

June 14, 1927.

L. THREEFOOT ET AL

1,632,203

CONVEYER SYSTEM

Filed March 19, 1923

3 Sheets-Sheet 1

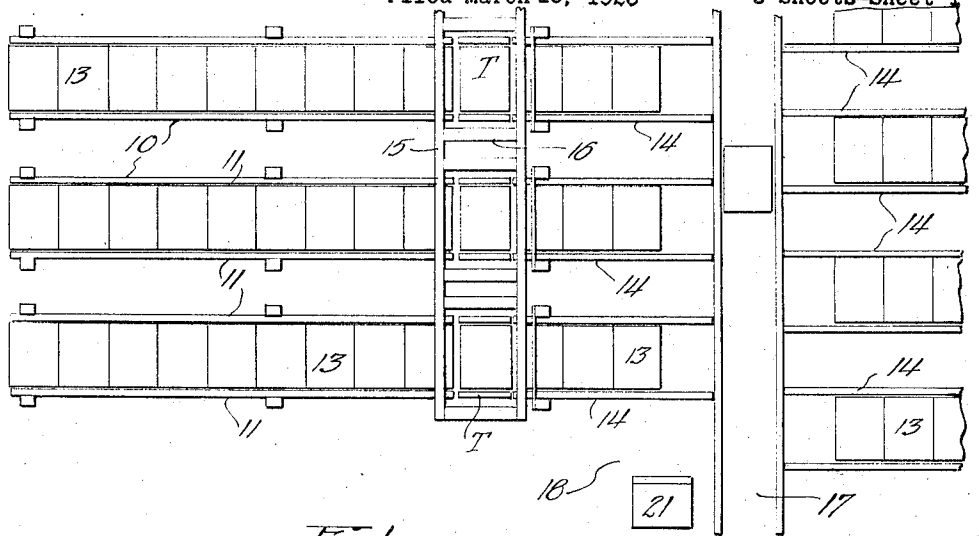


Fig. 1

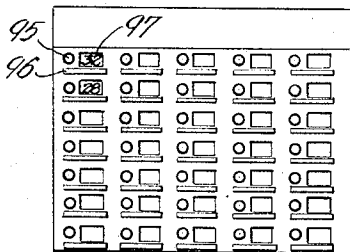


Fig. 6

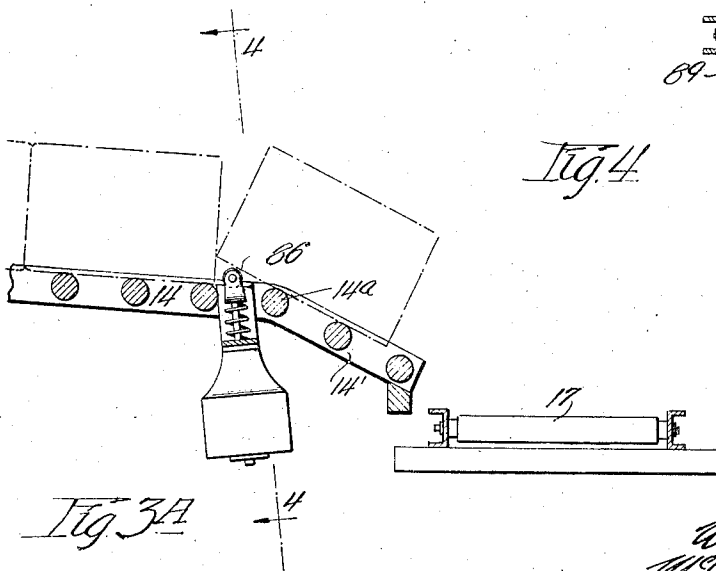


Fig. 3A

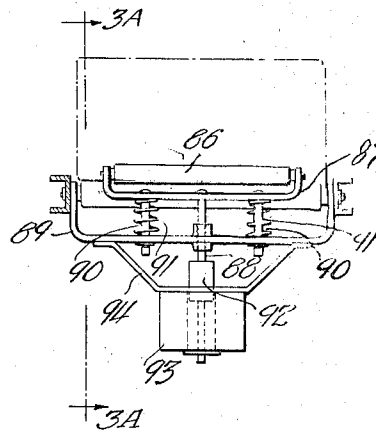


Fig. 4

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3 Sheets-Sheet 2

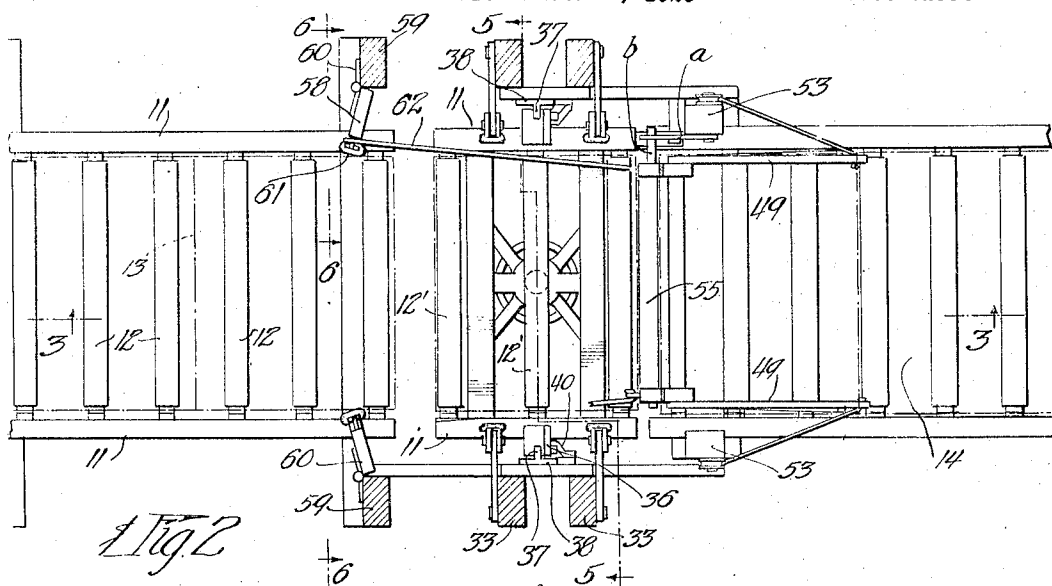


Fig. 2

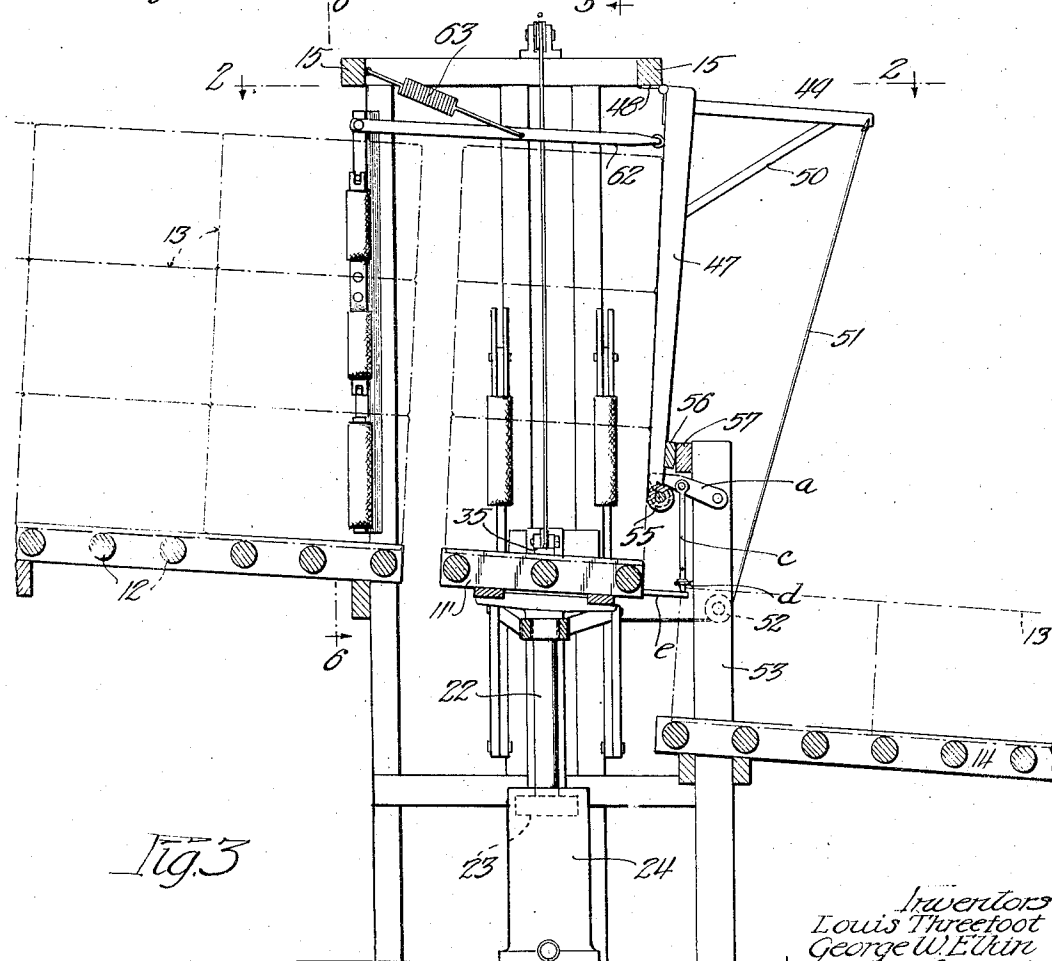


Fig. 3

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3 Sheets-Sheet 3

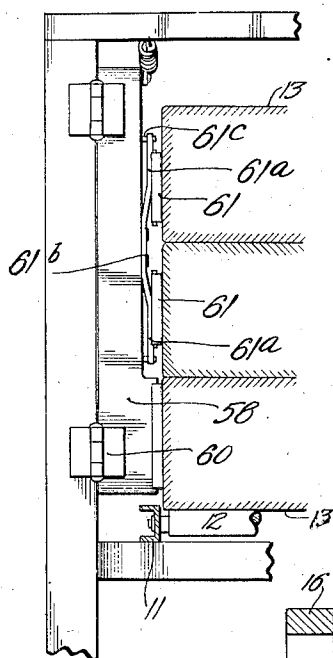


Fig. 6

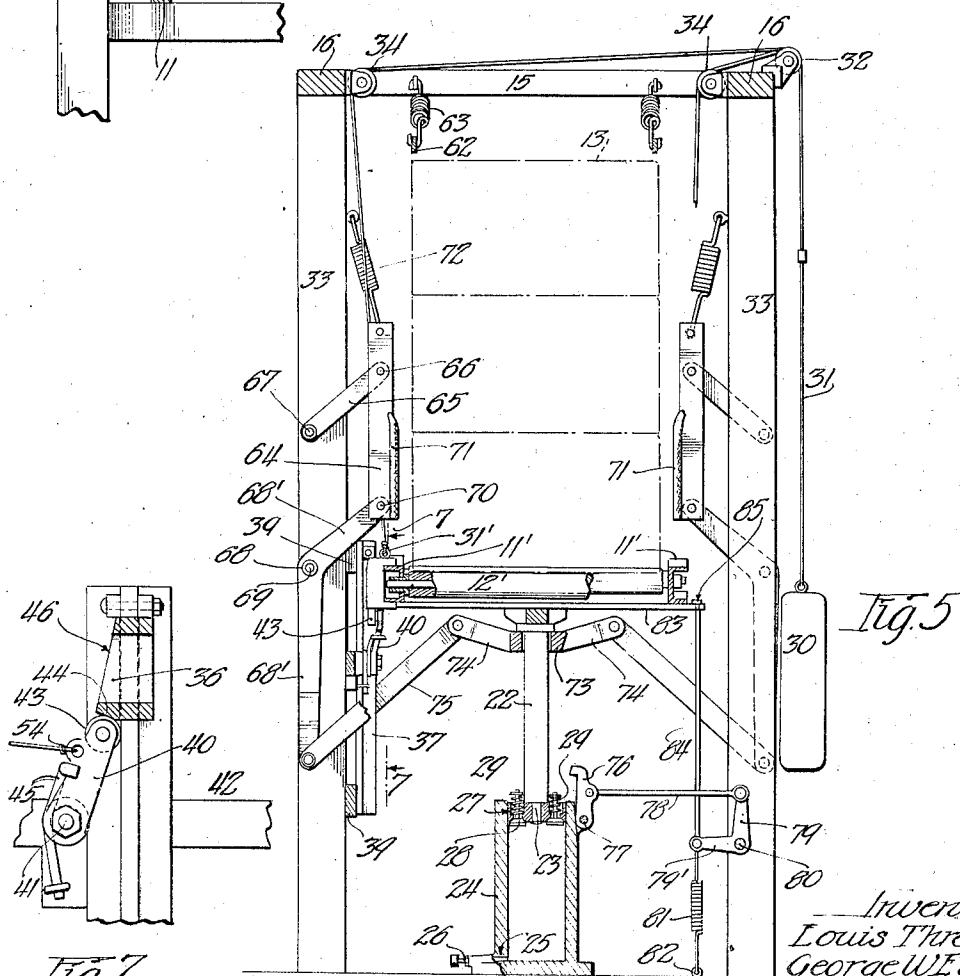


Fig. 5

Fig. 7

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UNITED STATES PATENT OFFICE.

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CONVEYER SYSTEM.

Application filed March 19, 1923. Serial No. 625,931.

Our invention relates to improvements in conveyer systems, and is particularly concerned with the provision of conveyer means particularly adapted for use in stores, storage and warehouses, and in any other place where it is desirable or necessary to deliver, from time to time, one or more articles, packages, or cases from a stock of such articles, packages, cases, etc.

In the accompanying drawings, Figure 1 is a plan diagram of a portion of a warehouse having installed therein one of our conveyer systems.

Figure 2 is a plan showing certain details of the construction of two of the conveyers, and a transfer device located therebetween and forming a part of our conveyer system, portions of the mechanism being broken away for the purpose of better illustration.

Figure 3 is a vertical longitudinal section taken on line 3—3 of Figure 2.

Figure 3^A is a continuation of the right hand end of Figure 3. This view includes a transverse section through the third conveyer forming a part of our system.

Figure 4 is a vertical transverse section taken on line 4—4 of Figure 3^A.

Figure 5 is a vertical transverse section taken on line 5—5 of Figure 2.

