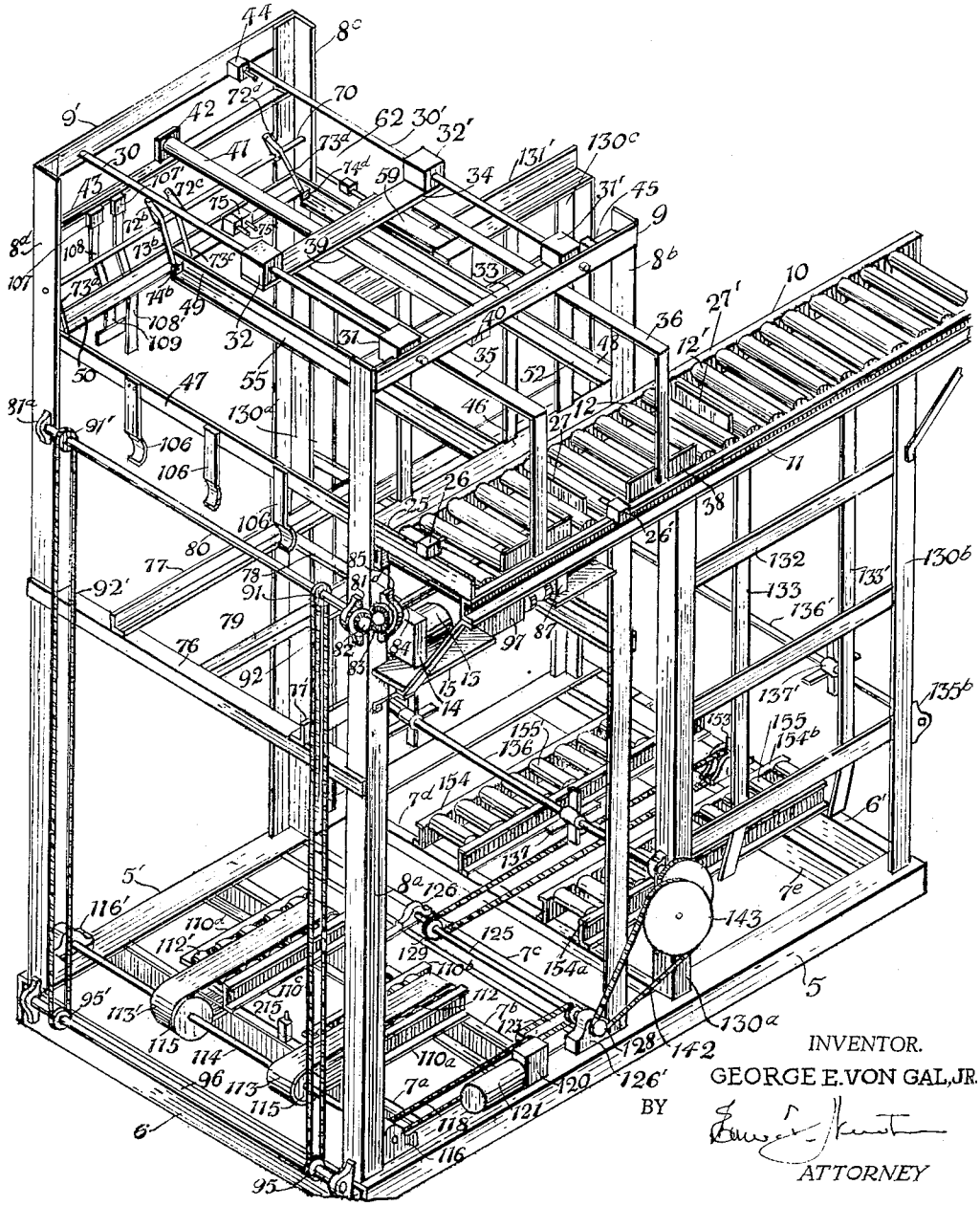
Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 1

Fig. 1



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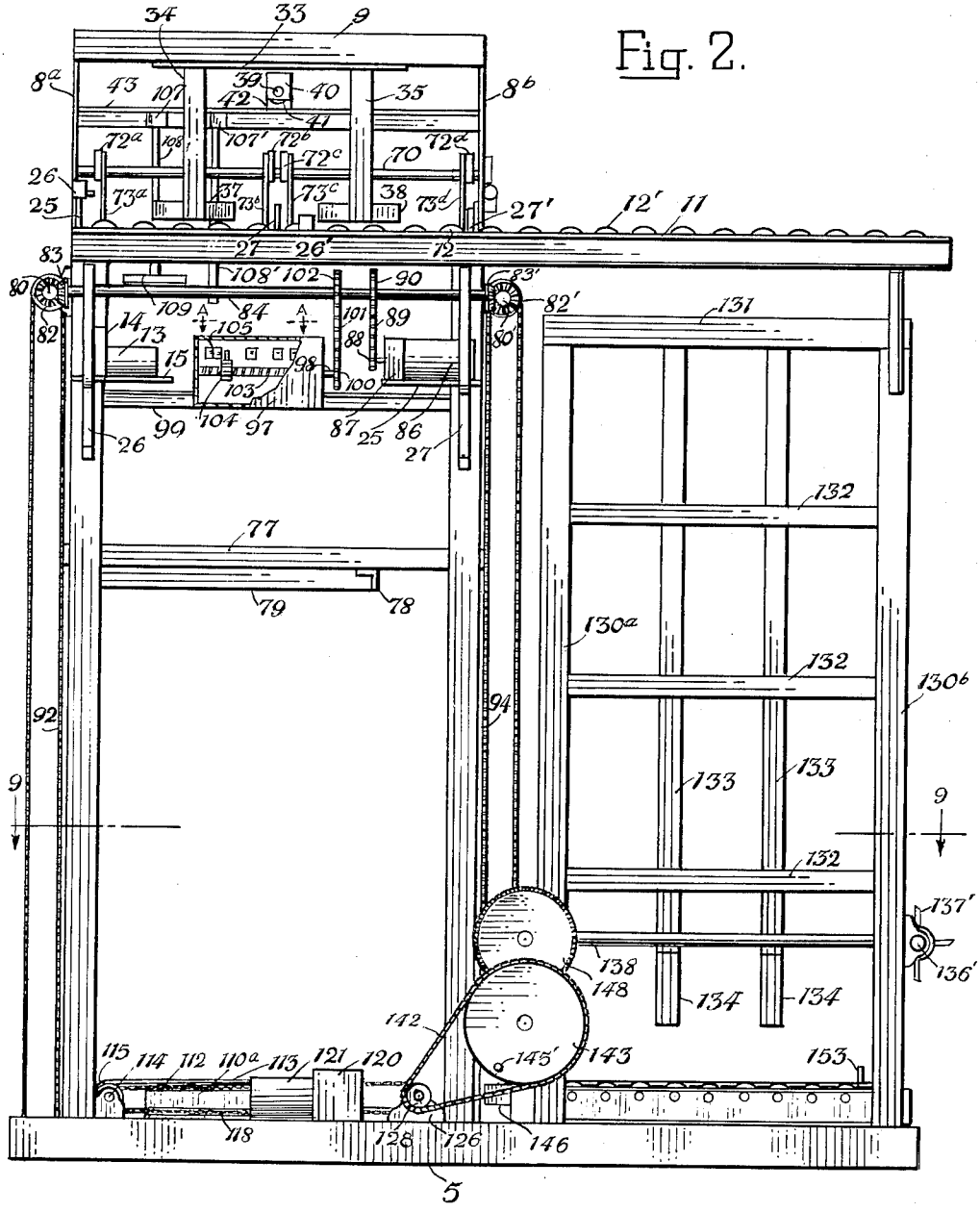
Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 2

Fig. 2.



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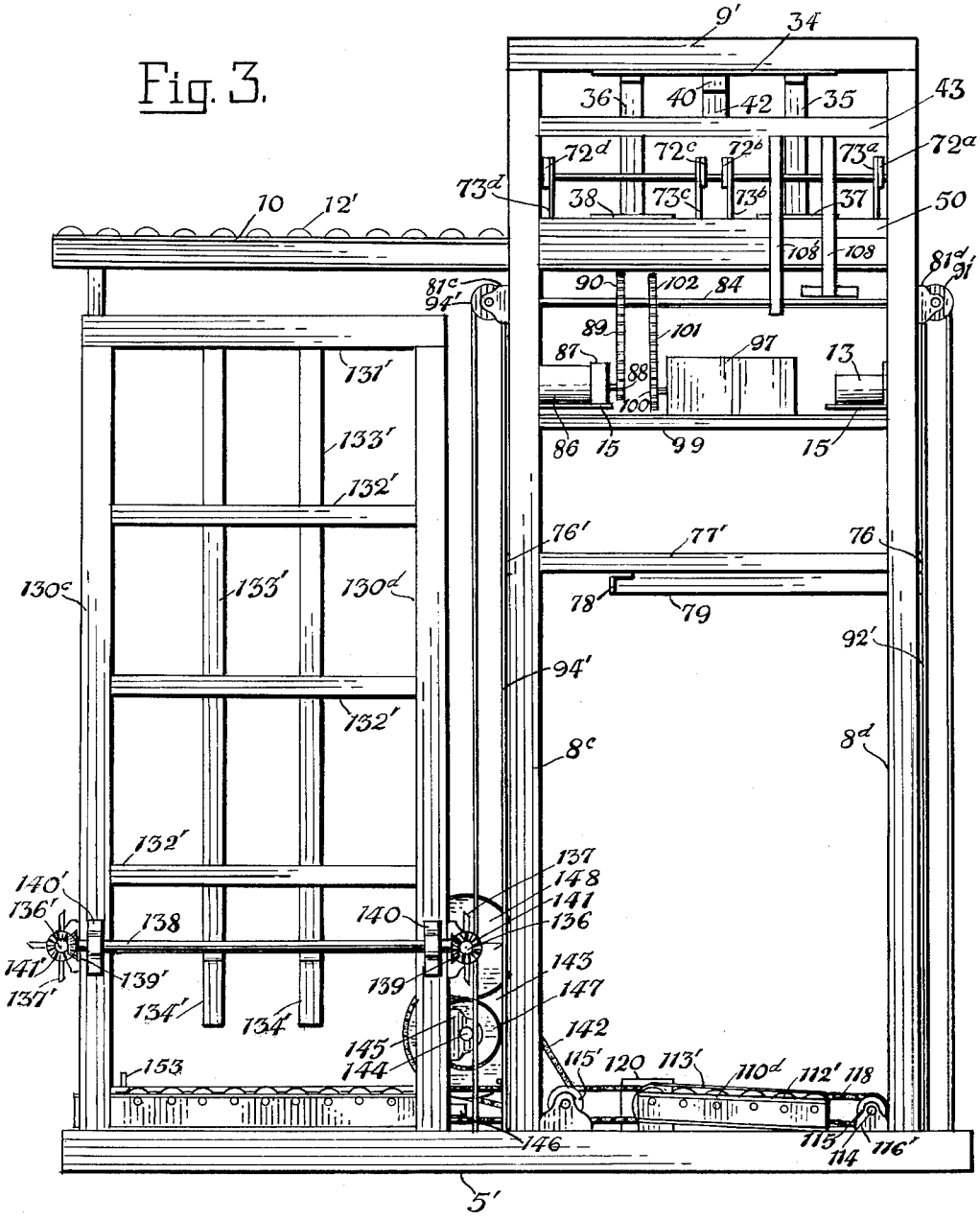
Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 3

Fig. 3.



