs 272 and dislodge the same from the platform portion of the supporting brackets 274, whereupon due to weight, the channel guides 257 and 258 will swing downwardly relative to the bearing shaft 254, the upper reach of the conveyor chains 244 and 245 dropping below the supporting surface of the rollers on the elevator. The combined weight of channel guides 257 and 258 and rods 196 and 199 and angle member 260 is sufficient to overcome the action of the spring 231 and springs 176 and thus as the channel guides move downward, the angle member 261 forces collar 216 downwardly far enough so that the pivot 222 of the toggle is below center at which time the action of springs 176 combined with the weight of the rods and angle member 260 opposes the action of spring 231 and the rods continue moving downwardly until they resume the position shown in Fig. 4. The uprights 74 and 75 are provided with bearing blocks 278 and 279 and extending therebetween is a shaft 280. The shaft carries a pair of sprockets 281 and 282, and the teeth of the said sprockets engage a lower reach of each continuous discharge conveyor chain (see Figures 3 and 7).

The lower reach of the discharge conveyor chain 244 is adapted to move within a channel guide 283 (see Figure 5) held by means of one or more brackets 284 secured to the brace 238. The arrangement is such that the lower reach of the conveyor chain 244 will avoid and not contact with the elevator chain 109. It is to be noted in this respect that a length of the elevator chain 109 substantially parallels the elongated tube 86, the said chain being passed over a sprocket 285 carried on a shaft 286, ends of the shaft being secured in bearing blocks 287 and 288, the bearing blocks in turn being secured to the brace members 92 and 93. The sprocket 285 has its periphery closely adjacent the plate members of the elevator when the elevator is in its lowered position.

If we assume that a box has been received upon the feeding conveyor and particularly on the conveyor chains 30 and 31, the parts being in the position illustrated in Figure 5, the box will be fed toward the elevator. To assure that the box will move upon the rollers 84 of said elevator, a feed roller 289 is provided. This feed roller is centrally disposed between the feed chains, and is mounted upon a shaft 290, the said shaft having its ends received in bearing blocks 291 and 292, secured to the framing members 72 and 74. A sprocket 293 is secured to the feed roller 289, the diameter of the sprocket being less than the diameter of the feed roller, and a continuous chain 294 is passed over the sprocket 293 and

a sprocket 295 is secured to the drive shaft 35 (see Figure 1). Thus, when the box has been fed a certain distance by the continuously running chains of the feed conveyor, the box will contact the periphery of the rotating feed roller 289 and be moved onto the elevator.

Depending from that portion of the elevator which faces the oncoming box from the feed conveyor is a box stop member 296. This box stop member is in the form of a rectangular framing. The upper end of the framing is flanged and by suitable means, such as nuts and bolts 297, the flange is secured to the base 79 of the elevator. Thus, when the elevator moves from the position of Figure 5 to that of Figure 6, the stop member 296 blocks entrance so that an oncoming box may not enter beneath the elevator. A further stop means is provided in the form of a stop bar 298, forwardly of and adjacent the periphery of the feed roller 289. Thus, when the continuously running feed conveyor chains are in the position shown in Figure 6, any box moving toward the feed roller, will be stopped from contact therewith by the stop bar. This stop bar extends between the upright framing members 72 and 74.

For the purpose of guiding the boxes as they are delivered from the continuously running feed conveyor onto the elevator when the elevator is in its lowered position, guides 299 and 300 are provided (see Figure 7). These guides are in the form of flat plates secured by means of arms designated generally as 301, and rods designated generally as 302, secured to the framing members 72 and 74. It will be noted upon reference to Figure 7 that the guides are spaced a distance apart slightly greater than the width of a box, to the end that a box will be directed substantially centrally of the elevator.

The lever 50 which controls elevation of the channel guides for the upper reaches of the continuously running chains of the feed conveyor, is limited as to its swing through the medium of tie bolts 303 passed through openings in the framing member 237. Through the medium of nuts 304, adjustability in movement of the lever is effected.

In Figures 1 and 2, I have illustrated clutch mechanism 17 adapted to be actuated in such a manner as to control movement of the feed conveyors, to the end that loaded boxes are prevented from being fed to the elevator if the elevator is raised during a box stacking operation, or if the elevator is lowered for the purpose of discharging the stacked boxes.