Figure 6 is a vertical transverse sectional detail taken on line 6—6 of Figures 2 and 3.

Figure 7 is an enlarged sectional detail taken on the line 7—7 of Figure 5, and

Figure 8 is a plan view on an enlarged scale of the keyboard which the operator uses for selecting the desired articles, and for recording either the number of said articles delivered or the number of said articles still remaining in stock, as may be desired.

Throughout the several views, similar reference characters are used for referring to similar parts, and the several sections are taken looking in the direction of the small arrows.

At the present time, goods which are sold in packages, boxes, cases, etc., are usually received and stored in the upper stories of

stores or warehouses, the lower story of such buildings being used for office purposes. When it becomes necessary to fill an order, workmen are sent to the proper story of the building with written orders. There they either select, or some one delivers to them, the requisite number of packages, articles, cases, etc. These are usually loaded upon a truck, or some other conveying device, and taken to an elevator, from which they are delivered to a loading platform. At this point, the goods are usually inspected by the shipping clerk to make certain that the order has been properly filled. Ordinarily, the shipping clerk is not the one who originally ordered the delivery of the goods. Such an arrangement requires a comparatively large number of men for the ordering and delivering of the goods desired.

In the accompanying drawings we have illustrated our invention as being installed in a warehouse, one of the upper floors and a portion of the first or lower floor being shown in plan in Figure 1. In this view, we have shown a plurality of conveyers, each comprising a pair of side rails for supporting the ends of a plurality of parallel rollers (see Figures 2 and 3) upon which are stacked a plurality of boxes or cases arranged in contiguous ranks and files. The several conveyers are spaced apart a distance sufficient to permit the workmen to have access to the spaces between them so as to expedite the piling of the boxes, cases, etc., upon these conveyers.

