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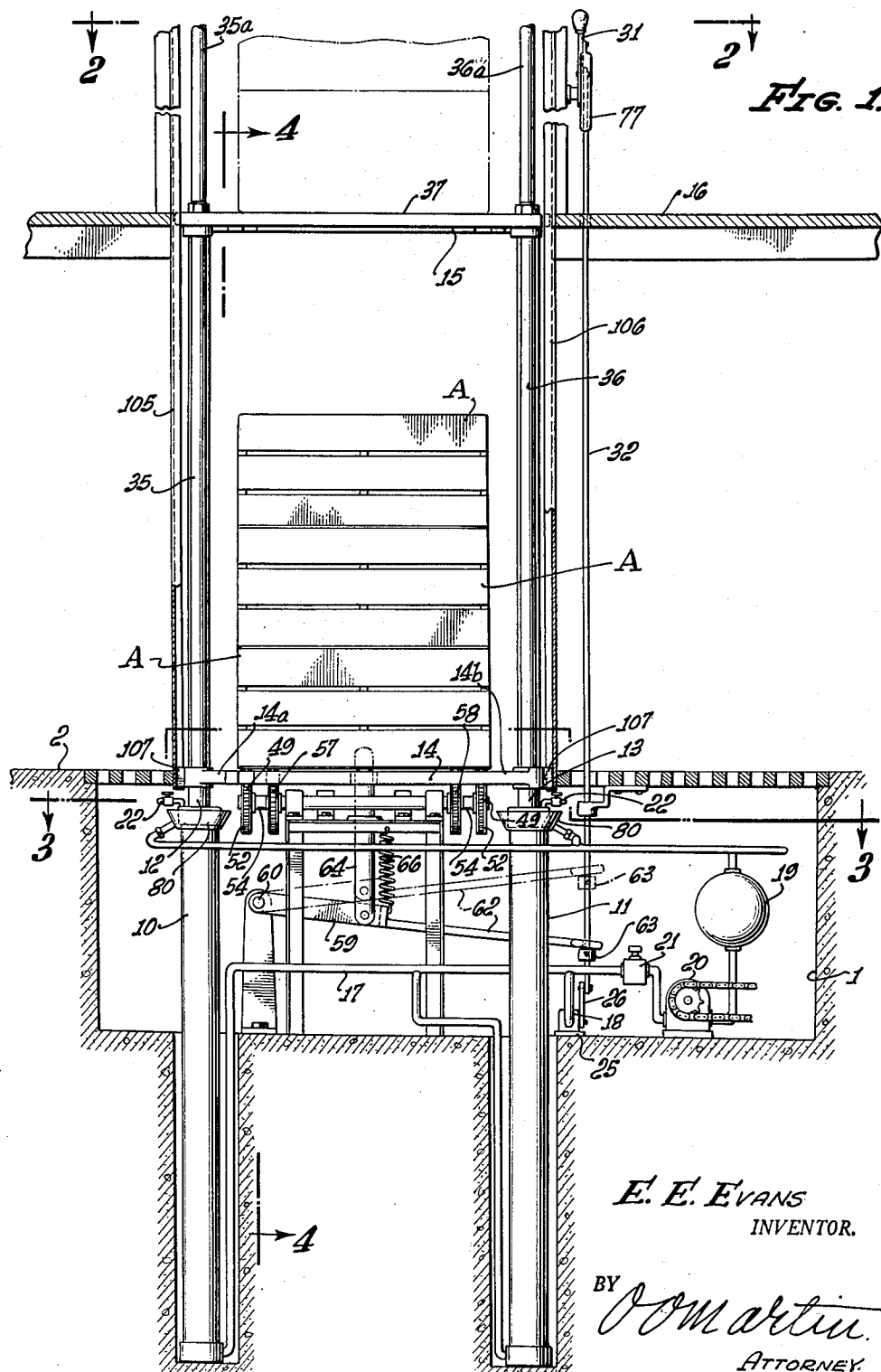
E. E. EVANS

2,667,982

WEIGHT ACTUATED ELEVATOR AND TRANSFER MECHANISM

Filed May 1, 1951

4 Sheets-Sheet 1



Feb. 2, 1954

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4 Sheets-Sheet 2

FIG. 3.