Referring to Figures 10 and 11, the feed conveyor chains 400 and 401 may be of extended length. Whereas in Figures 1 and 2, I have provided two independent pairs of feed conveyor chains, the present modification of this portion of the invention is so constituted and arranged that the feed chains are stopped when the contingency mentioned, supra, occurs. As depicted in Figures 1 and 2, swingable guide channels 42 and 43 are provided and which channels are carried by the cross shaft or rod 45. The guide channels 28 and 29 have ends contiguous to ends of channels 42 and 43, as shown at 402 in Figure 11. The shaft 45 carries a link 403 and one of the discharge conveyor channels, to wit, 257, carries link 404, between which links 403 and 404 is an extended link or arm 405. This arm 405 is in two parts, as shown at 406 and 407. Normally, the two portions of the arm are held in alignment by an overload spring arrangement designated generally as 408. This arrangement comprises a bar 409 fastened to the link 407 and overlapping the portion 406. The arm 405 considered as an entirety is channel in cross section and extending through the top surface is a bolt 410, the outermost end of which is provided with washers held in place by a nut 411; interposed between the washers and the top surface of the bar 409 and surrounding the bolt is a coil spring 412. Secured to the portion 406 of the arm is a bracket 413. This bracket supports a switch enclosed within a casing 414, and provided with a switch arm 415 having at its extremity, a wheel 416. Normally, the switch arm is urged to rotate clockwise, viewing Figure 11, although the rotative movement is restrained. As the remaining portions of the device illustrated in Figures 10 and 11 correspond to Figures 1 and 2, the mechanism will not be further described.

Referring to Figures 12 and 13, I have illustrated a modification of certain of the means 105 to raise and lower the elevator 4. A gear 417 has one of its spokes 418 transversely bored to permit passage therethrough of a shaft 419. One end of the shaft has pinned thereto an arm 420. This arm carries a trunnion 421, and upon which trunnion is secured a stud 422. This stud is adapted to receive the bolt 116, which is secured by suitable means to the end 115 of chain 109. The shaft 419 has pinned thereto an arm 423. The arm carries transversely at its outer end a roller 424. Secured to the side upright 73 is a block 425, which block has a bearing portion 426. A shaft 427 is passed through said bearing portion and the gear wheel 417 is keyed thereto at 428. Surrounding the part 426, and fastened thereto so as not to move is a cam 429. This cam is provided with a facial groove 430 adapted to receive the roller 424. As illustrated in Figure 12, the cam groove has a substantially constant radius from the zone 431 to 432. From 432 to the zone 433, the radius gradually increases, and from 433 to the zone 431, the cam groove is substantially straight.

The operation, uses and advantages of the invention are as follows:

The invention provides a ready means whereby boxes may be stacked without injury to any fruit in the boxes and which permits a constant feeding of the boxes, after the same have been filled with some commodity, to the stacking mechanism without any "jamming." The parts that have been described of the invention are so arranged as to best permit fool-proof operation. The inventor is aware that various box stacking mechanisms have been on the market, but so far as at present known, most of said devices are quite expensive to construct and require supervision as to maintenance. The present invention contemplates a feed conveyor and a discharge conveyor both leading to a stacking mechanism which includes an elevator adapted to raise the boxes to stack the same within a stacking trough. Primarily, the feed conveyor is in two parts, one of which parts continuously operates and the other may operate either continuously or intermittently, dependent upon a proper feeding of the boxes to the elevator. If boxes are placed upon the feed conveyor, said boxes, if improperly spaced when brought in juxtaposition to the elevating mechanism, will be prevented from attempted placement upon the elevator through mechanism which while not stopping operation of the continuously operating feed conveyor, never-

theless moves said conveyor out of box engagement. This condition will occur when the elevator is in the act of either raising a box within the stacking trough or while the elevator is being lowered. When the elevator is in position to receive a box, certain mechanism is operated which raises the continuously operating feed conveyor to move said box onto the elevator, and operation of the second member of said feed conveyor is resumed through the medium of a simple clutch arrangement, which may be thrown-out or thrown-in in accordance with the spacing of the boxes upon the feed conveyors, and the operation of the elevator. Hence, so far as this portion of the mechanism is concerned, the device is capable of functioning continuously without supervision to properly space the boxes upon the feeding conveyors so that boxes may be properly received upon the elevator.