A second conveyer is aligned with each of the conveyers but positioned at a lower level than the conveyers. Intermediate the adjacent ends of each pair of conveyers and is a transfer device, indicated in general by the reference character T, the details of construction of which will be described later on. The longitudinally extending members and the transverse members are merely portions of a framework used for supporting apparatus which controls the delivery of packages to the transfer devices and the operation of the transfer devices, as will later be pointed out.

All of the conveyers 14 discharge onto a common conveyer 17 which leads from an upper story of the building to a lower story 18 which may, if desired, be provided with a loading platform 19 alongside a driveway 20. The keyboard 21 of the operator is located adjacent the discharge end of the conveyer 17 so as to permit the operator to check the delivery of goods to make sure that the orders are being properly filled.

If desired, conveyers 14 may be arranged to discharge onto the common conveyer 17 from the side opposite the conveyers 14 just referred to. It will, of course, be understood that conveyers similar to the conveyers 10, and transfer devices similar to the transfer devices T, will be used for supplying cases to the conveyers 14 on the right hand side of the conveyer 17.

The apparatus which we shall now describe comprises means, under the control of the operator, for automatically discharging boxes, cases, articles, etc., one by one, from the conveyers 14 onto the conveyer 17. This apparatus also includes means for automatically transferring the cases, one by one, from the stack of cases on the conveyers 11 to the conveyers 14 so as to keep the latter conveyers constantly filled, and thus make it possible for the operator quickly to select and deliver any desired number of packages or cases.