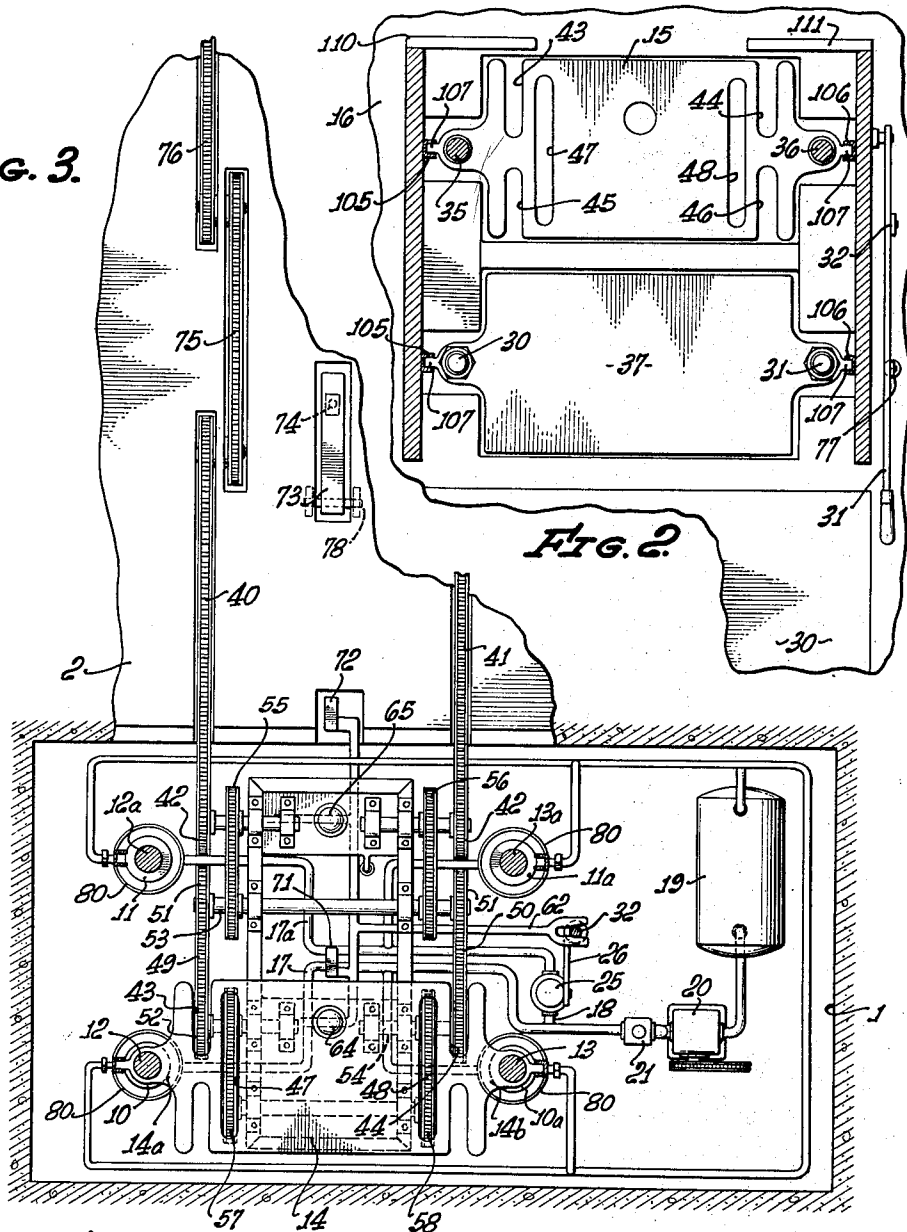
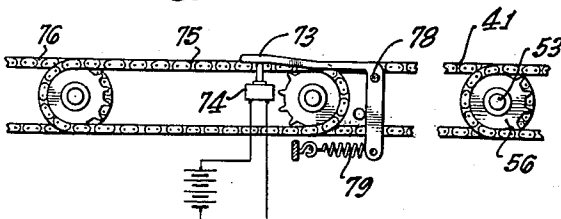


FIG. 2

FIG. 6.