A simple expedient in the form of arms is provided for supporting the stacked boxes within the stacking trough, and which arms function to spread apart as a box is elevated by the elevator, and then to swing under the lowermost box to hold the stack of boxes in position within the stacking trough, while the elevator again descends to receive a further box. When the last box to be received within the stack is raised by the elevator, the uppermost box will strike the cross arm **209** and raise the rods **199**, which in turn will move the links **223** and **224** and actuate the arms **161** and **162** to cause relative separation thereof and allow the entire stack of boxes to descend as the elevator descends. This action likewise brings into operation the discharge conveyor which will remove the stack of boxes to a selected location, in say, the warehouse. When the stack of boxes has been moved from the elevator by the discharge conveyor, contact is made with part **277** of lever **276** permitting a drop of the upper reach of the discharge conveyor chains. When this occurs, the upper reach of said chains will be below the top surface of the rollers of the elevator.

The operation of the modified forms of certain of the mechanism of the invention as illustrated in Figures 10 to 13, inclusive, is undoubtedly obvious. However, it may be pointed out that as to the mechanism depicted in Figures 10 and 11, the clutch mechanism shown in Figures 1 and 2 is dispensed with. As the boxes are carried on the conveyor chains **400** and **401** toward the elevator, there will come a time when movement of the chains must be stopped due to elevator position. Ordinarily, the mechanism will be as shown in Figure 11, but if the elevator is raised or boxes are being discharged when the elevator is in its lowered position, the chains **400** and **401** must be lowered so that the boxes will not move forwardly. To accomplish this, the switch arm **415** is adapted to be actuated so as to break the electrical circuit leading to the motor which, through the medium of a continuous chain, turns the sprocket **38**. The lever **50** maintains the guide channels in the position shown in Figure 11 when the elevator is in its lowered position. When the elevator is raised, the lever **50** allows the channels to drop thereby lowering the chains **400** and **401** below the rollers **53**, or to the position illustrated in Figure 6. When the elevator is in its lowered position, and the discharge conveyor system is ready to operate, the arm **405** will be moved upwardly, thereby positioning the wheel **416** above the upper surface of the conveyor chain so that an on-coming box will contact the same to move the switch arm and break the circuit to the motor adapted to drive the conveyor chains. To assure against breakage of the arm **405**, in the event the switch arm is actuated to the excursion of its movement, I have provided the overload spring arrangement **408**, previously described.

The form of the invention shown in Figures 12 and 13 is useful in that the elevator is moved at a slow rate of speed until a box is brought into contact with a box resting upon the supporting tops **167** of the arms **161** and **162**. This is accomplished through the provision of the cam **429**, which controls the actuation of the elevator through the medium of the chain **109**. Taking the position of the cam as shown in Figure 12, rotation of the gear is anti-clockwise, or in the direction of the arrow. The full line position shows the roller **424** in the position that it would assume relative to the facial groove of the cam when the elevator is in its lowermost position as, for instance, illustrated in Figure 5. Likewise, as illustrated in Figure 5, a box shown in dotted lines is resting upon the elevator. There is a slight distance that the elevator must move to bring the box into engagement with the shoes carried by the bent arms **165**. As before stated in detail, it is intended that a box being raised by the elevator should not permit the shoes to be totally disengaged from beneath the lowermost box, or a stack, until the box being raised is almost in contact with the stack. The present form or modification of the invention permits the box being elevated to move slowly and to assure that the arms are moved out of engagement with the lowermost box of the stack in such a manner that little or no shock occurs by the time the elevated box contacts the lower box of the stack. This is accomplished by the cam and particularly the straight portion of the cam, being that portion between the full line position and the dotted line position for the roller **424**. After the box being elevated has contacted the lowermost box of the stack, the speed of raising of the elevator is accelerated by the construction of the cam, until a time is reached when the elevator must again descend. The elevator descends at a uniform rate of speed.

Various refinements have been incorporated in the present mechanism, such as pneumatic means for controlling the rate of movement of the elevator as it moves downwardly either with or without load, as well as pneumatic means for controlling the drop of the means **197**.