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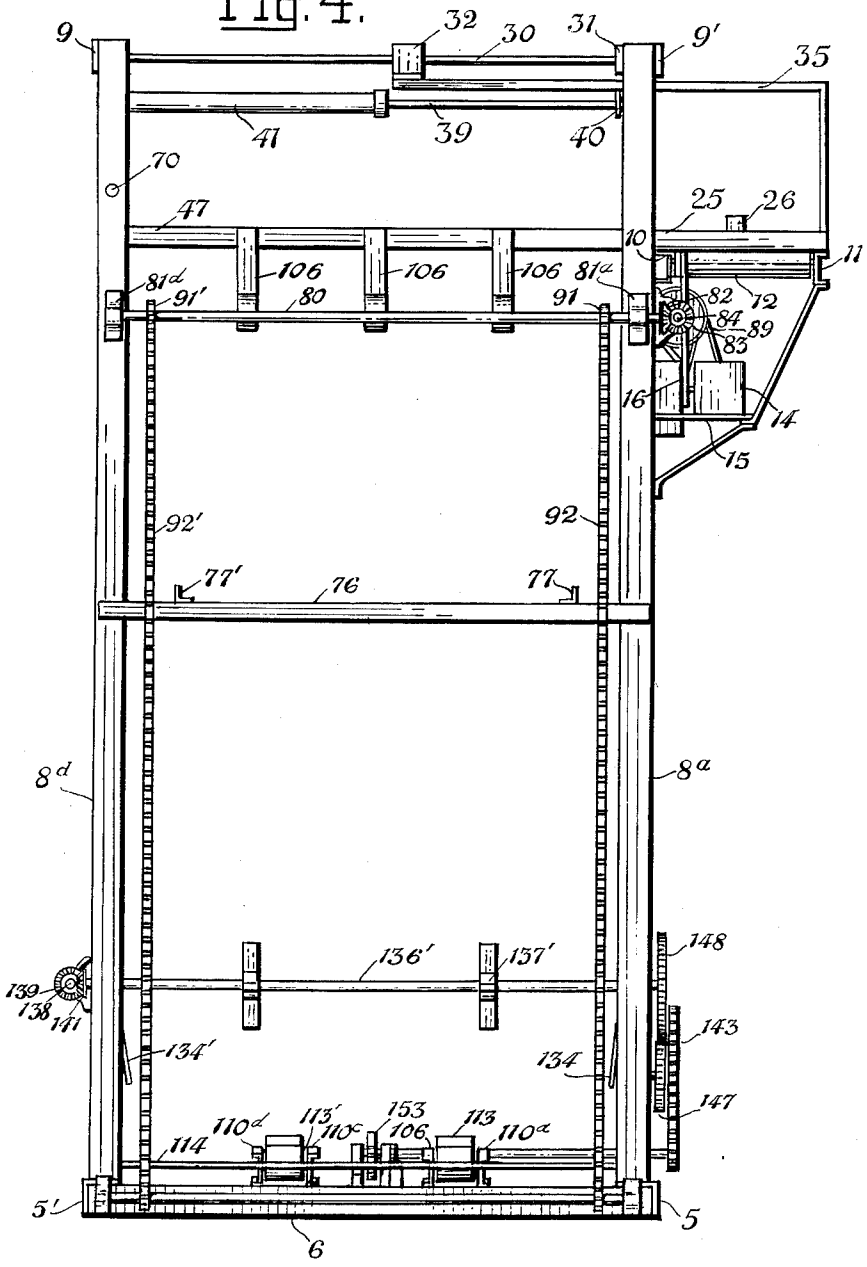
Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 4

Fig. 4.



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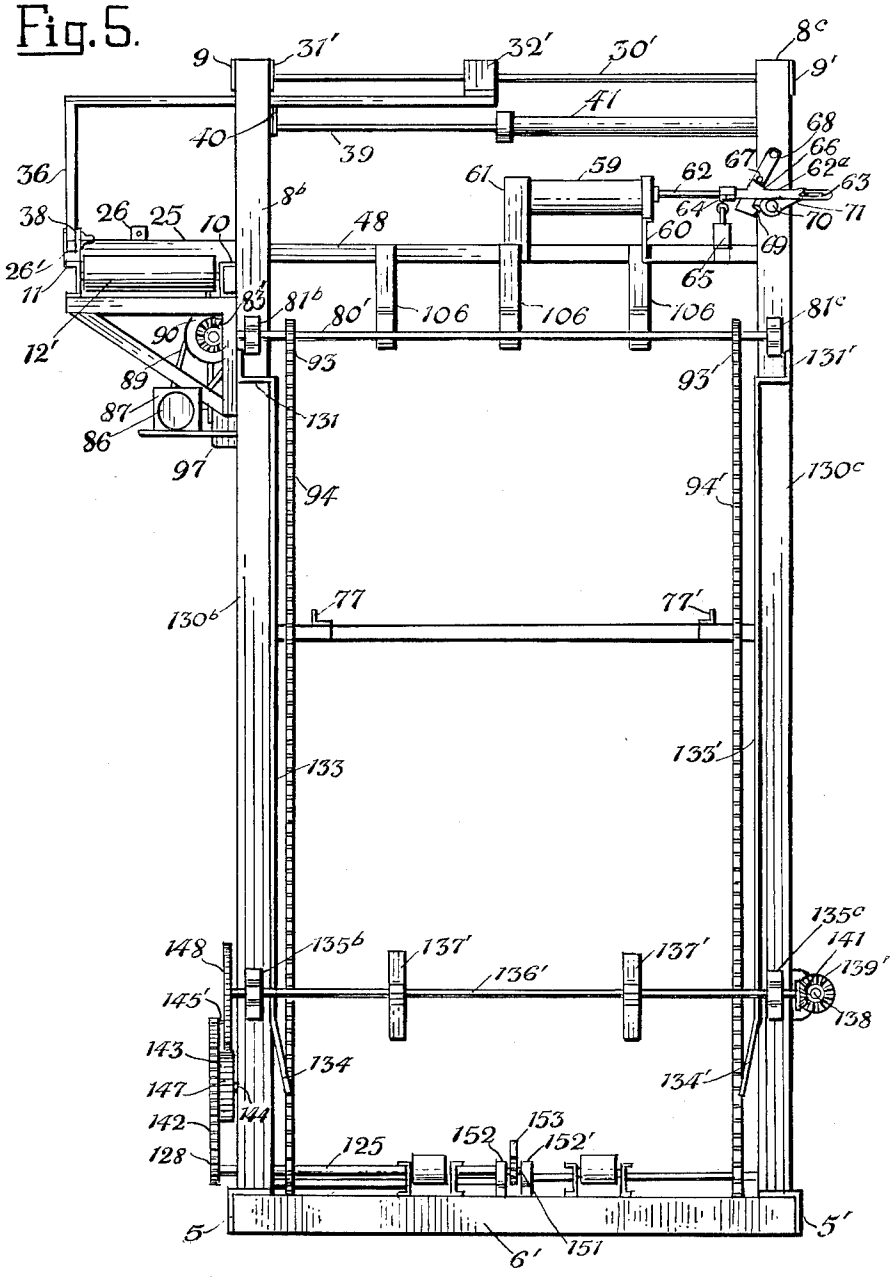
Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 5

Fig. 5.



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Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

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Filed June 12, 1957 8 Sheets-Sheet 6

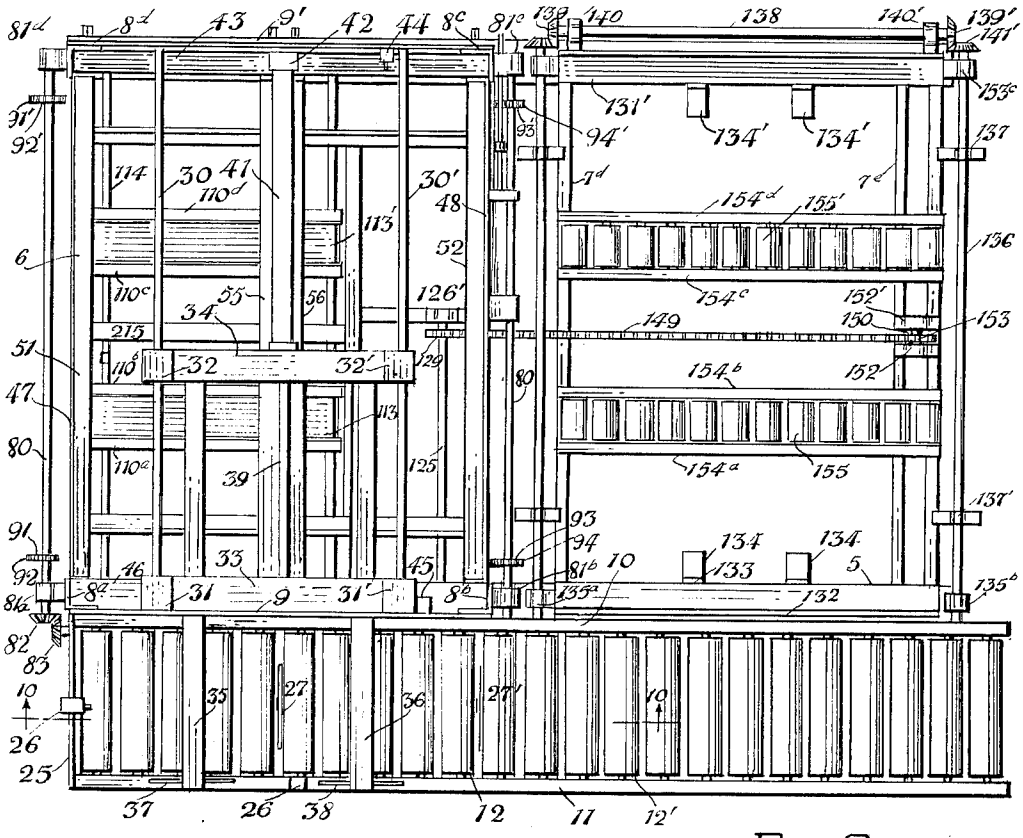

Fig. 6.