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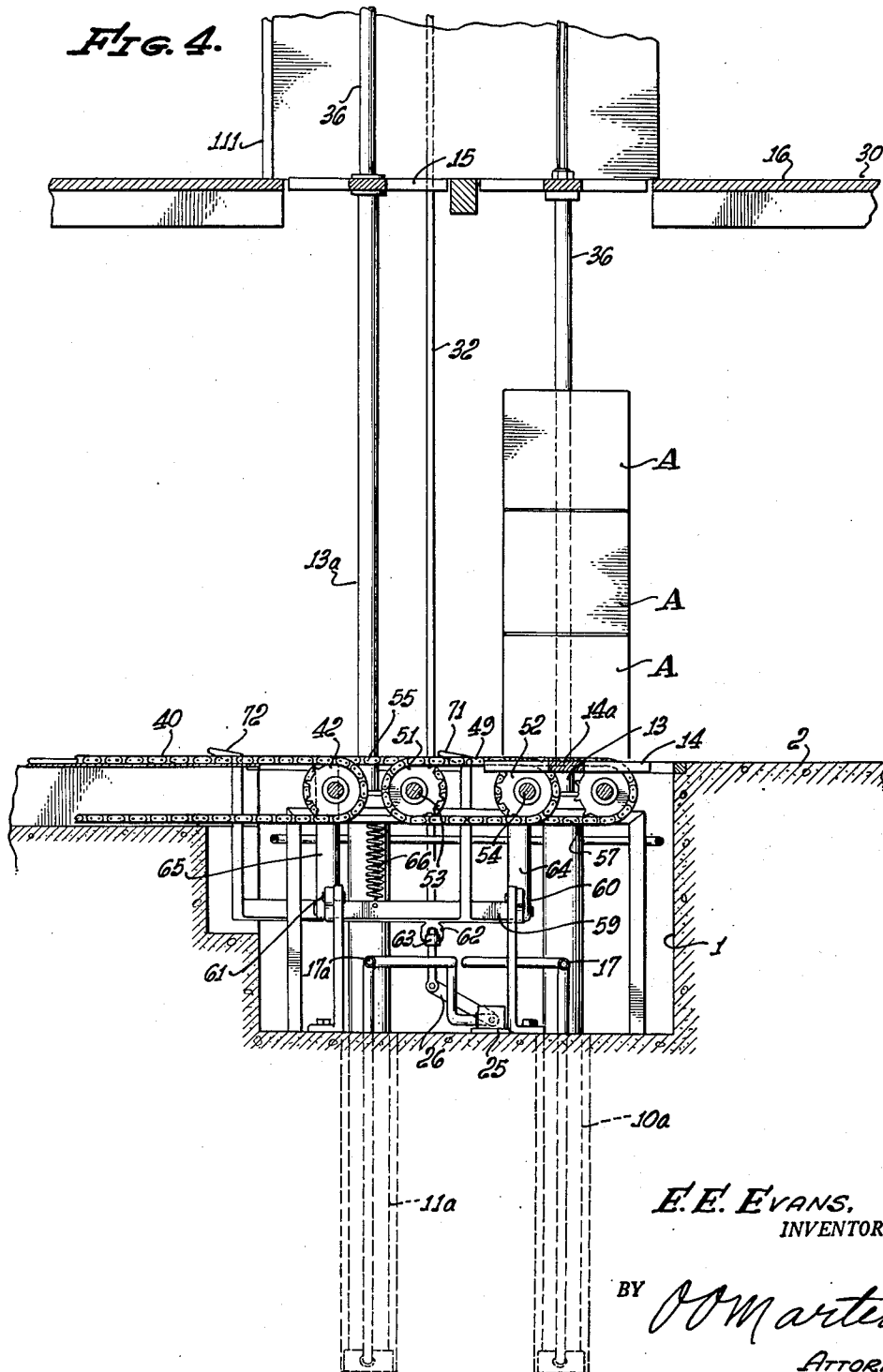
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4 Sheets-Sheet 3



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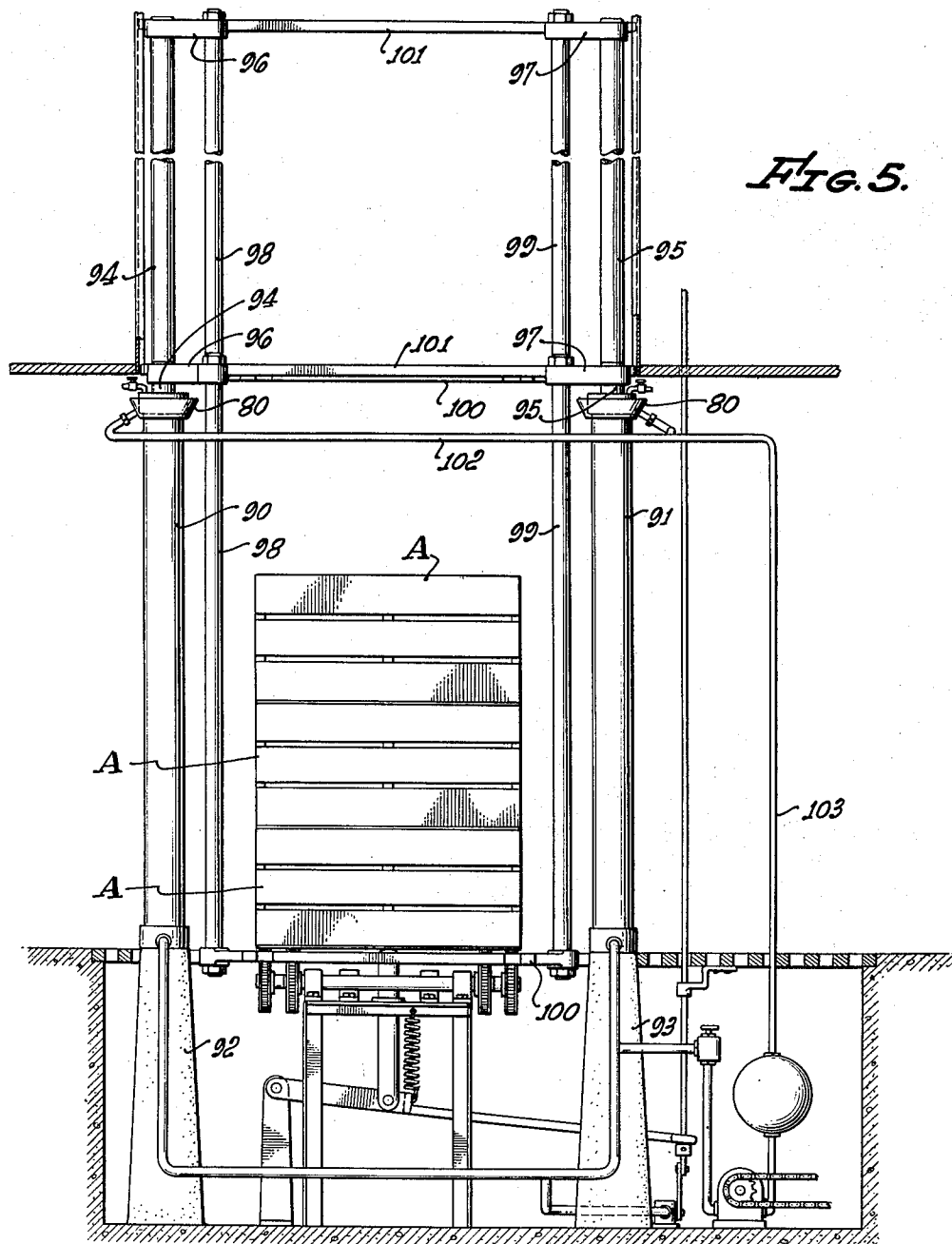
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WEIGHT ACTUATED ELEVATOR AND TRANSFER MECHANISM

