

July 10, 1934.

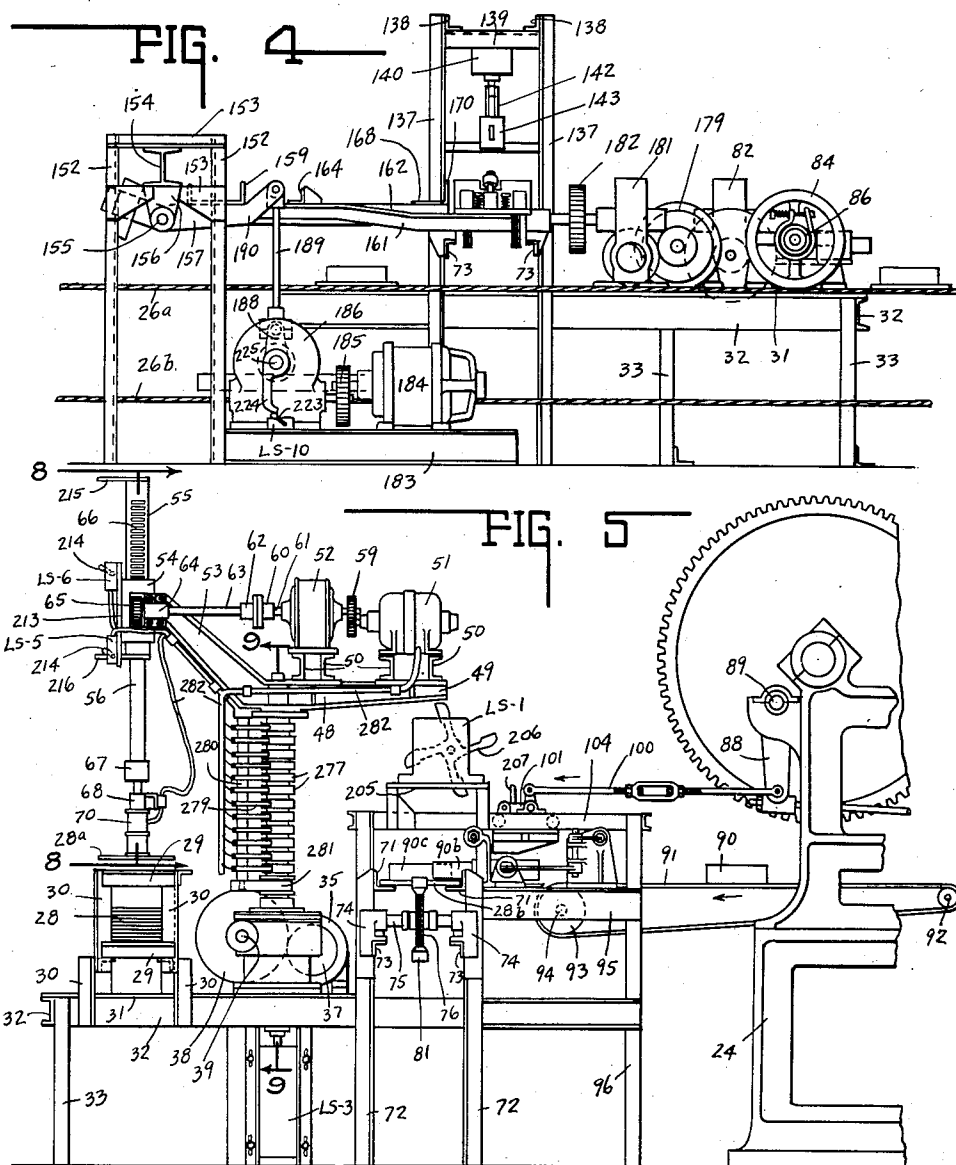
G. E. LUCE ET AL

1,965,745

OFF-BEARING MACHINE

Filed March 21, 1931

7 Sheets-Sheet 3



INVENTORS.

GRAFTON E. LUCE,

REX G. COX.

BY

Lockwood Lockwood Goldsmith & Selt

ATTORNEYS.

July 10, 1934.

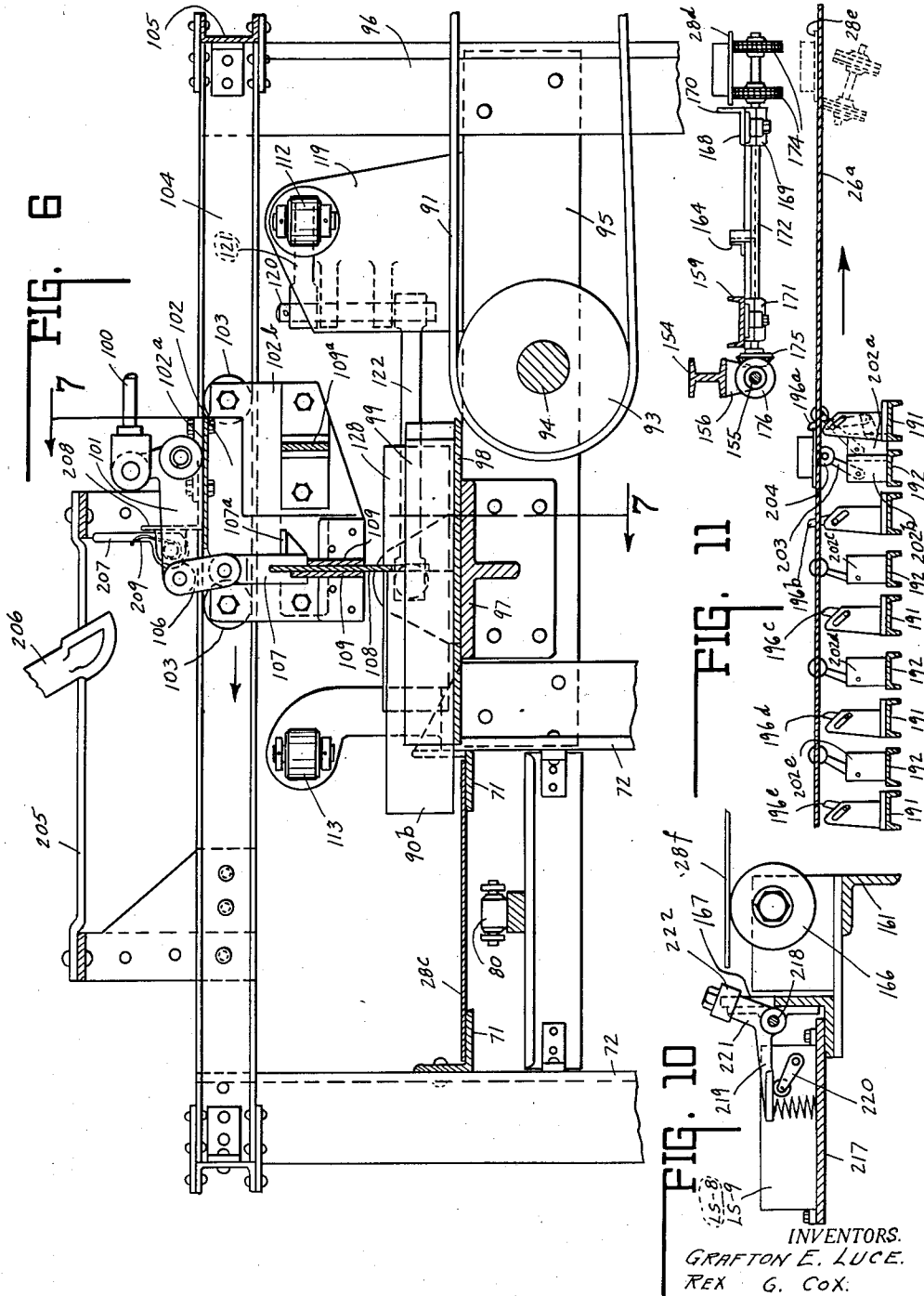
G. E. LUCE ET AL.

1,965,745

OFF-BEARING MACHINE

Filed March 21, 1931

7 Sheets-Sheet 4



July 10, 1934.