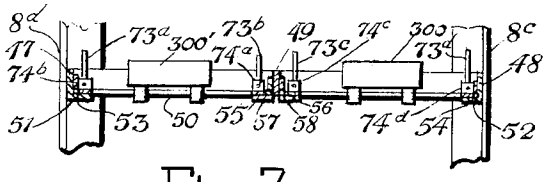

Fig. 7.

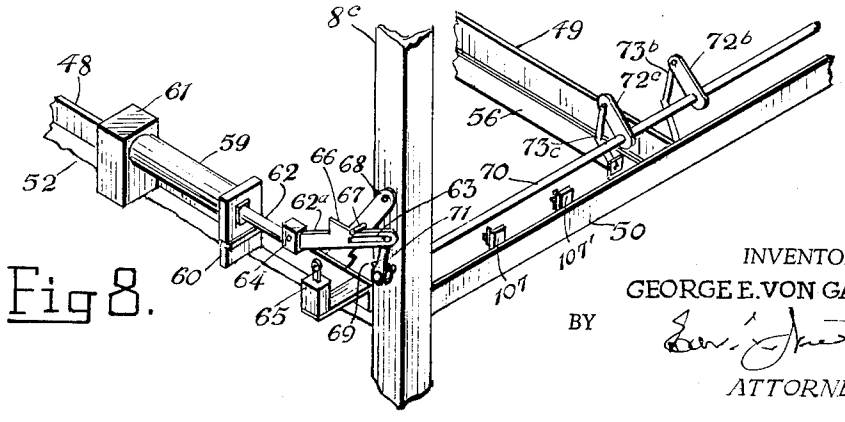

Fig 8.

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Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 7

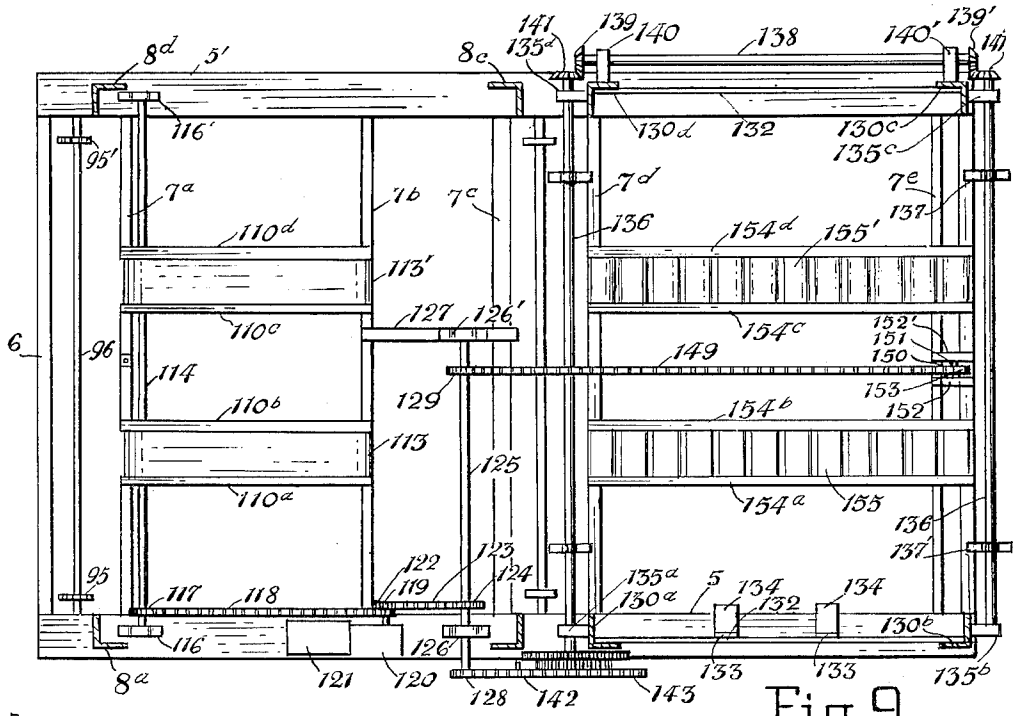

Fig. 9.

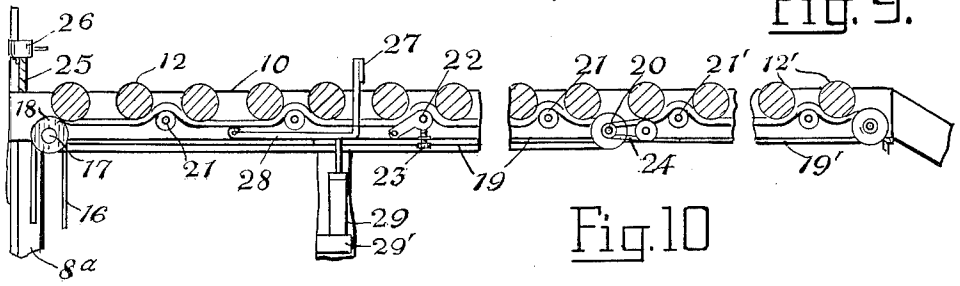

Fig. 10

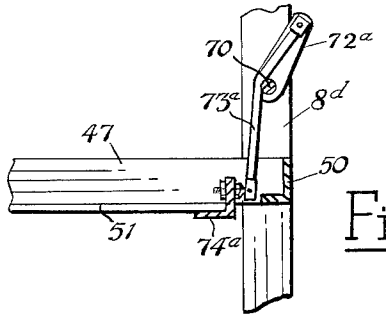

Fig. 11.

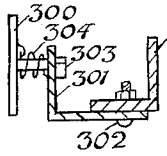

Fig. 12.

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Oct. 2, 1962 G. E. VON GAL, JR 3,056,513

STACKING MACHINE

Filed June 12, 1957 8 Sheets-Sheet 8

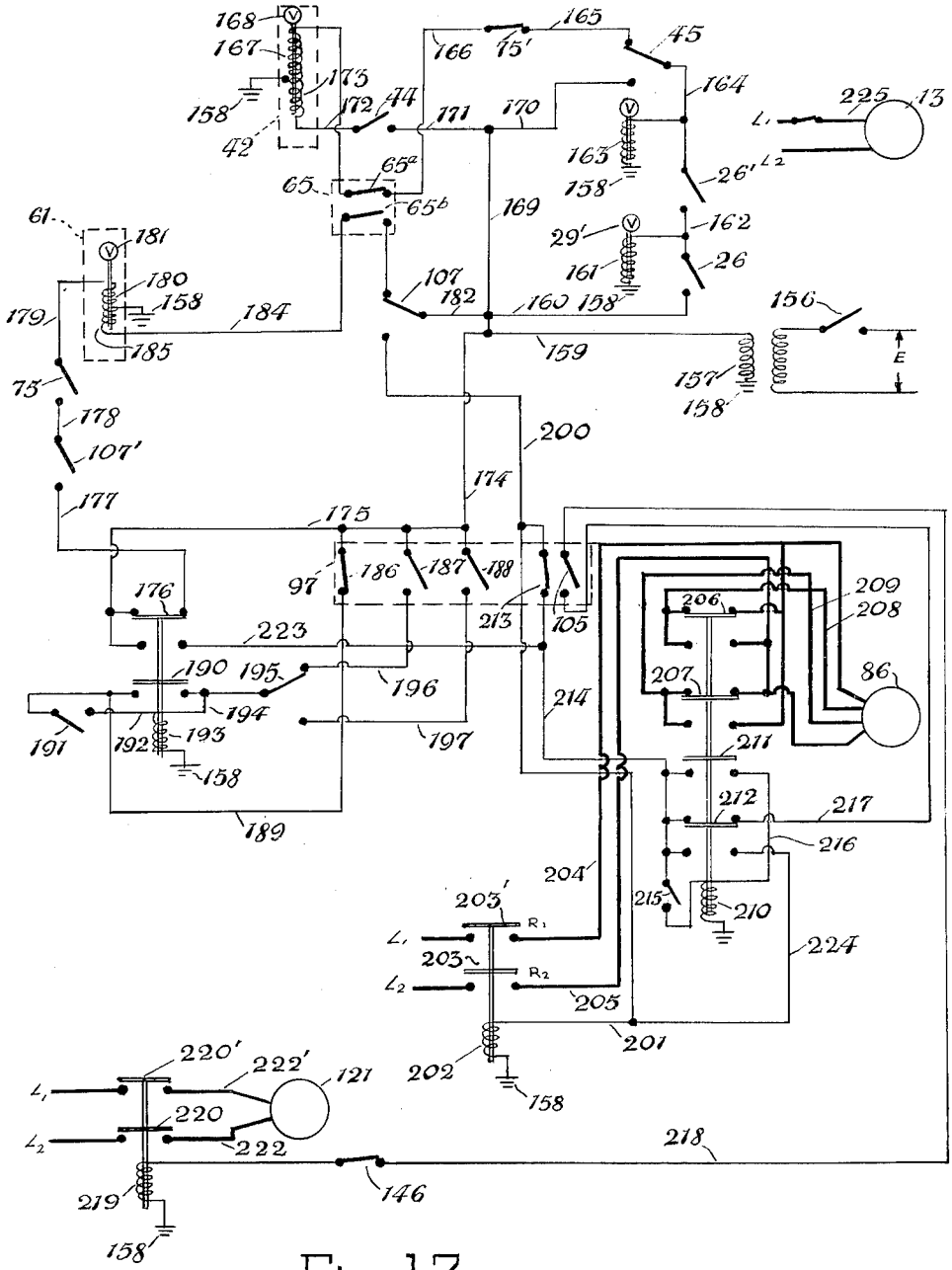

Fig. 13.

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United States Patent Office 3,056,513 Patented Oct. 2, 1962

3,056,513

STACKING MACHINE

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Filed June 12, 1957, Ser. No. 665,334
12 Claims. (Cl. 214—6)

This invention relates to a stacking machine and more particularly to a machine which will receive and automatically stack articles such as cartons and cases on a pallet or other receiving means.

In the past, many devices have been proposed and built for the purpose of stacking articles one on top of the other for storage and shipment. These prior art devices have usually been extremely expensive and complicated, thus precluding small manufacturers, such as a local soft drink bottling plant, from utilizing the same. Further, many prior art devices, which have been employed, operate at such a slow rate that several similar machines must be used in order to maintain a proper stacking speed with the assembly line discharge of articles.

In the bottling industries which may utilize stacking machines, most articles such as soft drink crates or cases are reusable and since such crates do not come in actual contact with the food or liquid to be consumed, they are seldom cleaned prior to being filled. Therefore a major problem in employing a stacking machine is that dirt and other foreign matter from the articles being handled will become lodged in the cogs, gearing or other mechanisms of the machine and thereby prevent proper functioning of the machine or cause the machine to break.