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,667,982

WEIGHT ACTUATED ELEVATOR AND
TRANSFER MECHANISMErnest E. Evans, Riverside, Calif., assignor to
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Application May 1, 1951, Serial No. 223,937

13 Claims. (Cl. 214—89)

1

This invention has relation to a device for transferring goods, such as packing cases, from a higher to a lower elevation and for transporting the goods away from the device along the ground or floor at such lower elevation.

In Patent No. 2,362,809, issued to me on November 14, 1944, is shown the combination of a pair of platforms which are held supported side by side and connected for simultaneous limited vertical movement in opposite directions. In this patent, it is the weight of packing cases loaded on one of the platforms at its upper position which causes this platform to descend and, in descending, to elevate the other platform after it has been emptied at its lower floor position.

It is the principal object of the present invention to embody in such transfer mechanism conveyor means for automatically carrying the goods away from each platform as it reaches its lower floor position. Another important object of the invention is to place one platform directly behind the other in such a manner that loading of either platform, while in its upper position, may be effected from a position in front of the platforms. Still another important object is so to construct and support the platforms that a single line of such conveying means may be sufficient to serve both platforms automatically to remove the goods therefrom.

These and other objects of the invention, together with the many advantageous features thereof will be better understood from the following detailed description and by referring to the accompanying drawings in which preferred forms of the invention are illustrated.

In the drawings:

Fig. 1 is a front elevational view of the package transfer mechanism of the invention in its relation to the floors it is designed to serve and with the extreme upper portion thereof broken away for the sake of clearness;

Figs. 2 and 3 are plan views of the device showing the two platforms thereof in different positions of elevation and taken respectively on lines 2—2 and 3—3 of Fig. 1;

Fig. 4 is a substantially corresponding side elevational view of the device as viewed from line 4—4 of Fig. 1, in the direction of the arrows;

Fig. 5 is a front elevational view of a somewhat modified form of the invention; and

Fig. 6 shows, diagrammatically, details of devices controlling the operation of the packing case conveying means.

In the form illustrated in the drawings, the device of the invention rises from a pit 1 which is

2

sunk into the basement floor 2 of a packing house where cases, such as orange crates, are received for transportation along the floor on a chain conveyor such as commonly installed in storage and packing houses.