It is important in mechanism of this character that the elevator always descend to its lowest level and remain at the lowest level while receiving a box. The present invention has been simplified as to motor control, as diagrammatically illustrated in Figure 9, which permits the elevator to descend and upon reaching a given level, stop motor operation without any further travel of the gear **108**.

It is thought that the dual switching arrangement is novel. Other novel features are thought to reside in the two-part feed conveyor, with means controlled in part by movement of the elevator, to bring the upper reaches of one of the feed conveyors into box engagement or out of box engagement. The discharge conveyor provides a new arrangement.

I claim:

1. The combination in box stacking and conveying mechanism, of a stacking trough, an elevator adapted to sequentially raise boxes within

said trough to form a stack, a pair of spaced, movable, support members engaging the lowermost box of the stack elevated within the trough during each ascension and descension of the elevator, a shiftable member mounted adjacent to one side of the trough and a pair of toggle arms secured to the shiftable member and to the pair of movable support members and operable by the uppermost box after a selected box stack height has been reached for releasing the support members from the lowermost box of the stack to permit descent thereof on said elevator.

2. In a device of the character disclosed, a stacking trough to receive boxes, a pair of swing arms provided with supports positioned on opposite sides of the stacking trough and receivable in part within the trough, an elevator adapted to receive a box and to move said box upwardly within the trough and past said arms, the said arms swinging apart to permit passage of the box within the trough followed by swinging beneath the box to prevent descent thereof, a cross arm within the trough, a rod secured to said arm, and a pair of toggle arms secured to the rod and to the swing arms, whereby after a given number of boxes have been stacked within the trough, the cross arm is moved upwardly by the uppermost box of the stack to move the rod and the toggle arms to swing the arms apart and release the stack of boxes.

3. The combination in box stacking and conveying mechanism, of an elevator, a stacking trough within which said elevator is adapted to raise boxes, a feed conveyor for conveying boxes onto said elevator, means for raising said elevator and said boxes within the stacking trough when received on said elevator, a pair of spaced movable support members adapted to engage beneath the raised boxes to hold the boxes elevated within the trough, the elevator descending; a shiftable member mounted adjacent to one side of the trough and a pair of toggle arms secured to the shiftable member and to the pair of movable support members and operable upon the stacking of a selected number of boxes within said trough to cause said toggle arms to release the support members and permit the stack to descend as the elevator is lowered, and a discharge conveyor adapted to move the stack from said elevator and outwardly of said trough.

4. The combination in box stacking and conveying mechanism, of an elevator having a box supporting surface, a stacking trough, means for raising and lowering the elevator within said stacking trough, a feed conveyor for feeding a box onto said elevator to be raised by said elevator within the trough, swing arms adapted to be separated upon elevation of the box and movable inwardly beneath the box to hold the box within the stacking trough, the elevator descending, a discharge conveyor, and means actuated upon a certain number of boxes being stacked within said trough to position said discharge conveyor above the supporting surface of said elevator when the elevator is in its lowered position, the said elevator depositing said stack of boxes on said discharge conveyor.

5. The combination in box stacking and conveying mechanism, of an elevator having a box supporting surface, a stacking trough, means for raising and lowering the elevator within said stacking trough, a feed conveyor for feeding a box onto said elevator to be raised by said elevator within the trough, swing arms adapted to be separated upon elevation of the box and movable inwardly beneath the box to hold the box within the stacking trough, the elevator descending, a discharge conveyor, means actuated upon a certain number of boxes being stacked within said trough to position said discharge conveyor above the supporting surface of said elevator when the elevator is in its lowered position, the said elevator depositing said stack of boxes on the said discharge conveyor, and means for lowering said discharge conveyor below the level which the elevator supporting surface assumes when the elevator is in its lowered position after the stack has been conveyed a selected distance from the elevator.

6. In a box handling apparatus, an elevator, means to raise and lower said elevator, a stacking trough positioned in the path of movement of the elevator, means in the path of movement of a box in the trough to support a box in said trough upon delivery thereto by said elevator, means to convey boxes to the elevator, a discharge conveyor extending into the path of movement of a stack of boxes in the trough, said discharge conveyor being movably mounted and being normally out of engagement with a box on the elevator when the lattter is in lowered position and means to shift said discharge conveyor to position to be engaged by a box lowered by the elevator.