Briefly in an attempt to obviate these problems in the prior art and provide an inexpensive yet efficient stacking machine, I have devised a stacking machine which includes a conveyor which delivers articles to a ram or rake mechanism which upon receiving a predetermined number of articles will be automatically actuated to deliver these articles in side by side relationship to a releasing mechanism. Upon completion of the loading of the releasing mechanism, the same is actuated to deposit the accumulated group of articles onto a pallet of an elevator mechanism which is then actuated to lower this pallet a predetermined distance so that the cycle of loading the releasing mechanism may be repeated and the second accumulated group of articles on the releasing mechanism may be released on top of the first loaded group, etc. until the pallet is loaded. Upon being loaded, the pallet is automatically moved to the bottom of the elevator shaft where it is discharged in its loaded condition and replaced with a second pallet which is carried to a position immediately below the releasing mechanism. Thereafter the cycle of my stacking machine is repeated.

Incorporated with my stacking machine is a mechanism for automatically discharging the pallets, one for each cycle of the elevator mechanism, and a mechanism for preselecting the number of stacks to be accumulated on the pallet before the elevator mechanism is actuated to discharge the pallet.

Accordingly, it is a primary object of my invention to provide an inexpensive, durable and efficient stacking machine which is easily manufactured, operated and maintained.

Another object of my invention is to provide a stacking machine which is well adapted to handle articles such as crates of soft drink bottles and stack these crates on a pallet.

Another object of my invention is to provide a stacking machine in which the number of stacks received by each pallet may be easily preselected or varied as desired.

Another object of my invention is to provide a stacking machine having relatively few moving parts to wear out or become out of adjustment.

Another object of my invention is to provide a stacking machine which is well adapted to operate in conjunction with an assembly line to receive articles discharged therefrom at substantially a constant rate and automatically load these articles onto a succession of pallets in an automatic sequence.

Another object of my invention is to provide a stacking machine which will operate substantially automatically and requires little attention from an operator during this operation.

Another object of my invention is to provide an automatic stacking machine which will occupy little floor space and which may be installed in processing plants without material alteration to the plant.

Another object of my invention is to provide an automatic stacking machine which will utilize conventional power sources such as compressed air and electricity which are found in most processing plants.

Another object of my invention is to provide a stacking machine which will receive and stack articles of varying height.

Other and further objects and advantages of my invention will become apparent from the following description when taken in conjunction with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views and wherein:

FIG. 1 is a perspective view of a stacking machine constructed in accordance with my invention.

FIG. 2 is an elevational view of one side of the stacking machine shown in FIG. 1.

FIG. 3 is an elevational view of the other side of the stacking machine shown in FIG. 1.

FIG. 4 is a front elevational view of the stacking machine shown in FIG. 1.

FIG. 5 is a rear elevational view of the stacking machine shown in FIG. 1.

FIG. 6 is a top plan view of the stacking machine shown in FIG. 1.

FIG. 7 is a cross-sectional fragmentary view of the releasing mechanism of the stacking machine shown in FIG. 1.

FIG. 8 is a fragmentary perspective view of a detail showing the releasing mechanism of the stacking machine of FIG. 1 in its releasing position.

FIG. 9 is a cross-sectional view taken along line **9—9** of FIG. 2.

FIG. 10 is a detail sectional view taken on line **10—10** of FIG. 6.

FIG. 11 is a detail side elevation of the drop gate linkage.

FIG. 12 is a fragmentary side elevation of a detail showing the stop plate of the machine shown in FIG. 1.

FIG. 13 is a schematic wiring diagram of the electrical system of the stacking machine shown in FIG. 1.

Referring now in detail to the embodiment chosen for purpose of illustration, it will be seen that the frame structure of my stacking machine is made from a plurality of L beams which are welded or otherwise secured together. This frame comprises a pair of spaced longitudinal base members 5, 5' connected at their ends by transverse base members 6, 6' to provide a rectangular base which supports the entire remaining structure. Within this base and running transversely thereof are a plurality of spaced reinforcing ribs 7*a*, 7*b*, 7*c*, 7*d*, 7*e* which provide support for the discharge rollers hereinafter to be described.

On the front portion of the base, extending upwardly from longitudinal base members 5, 5', are four spaced upstanding standards 8*a*, 8*b*, 8*c* and 8*d*, the lower and

central portions of which define an elevator chute and the upper portions of which are adapted to receive the releasing mechanism for dropping the articles onto the elevator, and the ram or rake mechanism for loading the releasing mechanism. For reinforcement, a pair of spaced longitudinal top bars 9, 9' are provided between standards 8*a*, 8*b* and 8*c*, 8*d*, respectively.

Feed Mechanism

Mounted along one side of the frame is a feed roller housing which includes a longitudinally extending roller supporting beam 10 and a complementary beam 11 which supports a plurality of feed rollers 12, 12' over which the articles to be stacked are fed to my machine. These feed rollers may be driven by appropriate motor drive mechanism or the articles may be fed by gravity toward the front of my stacking machine.

In the particular embodiment chosen to illustrate my invention, rollers 12 are driven from motor 13, through reduction gear 14 mounted on platform 15. For transferring power from reduction gear 14 to rollers 12, I have provided a continuous belt 16 which, as seen in FIG. 10, drives a shaft 17 provided with pulleys, such as pulley 18 which, in turn, drive spaced belts, such as belt 19. Belts, such as belt 19 pass beneath rollers 12 over idler shaft 20 and are urged against rollers 12 by interspaced idler rollers 21 and adjustable idler rollers such as roller 22. The position of idler rollers, such as rollers 22, may be adjusted by means of bolts such as bolt 23.

It will also be seen from FIG. 10 that the group of feed rollers 12', which are to the right of or up stream from the area adjacent standards 8*a*, 8*b*, 8*c*, 8*d*, are driven at a speed slower than the speed of rollers 12 by means of belts such as belt 19'. Belts such as belt 19' receive their power from idler shaft 20, through a speed reducing mechanism 24. Belt 19' is urged into engagement with rollers 12' by rollers 21' in a manner similar to the engagement of belt 19 with rollers 12. Therefore, as the articles are received from rollers 12' by rollers 12, a spacing of these articles takes place whereby the blocking gates, hereinafter disclosed, may operate after passage of the first article and then the second article onto rollers 12.

Across the front ends of beams 10 and 11 is switch supporting strap 25 which is provided with a first gate raising switch 26 mounted centrally of strap 25 in a position to be engaged by the first article moving forwardly on rollers 12. As will be described more fully hereinafter, the closing of switch 26 by the first article on rollers 12 causes a gate 27 to extend upwardly between adjacent rollers 12 to block the travel of all other articles on rollers 12. Positioned adjacent gate 27 is a second gate raising switch 26' which when closed, after closing of switch 26, causes a second gate 27' to extend upwardly and block all articles after the second article on rollers 12, 12' from moving past gate 27'.

As best seen in FIG. 10, gate 27 is carried by one end of a lever arm 28, the other end of which is pivotally mounted between beams 10 and 11. Lever arm 28 is actuated upon closing of switch 26 by means of an air cylinder and piston denoted generally by numeral 29. Air cylinder and piston 29 is mounted on its valve control mechanism 29' which is supported beneath beams 10 and 11. In an identical manner, gate 27' is supported and actuated.

Rake Assembly Mechanism

For moving the first and second articles on rollers 12 into the area defined by standards 8*a*, 8*b*, 8*c*, 8*d*, I have provided a ram or rake assembly mechanism which includes a pair of spaced traverse rods 30, 30' which extend between top bars 9, 9'. These traverse rods 30, 30' respectively receive a pair of slidable guide blocks 31, 31' and a second pair of slidable guide blocks 32, 32'. Rake arm supporting strap 33 extends between guide blocks 31, 31' and a second rake arm supporting strap 34 extends between guide blocks 32, 32'. Fixed to these straps 33 and

34 are a pair of rake arms 35 and 36 which extend outwardly, transversely over rollers 12 and then downwardly to terminate adjacent the outer edge of rollers 12. The end of rake arm 35 is provided with a pusher plate or rake 37 located between switch supporting strap 25 and first gate 27, while the end of arm 36 is provided with a pusher plate or rake 38 located between first gate 27 and second gate 27'. Rakes 37 and 38 are so positioned adjacent the outer edges of rollers 12 that, when my rake assembly mechanism is actuated, rake 37 will engage the outer side of the first article on rollers 12 and rake 38 will engage the outer side of the second article on rollers 12 and respectively urge them, in paths normal to their path of travel on rollers 12, into the area defined by standards 8*a*, 8*b*, 8*c*, 8*d*.

For actuating rakes 37 and 38, one end of a piston rod 39 is affixed by means of link 40 to the central portion of rake supporting strap 33 while the other end is connected to the piston (not shown) of a transversely disposed double acting, air cylinder 41. The outer end of cylinder 41 terminates, on the side of my mechanism opposite rollers 12, in a valve box 42 which is supported between standards 8*c*, 8*d* by brace 43. Thus it is seen that, upon actuation of cylinder 41 by the admission of air to one side of the piston within cylinder 41, piston rod 39 will be drawn within cylinder 41 and will urge the rake carriage, consisting of guide blocks 31, 31', 32, 32', straps 33, 34, and arms 35, 36, towards standards 8*c*, 8*d*, thereby moving rakes 37 and 38 across rollers 12.

Located adjacent traverse rod 30' on top bar 9' is an electrical ram cylinder actuating switch 44 which is so positioned as to be engaged and closed by guide block 32' as rakes 37, 38 reach the end of their travel across rollers 12. As will be described more fully hereinafter, upon closing of this switch 44, the solenoid in valve box 42 is actuated to operate the valve of cylinder 41 and introduce air on the other side of the piston therein and return the rake carriage to its original position shown in FIG. 1. Located on top bar 9, adjacent rod 30' in a position to be engaged and closed by guide blocks 32' is a switch 45 which causes gate 27' to drop below rollers 12, and thus condition the gates and ram assembly mechanism for another cycle of its operation.

Releasing Mechanism

For receiving, collecting and then depositing the articles urged into the area defined by standards 8*a*, 8*b*, 8*c*, 8*d*, is the releasing mechanism which includes a bearing plate 46 extending on substantially the same plane with the upper surface of rollers 12 between standards 8*a* and 8*b*. As best seen in FIG. 1, above bearing plate 46, one flange of each of standards 8*a* and 8*b* is removed to provide a sufficiently wide area for the articles to pass therethrough.

Extending from the ends of bearing plate 46, and connected between standards 8*a* and 8*d*, and between standards 8*b* and 8*c* respectively are vertically disposed guide rails 47 and 48. A vertically disposed partition member 49, which is equidistant between guide rails 47 and 48 and substantially aligned transversely with gate 27, extends from the midportion of bearing plate 46 to the midportion of a switch supporting bar 50, which bar extends between standards 8*c* and 8*d*. Guide rail 47 and partition member 49 define a first space for receiving articles from rake 37, and guide rail 48 and partition member 49 define a second space for receiving articles from rake 38.