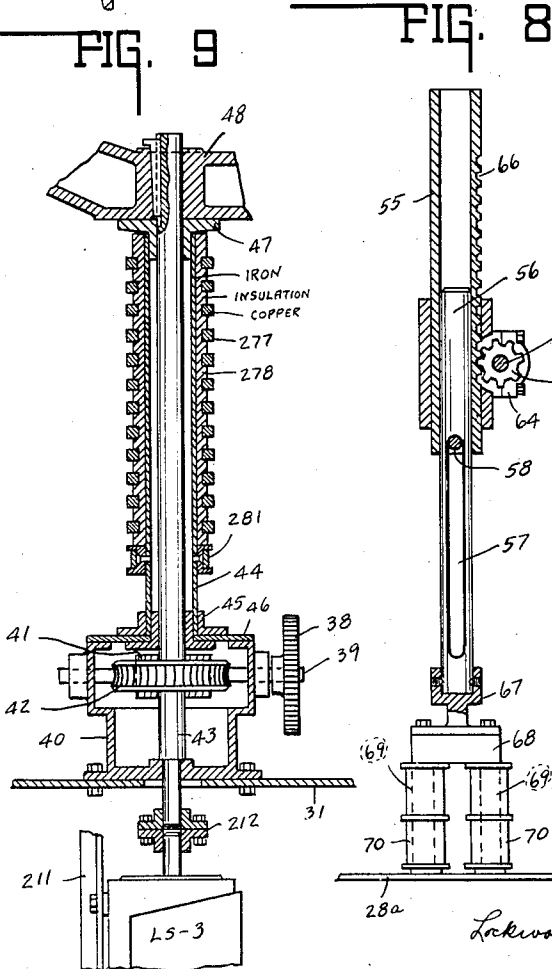
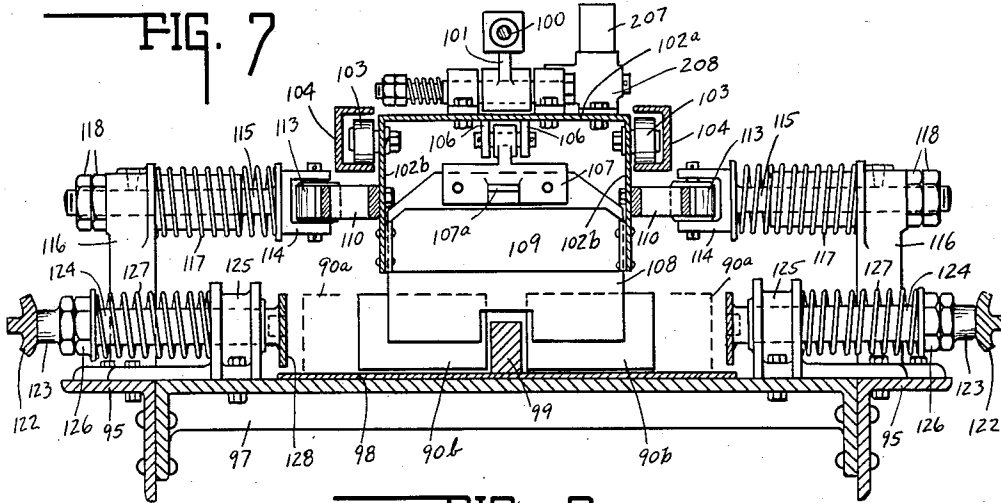
G. E. LUCE ET AL

1,965,745

OFF-BEARING MACHINE

Filed March 21, 1931

7 Sheets-Sheet 5



INVENTORS.
GRAFTON E. LUCE.
REX G. COX.

BY
Lockwood Lockwood Hollamith & Salt
ATTORNEYS.

July 10, 1934.

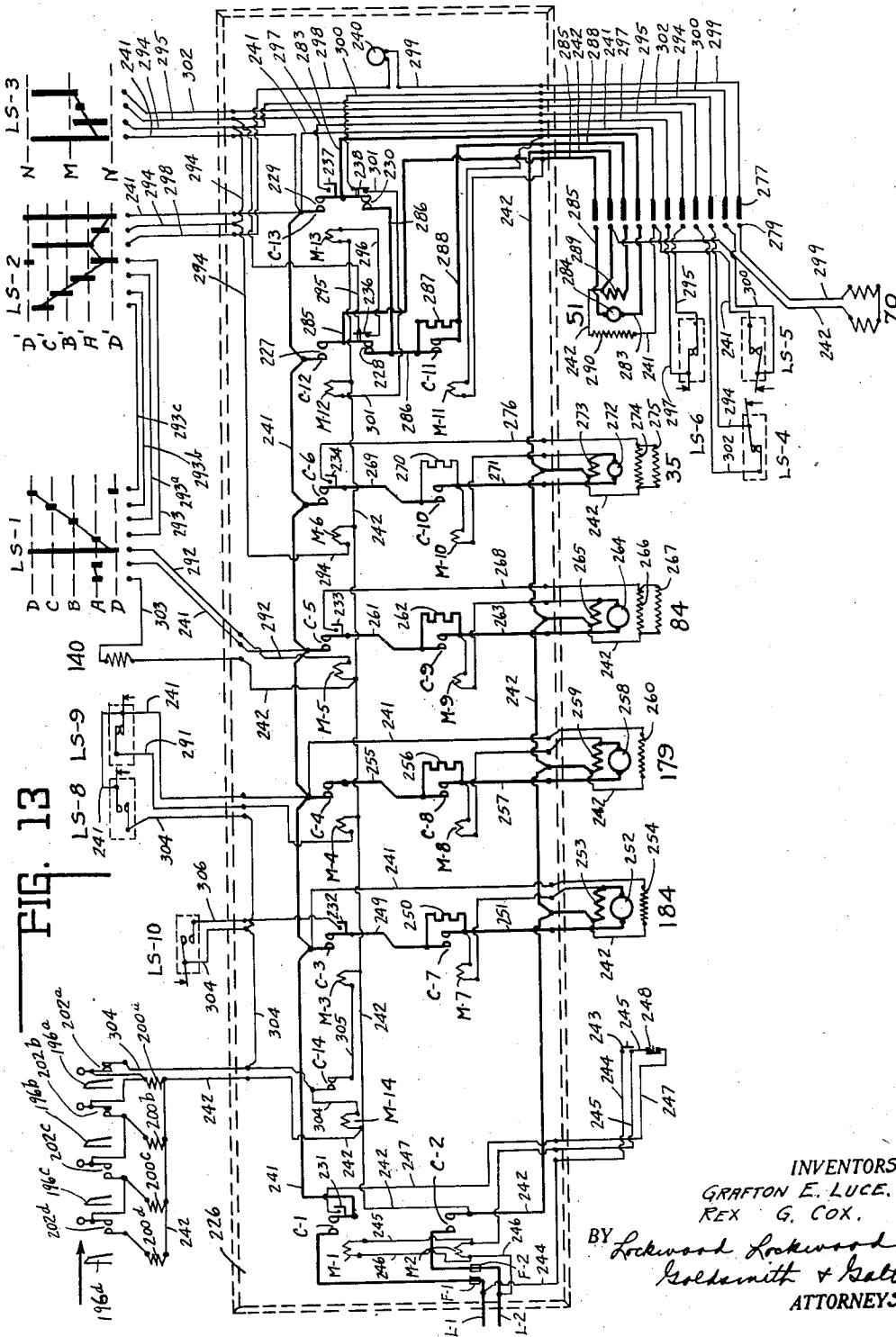
G. E. LUCE ET AL

1,965,745

OFF-BEARING MACHINE

Filed March 21, 1931

7 Sheets-Sheet 7



UNITED STATES PATENT OFFICE

1,965,745

OFF-BEARING MACHINE

Grafton E. Luce, Chicago, Ill., and Rex G. Cox,
Lancaster, Pa., assignors to Lancaster Iron
Works, Inc., Lancaster, Pa., a corporation

Application March 21, 1931, Serial No. 524,280

19 Claims. (Cl. 214—6)

This invention relates to an off-bearing machine and is particularly useful in loading repressed brick onto pallets as the brick are discharged from a repress machine. As will hereinafter appear, certain features of the invention are equally useful for other purposes.