7. In a box handling apparatus, an elevator, means to raise and lower said elevator, a stacking trough positioned in the path of movement of the elevator, means in the path of movement of a box in the trough to support a box in said trough upon delivery thereto by said elevator, means to convey boxes to the elevator, a discharge conveyor extending into the path of movement of a stack of boxes in the trough, said discharge conveyor being movably mounted and being normally out of engagement with a box on the elevator when the latter is in lowered position, means to shift said discharge conveyor to position to be engaged by a box lowered by the elevator, and means to cause a stack of boxes in the elevator to be lowered when the stack reaches a predetermined height.

8. In a box handling apparatus, an elevator, means to raise and lower said elevator, a stacking trough positioned in the path of movement of the elevator, means in the path of movement of a box in the trough to support a box in said trough upon delivery thereto by said elevator, means to convey boxes to the elevator, a discharge conveyor extending into the path of movement of a stack of boxes in the trough, said discharge conveyor being movably mounted and being normally out of engagement with a box on the elevator when the latter is in lowered position, means to shift said discharge conveyor to position to be engaged by a box lowered by the elevator and means to simultaneously cause the stack to be lowered and said discharge conveyor to be moved to stack engaging position.

9. In a box handling apparatus, an elevator having a supporting surface, means to raise and lower said elevator, means to stack boxes above the elevator upon delivery by said elevator, means to lower a stack of boxes when said stack becomes of a predetermined height, and a discharge conveyor, said discharge conveyor being normally below the supporting surface of the elevator when the elevator is in its lowered position and means to move the discharge conveyor

to a position above the supporting surface of the elevator when the latter is in its lowered position, said discharge conveyor being adapted to remove the lowered stack from said elevator.

10. In a box handling apparatus, an elevator having a box supporting surface, a feed conveyor adapted to deliver boxes to said elevator, means actuated by a box delivered onto the elevator to raise and lower said elevator, a stacking trough parallel to the path of movement of the elevator, means to stack boxes in said trough upon delivery thereto by said elevator, means to lower a stack of boxes in said trough when said stack becomes of a predetermined height, a discharge conveyor, said discharge conveyor being normally below the box supporting surface of the elevator when the elevator is in its lowered position and means to move the discharge conveyor to a position above the box supporting surface of the elevator when the latter is in its lowered position, said discharge conveyor being adapted to remove the lowered stack from said elevator.

11. In a box handling apparatus, an elevator having a platform thereon, a delivery conveyor adapted to deliver boxes upon said platform, means to raise and lower said elevator, means above the elevator to support boxes upon delivery thereto by said elevator, means to release said support means to thereby cause said elevator to lower a stack of boxes when said stack becomes of a predetermined height, and a discharge conveyor chain at each side of said platform and in the path of a lowered stack of boxes, said chains being adapted to discharge a stack lowered by said elevator.

12. In a box stacking apparatus, an elevator, means to raise and lower the elevator, a box support on the elevator, box guiding means in which the elevator moxes, said guiding means having a width greater than the width of the box supporting means whereby a space is provided at each side of the support, a conveyor chain mounted in each space, means to mount said conveyor chains for movement from a position above the supporting surface when the elevator is in the lowered position to a position below the supporting surface when the elevator is in its lowered position, means to raise and lower the conveyor chains and means to drive the conveyor chains.

13. In a box handling apparatus, an elevator having a platform thereon, a delivery conveyor adapted to deliver boxes upon said platform, said platform including a plurality of rollers having their axes extending transversely of the path of movement of a box delivered to said platform, means actuated by the delivery of a box upon said platform to raise and lower said elevator, means to support boxes upon delivery thereto by said elevator, means to release said support means to thereby cause said elevator to lower a stack of boxes when said stack becomes of a predetermined height, and a discharge conveyor chain at each side of said platform and adapted to engage the lowermost box in a stack and to discharge the stack lowered by the elevator.

14. In a box handling apparatus, an elevator having a platform thereon, means to raise and lower said elevator, a discharge conveyor including a pair of substantially parallel continuous chains, a portion of said chains being adjacent opposed sides of said elevator platform, the top most part of said chains adjacent said elevator platform being normally below the level of the top of said elevator platform when the elevator platform is in its lowered position, means to raise said chains adjacent said elevator platform above the level of the top of said platform when the platform is in its lowered position upon the lowering of a stack of boxes in said trough, whereby said chains will engage said stack when said elevator is lowered and will remove said stack from said elevator platform, and means to lower said chains adjacent said elevator platform to their normal position upon the discharge of a stack of boxes from said elevator platform.