For supporting and releasing the articles, guide rails 47 and 48 are provided respectively with hinged flanges or releasing gates 51 and 52 which normally project inwardly toward each other and are hinged by hinges 53 and 54, seen in FIG. 7, to the bottom edge of guide members 47 and 48. Similarly, partition member 49 is provided with hinged flanges or releasing gates 55 and 56 which respectively are complementary to and project to-

ward releasing gates 51 and 52. Releasing gates 55 and 56 are respectively hinged to the bottom edge of partition member 49 by hinges 57 and 58.

As best seen in FIG. 8, to actuate these releasing gates 51, 52, 55, 56 and pivot them downwardly, after they are loaded, I have provided a gate actuating, double acting, air cylinder 59 which is supported from guide rail 48 by bracket 60. Air cylinder 59 is provided with a valve and solenoid housing 61 for the electrical actuation of air cylinder 59. As is usual, air cylinder 59 is provided with a piston rod 62 which is adapted to be reciprocated by a piston (not shown) within air cylinder 59. At its end, rod 62 is provided with a camming member 64 which engages the upstanding finger of a switch 65 mounted adjacent cylinder 50 on guide rail 48. Camming member 64 pivotally carries one end of pitman 62*a*, the other end of which is provided with a longitudinal slot 63. On pitman 62*a*, between slot 63 and camming member 64, is a hasp unlocking finger 66 which has an upwardly sloping beveled edge and a vertical edge. In the normal position of pitman 62*a*, the vertical edge of finger 66 engages an outwardly projecting stud 67 fixed at an intermediate position on hasp 68. Hasp 68 is pivotally mounted by one end to standard 8*c* and is urged by gravity into locking engagement with a pivot arm 69 fixed to a releasing shaft 70. Thus, until rod 62 is withdrawn within cylinder 59, shaft 70 will not rotate in a counterclockwise direction as viewed in FIG. 5. Upon movement of rod 62 to the left in FIG. 5, finger 66 will urge stud 67 to the left, causing hasp 68 to be rotated in a clockwise direction and thereby release pivot arm 69 for counterclockwise rotation with shaft 70 to the position shown in FIG. 8.

From an examination of FIG. 8 it will be seen that one end of shaft 70 is located immediately below pitman 62*a*. A lever 71 projects upwardly and outwardly from shaft 70 and its end is engaged in slot 63. Thus, upon continued travel of rod 62 to the left, and after hasp 68 has been withdrawn from pivot arm 69, pitman 62*a* will urge the end of lever 71 in a counterclockwise direction, causing rotation of shaft 70 in that direction.

As best seen in FIGS. 1 through 4, shaft 70 is journalled for rotation in standards 8*c* and 8*d* above switch supporting bar 50. A plurality of levers, namely levers 72*a*, 72*b*, 72*c*, and 72*d* project upwardly and outwardly from shaft 70. The outer ends of these levers 72*a*, 72*b*, 72*c*, and 72*d* are respectively pivotally connected to links 73*a*, 73*b*, 73*c*, and 73*d* which, in turn, are pivotally connected to upturned end flanges 74*a*, 74*b*, 74*c*, and 74*d*. Links 73*a*, 73*b*, 73*c*, and 73*d* are each curved or dog leg members whereby when shaft 70 is in its normal position the pivoted ends of lever 72*a*, 72*b*, 72*c*, and 72*d* will be rotated beyond the diametrically opposed position with respect to the pivoted lower end of links 73*a*, 73*b*, 73*c* and 73*d* and, therefore, there will be no rotational force applied to shaft 70, regardless of the loading of links 73*a*, 73*b*, 73*c*, and 73*d*. End flanges 74*a*, 74*b*, 74*c*, and 74*d* are respectively integrally formed with the ends of releasing gates 51, 55, 56, and 52.

For actuating air cylinder 59, a gate releasing switch 75 is mounted on switch supporting bar 50, between gate 56 and gate 52. Adjacent switch 75 is a supervisory switch 75′ which prevents actuation of air cylinder 41 when the receiving compartments are filled with articles. Thus, when both the first and second receiving compartments defined, respectively by guide rail 47, and partition member 49, and guide rail 48 and partition member 49 are loaded, the action of rake 38 on the last article to be loaded will cause the first article in the second receiving compartment to depress switch 75, thereby causing air cylinder 59 to rotate shaft 70, and levers 72*a*, 72*b*, 72*c*, 72*d* to act against links 73*a*, 73*b*, 73*c*, and 73*d* and cause gates 51, 52, 55, 56 to be simultaneously lowered to the position shown in FIG. 8.

As best seen in FIG. 12, stop plates 300, 300′ are resiliently mounted, one to a compartment, on switch supporting bar 50 so that as each compartment is filled with articles, movement of the articles toward bar 50 will be resisted and thus the adjacent articles will be urged together.

In more detail, each stop plate, such as stop plate 300, is supported in parallel spaced relation to bar 50 by a pair of brackets, such as L-shaped bracket 301 having a slot (not shown) on the nether side through which bolt 302 passes to joint bracket 301 to bar 50. Thus, each bracket, such as bracket 301, may be adjusted transversely of my machine. The upstanding portion of each of the brackets, such as bracket 301, is provided with a hole through which a bolt, such as bolt 303, projects to threadedly engage the back side of its stop plate and a spring, such as spring 304, is provided, surrounding each bolt, such as bolt 303, to resiliently urge the stop plate and bracket apart.

Elevator Mechanism

For receiving the group of articles as they are dropped by gates 51, 52, 55, 56, an elevator frame is mounted within standards 8a, 8b, 8c, 8d, below the releasing mechanism. This elevator frame comprises a pair of horizontally extending L beams 76, 76′ which are respectively slidably positioned between standards 8*a*, 8*d* and 8*b*, 8*c*. The ends of beams 76, 76′ are notched, as best seen in FIG. 1, whereby bearing surfaces are provided for engagement with standards 8*a*, 8*b*, 8*c*, 8*d*. Longitudinal beams 77, 77′ extend between beams 76, 76′, within standards 8*a*, 8*b*, 8*c* and 8*d* and are each provided with upstanding flanges adapted to position a pallet on the elevator frame within the standards. For reinforcing and alignment of the elevator frame on the discharge means to be described hereinafter, a beam 78 extends between beams 77, 77′, intermediate their inner ends and their midportions and a reinforcing rib 79 extends from the midportion of beam 78 to the midportion of beam 76.

Adjacent and below guide rail 47 is a sprocket shaft 80 which is journalled for rotation outwardly on standards 8*a*, 8*d* by bearings 81*a*, 81*d*. A similar and complementary sprocket shaft 80′ is provided opposite shaft 80 and is journalled by bearings 81*b* and 81*c* on standards 8*b* and 8*c*. The outer ends of shafts 80, 80′ have bevel gears 82, 82′ which respectively mesh with bevel gears 83, 83′ mounted on the opposite ends of a power transfer shaft 84, journalled by bearings 85. Power transfer shaft 84 is driven by motor 86 through a reduction gear 87 which drives sprocket 88, driving through a continuous link chain 89, a sprocket 90 fixed to power transfer shaft 84. It is now seen that upon rotation of motor 86, shafts 80 and 80′ will be rotated in opposite directions at equal speed.

On shaft 80 are a pair of spaced chain driving sprockets 91, 91′ which respectively carry link chains 92, 92′. Similarly, shaft 80′ is provided with a pair of sprockets 93, 93′ which respectively carry chains 94, 94′.

Chains 92, 92′ are continuous link chains which extend downwardly and around idle sprockets 95, 95′ which latter sprockets are mounted on idle shaft 96 journalled by base members 5, 5′. In identical manner, chains 94, 94′ are provided with idle sprockets (not shown) which are carried by a shaft (not shown) journalled between base members 5, 5′. Chains 92, 92′, 94, 94′ are each connected appropriately to the elevator frame, chains 92, 92′ being connected to beam 76 and chains 94, 94′ being connected to beam 76′ to provide a lifting means for the elevator frame.

As best seen in FIG. 2, to control the positioning of the elevator frame through the excitation and de-excitation of motor 86, I have provided a control box 97 within which is a shaft 98. Control box 97 is mounted to a cross bar 99 extending between standards 8*a*, 8*b* while shaft 98 is provided with a sprocket 100 driven

by chain **101** from a sprocket **102** on power transfer shaft **84**. As best seen in FIG. 2, shaft **98** is provided with a helical screw **103** and a screw follower **104** which contacts any one of a plurality of switches such as switch **105**, depending, of course, on the position of the elevator frame, to which it is mechanically linked as described above.

As best seen in FIGS. 4 and 5, for urging the articles inwardly as they are dropped and thereby to provide a compact layer of articles, I have provided a plurality of alignment arms **106** which are fixed at spaced intervals along guide rails **47** and **48**.

To move the elevator frame downwardly whenever articles are deposited on the elevator frame but have not cleared the gates **51**, **52**, **55**, **56**, I have provided a feeler switch **107** on brace **43**. Feeler switch **107** is provided with a downwardly extending switch arm **108** which terminates in a feeler plate **109**. When feeler plate **109** is urged to one side by a pallet or articles on a pallet, switch **107** will be thrown to supply current to motor **86** to move the elevator frame downwardly. This throwing of switch **107** also opens the closing circuit of the cylinder **59** and hence so long as the elevator frame is moving downwardly, gates **51**, **52**, **55**, **56**, will not close, if open.

As an interlock mechanism to prevent actuation of the releasing mechanism before the elevator frame has properly positioned a pallet or a layer of articles immediately below the releasing mechanism, I have provided an interlock switch **107'** on brace **43**, provided with a downwardly and inwardly extending switch arm **108'**. As seen best in FIG. 2, the lower end of switch arm **108'** terminates below feeler plate **109** and therefore in normal operation the downward travel of the elevator frame will be stopped before switch **107'** is opened. When arm **108'** is urged to one side by either a pallet or a layer of articles on the elevator frame, switch **107'** will be closed, thereby providing current to switch **75**.

Discharge Mechanism

Within the base, defined by base members **5**, **5'**, **6**, **6'** is the discharge mechanism which includes two pairs of opposed channel members **110***a*, **110***b*, **110***c*, **110***d* on ribs **7***a* and **7***b*. As best seen in FIG. 3, blocks, such as block **111**, are mounted beneath channel members **110***a*, **110***b*, **110***c*, **110***d* so that these members are inclined forwardly toward standards **8***a*, **8***d*. Between channel members **110***a*, and **110***b* are a plurality of transverse rollers **112**. Similarly, between channel members **110***c* and **110***d* there are a plurality of rollers **112'**. Around rollers **112**, **112'** respectively extend discharge belts **113**, **113'** which are driven from a common drive shaft **114** through rollers **115**, **115'**. Therefore, upon rotation of shaft **114**, belts **113**, **113'** will pass respectively over the tops of rollers **112**, **112'** to move the pallet outwardly from the stacking machine when the elevator platform is in its lowermost position.