Pairs of cylinders 10, 11 and 10^a, 11^a rise from the floor of the pit to receive through the upper ends thereof pistons in the form of plungers 12, 13 and 12^a, 13^a. A platform 14 is provided with ears 14^a, 14^b projecting from the ends thereof to receive and rigidly to support the upper ends of these plungers. As best shown in Fig. 2, a second platform 15 is placed behind the platform 14 and similarly supported, but as this second platform assembly may in most respects be a duplication of the front platform assembly, it is to be understood that the following description pertains equally to both assemblies. These platforms are of a size to receive thereon packing cases or crates for transportation from the upper floor 16 to the basement floor and it is important to note that normally one platform is held in its upper position flush with the surface of the upper floor 16 while the other platform is at the bottom of its movement. Pipes 17, 17^a interconnect the two pairs of cylinders and a conduit 18 extends from these pipes to a tank 19 in which the operating fluid is stored. A pump 20 is cut into the conduit 18 and it is by an electric motor or other suitable prime mover (not shown) operated to force the fluid into one of the pairs of cylinders to cause the plungers thereof and the platform supported by these plungers to rise into top position flush with the surface of the upper floor 16. During this elevating movement of one of the platforms it becomes necessary to maintain the other platform in its lowermost position. A manually operable valve 21 is cut into the conduit 18 to prevent return flow of the fluid to the tank when the rising platform has reached its uppermost position. A waste discharge valve 22 is cut into each cylinder, at the top thereof and these valves remain open while fluid is being injected into the cylinders, whereupon they are tightly closed.

A normally closed control valve 25 is cut into the conduit 18 and this valve must be held open while the pressure fluid is injected in order that the spaces within the cylinders, below the plungers, may be completely filled, whereupon all of the aforementioned valves are tightly closed. In the type of packing case transfer mechanism herein described, it is not necessary to provide the plungers with closely fitted piston heads, but slight clearance for the plungers may be allowed in

order to insure freedom of sliding movement of the plungers within the cylinders. It is also for this reason advisable to place the relief valves 22 at the top of each cylinder and to keep these valves open during the fluid injection period in order to make certain that all air is expelled from beneath and about the plungers. But suitable packing must be placed at the top of the cylinders to prevent overflow of the operating fluid.

Packing cases to be transferred to the lower floor may be received at the building entrance 30 in front of the outerplatform 14 and placed thereon when this platform is in its uppermost position. A lever 31 is shown pivotally hung on the wall of the building, or any other suitable support, and a link 32 extends from this lever to an arm 26 of the valve 25. When the cases have been stacked on the platform 14, it is merely required for the attendant to depress this lever, thereby to open the valve 25, whereupon the weight of the cases causes the platform to descend and, in descending, to force the empty platform 15 upward into its loading position. But since the platform 14 now is at the bottom, it becomes necessary to cover the opening in the floor vacated by this platform in order to make it possible to reach the inner platform 15. This may be done in the following manner.

Rods 35, 36 rise from the top of the plungers 12, 13, in continued axial alinement therewith to support at the top a plate 37 which, when the platform 14 reaches its lowermost position, will cover the opening flush with the surface of the floor 16, substantially as indicated in Fig. 1 of the drawings. It is to be understood, of course, that such cover is similarly supported above the platform 15.

It was above stated that the cases are deposited on a chain conveyor for transportation along the basement floor. The chains of the conveyor are indicated at 40, 41 and they are shown hung on sprocket wheels 42 which rise through slots 43, 44 of the platform 15 when the latter reaches its bottom position. It is important to note that aligned slots 45, 46 are cut into the platform from the opposite edge thereof and that elongated perforations 47, 48 are cut through the platform within, parallel with and centrally positioned relative to the slots 45, 46; also that the platform 14 is similarly slotted and perforated.

Short chains 49, 50 are hung on sprocket wheels 51, 52 which, in turn, are rigidly mounted on shafts 53, 54. Other short chains 55, 56, 57, 58 are similarly hung on sprocket wheels and all of these chains are in any suitable manner (not shown) connected for rotation by a prime mover to carry the cases from the platforms on to the main conveyor 40, 41, as will be more fully described presently. The upper reaches of all of these chains rise through the slots and perforations of each descending platform to take a position slightly above the upper surface thereof when the platform reaches bottom. The cases may then be carried away without any frictional contact with the platform.

It was above stated that the valve 25 is opened by depressing the lever 31 to permit the loaded platform to descend. It becomes necessary again to close this valve when the platform reaches its bottom position in order to check the flow of oil through the cylinders and to maintain the valve closed until the conveyors have moved the packing cases entirely out of the platform zone. This may be done in the following manner. A rock

frame 59 is pivotally hung at 60, 61, and an arm 62 extends from this frame to the rod 32. The end of this arm is bifurcated to straddle the rod and a stop collar 63 is clamped in position on the rod below the arm. A pair of plungers 64, 65 are pivotally hung on the frame and they rise through perforations of the platforms 14, 15. A spring 66 is shown normally maintaining these plungers in the elevated position indicated in dotted outline in Fig. 1 of the drawings, but when a loaded platform descends, it is found that the bottom surface of the cases on the platform will depress the plunger rising through the platform to cause the frame 59 to swing downward on its pivot until the end of the arm 62 contacts and depresses the collar 63 to maintain the valve closed. The packing cases, having now landed on the short conveyors, are moved by these conveyors out of the platform zone on to the main conveyor 40, 41, during which movement the plungers 64, 65 are continuously held depressed by the cases to maintain valve 25 closed. In order to make certain that the valve will remain closed during this discharge movement of the cases, I have shown arms rising from the rock frame 59 and these arms terminate in upwardly and rearwardly inclined plates 71, 72, rising above the conveyor chains for engagement by the discharging cases to maintain the valve closed.