Having thus described in a general way the principal features of our invention, we shall now describe more in detail the means by which we accomplish the results just described. We shall first describe the means which we provide for automatically transferring the cases, one by one, from one of the first conveyers 11 to the corresponding second conveyer 14. For this purpose, we provide a platform which is formed from a short section of a conveyer, comprising the side rails 11' and the rollers 12'. This platform is supported by a piston rod 22, the lower end of which is provided with a piston 23 slidable in the cylinder 24. At its lower end, this cylinder is provided with an outlet opening 25, the size of which may be adjusted by a suitable valve 26. The piston 23 has a plurality of openings 27 formed therein which, during the downward movement of the piston, are closed by the valves 28 which are biased to their closed position by the springs 29. These springs are, however, tensioned so that during the upward movement of the piston, they will open under atmospheric pressure, thereby making it possible for the piston to return to its uppermost position more quickly than would be the case if the air had to enter the cylinder 24 through the opening 25.

For returning the platform to its uppermost position, we provide a counterweight 30 which is secured to one end of the cable

31, the other end of which is bifurcated and passes over a suitable pulley 32 mounted upon one of the longitudinal frame members 15, which, along with the frame member 16, are supported by posts or uprights 33 positioned alongside the platform. Other pulleys 34 mounted upon the longitudinal members provide means for guiding the bifurcations of the cable 31, the free ends 31' of which are secured to the side rails 11' of the platform by means of suitable clamps 35. For guiding the platform in its vertical movements, we provide a guide block 36 for each of the side rails 11', these guide blocks being secured to the side rails in any suitable manner and projecting outwardly therefrom. The outer faces of these guide blocks are provided with vertically extending grooves for receiving the ribs 37 of the vertical guide rails 38 which are mounted upon cross-pieces 39 secured to the uprights 33.

For holding the platform in its elevated position while a file of boxes or cases is being transferred from the first conveyer 11 to the platform, we provide a pair of arms 40 (see Figure 7), one of which is pivotally mounted by means of a bolt 41, or any other suitable means, upon a cross-piece 42 extending between the uprights 33 adjacent each of the blocks 36. The upper end of each of these arms is provided with a roller 43 which is adapted to engage with a curved surface 44 formed on the lower side of the adjacent block 36. A suitable spring 45, having one end bearing against the arm 40, urges each arm 40 toward the platform so that when the platform reaches its uppermost position, the rollers 43 will be moved inwardly to their supporting positions. The face 46 of the block adjacent the roller 43 is inclined downwardly and outwardly so as to place the spring 45 under tension as the platform moves to its uppermost position. The inward movement of the arms 40, when the platform is in a lowered position, is limited by the engagement of the rollers 43 with the ribs 37 of the guide rails. The curved surfaces 44 on the blocks are such that when the rollers 43 are in their load supporting positions, the weight of a file of cases upon the platform will not have a sufficiently large lateral component to dislodge the rollers 43 from their positions. The curve is, however, such that a small force applied to the upper ends of the arms will remove the rollers from their load supporting positions, so as to permit the platform to move downwardly under the weight of the cases. The downward movement of the platform is, of course, controlled by the compression of the air in the cylinder 24 and its rate of escape therefrom through the opening 25.

For releasing the platform to permit it

to move downwardly, we provide a pair of downwardly extending arms 47, the upper ends of which are pivotally mounted upon one of the longitudinally extending frame members 15 by means of hinges 48, so that the arms are free to move in a plane parallel with the plane of the stack of cases or boxes, etc. Means, which will later be described, are provided for urging the lower ends of the arms 47 inwardly to a position over the platform. A second pair of arms 49 project outwardly from the upper ends of the arms 47 and at substantially right angles thereto, suitable braces 50 being provided between the second pair of arms and the first pair of arms. A cable 51 has one end attached to the outer end of each of the arms 49, and passes around a pulley 52 secured to one of the posts or uprights 53 located upon opposite sides of the adjacent end of the conveyer 14. The other end of this cable passes through an eye 54 in the upper end of the adjacent arm 40, and is secured therein in any suitable manner.

As a file of cases rolls onto the platform, it moves toward the opposite side of the platform due to the inclination of the platform, and comes into contact with the lower ends of the arms 47 which are provided with an anti-friction roller 55, and pushes the ends of these arms outwardly until the file of cases and the arms occupy substantially the position shown in Figure 3. At this point, a brace 56 extending between the lower ends of the arms 47 contacts with a buffer 57, which spans the space between two of the posts 33, thereby preventing any further movement of the file of cases. The outward movement of the lower ends of the arms 47 causes the outer ends of the arms 49 to move upwardly, thereby pulling upon the cables 51, and causing them to move the arms 40 to a position in which the rollers 43 disengage the blocks 46. Thereupon, the platform and the file of cases supported thereby begin to descend under the weight of the file of cases.

It will be apparent that if the succeeding file of cases were permitted to follow the file of cases just delivered to the platform, up to the instant this file of cases starts to descend, there might be some interference with the downward movement of the platform due to the contacting vertical sides of the two files of cases. To prevent this, we provide means for stopping the forward movement of the remaining files of cases. These means comprises a shutter or detent 58 on each side of the stack of cases, this shutter being pivotally mounted upon suitable uprights 59 positioned adjacent opposite sides of the delivery end of the first conveyer, these shutters or detents being mounted upon the supports 59 by means of hinges 60. The free edges of these detents

are provided with pads 61 of rubber, or suitable friction material, for engaging the sides of the cases or boxes. These pads are preferably mounted upon the free ends 61^a of a leaf spring 61^b secured to the edge of the detents or shutters 58, as shown in Figure 6. If desired, the free ends of this leaf spring may be slotted to receive the ends of the pins 61^c for preventing the leaf spring from turning on the edge of the detent 58. A link 62 connects the upper end of each detent or shutter with the upper end of the adjacent arm 47 so that as the arm 47 swings outwardly under the lateral thrust due to the file of cases delivered to the platform, the detents 58 will be drawn in toward the stack of cases passing therebetween, until the pads 61 contact therewith, and then continued outward movement of the arms 47 and the files of cases on the first conveyer will cause the pads 61 to so tightly engage the adjacent sides of the cases as to prevent their further movement toward the platform.