15. In a box handling apparatus, an elevator having a platform thereon, means to raise and lower said elevator, a delivery conveyor adapted to deliver boxes to said elevator platform, a stacking trough parallel to the path of movement of said elevator, means to support a box in said trough upon delivery thereto by said elevator, means to release said support means to cause said elevator to lower a stack of boxes in said trough when said stack becomes of a predetermined height, a discharge conveyor including a pair of substantially parallel continuous chains, a portion of said chains being adjacent opposed sides of said elevator platform, the top most part of said chains adjacent said elevator platform being normally below the level of the top of said elevator platform when the elevator platform is in its lowered position, means to raise said chains adjacent said elevator platform above the level of the top of said platform when the platform is in its lowered position upon the lowering of a stack of boxes in said trough whereby said chains will engage said stack when said elevator is lowered and will remove said stack from said elevator platform, and means to lower said chains to their normal position upon the discharge of a stack of boxes from said elevator platform.

16. In a box stacking apparatus, an elevator, box guiding means above the elevator, a pair of pivoted arms disposed upon opposed sides of the guiding means and movable into a position beneath a box in the guiding means, means to raise the elevator, means normally urging the arms towards each other into box engaging position, pivoted link means for holding said arms separated, a rod for actuating said link means and means operated by a box in said guiding means for moving said rod and llinks to cause said arms to move from box engaging position.

17. In a box handling apparatus, an elevator, a delivery conveyor adapted to deliver boxes to said elevator, means actuated by the delivery of a box onto the elevator to raise and lower said elevator, a stacking trough parallel to the path of movement of said elevator, a pair of upwardly extending arms pivotally mounted adjacent opposed sides of said trough, said arms being normally resiliently urged inwardly of said trough and being normally in the path of movement of a box in the trough and being movable to engage a box in said trough, said arms being adapted to be forced outwardly of said trough by the elevation of a box by said elevator to thereby permit the upward movement of said elevated box into said trough, means to force said arms outwardly of said trough to thereby release a stack of boxes and to permit lowering of the stack by said elevator, a shiftable member mounted adjacent to one side of the trough and a pair of toggle arms secured to the shiftable member and to the upwardly extending arms and operable by a box in said trough for holding the arms outwardly and

out of the path of movement of the boxes in the trough to permit descent of a stack of boxes in the trough, and a discharge conveyor adapted to remove said lowered stack from said elevator.

18. In a box handling apparatus, a frame, an elevator mounted on the frame, a delivery conveyor adapted to deliver boxes to said elevator, a stacking trough secured to said frame and positioned in the path of movement of a box on said elevator, a pair of opposed, upwardly extending, arms pivotally mounted at the lower ends thereof to said frame, resilient means normally urging the upper ends of said arms inwardly in said trough, means actuated by the delivery of a box onto said elevator to raise and lower said elevator, said elevator being adapted to raise a box above said arms, said arms being adapted to be moved outwardly by a rising box and being adapted to move inwardly when freed to engage the lowermost box in said trough, vertically aligned guide members secured to one side of said frame and said trough, an upper and a lower rod, means resiliently connecting said rods, said rods being slidable in said guide members, a member adjustably secured to said upper rod and extending into said trough, a pair of links each pivotally secured at one end thereof to said lower rod, said links being pivotally secured at the other end thereof to said arms, the pivotal connection of said links with said rod being normally below the pivotal connections of said links with said arms, said horizontal member being adapted to be engaged and raised by the uppermost box of a stack in the trough when said stack reaches a predetermined height, the movement of said horizontal member causing upward movement of said rods and moving the pivotal connection of said links with said lower rod above the pivotal connections of said links with said arms whereby said arms are forced outwardly of said trough and away from engagement with the boxes in said stack thus allowing said stack to be lowered by said elevator, means to maintain said rods in elevated position during the lowering of said stack, a discharge conveyor adapted to remove said lowered stack from said elevator and means actuated by removal of a stack to lower said rods and the pivotal connection of said links with said lower rod to thus allow said arms to move inwardly of said trough and resume their normal position.

AMBROSE NEJA.