In the manufacture of repressed paving brick and other types of brick which are subjected to a repressing operation, it has heretofore been the practice to remove the brick from the repress machine by hand, stack them upon dryer cars and run the cars into a dryer where the brick are dried preparatory to burning. However, if the brick are placed upon pallets in a separated relation and the pallets then placed in a dryer of the pipe rack type where much freer circulation of heated air is obtained, the drying of the brick is much more rapid, thorough and uniform. The manual labor involved in removing brick from the repress machine, arranging them on pallets and then handling the large number of pallets required for a day's production has heretofore been a prohibitive factor in the use of the last-mentioned method of drying. The principal object of the present invention is to eliminate this manual labor by providing a machine which automatically receives the brick from the repress machine, arranges the same upon pallets and delivers the loaded pallets to a conveyor which carries them to a pipe rack dryer.

In the machine as built according to the present invention, a storage magazine is provided in which a large number of pallets may be placed. The said pallets are removed one by one from the magazine by mechanism operating in timed relation with the operation of the repress machine. Each pallet, when removed from the magazine, is placed at a brick-receiving position and, in that position, one or more brick are delivered from the repress machine and placed upon the pallet. In the preferred form of the invention illustrated herein, the pallet is then moved step by step to other brick-receiving positions at each of which one or more brick are placed thereon. The pallet, when loaded, is automatically moved to a position above a conveyor leading to a suitable pipe rack dryer. In this position, the pallet is supported by members adapted to be lowered to place the pallet upon the conveyor. The lowering of the said members is preferably accomplished by means of mechanism automatically controlled in such manner as to place the pallet upon the said conveyor without interfering with pallets from other repress machines which may be travelling upon the conveyor.

Other objects and features of the invention will be understood from the accompanying drawings and the following description and claims:

Figure 1 is a diagrammatic plan view of the

machine room of a repress brick plant in which there are illustrated a brick-forming machine, four repress machines and four of the off-bearing machines forming the subject matter of the present application. Figure 2 is an elevational view of the off-bearing machine with parts removed taken on the line 2—2 of Figure 1. Figure 3 is a plan view thereof. Figure 4 is an elevational end view of the off-bearing machine taken on the line 4—4 of Figure 1. Figure 5 is a similar end elevational view of the opposite end of the machine particularly showing the connection thereof with the repress machine. Figure 6 is an enlarged sectional view in elevation taken upon the line 6—6 of Figure 3 and illustrating in detail the mechanism used for placing the brick upon the pallet. Figure 7 is an elevational sectional view taken on the line 7—7 of Figure 6. Figure 8 is an elevational sectional view taken on the line 8—8 of Figure 5 and illustrating a portion of the mechanism used for removing pallets from the magazine to the initial brick-receiving position. Figure 9 is an elevational sectional view on the line 9—9 of Figure 5 illustrating another portion of the same apparatus. Figure 10 is an elevational sectional view taken on the line 10—10 of Figure 3 and illustrating the mechanism by means of which the lowering of the loaded pallets upon the conveyor is initiated. Figure 11 is an elevational sectional view taken on the line 11—11 of Figure 3 and showing in detail certain of the mechanism used for placing the loaded pallets upon the conveyor and for controlling the travel of other pallets upon said conveyor to prevent interference. Figure 12 is a perspective view of certain portions of the mechanism of Figure 11. Figure 13 is a wiring diagram of electrical connections by means of which the actuation of the various parts of the off-bearing machine is secured. Figures 14 and 15 are elevational views of an alternative form of apparatus used for removing pallets from the storage magazine and placing the same in brick-receiving position.

Machine room arrangement

In Figure 1 the numeral 20 indicates a so-called stiff mud brick machine by means of which a ribbon of clay is formed from which brick are to be cut. The said ribbon of clay is delivered to a conveyor 21 and conducted thereby to a cutter 22 where it is cut into the desired brick lengths. From the cutter the brick are conveyed upon a conveyor 23 past a group of repress machines 24. At each repress machine an operator removes brick by hand from the conveyor 23 and feeds the same to the repress. Each repress machine has associated therewith one of the off-bearing machines 25 which have hereinbefore been partially de-

scribed. It will be seen in Figure 1 that repress machines and off-bearing machines may be located upon either side of the conveyor 23. In that case the off-bearing machines 25 upon one side of the said conveyor discharge their loaded pallets to a conveyor 26 associated therewith while the off-bearing machines upon the other side of the conveyor 23 discharge their loaded pallets to a similar conveyor 27. The conveyors 26 and 27 conduct the pallets of brick delivered thereto to a suitable dryer not shown in the drawings.

Mechanism for removal of pallets from pallet storage magazine

The pallets 28, to be used with the off-bearing machine, are preferably formed of sheet metal of the proper dimensions and weight to carry eight or more brick. A number of said pallets are stored in a magazine, herein shown constructed of horizontal angle members 29 and vertical angle members 30 supported upon a platform consisting of a deck 31 in turn supported upon horizontal frame members 32 and vertical members 33. The said magazine is open at the side, indicated by the numeral 34 in Figure 3, to facilitate the placing of the pallets therein and is also open at the top to permit removal of pallets therefrom.

The deck 31 carries an electric motor 35, referred to hereinafter as the "pallet turn motor", having a brake 36 of a common magnetic type which is automatically applied to prevent rotation of the motor shaft when no current is supplied to the motor. The motor 35 carries a pinion 37 meshing with a gear 38 which is in turn carried by a shaft 39 supported upon the housing 40 of a worm gear unit. The shaft 39 carries a worm 41 meshing with a worm wheel 42 within the housing 40. The worm wheel 42 is keyed to a vertical shaft 43 which finds suitable bearings in the housing 40 and which extends beneath the deck 31 as shown in Figure 9. The shaft 43 also extends above the housing 40 and the upwardly-extending portion thereof is surrounded by a tubular casing 44 fastened by means of a flange 45 to the cover 46 of the housing 40. The tubular casing 44 carries at its upper end a bearing 47 which serves as an additional bearing for the shaft 43. By means of this construction, the shaft 43 may be rotated by the operation of the pallet turn motor 35.

The shaft 43 carries at its upper end a member 48 keyed thereto. The member 48 has a horizontally-extending portion 49 upon which there are carried a plurality of channel members 50 in turn supporting a motor 51 and a geared speed reducer unit 52. The motor 51 is hereinafter referred to as the "pallet lift motor". The member 48 also has an arm 53 extending diagonally upward and terminating in a bearing portion 54. A tubular sleeve 55 is slidably mounted within the bearing portion 54 and is free for upward and downward movement therein. Within the sleeve 55 there is located the upper end of a shaft 56 having an elongated slot 57 therein. A pin 58 passes through the said slot and is fastened to the sleeve 55 adjacent its lower end. By this construction the shaft 56 is free for limited upward and downward movement within the sleeve 55 and the extent of this movement is determined by the length of the slotted opening 57.

The pallet lift motor 51 is connected to the speed reducer unit by gears 59 and the said speed reducer is fitted with a flanged fitting 60 carried upon the output shaft 61 thereof. A mating fitting 62 is carried by a shaft 63 which finds a

bearing 64 upon the upper end of the arm 53. The shaft 63 carries a pinion 65 engaging gear teeth 66 formed upon the side of the sleeve 55. By this means the motor 51 may be operated to raise and lower the sleeve 55. The shaft 56 carries at its lower end a fitting 67 to which there is bolted a stationary armature 68 in turn carrying the cores 69 of a pair of electromagnets 70, known hereinafter as "pallet lift magnets".