As best seen in FIG. 9, shaft **114** is journalled by bearings **116**, **116'** and is provided with a sprocket **117** which is driven by means of link chain **118** from a sprocket **119** on reduction gear **120** of motor **121**. Reduction gear **120** and motor **121** are mounted on base member **5** in a position between standards **8***a* and **8***b*.

Pallet Transfer Mechanism

As is seen best in FIG. 9 the motor **121** and reduction gear **120** also drive a sprocket **122**, over which is a link chain **123** driving sprocket **124**. Sprocket **124** is fixed to a power transfer shaft **125** journalled by bearings **126**, **126'**. Bearing **126** is mounted centrally of base member **5** while bearing **126'** is mounted on a central strap **127** extending between ribs **7***b* and **7***c*. Outwardly of bearing **126** is a sprocket **128** on shaft **125** and adjacent bearing **126'** is a sprocket **129**. Sprocket **128** drives the pallet releasing mechanism and sprocket **129** drives the pallet moving mechanism, both to be described hereinafter.

As will be seen in FIGS. 1, 2, 3 and 6, adjacent the elevator chute defined by standards **8***a*, **8***b*, **8***c*, **8***d* is a pallet magazine or chute which is defined by vertical standards **130***a*, **130***b*, **130***c* and **130***d*. Standards **130***a* and **130***b* extend up from base member **5** and standards **130***c* and **130***d* extend up from base member **5'**. Between the upper ends of standards **130***a*, **130***b* is a cross member **131**, and between standards **130***c*, **130***d* is cross member **131'**. A plurality of spaced horizontally extending brace members **132** are fixed between standards **130***a*, **130***b* and support a plurality of runners **133**, the lower ends **134** of which are inwardly and downwardly extended to terminate in a plane above the base of my stacking machine. In complementary fashion, standards **130***c*, **130***d* are provided with brace members **132'**, runners **133'** having lower inwardly turned ends **134'**.

Mounted on standards **130***a* and **130***d* respectively are a pair of horizontally aligned bearing members **135***a*, **135***d* which are positioned intermediate the central and lower portions of standards **130***a* and **130***d*. These bearing members **135***a*, **135***d* comprise part of the pallet release mechanism and receive for rotation therein a horizontally extending pallet feed shaft **136** which is provided with a pair of spaced four pronged escape wheels **137**. Opposite shaft **136** is a complementary pallet feed shaft **136'** supported from standards **130***b*, **130***c* by bearing members **135***b* and **135***c*. Shaft **136'** is provided with a pair of spaced escape wheels **137'** similar to escape wheels **137**. The two shafts, namely shafts **136**, **136'**, are synchronized to be rotated in opposite directions by a linking shaft **138** which is provided with beveled gears **139**, **139'** at its ends and supported for rotation by journals **140**, **140'** on standards **130***c*, **130***d*. Bevel gears **139**, **139'** mesh respectively with bevel gears **141**, **141'** on the ends of shafts **136**, **136'**.

The drive for shaft **136**, and hence for shaft **138** and **136'** includes a link chain **142** which extends from sprocket **128** to sprocket **143**. A seen in FIG. 3, sprocket **143** is mounted for rotation on a stub shaft **144** carried by a bearing **145** which is fixed to standard **130***a* adjacent bearing **135***a*. Adjacent the peripheral edge of sprocket **143** is a switch engaging finger **145'** which engages switch **146** mounted adjacent thereto on standard **130***a*. Concentrically mounted on stub shaft **144** is a cog **147** which meshes with a larger cog **148**, the ratio of these cogs being 1:4. Cog **148** is fixed to the end of shaft **136**. It is now seen that upon each revolution of sprocket **143**, shafts **136**, **136'** are rotated one-fourth revolution to thereby rotate escape wheels **137**, **137'** so that one prong on each escape wheel is pivoted from the horizontal inwardly extended position to the downwardly extending position.

Centrally of my stacking machine is a pallet moving mechanism comprising a continuous link chain **149** which extends around sprocket **129** and then around an idler sprocket **150**. Sprocket **150** is provided with a shaft **151**, journaled for rotation by bearing members **152**, **152'** on transverse base member **6'**. Chain **149** is provided with an upstanding pallet engaging lug **153** which is normally positioned adjacent transverse base member **6'**. The gear ratio of sprockets **128**, **143**, **129** and cogs **147**, **148** are such that upon each revolution of sprockets **143**, chain **149** will make one cycle to thus carry lug **153** around its sprockets once and then position lug **153** adjacent bearing members **152**, **152'** as one prong of each of escape wheels **137**, **137'** is rotated from a horizontal to a vertical position. Positioned on opposite sides of chain **149** are channel members **154***a*, **154***b*, **154***c*, **154***d* which are respectively aligned with channel members **110***a*, **110***b*, **110***c*, **110***d*. Channel members **154***a*, **154***b*, **154***c*, **154***d* are mounted parallel to each other between ribs **7***d* and **7***e*. Rollers **155**, **155'** are provided respectively between channel members **154***a*, **154***b* and between

channel members 154c, 154d. These rollers 155, 155' together with chain 149 receive the lowermost pallet in the pallet chute, upon actuation of motor 121 and transfer this pallet by action of lug 153 to rollers 113, 113'.

Electrical circuit

In FIG. 13 is the wiring diagram for my stacking machine, the wires connecting the various switches, motors and related equipment being deleted in the previous drawings. In FIG. 13 it will be seen that I have provided a control circuit having an on-off switch 156, which when on, supplies current from a source of current E to transformer 157 where the normal 110 volts A.C. current is converted to 12 volts A.C. On the 12 volt side of transformer 157 is a ground 158 and a hot wire 159. Wire 159 supplies current to wire 160 which is connected through normally open, first gate switch 26 to operate the solenoid 161 which controls air to control valve 29' to actuate air cylinder 29 and raise gate 27. After closing of switch 26, current is also supplied through wire 162 to normally open, second gate switch 26'. Upon closing of switch 26', current is supplied to solenoid 163 to actuate the valve of the second air cylinder (not shown) and raise second gate 27'. Upon closing of both switch 26 and 26', and provided switch 45 is depressed to the position shown in FIG. 13, current is supplied through wire 164 and switch 45 to wire 165 and thence through normally closed switch 75' to wire 166.

From wire 166, current flows through the normally closed arm 65a of switch 65 to actuating coil 167 and then to ground 158.

It will be remembered that when rakes 37, 38 are in their normal position, guide block 31' depresses switch 45. Therefore, after the first two articles on rollers 12 have closed switches 26, 26' respectively, it will be seen that, in normal operation, actuating coil 167 will be energized, rotating valve 168 in housing 42 to a position to admit air to one side of the piston in cylinder 41, thereby retracting piston rod 39 and moving the rake carriage assembly across the space defined by standards 8a, 8b, 8c, 8d. When guide block 31' moves away from switch 45, this switch moves to its other position, whereby current is still supplied through wires 169, 170, switch 45 and wire 164 to maintain coil 163 in its energized condition and thus gate 27' remains up but current is interrupted to coil 167 by the throwing of switch 45.

As the rake carriage assembly approaches standards 8c, 8d, guide block 32' engages and closes switch 44, thereby supplying current from wire 169 and wire 171, and through wire 172 to energize return coil 173 which is also connected to ground 158. Upon the energization of coil 173, valve 168 is moved to a position supplying air to the other side of the piston in cylinder 41, and hence the rake carriage assembly is moved to its normal position as shown in FIG. 1. Of course, guide block 31' reengages and throws switch 45 to its position shown in FIG. 13 which interrupts current to coil 163 and drops gate 27'. It is also to be remembered that switches 26, 26' are normally open switches and hence if the articles are removed from engagement with these switches they will again open.

From wire 159, current is also supplied through wires 174, 175 to a normally closed switch 176 of a multi-switch relay and thence through wire 177 to a normally open switch 107'. When interlock switch 107' is closed, current is supplied through wire 178 to a normally open cylinder actuating switch 75. When switches 176, 107' and 75 are closed, current passes through wire 179 through coil 180 to ground 158, thereby energizing coil 180 to rotate valve 181, to a position admitting air to the piston of cylinder 59 for pivoting gates 51, 52, 55, 56 to the position shown in FIG. 8. For returning the gates to their normal position as seen in FIG. 1, a wire 182 leads from wire 159 to a double throw single pole feeler switch 107. As described above, switch 107 is located adjacent gate 52 and detects the presence of an article in the gate area. Normally this switch 107 is in the position shown in FIG. 13 but when an article on the pallet is detected by plate 109, switch 107 is thrown to its other position. Therefore, if switch 65b is closed, a circuit is normally made through wire 184, switch 65b and coil 185 to ground 158. It is to be remembered, however, that switch 65b is closed only when switch 65 is not engaged by camming member 64, but opens when camming member 64 is returned to its original position with gates 51, 52, 55, 56 closed. Thus, this gate closing coil 185 is only energized after the gates 51, 52, 55, 56 have been opened and the elevator frame is not moving downwardly.

Also leading from wire 175 are a plurality of parallel switches 186, 187, 188 contained in control box 97. Switch 186 is a normally closed upper limit switch, switch 187 is a normally open switch for determining when the elevator frame is in position to have received five layers of articles and switch 188 is a normally open switch for determining when the elevator frame is in position to have received say seven layers of articles. From switch 186, a wire 189 supplies current to a normally open switch 190 of a relay and to a manually operated, normally open, partial loader switch 191. Through wire 192, switch 191, when closed, supplies current through the solenoid 193 to ground 158. A wire 194 leads from wire 192 to the other side of switch 190 and also to arm of a manually operated selector switch 195 having terminals respectively connected through wire 196 to switch 187 and through wire 197 to switch 188. When solenoid 193 is energized, either via switch 191, 187 or 188, current via wire 189 passes through switch 190 to hold down switch 190 until upper limit switch 186 is opened by the return of the elevator frame to its upper position. Switch 190 is coupled with switch 176 and therefore upon actuation of the relay by solenoid 193, the circuit to coil 180 is broken and thus gates 51, 52, 55, 56 may not be opened. The additional function of switch 176 will be described hereinafter.

With an article being detected by plate 109, current is supplied from switch 107 through wire 200 to a common bus 201 and thence through coil 202 of the motor actuating relay to ground 158. Upon being energized, coil 202 causes closing of switches 203, 203' which supply line current from a source L1, L2 through wires 204, 205 respectively to the armature of motor 86. Field excitation for rotation of motor 86 in a selected direction is supplied from wires 204, 205 through appropriate reversing switches 206, 207 of the reversing relay. From switch 206 a wire 208 leads to one terminal to the field of motor 86 while from switch 207, wire 209 leads to the other terminal of the field of motor 86.