A tension spring 63 is provided for each of the links 62, one end of this spring being secured to the link, as shown in Figure 3, and the other end thereof being attached to a suitable support, such, for instance, as one of the frame members 15, so that as the lower ends of the arms 47 move outwardly under the thrust of the file of cases, the springs 63 are put under tension so that when all of the cases have been discharged from the platform, in a manner about to be described, the springs 63 will, by pulling upon the links 62, cause the lower ends of the arms 47 to be positioned over the platform, and at the same time cause the detents or shutters 58 to be moved to a position which will release the next succeeding file of cases and permit it to move into position on the transfer platform. The operation just described is repeated as fast as the cases forming the file of cases are discharged from their positions over the platform, except as this operation is interrupted due to the second conveyer becoming filled with the cases discharged from the platform.

Our apparatus comprises means for successively discharging the cases, one by one, from the descending platform onto the second conveyer. To do this, we have provided means for suspending all but the lowermost case of the file of cases while the lowermost case is being delivered to the second conveyer. This suspension means comprises a pair of friction plates 64 located on each side of the delivery end of the first conveyer. The upper ends of these plates are supported by means of the links 65. The inner ends of these links are pivotally connected with the friction plates 64 by means of suitable pivot pins 66, and the other ends of these links are pivotally

mounted upon the posts 33 by means of bolts or screws 67. For supporting the lower ends of the friction plates 64, we provide a pair of bell crank levers 68 which are pivotally mounted upon the supports 33 by means of pivot pins 69. The upper arms 68' of these bell crank levers are pivotally secured to the lower ends of the friction plates 64 by means of the pins 70. The links 65 and the upper arms of the bell crank levers 68 are of the same length so that in moving inwardly, the friction plates 64 will be held parallel with the adjacent walls or faces of the cases. The inner edges of the friction plates 64 are preferably provided with pads 71 of rubber, or other suitable friction material. It will, of course, be understood that these faces of the friction plates could be roughened or otherwise treated to increase the friction between them and the sides of the boxes or cases. Springs 72 secured to the upper ends of the friction plates 64 and to the uprights 33 provide means for urging the friction plates into the positions in which they do not contact with the sides of the boxes or cases.

A yoke 73 is slidably mounted upon the piston rod 22 and is provided with two pairs of outwardly extending arms 74. A link 75 is pivotally connected with each of these arms and the lower end of the arms 68' of the adjacent bell crank lever 68. The arms 74 and the links 75 thus form a toggle mechanism for forcing the lower ends of the bell crank lever 68 outwardly and the friction plates 64 inwardly. By this means, we are enabled to exert sufficient lateral pressure upon the friction plates 64 to press them against the sides of the next to the lowest case on the platform, and thus hold this case and the superimposed cases suspended while the lowermost case is being discharged from the platform. The dimensions of the toggle mechanism and the bell crank lever are such that the friction pads 71 of the friction plates do not come into contact with the walls of the cases until the lowermost case has just cleared the end of the friction plates 64, so that up to this point the entire weight of the file of cases is exerted in moving the platform downwardly and the friction plates inwardly. As the platform moves downwardly under the weight of the lowermost case, the yoke 73 is moved into position so that the latch 76 can engage the top of the yoke 73 and hold it from moving upwardly while the lowermost case is being discharged from the platform. The latch 76 is pivoted to one side of the cylinder 24, as shown at 77, and is yieldingly held in its locking position by means of the link 78, the bell crank lever 79 which is pivotally mounted upon one of the supports 33 at the point 80, and the tension spring 81, one end of which is secured to the inwardly extend-

ing arm 79' of the bell crank lever 79, and the other end of which is secured to the floor, as shown at 82, or to any other suitable support.

After the lowermost case has been discharged from the platform onto the second conveyer, the counterweight 30 acts to return the platform to its uppermost position. This return is facilitated by the valves 28 which open, as heretofore described, and permit air rapidly to enter the cylinder 24.

A bar 83 is secured to the platform and projects therefrom, the outer end of this bar being provided with an opening which receives the rod 84, the lower end of which is pivotally connected with the arm 79' of the bell crank lever 79. The upper end of the rod 84 is provided with a head or stop 85 which is adapted to be engaged by the outer end of the bar 83 just before the platform reaches its uppermost position. This causes the rod 84 to be pulled upwardly, thereby releasing the latch 76 from the yoke 73. This relieves the tension on the friction plates, and permits the file of cases to drop downwardly until the lowermost case of the file rests upon the platform, whereupon the operation just described is repeated. It will, of course, be understood that when the lowermost case is removed from the bottom of the file by the downward movement of the platform, the remaining cases will continue to move downwardly through a slight distance until the pressure on the friction plates is increased to the point where it prevents any further downward movement of these cases. This means that the bottom of the lowermost case will always project somewhat beyond the lower end of the friction plates 64. The length of the piston rod and of the rod 84, and the dimensions of the remaining portions of the control apparatus just described can be made so that the release of the yoke 73 will take place just before the platform engages the bottom of the lowermost case in the file, so as to prevent the file of cases from dropping so far as to injure the contents of the cases.

If the cases delivered to the second conveyer from the platform are permitted to discharge from the second conveyer so as not to interfere with the discharge of successive cases from the platform, the operation just described will be repeated until all of the cases have been transferred from their position above the platform to the second conveyer. When this occurs, the springs 63 will pull inwardly the lower ends of the arms 47, and will also move the detents or shutters 58 to a position to release the next succeeding file of cases which will then move downwardly under the influence of gravity and onto the platform, thus providing another supply of cases to be trans-

ferred to the second conveyer. As described above, the movement of this file of cases onto the platform will automatically move the detents or shutters 58 into position to prevent further advance of the next succeeding file of cases. By these two combined operations, all of the cases on the first conveyer can be automatically transferred, one by one, to the second conveyer.

When the last box or case of any given file of cases has been discharged from the platform, and the platform moves upwardly, the detents or shutters 58 would be opened so as to permit the next succeeding file of cases to move downwardly toward the platform before the latter had reached its uppermost position, unless some means are provided for preventing this. For this purpose, we provide a latch *a*, the outer end of which is pivoted to one of the uprights 53, and the inner end of which is adapted to engage the projecting end of the shaft *b* of the roller 55. A rod *c* is pivotally connected with the latch *a* intermediate the ends of the latter, and its lower end reciprocates in a suitable guide *d* carried by the support 53, so that the lower end of the rod *c* is positioned in the path of a projection *e* extending outwardly from the platform. This projection engages the lower end of the rod *c* just before the platform reaches its uppermost position, so as to release the latch *a* from the end of the shaft *b*, and thus permit the arm 47 to swing inwardly, and the detents 58 to open to allow another file of cases to move outwardly onto the platform.