In the normal initial position of the apparatus, the sleeve 55 is in an upraised position and the shaft 43 is in such an angular position that the electromagnets 70 are positioned immediately above the center of the pallet storage magazine. By means of electrical connections, to be hereinafter described, the pallet lift motor 51 is actuated at the proper time in the cycle of operations of the repress machine to move the sleeve 55 downward, thereby bringing the lower ends of the magnet cores 69 into engagement with the uppermost pallet of the storage magazine. When the said cores reach the said pallet, the downward movement of shaft 56 naturally ceases. The downward movement of sleeve 55 is continued, however, and the pin 58, therefore, moves in the slot 57. The downward movement of sleeve 55 is sufficient at each operation to permit the magnet cores 69 to reach the lowermost pallet in the magazine in case only one pallet is present therein.

At or before the time of engagement of the magnet cores 69 with the pallet, the pallet lift magnets 70 are energized by suitable electrical connections and the uppermost pallet 28a is thereby caused to adhere to said cores. The strength of the magnets 70 is so chosen that there is sufficient magnetic attraction to lift the uppermost pallet but not sufficient attraction to cause the next pallet to adhere to the said uppermost. Thus, only one pallet at a time is removed from the magazine. Upon the completion of the downward travel of the sleeve 55, the pallet lift motor 51 is automatically reversed, the sleeve 55 is elevated to normal position and the shaft 56, pallet lift magnets 70 and pallet 28a are elevated therewith. Upon the completion of the upward movement of sleeve 55, the pallet turn motor 35 is automatically actuated to turn the shaft 43 through one hundred and eighty degrees. In the rotation of said shaft, the pallet is carried to a position above a pair of horizontal angle irons 71 supported upon vertical members 72. The said angle members 71 are arranged as shown particularly in Figure 5 to form a channel-way upon which a pallet may be supported and moved. When the pallet has been placed in position above said channel-way, the pallet lift magnets 70 are deenergized by suitable controls and the pallet is allowed to drop to the position indicated by pallet 28b in Figures 3 and 5, at which position the pallet rests upon the angle members 71 and may be moved thereon by suitable mechanism to be described.

Mechanism for advancing pallets to successive brick-receiving positions

Beneath the pallet-supporting angles 71 a pair of horizontal frame members 73 are carried by the vertical frame members 72. The said horizontal frame members carry at one end a pair of bearings 74, in turn supporting a shaft 75 upon which there is mounted a sprocket 76. The frame members also carry a second pair of bearings 77 (only one of which is visible in the drawings) in turn supporting a shaft 78. A sprocket

79 is keyed to the said shaft and a sprocket chain 80 is trained about the sprockets 76 and 79. The upper flight of said sprocket chain travels immediately beneath the pallet resting on the angle supports 71. Attachments 81 are carried by the said chain and serve to engage the end of each pallet for propelling the same upon the angle supports. The chain 80 is hereinafter called the "intermittent conveyor chain", since the movement thereof is intermittent rather than continuous.

The shaft 78 is attached to a worm gear unit 82 by means of a flanged coupling 83. A motor 84, on the deck 31, is connected to the said worm gear unit by reduction gears 85 and serves therefore to move the chain 80. This motor is hereinafter called the "intermittent conveyor motor". The said motor is fitted with the usual magnetic brake 86. In the operation of the apparatus so far described a pallet 28b is dropped upon the angle supports 71 while the preceding pallet 28c is positioned with its rearward portion opposite a brick-receiving station indicated by the numeral 87 in Figure 3 at which position the upwardly-extending flange of one of the angle supports 71 is cut away to permit brick to be discharged upon the pallet by mechanism to be hereinafter described. When the pallet 28c has been filled with brick, the intermittent conveyor motor 84 is automatically operated by circuits to be described and the chain 80 and attachments 81 then move the said pallet from the receiving station and move the succeeding pallet 28b to bring its forward portion adjacent said receiving station. When brick have been placed upon said forward portion, the intermittent conveyor motor 84 is again actuated to move the pallet to bring another portion opposite said receiving station. The pallets are thus successively moved step by step by successive operations of the intermittent conveyor motor until said pallets are filled with brick.

Apparatus for receiving brick from repress machine and placing the same upon pallets

In Figure 5 there is shown a portion of one of the repress machines 24. This machine is of a well known form having an oscillating arm 88 adapted to make one oscillation upon a pivot shaft 89 for each operation of the repress. At each operation of the repress one or more brick 90 are pressed and discharged upon the usual off-bearing conveyor 91. In the apparatus illustrated herein, the repress is adapted to press two brick at each stroke and the said brick are delivered to the conveyor 91 side by side with a relatively wide space between them, as illustrated in Figure 3. The conveyor 91 is of the belt type and is driven in the usual manner by means of a pulley 92 which is carried by the repress machine and receives its power from the same source as the said machine. The opposite end of the said conveyor is carried by a roller 93 supported upon a shaft 94 in turn carried by a pair of horizontal angle frame members 95. The said frame members are supported upon two of the vertical supports 72 and upon other vertical supports 96. A casting 97 extends between the angle frame members 95 at a point adjacent the roller 93. The said casting carries a deck plate 98, arranged as best shown in Figure 6, with one edge close to roller 93 in such position that the brick 90 may be discharged from the conveyor 91 directly upon the said plate. The plate 98 also carries a central rib 99 of

approximately the width of the space which it is desired to maintain between the brick when placed upon the pallet.

Referring again to Figure 5, it will be seen that an adjustable rod 100 is attached to the oscillating arm 88 and is attached at its opposite end to one arm of a bell crank 101. The said bell crank is pivotally mounted upon the top of a carriage 102 (see Figures 6 and 7). The said carriage is preferably formed of sheet metal having an upper horizontal portion 102a and two downwardly-extending side portions 102b rigidly connected by two cross members 109 and one cross member 109a. The carriage 102 is supported by rollers 103 which are free to travel in a trackway formed by a pair of channel members 104 in turn supported by two of the vertical frame members 72 and by a cross member 105 carried upon the upper ends of the frame members 96. The opposite arm of the bell crank 101 is connected by means of a pair of pivotally connected links 106 to a casting 107 fastened to the upper edge of a vertically-arranged plate 108. The plate 108 is arranged to slide vertically between the cross members 109, before mentioned.

The carriage member 102 carries upon the outer face of each side portion 102b a cam casting 110 shaped as shown particularly in Figure 3. Each of the said cam castings has a central notch 111 and each of said notches is adapted to engage a roller 112 at one end of the travel of carriage 102 and a roller 113 at the opposite end of said travel. The rollers 113 are each mounted in a yoke 114 carried on the end of a bar 115 slidably and non-rotatably mounted upon a casting 116 carried by one of the horizontal frame members 95. A compression spring 117 abuts at one end against each yoke 114 and at the other end against the corresponding casting 116 and serves to urge the roller 113 against the cam 110. A pair of adjusting nuts 118 are threadedly carried by the outer end of each bar 115 and abut against the casting 116 to limit the movement of said bar. Thus the rollers 113 exert a yielding pressure upon the cams 110 and, when engaged with the notches 111, this pressure serves to resist movement of the carriage 102 upon the trackway 104. The rollers 112 are similarly mounted upon castings 119 also carried upon the frame members 95. The said castings 119 pivotally support vertical stems 120 to each of which there are attached arms 121 and 122. Each of the arms 121 engages the outer end of one of the movable bars upon which the rollers 112 are carried. Each of the arms 122 engages a nut 123 threadedly engaged with the outer end of a bar 124 slidably and non-rotatably mounted in a casting 125 in turn carried partially by the frame member 95 and partially by the casting 97 (see particularly Figure 7). A second nut 126 is also threadedly engaged with each bar 124 and serves as a seat for a compression spring 127 which abuts also against the casting 125. Each of the bars 124 carries at its inner end a plate 128 normally positioned as shown in Figure 7.