Associated with the reversing relay is the relay coil 210 which actuates switches 206, 207 as well as a hold down switch 211 and the pallet motor deactivating switch 212. Current for energizing coil 210 is led from wire 200 through a normally closed bottom limit switch 213, through wire 214 and pallet feed limit switch 215. Once pallet feed limit switch 215 is closed, current to coil 210 is supplied from hold down switch 211, via wire 216 whereby the reversing relay remains energized so long as current is not interrupted thereto.

When coil 210 is deenergized, current is supplied from wire 214 through switch 212 and wire 217 to a second normally open bottom limit switch 105 and thence through wire 218 and normally closed limiting switch 146 to the coil 219 of the pallet motor relay, the circuit being completed from coil 219 to ground 158. Upon energizing of coil 219, switches 220, 220' are closed to supply line current via wires 221, 222 to motor 121.

Returning to wire 214, it will be seen that a wire 223 leads from a normally open terminal of switch 176 to wire 214 and that wire 224 leads from a normally open terminal of switch 212 to bus 201.

Operation

From the foregoing description the operation of my device is apparent. First a plurality of pallets are stacked in the pallet magazine defined by standards 130a, 130b,

130c, 130d so that the lowermost pallet is supported by the inwardly extending prongs on escape wheels 137, 137'. Next a single pallet is placed on rollers 155, 155' so that lug 153 engages the outer edge of this pallet.

Thereafter, selector switch 195 is positioned for the number of articles to be stacked. It is to be understood that while I have disclosed but two terminals for selector switch 195 and but two switches, such as switches 187, 188, any number of such terminals and switches may be provided for infinite selection of the height of the stack to be formed. Next on-off switch 156 is closed, thereby providing current to my electrical system and then partial loader switch 191 is momentarily depressed to close the circuit through wires 159, 174, 175, upper limit switch 186, wires 189, 192 to energize solenoid 193. Thus, switches 176, 190 are moved downwardly, in FIG. 13, and a circuit is made from wire 189 through switch 190 and wire 194 to supply current continuously to solenoid 193. Simultaneously, current is supplied from wire 175 via switch 176 to wire 223 and thence via wire 214, normally closed bottom limit switch 213, wire 200 and bus 201 to energize coil 202, causing closing of switches 203, 203'. Upon closing of switches 203, 203', line current from L1, L2 is supplied via wires 204, 205 to energize the armature of motor 86. Of course, current is also supplied through switch 206, 207 and wires 208, 209 to the field of motor 86 to cause motor 86 to drive, by means of chain 89, shaft 84 and hence shafts 80, 80' in a direction to begin lowering the elevator frame, defined by beams 77, 77', 78 and rib 79.

As the elevator frame reaches the bottom of the elevator chute, switch 105 is closed and switch 213 is opened by means of screw follower 104 and therefore current is supplied from wire 213 via normally closed switch 212 and wire 217 through switch 105 to wire 218, switch 146 to energize coil 219 and cause closing of switches 220, 220' and the actuation of motor 121. The opening of switch 213 deenergizes coil 202 causing return of switches 203, 203' to their open position and hence current is no longer supplied to motor 86. Motor 121 rotates until cog 148 has made one revolution and finger 145 has opened switch 146 to deenergize coil 219 and permit opening of switches 220, 220'. Rotation of motor 121 causes rotation of shaft 125 and therefore movement of chain 149 to carry lug 153 through one cycle which urges the pallet on rollers 155, 155' onto the elevator frame. During the time that the pallet is being transferred from rollers 155, 155' onto the elevator frame, escape wheels 137, 137' are being rotated slowly one fourth a revolution so that after lug 153 has passed sprocket 129 and begins its travel back to its original position, the lowermost pallet in the stack of pallets is dropped onto rollers 155, 155' and the remainder of the stack of pallets is supported by the prongs which are spaced 90 degrees from the prongs which previously supported the stack of pallets.

As the pallet from rollers 155, 155' is received on the elevator frame, it strikes and closes switch 215 which completes a circuit from wire 214 to coil 210 of the reversing relay which brings switches 206, 207, 211, 212 downwardly, thereby reversing the field of motor 86 to reverse its direction of rotation. Simultaneously a circuit is made from wire 200 through wire 224 and switch 212 to wire 214, bypassing switch 213 and reenergizing coil 202 to again close switches 203, 203' and supply current to motor 86. It will be remembered, however, that switches 206, 207 have been thrown and hence the motor 86 begins to rotate in a direction to raise the elevator frame. The raising of the elevator frame, of course, causes switch 215 to reopen as the pallet is lifted by the elevator frame; however, coil 210 remains energized because of a hold down circuit from wire 214 via switch 211 and wire 216 to coil 210.

Switch 105 reopens and switch 213 closes as screw follower 104 moves axially along shaft 98. The inertia of motor 121, after being deenergized, as described above, will cause finger 145 to travel past switch 146 and the switch 146 will again close but motor 121 will not be actuated because switch 212 has been thrown and no current is supplied to wire 217. Further, switch 105 has been reopened and hence no current, if supplied to wire 217, would reach wire 218.

Motor 86 continues to raise the elevator frame until screw follower 104 opens upper limit switch 186, at which time the elevator frame has delivered its pallet to a position immediately below gates 51, 52, 55, 56. The opening of switch 186 interrupts current to solenoid 193 and permits switches 176, 190 to return to their original position. The opening of switch 176 interrupts current via wires 223, 213, switch 212, wire 224 to coil 202 and therefore causes opening of switches 203, 203' and interruption of current to motor 86 via wires 204, 205. Current is also interrupted to coil 210 and hence switches 206, 207, 211, 212 return to their normal position as shown in FIG. 13.

As seen in the right hand upper corner of FIG. 13, line voltage from L1, L2 is supplied directly to motor 13 through a manual switch 225. With the elevator in its up position, or prior to this time, switch 225 is closed and articles are successively fed from the assembly line to rollers 12' and then to rollers 12. Because of the rotation of rollers 12, a space is provided between each article which is fed onto rollers 12. When the first article reaches strap 25, it closes switch 26 which supplies current from wires 150, 160 to solenoid 161 to cause valve 29' to admit air to cylinder 29 and raise gate 27. The next articles, of course, strike gate 27 and also engage switch 26' to complete a circuit from switch 26' via wires 162 to coil 163, thereby in a manner similar to that just described, raising gate 27 and blocking travel of all other articles onto rollers 12, 12'.

As seen in FIG. 13, with switches 26, 26' closed, current is supplied via wire 164, switch 45, wire 165, switch 75, wire 166, switch 65a to energize solenoid 167 and cause actuation of the rake assembly mechanism by operation of valve 168 to admit air into cylinder 41 to retract piston rod 39. Upon movement of piston rod 39 into cylinder 41, guide block 31' moves away from switch 45 which causes the arm of switch 45 to be thrown to make a circuit from wires 169, 170 to wire 164 and continue to energize coil 163 while breaking the circuit energizing coil 167.

As best seen in FIG. 1, the rakes 37, 38 are carried by the rake assembly mechanism, across rollers 12, thereby placing the first and second articles respectively in the compartment defined by guide rail 47 and partition member 49 and the compartment defined by guide rail 48 and partition member 49.

Upon the travel of the rake assembly mechanism across to a position adjacent standards 8c, 8d, guide block 32' strikes switch 44 which supplies current from wires 169, 171 via wire 172 to solenoid 173. The actuation of solenoid 173 causes valve 168 to redirect the air to the other side of cylinder 41, thereby pushing piston rod 39 outwardly to return the rake assembly to its original position. When guide block 31' returns to its original position, switch 45 is engaged to throw the switch back to its original position to thereby interrupt current to coil 163 and drop gate 27. Of course, switch 44 is again open when guide block 32' no longer is engaging it; thus, the cycle of receiving compartments may be repeated. In each cycle, the articles pushed by the rakes 37, 38 onto release gates 51, 52, 55, 56 push the next preceding articles further along gates 51, 55 and gates 52, 56 until the last pair of articles is received, at which time the first article on gates 52, 56 will engage switches 75, 75', opening switch 75' and closing switch 75. In the present embodiment the length of each receiving compartment is sufficient to accommodate three articles. Of course longer or shorter compartments may be employed if desired.

Since switch 75' is open, the circuit to cause actuation of the rake assembly will be open and hence no further action of the rake is possible until the collected articles have been dropped by gates 51, 52, 55, 56.

The closing of switch 75, provided that feeler switch 107' is closed, completes the circuit from wires 159, 175 through switch 171, wire 177, switch 107', wire 178, switch 75, wire 179 to solenoid 180. This causes valve 181 to be thrown introducing air into cylinder 60 to withdraw piston rod 62. Piston rod 62, in turn, pulls pitman 62a, thereby unlocking hasp 67 from engagement with latch 69 and then causing rotation of shaft 70 to open gates 51, 52, 55, 56 as described above. Upon opening of gates 51, 52, 55, 56, the articles received thereby are simultaneously dropped onto the pallet which is positioned therebeneath on the elevator frame.

The movement of piston rod 62 also disengages camming member 64 from switch 65, thereby providing another open switch 65a in the circuit to actuate rakes 37, 38. The movement of camming member 64 away from switch 65 causes closing of switch 65b which, when switch 107 is thrown to the position shown in FIG. 13, will cause closing of gates 51, 52, 55, 56. Switch 107, however, is not in the position shown in FIG. 13, because, as the articles are dropped by gates 51, 52, 55, 56, plate 109 is depressed by these articles and remains depressed so long as the articles remain in the gate area.

With switch 107 being thrown by action of the articles dropping onto the pallet, a circuit is made from wire 160 through switch 107, via wires 200, 201 to energize solenoid 202 and close switches 203, 203', thereby energizing motor 86 to lower the elevator frame until switch 107 opens as the articles clear plate 109. The throwing of switch 107 to its original position supplies current via closed switch 65b and wire 184 to energize coil 185 and cause gates 51, 52, 55, 56 to be closed by action of air cylinder 59.

When camming member 64 is returned to its original position by action of air cylinder 59, indicating that gates 51, 52, 55, 56 are closed, it again opens switch 65b, thereby deenergizing coil 185 and closing switch 65a whereby the circuit for actuating rakes 37, 38 is rendered again operable. Thus, the cycle of my machine as described above is repeated and additional stacks of articles are deposited one over the other until the elevator frame has lowered to a position where switch 187 is contacted and closed by screw follower 104. At this point, provided the manual selector switch 195 has been positioned as shown in FIG. 13, a circuit is completed from wire 174 through switch 187, wire 196, switch 195, wire 194 to energize coil 193 to cause switches 176 and 190 to be moved downwardly, thereby again deactuating the circuit for opening gates 51, 52, 55, 56 and completing a circuit from wire 175 through switch 176 via wires 223, 214, switch 213, wires 200, 201 to energize coil 202 and cause motor 86 to be energized to move the elevator frame downwardly until the elevator frame reaches the bottom and screw follower 104 engages and opens switch 213, opening the circuit just described above. It will be remembered that the closing of switch 190 completes a hold down circuit and therefore the opening of switch 187 does not interrupt the supply of current to coil 202.