We shall next describe the means by which the transfer of the cases from the second conveyer to the third conveyer is automatically effected under the control of the operator. By reference to Figure 3^A, it will be noted that the side rails at the discharge end of the second conveyer 14 terminate in a short section 14', which is inclined to the remaining portion of the conveyer so that as the boxes or cases successively move onto this portion of the second conveyer, their front ends will tilt downwardly as their center of gravity moves past the roller 14^a positioned at the upper end of the short inclined section, as shown in Figure 3^A, the boxes or cases being shown in dotted outline. For preventing the succeeding box or case from discharging onto the third conveyer 17, we provide a stop or detent which comprises the roller 86 (see Figures 3^A and 4), the ends of which are pivotally mounted in a yoke 87 carried by the rod 88. This assembly is carried by a second yoke 89, the opposite ends of which are secured to the side rails of the conveyer 14. A pair of guide rods 90 are secured to the yoke 87 and pass through suitable openings in the bottom of the yoke 89. Compression springs 91 surrounding these guide rods yieldingly

hold the stop roller 86 in its uppermost position, which is in the path of the oncoming boxes or cases.

A cylindrical armature 92 is carried by the rod 88, intermediate its ends, and is adapted to be pulled downwardly by means of the electrical solenoid 93 carried by the bracket or yoke 94, the ends of which are secured to the bottom of the yoke 89. When current passes through the solenoid 93, it pulls the armature 92 downwardly, thereby removing the roller 86 from the path of the boxes or cases, and permits the next box to roll downwardly onto the conveyer 17. If, after depressing the roller 86, the operator immediately opens the circuit controlling or supplying current to the solenoid 93, the downward pull upon the armature 92 will cease, and the springs 91 will tend to move the roller 86 upwardly, but such upward movement of the roller will not take place until the box or case then passing over it reaches a position where its front end tilts downwardly. Thereupon, the roller will move upwardly and prevent the next succeeding box or case from moving onto the third conveyer. By repeatedly closing the circuit of the solenoid controlling the proper set of conveyers 11 and 14, the operator can cause the delivery of any desired number of cases to the conveyer 17. This conveyer, as heretofore pointed out, delivers the boxes or cases at a point adjacent the operator's desk, so that the operator can ascertain whether or not the proper number of boxes, cases, or articles has been delivered.

It will, of course, be understood that the keyboard, shown in Figures 1 and 8, merely provides terminals and switching devices for suitable conductors for selectively energizing the solenoids 93. Remote control of apparatus of this type is well known, and a detailed description thereof appears to be unnecessary. In Figure 8, we have indicated push buttons 95 for controlling the flow of current through the various circuits leading to the solenoids 93, and associated with each of these push buttons is a holder 96 for receiving a label upon which may be printed the name of the commodity delivered through the operation of the push button. Also associated with each push button is a counter or odometer 97 which can be of conventional construction. This counter may be used either for indicating to the operator the number of boxes or cases removed from each stack, or may be so connected with the electrical circuit as to indicate the number of boxes remaining in a given stack. If used in the latter way, the counter or odometer would embody means for actuating the elements thereof to indicate the number of boxes or cases placed in each stack. Then upon each operation of the push button, the number set up on the elements of the counter would be decreased by one.

Wherever in this specification and claims we have made use of the terms "article", "box", case", "package", "goods", etc., these terms are intended to be generic in character and cover any object or objects which might be handled by our conveyer apparatus. Without further elaboration, the foregoing will so fully explain our invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. It will be obvious, that it is not necessary that all the features of the invention be employed in conjunction, since they may be advantageously embodied in various combinations and sub-combinations.

Having thus described our invention, what we claim is:

1. The combination with a first gravity conveyer for holding cases in contiguous ranks and files, and a third gravity conveyer for delivering said cases to a lower level, said third gravity conveyer being positioned at a lower level than said first gravity conveyer, of means for transferring said cases one by one from said first gravity conveyer to said third gravity conveyer, comprising a second gravity conveyer, a platform for successively receiving the files of cases from said first conveyer, said platform being inclined toward said second gravity conveyer and provided with rollers upon which said files of cases rest, means for holding said platform in its uppermost position, means controlled by the lateral thrust of a file of cases on said platform for releasing said platform, means for permitting said platform to descend under the weight of a file of cases thereon, means actuated by the weight of said file of cases for supporting all but the lowermost of said file of cases while said lowermost case is rolling from said platform onto said second gravity conveyer, means for returning said platform after said lowermost case has been discharged therefrom, means actuated by said platform in its upward movement for releasing said supporting means, remote control means for controlling the transfer of cases from said second gravity conveyer to said third gravity conveyer, and means for controlling the transfer of successive files of cases from said first gravity conveyer to said platform.

2. The combination with a first gravity conveyer for holding cases in contiguous ranks and files, and a third gravity conveyer for delivering said cases to a lower level, said third gravity conveyer being positioned at a lower level than said first gravity conveyer, of means for transferring said cases one by one from said first gravity conveyer to said third gravity conveyer, comprising a second gravity conveyer, a platform for successively receiving the files of cases from said

first conveyer, means for holding said platform in its uppermost position, means controlled by the lateral thrust of a file of cases on said platform for releasing said platform, means for permitting said platform to descend under the weight of a file of cases thereon, means actuated by the weight of said file of cases for supporting all but the lowermost of said file of cases while said lowermost case passes from said platform onto said second gravity conveyer, means for returning said platform after said lowermost case has been discharged therefrom, means for releasing said supporting means, remote control means for controlling the transfer of cases from said second gravity conveyer to said third gravity conveyer, and means for controlling the transfer of successive files of cases from said first gravity conveyer to said platform.