By means of this apparatus, when the carriage 102 has been moved to that end of its travel at which the rollers 113 engage the notches 111, the movement of the oscillating arm 88 to the right in Figure 5 will tend to move the carriage 102 in the same direction. The said movement is resisted, however, by the pressure of the said rollers so that the bell crank 101 will be rocked about its pivotal mounting to elevate the plate 108. When so elevated, a lip 107a on the casting 107 engages the upper portion 102a of the car-

riage 102 and prevents further pivotal movement of the bell crank 101. The full force of movement of the arm 88 is thereafter applied to move the carriage 102 and this force thereupon overcomes the retarding force of the rollers 113 and causes the carriage to move bodily upon the trackway 104. Since vertical plate 108 is elevated at the start of this movement and remains elevated during the movement, the said plate clears the path of brick delivered by the conveyor 91. The delivery of brick is so timed that a pair of brick are delivered to deck plate 98 during each movement of the carriage 102 to the right.

The normal construction of a repress machine is such that the brick in each pair will be spaced apart a greater distance when delivered from the repress than the spacing desired when placed on the pallets. The brick, therefore, reach the plate 98 with their outer edges in the positions shown by broken lines 90a in Figure 7. At the end of the right hand travel or "return" travel of the carriage 102, the cams 110 engage the rollers 112. This engagement moves the said rollers and their supporting bars outwardly and this movement is transmitted by arms 121, stems 120 and arms 122 to the bars 124 carrying plates 128. The said plates are thereby moved inwardly to engage the brick and move the same to the relative position they are to assume upon the pallet. This position is shown by brick 90b in Figure 7. In this action the central rib 99 acts to correct the position of any brick which may have become skewed about in its delivery to the plate 98.

The distance between the rollers 112 and 113 is so chosen that the notches 111 reach the rollers 112 at the end of the return stroke of the oscillating arm 88. Thereupon the arm 88 commences its movement to the left or "forward" movement, tending to move the carriage 102 in the same direction. This movement, however, is resisted by the rollers 112 until the bell crank lever 101 has been moved into the position as shown in Figure 6, at which position the plate 108 is at the extreme downward limit of its travel and the arm of bell crank 101 is in contact with the upper surface of the carriage 102. Thereupon the entire force of the movement of arm 88 is available to move the carriage 102 and the resistance of the rollers 112 is overcome. Thus the plate 108 is in the lowered position when the said carriage is moved through its forward stroke and the said plate engages the rear ends of the brick and pushes the same from the deck 98 to the pallet. In Figure 5, brick 90b are shown as they are being moved to the pallet to a position beside brick 90c which have already been placed thereon.

Apparatus for carrying loaded pallets to position above the conveyor

A pair of angle members 129 are hinged to the ends of the pallet-supporting angles 71 by means of hinges 130 and constitute a continuation of the pallet-supporting channelway formed by angles 71. The said angles 129 are fitted at their free ends with plates 131 connected by cross rods 132. A link 133 is connected to one of said cross rods at one end and is pivoted at the opposite end to a lever 134 pivotally supported upon a pivot rod 135. The rod 135 is carried by a pair of vertical frame members 136. The said frame members form a part of a frame also including vertical members 137 and horizontal members 138 and 139, said frame serving as a support for a solenoid 140, hereinafter called the "pallet balance

solenoid". The said solenoid is fitted with a plunger 141 connected by a link 142 with the lever 134. The lever 134 also carries a counterweight 143. When the solenoid 140 is not energized, the angle members 129 remain in the elevated position shown in Figure 2 due to the overbalance of the counterweight 143. When the solenoid 140 is energized, however, the lever 134 is tilted to raise the counterweight and lower the angle members 129 about their hinges 130.

The frame members 73 carry bearings 144 in turn supporting a shaft 145 upon which a pair of sprockets 146 are mounted. The members 73 also carry a pair of bearings 147 in turn carrying a shaft 148 upon which a pair of sprockets 149 are mounted. A pair of conveyor chains 150, known as the "continuous conveyor chains" are trained about the sprockets 146 and 149. The said chains are moved by mechanism to be hereinafter described and the movement thereof is independent of the movement of the intermittent conveyor chain 80. During the filling of a pallet with brick, the pallet balance solenoid 140 is not energized and the said pallet is moved step by step onto the channel members 129 which are maintained in their elevated position. In this position, the pallet can not engage the moving chains 150 and the movement of the pallet is accomplished entirely by means of the intermittently moving chain 80. At the completion of filling of a pallet, however, the pallet balance solenoid 140 is energized, causing the angle supports 129 to lower the pallet onto the continuous conveyor chains 150. The said chains frictionally engage the undersurface of the pallet and advance the same independently of the movement of the intermittent conveyor chain 80. In this movement, the pallet is guided by angle members 151 supported by vertical members 136 and 137 but the weight of the pallet rests on the chains 150.

In Figures 2, 3 and 4, the upper flights of a cable conveyor corresponding to conveyor 26 of Figure 1 are indicated by the numerals 26a. The lower flights of the same conveyor are indicated by the numerals 26b. At each side of the said conveyor there is erected a frame consisting of vertical channel members 152 and horizontal members 153. An I-beam 154 is supported upon the said frames and extends across the conveyor. A horizontal shaft 155 is supported upon bearings 156 fastened to the undersurface of said I-beam. The said shaft carries a pair of castings 157 and 158 freely mounted thereon. The said castings each extend horizontally a sufficient distance to support a horizontal channel member 159. Each of said castings also carries a counterweight 160. An angle member 161, a channel member 162 and a second angle member 163 are each fastened to the channel member 159 and each extends in a substantially horizontal direction parallel with the conveyor flights 26a. The said angles and channel member are connected by a laterally-disposed angle member 164 to provide the necessary stiffness to the construction. The angle members 161 and 163, the channel members 159 and 162, and the castings 157 and 158 form a rigid frame free to oscillate about the shaft 155 and partially counterbalanced by weights 160.

The angle member 163 carries at its outer end a plurality of rollers 165 arranged substantially in alignment with the chains 150. The angle member 161 carries similar rollers 166 similarly arranged and also carries a stop plate 167. The

channel member 162 carries at its outer end an angle plate 168 having a pair of bearings 169 fastened to its undersurface and having an up-turned edge 170 serving as a guide for the pallets.

5 A similar pair of bearings 171 are fastened to the undersurface of channel 159. A pair of parallel shafts 172 are carried upon the bearing members 169 and 171. The said shafts carry at their outer ends sprockets 173 in turn carrying sprocket

10 chains 174 in substantial alignment with the sprocket chains 150. One of the shafts 172 carries a bevel gear 175 meshing with a similar bevel gear 176 carried by the shaft 155. The shaft 155 also carries a bevel gear 177 meshing with a bevel

15 gear 178 carried by the shaft 148. A motor 179, known as the "continuous conveyor motor", is carried on the deck 31 and is connected by means of reduction gears 180 to a worm gear unit 181 in turn connected by gears 182 to the shaft 148.

20 By means of this construction the actuation of the motor 179 serves to move the continuous conveyor chains 150 and also the chains 174, even though the latter are carried upon the before-mentioned frame which is free to oscillate about the shaft

25 155. The loaded pallet, when once placed upon the continuous conveyor chains 150, is, therefore, propelled along said chains to the rollers 165 and thence to the chains 174. The pallet comes to rest with its forward end resting upon the rollers 166 and its forward edge engaging the stop plate 167.

30 In this position it is immediately above the conveyor flights 26a and may be lowered thereon by oscillation of the said frame about the shaft 155. When a pallet has reached this position, the continuous conveyor motor 179 is preferably stopped until the pallet has been placed upon the conveyor flights 26a.