With the elevator frame at the bottom, the pallet carrying the stacked articles is resting on belts 113, 113' and the elevator frame is below the upper surface of these belts, switch 215 will be closed. Also, switch 105 is closed by screw follower 104 which provides current from wire 214 via switch 212, wires 217, 218, switch 146 to energize coil 219 to thereby close switch 220, 220' to actuate motor 121. The actuation of motor 121 supplies power to chain 118 and shaft 114 to motorize belts 113, 113' and discharge the pallets carrying the stacked articles. Further, the operation described above, which feeds a new pallet to the elevator is simultaneously set in operation whereby a new pallet replaces the old pallet on the elevator frame and a new cycle of my machine takes place.

If, at any time, electrical power is temporarily interrupted by my stacking machine, switch 191 must be manually depressed which, as previously described, will cause discharge of any pallet on the elevator frame and a new cycle to begin.

If, for any reason, no pallet is on the elevator frame as it moves upwardly to a position for receiving the first stack of articles, or the stack of articles is too low to receive the next stack of articles on the elevator frame, arm 108' will not be depressed and hence switch 107' and the circuit to actuate the gates 51, 52, 55, 56 will remain open and these gates will remain up.

If, crates or stacks of articles of varying heights are fed, say six at a time, to my stacking machine, the machine will operate properly since arm 108 will detect the difference in height and cause motor 86 to remain actuated until the stack of articles has cleared the gate area.

It will be apparent to those skilled in the art that, while I have illustrated and described what I consider to be the preferred embodiment of my invention, this embodiment may be varied, parts or elements may be made integral or separated into a number of elements or parts, certain parts may be eliminated from the structure and other circuitry and actuating mechanisms may be substituted for the corresponding circuitry and actuating mechanisms and full resort may be had to equivalents without departing from the scope of my invention as defined by the appended claims.

I claim:

1. A stacking machine for receiving and stacking a plurality of articles successively fed in a single file fashion to said machine comprising a frame, means for receiving said successive articles, cam means for urging a plurality of said articles simultaneously in a direction normal to the direction of feed of the articles into compartments within said frame, releasing means in each compartment for receiving and supporting said articles by their opposite edges, said releasing means being actuatable by said articles in said compartments for opening to release said articles from said compartments after a predetermined number of said articles have been received in said compartments, and movable receiving means below said compartments within said frame onto which said articles are dropped by said releasing means, means for urging said articles dropped from the respective compartments together during their downward travel, and means for moving said receiving means a distance downwardly determined by the height of said articles received on said receiving means, means for automatically closing said releasing means after said articles released by said releasing means have cleared said releasing means, and means actuated by said articles in said compartments for interrupting the urging of said articles into said compartments.

2. Apparatus of the class described comprising a frame, a conveyor mounted adjacent the top of said frame, said conveyor moving successive articles in single file fashion along a path, means for moving a plurality of said articles simultaneously in a direction normal to said path from said conveyor into the top portion of said frame, guide means within said frame adapted to guide said articles, opposed pairs of gates hinged to said guide means, control means for supporting said gates in a horizontal position to receive said articles by opposite edges of each of said articles thereon and for simultaneously pivoting said gates to release the received articles, sensing means actuated by a predetermined number of articles being received on said gates for actuating said control means, an elevator within said frame movable in a vertical direction upwardly and downwardly beneath said gate means, and detecting means for determining that a surface on said elevator is immediately below said gates, said detect-

ing means being connected with said gate means to maintain said gates in their horizontal position until said detecting means has detected said surface.

3. The structure defined in claim 2 wherein said elevator moves incrementally downwardly upon each cycle of said gates and including means for moving said elevator continuously downwardly when said elevator has reached a predetermined position in its downward travel.

4. In a stacking machine having a frame, a feed mechanism for feeding successive articles in single file fashion to said frame, and an elevator within said frame for receiving said articles as said elevator is moved downwardly comprising rake mechanisms arranged adjacent said feed mechanism for moving a plurality of said articles simultaneously in a normal direction to said feed mechanism, spaced opposed pivoted gates disposed above said elevator to receive said articles by opposite bottom edges thereof when said articles are moved in said normal direction, means actuatable by said articles on said gates and after a predetermined number of said articles have been received on said gates for pivoting said gates to release said articles thereon onto said elevator.

5. In a machine of the class described, releasing mechanism for releasing articles received thereon comprising a pair of guide rails spaced in parallel relationship to each other, a flat vertically disposed partition member between said guide rails defining a pair of article receiving compartments, gates normally extending horizontally toward each other and hinged to said guide rails, gates hinged to said partition member and normally extending horizontally toward said first mentioned gates, said gases supporting the articles received in said compartments, means common to all said gates for pivoting the same simultaneously from their horizontal position to a vertical position to release said articles and means below said gates for urging the released articles together.

6. In an apparatus of the class described, an elevator chute, releasing means mounted on said elevator chute, an elevator in said elevator chute, power means for raising and lowering said elevator, control means connected to said power means, said control means being adapted to move said elevator upwardly and incrementally downwardly, said control means also including a plurality of electrical switches, drive means synchronized with said power means, follower means controlled by said drive means for selective engagement with all of said switches depending upon the position of said follower means with respect to said drive means, said drive means being driven by said power means, a selector switch selectively connectable to each of said electrical switches, circuitry means connected to said electrical switches and said selector switch for supplying current to said power means for moving said elevator downwardly to its lowermost normal position when said selector switch is connected to one of said electrical switches and said follower means engages said one electrical switch.

7. In a stacking machine, wherein an electrical motor controls the travel of an elevator upwardly and progressively downwardly for receiving layers of articles stacked on said elevator from a zone thereabove during the period when said elevator is moved progressively downwardly the combination therewith of a screw rotated by said motor and synchronized with the movement of said elevator, a screw follower on said screw, switches positioned adjacent said screw and actuatable selectively by said screw follower, and circuits connected to said switches and selectively connectable to said motor for actuating said motor to lower said elevator continuously downwardly when said screw follower actuates the switch of the circuit connected to said motor.

8. In a machine of the class described, a feed mechanism for conveying successive articles, a strap at the end of said feed mechanism, actuating means mounted on said strap for actuation by engagement thereagainst of the first article on said feed mechanism, a gate spaced from the end of said feed mechanism by at least the length of said first article, said gate being movable into and out of the path of travel of said articles to block movement of all articles after said first article on said feed mechanism, said gate being controlled by said actuating means, means for moving said first article from said feed mechanism after said gate has been moved into the path of travel of said articles, a second actuating means, a second gate movable into and out of the path of travel of said articles to block movement of all articles after the second article on said feed mechanism, said second actuating means being actuatable by engagement therewith of said second article on said feed mechanism only after said first mentioned actuating means has been actuated, said second actuating means controlling the actuation of said second gate, and means for moving said second article from said feed mechanism.

9. In a machine of the class described, releasing mechanism for releasing articles received thereon comprising a pair of guide rails spaced in parallel relationship to each other, a flat vertically disposed partition member between said guide rails, gates normally extending horizontally toward each other and hinged to said guide rails, gates hinged to said partition member and normally extending horizontally toward said first mentioned gates, means common to all said gates for pivoting the same simultaneously from their horizontal position to a vertical position, means actuatable by said articles for actuating said means common to all said gates, and said means common to all said gates including a shaft, a plurality of levers extending from said shaft, and a plurality of dog leg links pivotally connected to the ends of said levers and to said gates, the pivoted connection of said links when said gates are in their normal position being in a line on one side of said shaft and upon rotation of said shaft being movable to a line on the other side of said shaft.

10. In a stacking machine wherein an elevator in a frame is moved vertically downwardly in predetermined sequence to receive successive layers of articles thereon from a zone thereabove wherein each layer of articles is collected before being deposited upon the top of the subsequent layer of articles on the elevator, the combination therewith of a pair of flat opposed gates in said zone for slidably receiving a plurality of articles by their opposite edges thereon, said gates being pivotally connected by their outer extremities to said frame for pivoting downwardly from a position in the same horizontal plane to a position about vertically parallel to each other to discharge said articles, the hinged portion of said outer extremities lying about in said horizontal plane, control means for simultaneously pivoting said gates from said horizontal position to said vertical position and back to said horizontal position in predetermined relationship to the lowering of said elevator, said control means including a shaft connected to said frame and extending transversely with respect to said hinged portions of said gates, levers extending from said shaft, links extending from said levers to said gates, means for rotating said shaft, said links being connected by their ends to said gates and said levers, and said links being bent for permitting the ends of said links connected to said levers to pass beyond the diametrically opposed position of the other ends of said links with respect to said shaft when said gates are in said horizontal position.

11. Apparatus of the class described comprising a frame, a conveyor mounted adjacent the top of said frame, said conveyor moving successive articles in single file fashion along a path, means for moving a plurality of said articles simultaneously in a direction normal to the path of said conveyor into the top portion of said frame, guide means within said frame adapted to guide said articles, opposed pair of gates hinged to said guide means, control means for supporting said gates in a horizontal position to receive said articles by opposite edges of

each of said articles thereon and for simultaneously pivoting said gates to release the received articles, sensing means actuated by a predetermined number of articles being received on said gates for actuating said control means, an elevator within said frame moving both in a vertical direction upwardly and downwardly beneath said gates, detecting means for determining that a surface of said elevator is immediately below said gates, said detecting means being connected with said gate means to maintain said gate means in its horizontal position until said detecting means has detected said surface, drive means synchronized with said elevator, follower means controlled by said drive means, a plurality of switches arranged adjacent said drive means and selectively engageable by said follower means, a selector switch selectively connectable to each of said electrical switches, circuitry means connected to said electrical switches and said selector switch for supplying power to said elevator, for moving said elevator downwardly to its lowermost normal position when said selector switch is connected to one of said electrical switches and said follower means engages said one electrical switch.

12. In a stacking machine wherein an elevator in a frame is moved vertically downwardly in predetermined sequence to receive successive layers of articles thereon from a zone thereabove wherein each layer of articles is collected before being deposited upon the top of the subsequent layer of articles on the elevator, the combination therewith of a pair of flat opposed gates in said zone and spaced from each other for slidably receiving a plurality of articles by their opposite edges thereon, guide

means spaced from each other by approximately the width of said articles, said gates being pivotally connected by their outer extremities to said guide means for pivoting downwardly from a position in the same horizontal plane to a position about vertically parallel to each other and aligned with said guide means to discharge said articles, the hinged portion of said outer extremities lying about in said horizontal plane, and control means for simultaneously pivoting said gates from said horizontal position to said vertical position and back to said horizontal position in predetermined relationship to the lowering of said elevator, said control means including a shaft connected to said frame and extending transversely with respect to said hinged portions of said gates, levers extending from said shaft, links extending from said levers to said gates and means for rotating said shaft.

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