3. The combination with a first gravity conveyer for holding cases in contiguous ranks and files, and a third gravity conveyer for delivering said cases to a lower level, said third gravity conveyer being positioned at a lower level than said first gravity conveyer, of means for transferring said cases one by one from said first gravity conveyer to said third gravity conveyer, comprising a second gravity conveyer, a platform for successively receiving the files of cases from said first conveyer, means for holding said platform in its uppermost position, means for releasing said platform, means for permitting said platform to descend under the weight of a file of cases thereon, means for supporting all but the lowermost of said file of cases while said lowermost case passes from said platform onto said second gravity conveyer, means for returning said platform after said lowermost case has been discharged therefrom, means for releasing said supporting means, means for controlling the transfer of cases from said second gravity conveyer to said third gravity conveyer, and means for controlling the transfer of successive files of cases from said first gravity conveyer to said platform.

4. The combination with a first gravity conveyer for holding cases in ranks and files, and a third conveyer, of means for transferring said cases one by one from said first gravity conveyer to said third conveyer, comprising a second conveyer, a platform for successively receiving the files of cases from said first conveyer, delivering said cases one by one to said second conveyer, means for controlling the transfer of cases from said second gravity conveyer to said third conveyer, and means for controlling the transfer of successive files of cases from said first gravity conveyer to said platform.

5. The combination with a first gravity conveyer for holding cases in contiguous ranks and files, and a third gravity conveyer

for delivering said cases to a lower level, of means for transferring said cases from said first gravity conveyor to said third gravity conveyor, comprising a second gravity conveyor lying at a lower level than said first gravity conveyor and inclined toward said third gravity conveyor, a vertically reciprocable platform positioned between said first and second gravity conveyor for transferring said cases one by one from said first gravity conveyor to said second gravity conveyor, and manually operable means for controlling the transfer of cases from said second gravity conveyor to said third gravity conveyor.

6. The combination with a first gravity conveyor for holding cases in ranks and files, and a third conveyor, of means for transferring said cases from said first gravity conveyor to said third conveyor, comprising a second gravity conveyor lying at a lower level than said first gravity conveyor and inclined toward said third conveyor, a vertically reciprocable platform positioned between said first and second gravity conveyor for transferring said cases one by one from said first gravity conveyor to said second gravity conveyor, and manually operable means for controlling the transfer of cases from said second gravity conveyor to said third conveyor.

7. The combination with a first gravity conveyor for holding cases in ranks and files, and a third conveyor, of means for transferring said cases from said first gravity conveyor to said third conveyor, comprising a second gravity conveyor lying at a lower level than said first gravity conveyor and inclined toward said third conveyor, means including a reciprocable platform for receiving a plurality of cases simultaneously from said first conveyor and delivering them one by one to said second conveyor, and means for controlling the transfer of cases from said second gravity conveyor to said third conveyor.

8. The combination with a first gravity conveyor for holding a plurality of cases in contiguous ranks and files, and a second gravity conveyor located below said first gravity conveyor, of means for transferring the cases from said first gravity conveyor to said second gravity conveyor, comprising a platform mounted to reciprocate vertically between said gravity conveyers, said first gravity conveyor comprising gravity actuated means for transferring said files of cases from said first gravity conveyor to said platform, and means for transferring said cases one by one from said platform to said second gravity conveyor.

9. The combination with a first gravity conveyor for holding a plurality of cases in contiguous ranks and files, and a second gravity conveyor for receiving said cases

from said first gravity conveyor, of means for transferring the cases from said first gravity conveyor to said second gravity conveyor, comprising a movable platform for successively receiving the files of cases from said first gravity conveyor, means controlled by the weight of said files of cases for preventing succeeding files of cases from interfering with the movement of said platform, and means actuated by the weight of the cases on said platform for causing said platform to deliver said cases one by one to said second gravity conveyor.

10. The combination with a first gravity conveyor for holding a plurality of cases in contiguous ranks and files, and a second gravity conveyor for receiving said cases from said first gravity conveyor, of means for transferring the cases from said first gravity conveyor to said second gravity conveyor, comprising a movable platform for successively receiving the files of cases from said first gravity conveyor, means for preventing succeeding files of cases from interfering with the movement of said platform, and means actuated by the weight of the cases on said platform for causing said platform to deliver said cases one by one to said second gravity conveyor.

11. The combination with a first gravity conveyor for holding a plurality of cases in contiguous ranks and files, and a second gravity conveyor for delivering said cases at a lower level, of means for transferring said cases from said first gravity conveyor to said second gravity conveyor, comprising means for successively removing said cases from successive files beginning with the lowermost case of each file.

12. The combination with a first gravity conveyor for holding a plurality of cases in ranks and files, and a second conveyor for delivering said cases at a lower level, of means for transferring said cases from said first gravity conveyor to said second conveyor, comprising means for successively removing said cases from successive files beginning with the lowermost case of each file.

13. The combination with a first conveyor for holding a plurality of cases arranged in contiguous ranks and files, and a second conveyor for receiving said cases, of means for transferring said cases from said first conveyor to said second conveyor, comprising a platform mounted to reciprocate between said conveyers, said platform being arranged to successively receive the files of cases from said first conveyor, means actuated by the weight of the files delivered to said platform for supporting all but the lowermost case of said file so as to permit said platform to descend under the weight of said lowermost case and deliver said lowermost case to said second conveyor, means for returning said platform to receive

the next lowermost case from said file, and means controlled by return movement of said platform for releasing said supporting means to permit the next lowermost case to be deposited upon said platform.

14. The combination with a first conveyer for holding a plurality of cases arranged in contiguous ranks and files, and a second conveyer for receiving said cases, of means for transferring said cases from said first conveyer to said second conveyer, comprising a platform mounted to reciprocate between said conveyers, said platform being arranged to successively receive the files of cases from said first conveyer, means for supporting all but the lowermost case of said file so as to permit said platform to descend under the weight of said lowermost case and deliver said lowermost case to said second conveyer, means for returning said platform to receive the next lowermost case from said file, and means for releasing said supporting means to permit the next lowermost case to be deposited upon said platform.