Apparatus for placing loaded pallets upon conveyor

40 In Figures 2, 3 and 4 there is shown a platform 183 upon which there is mounted a motor 184, called the "loaded pallet delivery motor". The said motor is connected by reduction gears 185 to a worm gear unit 186. The said worm gear unit is directly connected by means of a coupling 187 with a crank shaft 188 supported upon suitable bearings and connected by a pitman 189 with extensions 190 of the casting 157. By means of

45 this, the operation of the loaded pallet delivery motor 184 rotates the crank shaft 188, thus oscillating the casting 157 and the frame associated therewith about the shaft 155. In the said oscillation, a pallet carried upon the chains 174 is moved from the position 28d shown in solid lines in Figure 11 to the position 28e shown in broken lines therein. In arriving at this position, the pallet is gently placed upon the conveyor flights 26a and is conveyed thereby to the dryer. It will

50 be noted that in the lowering of the pallet the chains 174 and their supporting members pass between the flights 26a while the rollers 165 and 166 and their supporting members pass upon opposite sides of the said flights. Therefore, there

55 is no interference with the conveyor cables by any of the members supporting the pallet.

Apparatus for preventing interference with pallets already travelling upon conveyor

70 Referring to Figure 11, a plurality of horizontal channel members 191 are carried upon suitable supports, not shown, beneath the cable flights 26a. A plurality of similar channel members 192 are arranged in alternating relation with the said

75 channels 191. Each of the channels 191 supports

a pallet stop unit shown in detail in Figure 12. Each of said units consists of a pair of stop frames 193 upon which a horizontal shaft 194 is mounted. Within each of the frames 193 an arm 195 is keyed to the said shaft. Each of the arms 195 is pivotally connected to a stop member 196a, 196b, etc. and each of said stop members carries a roller 197 freely moving in a slotted opening 198 in the side of the corresponding frame 193. Midway between the frames 193 a third frame 199 is carried by each channel 191. The said frames carry solenoids 200a, 200b, etc., the plungers of which are each connected by means of an arm 201 with the corresponding shaft 194. By means of this construction, the energizing of each solenoid rocks its shaft 194 and elevates the corresponding stops 196a, 196b, etc. to pallet-stopping position. When the said solenoids are not energized, the said stops are free to drop by gravity or may be pushed down by contact of a pallet therewith. When so lowered, the upper ends thereof are beneath the path of travel of the pallets.

An electric switch 202a is partly supported upon the first channel 191 and partly upon the first channel 192 and each of the channel members 192 carries an electric switch 202b, 202c, etc. Each of said switches is provided with an operating arm 203 carrying a roller 204 extending into the path of travel of pallets moving on the conveyor flights 26a.

By means of suitable automatically operated electrical connections, the solenoid 200a of the first pallet stop unit is actuated upon the arrival of a pallet in the position 28d of Figure 11 to bring stop 196a into pallet-stopping position. If a pallet reaches the said stop while in pallet-stopping position, the said pallet actuates switch 202b which is suitably connected to energize the next succeeding pallet stop unit. Successive stop units are similarly actuated to the number required to control the expected flow of pallets. Thus the flow of pallets upon the conveyor is interrupted during deposition of a pallet thereon. It will be seen that this arrangement prevents interference with pallets which may reach the pallet stop units after the arrival of a pallet in the position 28d. However, at the time of arrival of a pallet at the said position, there may be a pallet on the conveyor which has passed the pallet stop units but has not yet cleared the lowering mechanism. To prevent interference with such a pallet, a timing control is introduced in the circuits for the motor 184 so that a definite interval of time elapses after the arrival of a pallet in the position 28d before the motor 184 is actuated to place the pallet upon the conveyor. This interval of time is long enough to permit any pallet which may have passed the pallet-stopping units to pass to a clear position before the motor is actuated. The electrical control apparatus for accomplishing this result will be hereinafter described.

Limit switches

The control of the various motors and solenoids by means of which the mechanical operations of the off-bearing machine are performed is preferably accomplished by electrical circuits, each of which is automatically actuated upon the completion of the last preceding operation. These circuits are controlled by a number of limit switches, each mechanically operated by one of the moving parts of the apparatus.

Limit switches LS1, LS2 and LS3 are of a well known rotary type illustrated diagrammatically

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

in Figure 13. The said switches are each provided with a rotary element such as a drum having segmental conductors thereon or a shaft carrying cams adapted to operate suitable electrical contact elements. The rotary elements of the switches are adapted to assume various positions indicated by the broken lines A, B, C, D, A', B', C', D', M and N and at each of these positions electrical connections are made which will hereinafter be described in detail.

Limit switch LS1 is mounted upon a platform 205 carried upon the trackway 104. The switch is provided with a spider 206 adapted to move the rotary element of the switch and having four arms adapted to project into the path of travel of a trigger 207 carried upon the carriage 102. The said trigger is pivotally mounted on an abutment 208 shown particularly in Figure 6 and is maintained in the upraised position shown in the said figure by means of a spring 209. In each forward stroke of the carriage 102, the trigger 207 engages one of the arms of the spider 206 thus rotating the spider and the rotary element of LS1 to a new position. Upon the return stroke of the carriage 102, the trigger 207 also engages the spider 206, but since the said trigger is free to move in this direction against the action of the spring 209, no movement of the spider 206 takes place. In the apparatus herein illustrated, each pallet is capable of holding eight brick. The brick are discharged by the repress in pairs, and, therefore, each pallet must be stopped in four different brick-receiving positions to receive the four pairs of brick necessary to fill the pallet. Four strokes of the repress machine are, therefore, necessary for the complete filling of a pallet. For that reason the spider 206 is furnished with four arms and the same is moved through ninety degrees at each stroke of the repress, this movement taking place at a time close to the end of the forward stroke of carriage 102 when the pair of brick have practically reached their position upon the pallet. The rotary element of LS1, therefore, makes one complete revolution for each pallet to be filled. In the diagram of Figure 13, the four positions of the said rotary element corresponding to the four loading positions of the pallet are indicated by the broken lines A, B, C and D and the electrical connections of each position are diagrammatically represented.

Limit switch LS2 is mounted upon the deck 31 and its rotary element is driven by means of a sprocket chain 210 or by suitable gearing from the shaft 78. The said rotary element is driven through one complete revolution during the movement of chain 80 for the filling of each pallet. In Figure 13 the four positions assumed by the said rotary element corresponding to the four loading positions of the pallet are indicated by the broken lines A', B', C' and D' and the electrical connections of each position are diagrammatically illustrated.

Limit switch LS3 is mounted upon vertical members 211 beneath the platform 31. The rotary element of said switch is coupled by means of a coupling 212 to the lower end of the shaft 43 and makes one complete revolution for each revolution of the said shaft. In Figure 13, the positions assumed by the switch when the pallet-lifting solenoids 70 are above the magazine and when the said solenoids are above the chain 80 are indicated by broken lines M and N respectively and the electrical connections for the said positions are shown diagrammatically.

Limit switches LS4, LS5, and LS6 are carried

upon a plate 213 in turn carried upon the bearing portion 54 of the arm 53. The said switches are of the single circuit type and each is provided with a lever arm 214 for actuation thereof. The switch LS6 is of the normally closed contact type and the circuit therein is open only when a trigger 215 carried upon the top of the sleeve 55 engages the lever arm 214 of the said switch. This occurs when the sleeve 55 has been lowered to its lowermost position. Switch LS4 is of the normally open type and its circuit is only closed when its lever arm 214 is engaged by a trigger 216 carried by the lower end of the sleeve 55. This occurs when the said sleeve has reached its uppermost position. Switch LS5 is of the normally closed type and its circuit is only opened by engagement of the trigger 216 with its lever arm 214.

Limit switches LS8 and LS9 are also single circuit switches and are mounted upon a plate 217 located adjacent the stop plate 167 and movable therewith. The stop plate 167 carries a rock shaft 218 upon which there are mounted a pair of levers 219 engaging lever arms 220 for operating the said switches. The said arms 219 have formed integrally therewith an upwardly-extending portion 221 carrying a roller 222 which projects into the path of the pallet 28f as the said pallet is propelled upon the chains 174. The lever arms of both switches are, therefore, actuated upon the arrival of a pallet in the position 28d of Figure 11. The switch LS8 is of the normally open type and its circuit is only closed by the engagement of the pallet with the roller 222. The switch LS9 is of the normally closed type and its circuit is only opened by the said engagement.