The short conveyors may be maintained in motion during the period of transfer of cases from the upper floor to the main conveyor, but the latter is not started until the cases are delivered thereon and remains in motion merely long enough to move the stack of cases a short distance away from the inner platform. Means for effecting such periodic movement is, for the sake of simplicity, in Fig. 3, shown to include a plate 73 which is shown pivotally hung on brackets 78 secured to the underside of the floor 2. This plate, like the plates 71, 72, rises above the conveyor chains and so becomes depressed by the moving cases to close a switch 74 which in any conventional manner, not shown, is cut into a motor circuit controlling the operation of the conveyor 76 to start this conveyor. Means, such as a spring 79, should be provided for returning the plate to its elevated position the moment the cases pass beyond this plate, thereby again to release the switch to reopen the circuit and so to stop the movement of the conveyor. These connections are diagrammatically outlined in Fig. 6 of the drawings.

In order more perfectly to balance the movement of the starting lever and the rod 32, I have shown a counterweight 77 mounted on this lever. The purpose of the intermittent movement of the main conveyor 76 is to afford the attendants time to arrange for the disposal of the cases. Had this conveyor been continuously in motion, there is danger that the cases might be moved to the end of the conveyor, during a temporary unloading delay on the part of the attendants, to be there piled together and most likely overthrown, scattering the contents of the cases over the floor.

In actual practice, it is not found advantageous to cause the rock frame 59 completely to close the valve 25, since such complete shut-off would cause the platforms to come to a stop so suddenly that the ensuing jar would be likely to cause the stack of cases to topple over. This valve closing movement can for this reason be adjusted to set the cases gently on the short conveyors. But when the plates 71 and 72 are shaped to rise slightly higher above the conveyor chains than the

plungers 64, 65, it is found that depressions of these plates will entirely close the valves.

It was above stated that packing is applied to the upper ends of the cylinders to check overflow. But even with such packing, it is found that some fluid may gradually be forced slowly through the packing. In order not to waste this overflow and also so as to keep the pit in the basement floor clean, it is advisable to provide means for returning such overflow to the storage tank 19. Cups 80 are, for this purpose fitted to the tops of the cylinders and a system of pipes lead from these cups to the tank 19.

In the device above described, as well as in my said earlier patent, the pits below the lower floor must be deep enough to accommodate the cylinders. Ordinarily this is not found objectionable, but there may be times when it is inconvenient or too difficult and expensive to provide such deep pits. In such cases, it may be found advantageous to place the cylinders above the pit, and such combination is illustrated in Fig. 5. The cylinders 90, 91 may remain unchanged but they are shown mounted on columns 92, 93 rising from the floor of the pit. The plungers 94, 95 may also remain unchanged, but they are at the top thereof fitted with yokes 96, 97, in which pendent rods 98, 99 are anchored to support at the lower ends thereof a platform 100, which may be an exact duplicate of the platforms 14, 15. All the above described valve and conveyor control mechanism may also remain substantially unchanged, but the rods 36, rising from the plungers 12, 13 are not required since the plate 101, which takes the place of the plate 37, may be placed directly on the yokes 96, 97. The pipe system 102, 103 for carrying overflow fluid back to the reservoir must also be somewhat differently arranged, substantially as illustrated in Fig. 5, in order to provide clearance for discharge of the packing cases from the platforms.

Means should be provided for guiding the platforms during their travels up and down, but as such means is commonly employed in elevators, it is believed sufficient, in Fig. 2, to show channeled guide beams 105, 106 engaged by lateral projections 107 of the platforms. Where the platforms are of a size to receive only one packing case, as found most convenient in storage plants for citrus fruit, it is found that a great number of cases may be stacked on top of each other and that there is danger that the stack may topple over in loading. It is, for this reason, also necessary to provide safety devices in the form of panels which are hung for vertical sliding movement in front of and behind the platforms, as indicated at 110, 111 in Fig. 2. But as gates are shown in my said former patent for similar purposes, and since such devices are not dependent upon or in any way affect the operation of the important features of the present invention, the construction and operation thereof are not herein further described.

It is seen from the foregoing description that I have provided a simple and inexpensive device which will not merely transfer packing cases from one floor to another but will also automatically transport the cases away from the device for disposal within a building. But while I have for the sake of clearness illustrated simple means of effecting the various movements and obtaining the essential controls of the movements of the device, I do not thereby intend to be limited to the arrangements, proportions and shapes exactly as shown but reserve the right to embody modi-

fications thereof within the scope of the claims hereto appended.