15. The combination with a first conveyer for holding a plurality of cases arranged in ranks and files, and a second conveyer for receiving said cases, of means for transferring said cases from said first conveyer to said second conveyer, comprising a platform mounted to reciprocate between said conveyers, said platform being arranged to successively receive the files of cases from said first conveyer, means for supporting all but the lowermost case of said file so as to permit said platform to deliver said lowermost case to said second conveyer, means for returning said platform to receive the next lowermost case from said file, and means for releasing said supporting means to permit the next lowermost case to be deposited upon said platform.

16. The combination with a first conveyer for holding a plurality of cases arranged in ranks and files, and a second conveyer for receiving said cases, of means for transferring said cases from said first conveyer to said second conveyer, comprising a platform mounted to move between said conveyers, said platform being arranged to successively receive the files of cases from said first conveyer, means for supporting all but the lowermost case of said file so as to permit said platform to deliver said lowermost case to said second conveyer, means for moving said platform to receive the next lowermost case from said file, and means for releasing said supporting means to permit the next lowermost case to be deposited upon said platform.

17. The combination with means for receiving a pile of superimposed cases, of means for successively removing the lowermost case of said pile, and means for supporting the remainder of said cases while

said lowermost case is being removed, said last named means being actuated by the weight of said cases.

18. The combination with a conveyer, of a reciprocating platform for delivering cases to said conveyer, and means controlled by the weight of cases positioned vertically above said platform for delivering said cases one by one to said platform.

19. The combination with a conveyer, of a reciprocating platform for holding a plurality of superimposed cases, and means controlled by the weight of said cases for delivering said cases one by one from said platform to said conveyer beginning with the bottom one.

20. The combination with a support for holding the stack of cases in ranks and files, of a conveyer, automatic means actuated by the weight of the cases themselves for receiving a file of said cases simultaneously from said support and delivering them one by one to said conveyer, and operator-controlled means for controlling the delivery of individual cases from said conveyer.

21. The combination with a support for holding a stack of cases in horizontal ranks and vertical files, of a conveyer, and means for receiving a file of said cases simultaneously from said support and delivering them one by one to said conveyer.

22. The combination with a support for holding a stack of cases in ranks and files, of a conveyer, and automatic means actuated by the weight of the cases themselves for receiving a file of said cases simultaneously from said support and delivering them one by one to said conveyer.

23. The method of automatically delivering articles one by one from a stack of articles arranged in ranks and files, which comprises separating one file from the rest of the stack, withdrawing the articles from the separated file one by one, beginning at the bottom, and when the file is exhausted separating another file.

24. The method of automatically delivering articles one by one from a stack of articles arranged in horizontal ranks and vertical files, which comprises separating one file from the rest of the stack, withdrawing the articles from the separated file one by one, beginning at one end, and when the file is exhausted separating another file.

25. The method of automatically delivering articles one by one from a stack of articles arranged in horizontal ranks and vertical files, which comprises separating one file from the rest of the stack, withdrawing the articles from the separated file one by one, and when the file is exhausted separating another file.

26. The method of automatically delivering articles one by one from a stack of articles arranged in horizontal ranks and verti-

cal files, which comprises separating one file from the rest of the stack, and withdrawing the articles from the separated file one by one, beginning at one end.

5 27. The combination with a first gravity conveyer for holding a plurality of cases in contiguous ranks and files, and a second gravity conveyer for receiving said cases from said first gravity conveyer, of means 10 for transferring the cases from said first gravity conveyer to said second gravity conveyer, comprising a movable platform for successively receiving the files of cases from said first gravity conveyer, means for preventing succeeding files of cases from interfering with the movement of said platform, 15 and means for causing said platform to deliver said cases one by one to said second gravity conveyer.

20 28. The combination with a gravity conveyer for holding a plurality of cases in contiguous ranks and files, and a second conveyer for receiving said cases from said gravity conveyer, of means for transferring 25 the cases from said gravity conveyer to said second conveyer, comprising a movable platform for successively receiving the files of cases from said gravity conveyer, means for preventing succeeding files of cases from interfering with the movement of said platform, 30 and means for causing said platform to deliver said cases one by one to said second conveyer.

29. The combination with a gravity conveyer for holding a plurality of cases in 35 ranks and files, and a second conveyer for receiving said cases from said gravity conveyer, of means for transferring the cases from said gravity conveyer to said second conveyer, comprising a platform for successively receiving the files of cases from said gravity conveyer, and means for causing 40 said platform to deliver said cases one by one to said second conveyer.

45 30. The combination with a first conveyer for holding a plurality of cases arranged in contiguous horizontal ranks and vertical files, and a second conveyer for receiving

and holding a plurality of cases arranged in a single row, of means for successively transferring said cases from said first conveyer 50 to said second conveyer, said means being actuated by the weight of said cases, a third conveyer for receiving cases from said second conveyer, and remote control means for 55 causing said cases to be delivered from said second conveyer to said third conveyer.

31. The combination with a first conveyer for holding a plurality of cases arranged in contiguous horizontal ranks and vertical 60 files, and a second conveyer for receiving and holding a plurality of cases arranged in a single row, of means for successively transferring said cases from said first conveyer to said second conveyer, a third conveyer for 65 receiving cases from said second conveyer, and means for causing said cases to be delivered one by one from said second conveyer to said third conveyer.

32. The combination with a first conveyer 70 for holding a plurality of cases arranged in horizontal ranks and vertical files, and a second conveyer for receiving and holding a plurality of cases arranged in a single row, of means for successively transferring 75 said cases from said first conveyer to said second conveyer, a third conveyer for receiving cases from said second conveyer, and means for causing said cases to be delivered from said second conveyer to said third con- 80 veyer.

33. The combination with means for holding a plurality of cases in contiguous horizontal ranks and vertical files, of a conveyer, and gravity actuated means for transferring 85 said cases one by one to said conveyer.

34. The combination with means for holding a plurality of cases in horizontal ranks and vertical files, of a conveyer, and means for transferring said cases one by one to 90 said conveyer.

In witness whereof, we hereunto subscribe our names this 16 day of March, 1923.

LOUIS THREEFOOT.
GEO. W. ELKIN.