Limit switch LS10 is also a single circuit switch and is carried upon the platform 183 in the position best illustrated in Figure 4. The lever arm 223 of the said switch is actuated by an arm 224 carried by the shaft 225 of the worm gear unit 186. This engagement takes place when the pitman 189 has reached the upward limit of its travel, bringing the rollers 165 and 166 and the chains 174 into substantial alignment with the chains 150. The said switch is of the normally closed type and its circuit is opened by the engagement of the arm 224 therewith.

Control panel

The five motors hereinbefore mentioned are actuated by means of magnetic control apparatus mounted upon a control panel 226 indicated by broken lines in the wiring diagram, Figure 13. This panel, which may be placed in any convenient location about the machine room, carries a number of normally open magnetic contactors indicated by the characters C1 to C11, inclusive, and a pair of double throw magnetic contactors C12 and C13. The said contactors are actuated respectively by magnets M1 to M13, inclusive. The double throw contactor M12 is fitted with a pair of contact points 227 normally open and a pair of contact points 228 normally closed. Upon the actuation of the magnet M12, the 227 contact is made while the 228 contact is broken. The contactor C13 is similarly fitted with a normally open pair of contact members 229 and a normally closed pair 230, the former being closed and the latter being opened by the actuation of the magnet M13. A time interval contactor C14 is also carried upon the said panel and its contact is closed a predetermined time after the actuation of a magnet M14. This contactor is of a common commercial form, the tim-

ing of which may be readily adjusted as desired. The contactor C1 carries a normally open, non-insulated interlock 231 adapted to be closed when the said contactor is closed. The contactor C3 carries a similar interlock 232. The contactor C5 carries a similar interlock 233. The contactor C6 carries a similar interlock 234. The contactor C12 carries a normally closed insulated interlock 236. The contactor C13 carries a normally open non-insulated interlock 237 and a normally closed insulated interlock 238. A rheostat 240 is also carried upon the said panel.

Motor circuits

A pair of power mains L1 and L2 leading from any suitable source of electrical current are connected through fuses F1 and F2 to the contactors C1 and C2 respectively. To the opposite terminal of contactors C1 a distributory conductor motors are connected to the distributories 241 in all of its branches. A distributory conductor is also connected to the opposite terminal of the contactor C2 and is numbered 242 in all of its branches. The circuits for operating the several motors are connected to the distributories 241 and 242 so that these circuits can only be energized by the closing of contactors C1 and C2, which contactors, therefore, serve as a master control for the operation of the entire machine. The magnets M1 and M2 which actuate these contactors are energized by a normally open "start" push button 243, the operation of which closes a circuit as follows: L1, 244, 243, 245, M2 and M1, 246, L2. When this circuit has been formed, the contactors C1 and C2 are closed, energizing the distributories 241 and 242 and also closing the interlock 231 carried by contactor C1. The closing of the said interlock completes a circuit as follows: L1, C1, 231, 247, a normally closed "stop" push button 248, 245, M2 and M1, 246, L2. By means of this circuit, the magnets M1 and M2 are energized after the actuation of push button 243 even though the said push button is allowed to move to open circuit position. The said circuit may be broken to open contacts C1 and C2 by operation of the stop push button 248. The said push button, therefore, serves to stop the operation of any and all of the motors.

When magnet M3 is energized by suitable control circuits, the contact C3 is closed and a circuit is completed for the operation of the loaded pallet delivery motor 184, as follows: L1, C1, 241, C3, 249, start resistance 250, 251, armature 252, series field 253 of motor 184, 242, C2, L2. The shunt field 254 of the said motor is directly connected across the distributories 241 and 242. The magnet M7 is directly connected across the armature of the said motor and, therefore, is energized when the motor has reached a predetermined speed. The contactor C7 is connected in parallel with the start resistance 250 and is closed by the actuation of said magnet to short circuit said start resistance and allow the motor to come to full speed.

When the magnet M4 is energized by suitable control circuit, the contactor C4 is closed and a circuit is completed for the actuation of the continuous conveyor motor 179 as follows: L1, C1, 241, C4, 255, start resistance 256, 257, armature 258, and series field 259 of motor 179, 242, C2, L2. The shunt field 260 of the said motor is directly connected across the distributories 241 and 242. The magnet M8 is directly connected across the armature of the motor and serves to actuate contactor C8 to short circuit the start

resistance 256 when the motor has reached a predetermined speed.

When the magnet M5 is energized by suitable control circuits, the contactor C5 is closed and a circuit is completed for the actuation of the intermittent conveyor motor 84 as follows: L1, C1, 241, C5, 261, start resistance 262, 263, armature 264 and series field 265 of motor 84, 242, C2, L2. The shunt field 266 and brake winding 267 have one terminal of each connected to the distributory 242 and the opposite terminal of each is connected by a wire 268 to the interlock 233. The shunt field and brake coil are, therefore, energized only when the motor is running. The magnet M9 is connected directly across the armature of the motor and serves to actuate the contactor C9 to short circuit the starting resistance when the motor has reached a predetermined speed.

When the magnet M6 is energized, the contactor C6 is closed and a circuit is completed for the operation of the pallet turn motor 35 as follows: L1, C1, 241, C6, 269, start resistance 270, 271, armature 272 and series field 273 of motor 35, 242, C2, L2. The shunt field 274 and the brake coil 275 have one terminal of each connected directly to the distributory 242 and the opposite terminal connected by a conductor 276 to the interlock 234. These windings, therefore, are only energized when the motor is in operation. The magnet M10 is directly connected across the armature of the motor and serves to actuate contactor C10 to short circuit the start resistance 270 when the motor has reached a predetermined speed.

In order to connect the pallet lift motor 51, limit switches LS4, LS5 and LS6 and the pallet lift solenoids 70, it is necessary that a group of circular electrical conductors or slip rings 277 be mounted upon an insulation member 278 in turn carried by the tubular member 44 shown in Figure 9. Each of said slip rings has associated therewith a brush 279 carried by a vertical bar 280 fastened to and movable with the member 48. The said vertical bar 280 is suitably insulated from the said brushes and is supportable at its lower end by an arm 281 rotatably mounted upon the sleeve 44. The brushes 279 are electrically connected to conductors carried in cables 282 leading to the said motor, switches and magnets. In the wiring diagram, Figure 13, the slip rings 277 and brushes 279 are indicated, but the conductors passing therethrough are considered as continuous conductors so far as reference numerals are concerned.

When the magnet M13 is energized to actuate the contactor C13, a circuit is completed to operate the pallet lift motor 51 to move the pallet lift magnets 70 downwardly as follows: L1, C1, 241, 229, 283, armature 284 of motor 51, 285, 228, 286, start resistance 287, 288, series field 289 of motor 51, 242, C2, L2. The shunt field 290 is directly connected across the distributories 241 and 242. The magnet M11 is directly connected across the armature of the motor and serves to actuate the contact C11 to short circuit the start resistance 287 when the motor has reached a predetermined speed.

When the magnet M12 is energized to actuate contactor C12, a circuit is completed to operate the said motor in the opposite direction,—that is, in the direction to raise the pallet lift magnets 70. The said circuit is as follows: L1, C1, 241, 227, 285, 284, 283, 230, 286, 287, 288, 289, 242, C2, L2.

Cycle of operation and control circuits

The cycle of operation of the off-bearing machine consists of those operations necessary in the loading and discharge of one pallet. It, therefore, includes in the present example four strokes of the repress machine and four reciprocations of the carriage 102. During the cycle of operation, the pallet successively assumes the four loading positions hereinbefore mentioned and the cycle may best be described by assuming it to start with a pallet in one of these positions. It is most convenient to assume that this initial position is that illustrated in Figure 3 in which the last pair of brick are to be placed upon one pallet 28c and in which the succeeding pallet 28b has already been dropped in position upon the support members 71. In this position the pallet lift magnets 70 are still positioned above the pallet 28b which has just been dropped instead of being oppositely positioned as shown in Figure 3. The limit switch LS3, therefore, is in the "N" position indicated in Figure 13. The limit switch LS1 is in the D position, limit switch LS2 is in the D' position and all other limit switches are in the open or closed position illustrated in Figure 13. In this assumed initial position, the only motor in operation is the continuous conveyor motor 179 driving conveyor chains 150 and 174. The magnet M4 for operating this motor is actuated by the following circuit: L1, C1, 241, LS9, 291, M4, 242, C2, L2.