I claim:

1. In a device for lowering packing cases from an upper floor to a lower floor, a pair of platforms vertically movable between the two floors, one platform being positioned behind the other in parallel relation thereto, the platforms having the side edges thereof in continued alinement horizontally, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means being positioned below the platforms beyond the side edges thereof, conveying means on the lower floor extending through and beyond the spaces below the platforms for carrying the cases away from the descending platforms, said hydraulic means including a normally closed valve and connections for controlling said valve, said connections being manually operable to open the valve to release the platforms for movement, and means actuated by cases on a descending platform to close the valve.

2. In a device for lowering packing cases from an upper floor to a lower floor, a pair of platforms vertically movable between the two floors, one platform being positioned behind the other in parallel relation thereto, the platforms having the side edges thereof in continued alinement horizontally, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means being positioned below the platforms beyond the side edges thereof, conveying means on the lower floor extending through and beyond the spaces below the platforms for carrying the cases away from the descending platforms, said hydraulic means including a normally closed valve and connections for controlling said valve, said connections being manually operable to open the valve to release the platforms for movement, and means actuated by the cases leaving the platform to retain the valve closed until the cases by said conveyor are entirely clear of the platform zone.

3. In a device for lowering packing cases from one floor to another and for moving the cases along said lower floor, a pair of platforms set one directly behind the other, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means including a valve, manual means for opening said valve to release the platforms for relative movement by the weight of packing cases on one of the platforms, means actuated by the descending cases to close the valve, a continuously moving conveyor extending along the lower floor through the space below both platforms for carrying the cases away from the platform as it reaches bottom, a normally inactive conveyor extending from said moving conveyor, means actuated by the cases deposited on the moving conveyor to impart movement to said inactive conveyor, and means actuated by the cases leaving the platform to lock the valve against opening movement until the cases are carried away by the conveyor.

4. In a device for lowering packing cases from an upper to a lower floor, a pair of platforms positioned one behind the other, hydraulic means interconnecting said platforms for simultaneous vertical movement in opposite directions when packing cases are loaded on one of said platforms, said means including, a pair of cylinders below each platform, piston rods rising from said cylinders to the side edges of the platforms, conduits

interconnecting the lower ends of said cylinders, a valve checking flow through said conduits, means for manually opening said valve to cause the weight of cases on one platform to lower the platform and to cause the other platform to rise, means actuated by the descending cases to close the valve, conveyor means passing through the spaces directly beneath the two platforms for receiving the descending cases and for carrying the cases away from the platforms, and means actuated by the cases during their movement away from the platform for locking the valve against opening movement.

5. In a device for lowering packing cases from one floor to another and for moving the cases along said lower floor, a pair of skeletonized platforms set one directly behind the other, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means including a valve, manual means for opening said valve to release the platforms for relative movement by the weight of packing cases on one of the platforms, means actuated by the descending cases to close the valve, a conveyor extending along the lower floor through the space below both platforms rising through openings in each of the descending platforms as it reaches bottom position thereby to receive and to carry the cases thereon away therefrom, and means actuated by the cases to lock the valve against opening movement until the cases are by said conveyor moved entirely clear of the platforms.

6. In a device for lowering packing cases from an upper floor to a lower floor, a pair of platforms vertically movable between the two floors, one platform being positioned behind the other in parallel relation thereto, the platforms having the side edges thereof in continued alignment horizontally, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means being positioned below the platforms beyond the side edges thereof, conveying means on the lower floor extending through and beyond the spaces below the platforms for carrying the cases away from the descending platforms, said hydraulic means including cylinders below each platform, piston rods extending from said cylinders to the side edges of the platforms leaving the spaces occupied by the platforms during their vertical movements entirely clear, a normally closed valve and connections for controlling said valve, said connections being manually operable to open the valve to release the platforms for movement, and means actuated by cases on a descending platform to close the valve.

7. In a device for lowering packing cases from one floor to another and for moving the cases along the lower floor, a pair of platforms set one directly behind the other, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, one platform being normally at the top floor while the other is at the lower floor, conveying means on the lower floor extending through and beyond the spaces below the platforms for carrying packing cases away from the platforms, a normally closed valve in said hydraulic means, connections manually operable to open said valve to release the platforms for relative movement, means operable by cases on a descending platform to close the valve upon reaching bottom position, rods rising from each platform at the side edges thereof, and a plate secured to the upper ends of the

rods of each platform in position to occupy the space at the upper floor left vacant by the descended platform.

8. In a device for lowering packing cases from an upper floor to a lower floor, a pair of platforms vertically movable between the two floors, one platform being positioned behind the other in parallel relation thereto, the platforms having the side edges thereof in continued alignment horizontally, means hydraulically interconnecting the platforms for simultaneous vertical movement in opposite directions, said means being positioned below the platforms beyond the side edges thereof, conveying means on the lower floor extending through and beyond the spaces below the platforms for carrying the cases away from the descending platforms, said hydraulic means including a normally closed valve and connections for controlling said valve, said connections being manually operable to open the valve to release the platforms for movement, a pair of rods rising from each platform at the side edges thereof, and a platform secured to the upper ends of each pair of rods in position to occupy the space at the upper floor level left vacant by the descended elevator.

9. In a device for lowering packing cases from an upper to a lower floor, a pair of platforms positioned one behind the other, hydraulic means interconnecting said platforms for simultaneous vertical movement in opposite directions when packing cases are loaded on one of said platforms, said means including, a pair of cylinders below each platform, piston rods rising from said cylinders to the side edges of the platforms, conduits interconnecting the lower ends of said cylinders, a valve checking flow through said conduits, means for manually opening said valve to cause the weight of cases on one platform to lower the platform and to cause the other platform to rise, means actuated by the descending cases to close the valve, conveyor means passing through the spaces directly beneath the two platforms for receiving the descending cases and for carrying the cases away from the platforms, said piston rods having upwardly directed extensions, and a plate mounted on the extensions of the piston rods of each platform in position to occupy the space level with the upper floor left vacant by the descended platform.

10. In a device for lowering packing cases from an upper to a lower floor and for discharging the packing on the lower floor, two pairs of cylinders rising from said lower floor in spaced relation to each other, piston rods upwardly movable through said cylinders, a bracket at the upper end of each piston rod, a rod secured to and downwardly extending from each bracket parallel with said cylinders, a pair of platforms set end to end, the platforms being secured to the lower ends of said pendent rods within the spaces between said cylinders and rods and flush with the lower floor when the piston rods are in their lowermost position and with the upper floor when the pistons are in their uppermost position, conduits interconnecting the lower ends of said cylinders, means forcing operating fluid into said conduits and cylinders to move one platform into its upper position flush with the upper floor while the other platform is held in line with the lower floor, a valve in said conduits, conveying means on the lower floor passing through the space directly beneath the two platforms for carrying packing cases away from the platforms, and means for controlling the operation of said valve.

11. In a device for lowering packing cases from one floor to another and for moving the cases along the lower floor, a conveyor on the lower floor, depressible elements in the lower floor rising above the upper level of said conveyor, two elevator platforms mounted one behind the other above the conveyor, the platforms having passages therethrough for said elements, hydraulic means operatively interconnecting the two platforms for simultaneous vertical movement in opposite directions, the weight of cases loaded on one platform at the upper floor causing the platform to descend to a point a short distance below the upper level of the conveyor and to deposit the cases thereon, a manually operable valve controlling flow through said hydraulic means to release the platforms for relative movement, and connections from the elements to the said valve, the packing cases on the descending platform depressing the elements thereunder through said valve connections to close the valve.

12. In a device for lowering packing cases from one floor to another and for moving the cases along the lower floor, a conveyor on the lower floor, depressible elements in the lower floor rising above the upper level of said conveyor, two elevator platforms mounted one behind the other above the conveyor, the platforms having passages therethrough for said elements, hydraulic means operatively interconnecting the two platforms for simultaneous vertical movement in opposite directions, said hydraulic means including a cylinder at each side of each platform, piston rods rising from said cylinders to the side edges of the platforms, the weight of cases loaded on the platform at the upper floor causing the platform to descend to a point a short distance below the upper level of the conveyor and to deposit the cases thereon, a manually operable valve controlling flow through said hydraulic means to release the platforms for relative movement, and connections from the elements to the said valve, the packing cases on the descending platform depressing the elements

thereunder through said valve connections to close the valve.

13. In a device for lowering packing cases from one floor to another and for moving the cases along the lower floor, a conveyor on the lower floor, depressible elements in the lower floor rising above the upper level of said conveyor, two elevator platforms mounted one behind the other above the conveyor, the platforms having passages therethrough for said elements, hydraulic means operatively interconnecting the two platforms for simultaneous vertical movement in opposite directions, said hydraulic means including cylinders at the side edges of the platforms, piston rods rising from said cylinders to support the platforms, a plate secured to the upper end of the piston rods of each platform to occupy the space at the upper floor left vacant by the descended platform, the weight of cases loaded on one platform at the upper floor causing the platform to descend to a point a short distance below the upper level of the conveyor and to deposit the cases thereon, a manually operable valve controlling flow through said hydraulic means to release the platforms for relative movement, and connections from the elements to the said valve, the packing cases on the descending platform depressing the elements thereunder through said valve connections to close the valve.

ERNEST E. EVANS.

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