When the last pair of brick are placed upon the pallet 28c, the movement of the carriage 102 causes the limit switch LS1 to be moved to the A position, in which position a circuit is closed within the switch between a pair of wires 292 and 293. The wire 293 leads to the switch LS2 and in the D' position of the said switch a connection is made between the said wire and a branch of the distributory 241. A circuit is, therefore, formed for the operation of the intermittent conveyor motor 84 to move the pallets to the next position. The said circuit is as follows: L1, C1, 241, LS2, 293, LS1, 292, M5, 242, C2, L2. The operation of motor 84 continues until the pallet 28b has reached its first brick-receiving position, at which time the switch LS2 reaches the A' position. At that position, the contact within switch LS2 between lines 241 and 293 is broken and the motor and conveyor are, therefore, stopped.

When the first pair of brick are placed upon the pallet 28b at its first brick-receiving position, the movement of the carriage 102 moves limit switch LS1 to B position. In that position a contact is made between the line 292 and a line 293a. The last-mentioned line leads to switch LS2 and, in the A' position of the said switch, is connected to the distributory 241. The circuit for operation for the intermittent conveyor motor 84 is, therefore, again completed, the line 293a being substituted for the line 293 therein. This circuit is broken when LS2 reaches the B' position, at which time the pallet has reached its second loading position. The pallet is similarly moved to the third loading position when LS1 is moved to the C position by means of a similar circuit through a line 293b and is moved to the fourth loading position when LS1 is moved to the D position, the circuit in the latter case being completed through a line 293c.

Returning now to the time in the cycle during which the pallet is being moved to its first loading position and the limit switch LS2 is moving between the D' and the A' positions, a connection

is made within the switch between a branch of the distributory 241 and a line 294. This connection completes a circuit for the energizing of magnet M6 to actuate contactor C6 for starting the pallet turn motor 35. The said circuit is as follows: L1, C1, 241, LS2, 294, M6, 242, C2, L2. The operation of the said motor rotates the pallet lift magnets 70 toward the pallet storage magazine and also causes limit switch LS3 to leave the N position and move toward the M position. When this occurs, a connection is made within the said switch LS3 between a branch of the distributory 241 and a branch of the line 294. Thus the circuit for the operation of the motor is maintained even though the 241—294 connection in switch LS2 is broken when that switch reaches the A' position. When the said pallet lift magnets 70 reach their position above the pallet storage magazine, limit switch LS3 reaches the M position. In this position, the 241—294 contact in LS3 is broken and the pallet turn motor is, therefore, stopped.

Immediately before reaching the M position, an instantaneous contact is made within the limit switch LS3 between the distributory 241 and a line 295. This contact completes a circuit for the energizing of magnet M13 as follows: L1, C1, 241, LS3, 295, interlock 236 on contactor C12, 296, M13, 242, C2, L2. The energizing of magnet M13 actuates contactor C13 to close the 229 contact and open the 230 contact, thus operating the pallet lift motor in the downward direction as previously described. The actuation of contactor C13 also closes the normally open interlock 237 and a circuit is formed thereby which maintains the magnet M13 in its energized condition after the breaking of the instantaneous contact 241—295 in switch LS3. The said circuit is as follows: L1, C1, 241, 229, 237, 297, LS6, 295, interlock 236 on contactor C12, 296, M13, 242, C2, L2. The said circuit is only broken when trigger 215 actuates limit switch LS6 at the lowermost limit of the downward travel of the sleeve 55.

As the pallet is moved to its first brick-receiving position and LS2 is moved to the A' position, a contact is also made within the said switch between the distributory 241 and a line 298. By means of this contact a circuit is formed for the energizing of the pallet lift solenoids 70 as follows: L1, C1, 241, LS2, 298, 240, 299, 70, 242, C2, L2. In this circuit the rheostat 240 is used to adjust the strength of the magnets 70 to the proper value for picking up a single pallet. The said circuit is maintained through the contact in LS2 until the pallet being loaded has reached its final brick-receiving position, at which point the switch LS2 reaches the D' position. Thus the pallet lift magnets 70 are energized throughout the operation of the pallet turn motor and pallet lift motor and the said magnets remain energized until the preceding pallet has reached the proper position to allow the new pallet to be dropped upon the supports 71.

Upon actuation of limit switch LS6 at the end of the downward travel of sleeve 55, the contact in LS6 is opened, deenergizing the magnet M13 and permitting the contactor C13 to assume its normal position. In this normal position, the insulated interlock 238 is closed. A circuit is formed thereby for energizing the magnet M12 to reverse the pallet lift motor 51 for elevating the sleeve 55, pallet lift magnets 70 and the pallet carried thereby. The said circuit is as follows: L1, C1, 241, LS5, 300, interlock 238, 301, M12, 242, C2, L2. This circuit is maintained until the trigger

216 actuates limit switch LS5 to open the circuit at the limit of upward travel of sleeve 55.

At the same time that LS5 is actuated, the trigger 216 actuates switch LS4 to close a circuit between a branch of the line 294 and a line 302.

The line 302 is connected to a branch of the distributory 241 by a contact in limit switch LS3, the said contact being made as the switch LS3 reaches the M position with the pallet lift magnet

70 over the magazine. It is to be noted, however, that the 241—295 contact in LS3 for starting the downward travel of sleeve 55 is made before reaching the M position. The downward travel of the sleeve 55 is, therefore, commenced and the contact in LS4 is broken before the 241—302 contact in LS3 can be made. No circuit can therefore be formed through the said contacts until the sleeve 55 has again reached its upper position after the magnets 70 have picked up a pallet.

When this occurs, the LS4 contact is closed and a circuit is completed as follows: L1, C1, 241, LS3, 302, LS4, 294, M6, 242, C2, L2. This circuit energizes magnet M6 starting the pallet turn motor 35 to place the pallet in position over the supports 71. When this position has been reached LS3 reaches the N position and the 241—302 contact therein is broken, stopping motor 35.

The parts remain in this position with the pallet suspended above the support 71 until the preceding pallet is moved to the last brick-receiving position, at which time LS2 moves to the D' position and the 241—298 contact therein is broken. When this occurs, the pallet lift magnet 70 is deenergized and the pallet is dropped.

As the last pair of brick are placed upon a pallet and LS1 is moved to the A position, a contact is formed therein between a branch of the distributory 241 and a line 303. The last-mentioned line leads to the pallet balance solenoid 140, the opposite terminal of which is connected to a branch of the distributory 242. The said solenoid is, therefore, energized to permit the pallet supports 129 to lower the pallet into contact with the continuous conveyor chains 150. Since the continuous conveyor motor 179 is in operation, the pallet is moved by said chains to the position 28d above the conveyor flights 26a.

When this position has been reached, limit switch LS8 is operated to close its circuit and limit switch LS9 is operated to open its circuit by the engagement of the pallet with roller 222. The opening of the circuit in LS9 stops the continuous conveyor motor 179 since it is included in the circuit for the said motor hereinbefore set out. The closing of limit switch LS8 completes a circuit for the actuation of the time relay magnet M14 and also a circuit for the first pallet stop solenoid 200a. The first of these circuits is as follows: L1, C1, 241, LS8, 304, M14, 242, C2, L2. The second of these circuits is as follows: L1, C1, 241, LS8, 304, switch 202a, solenoid 200a, 242, C2, L2. The switch 202a in the latter circuit is a normally closed switch which is only opened by the engagement of a pallet therewith. Thus the magnet 200a will not be energized if there is a pallet directly above the stop members 196a, the actuation of said solenoid being delayed until the pallet has cleared the said stop. Upon the arrival of a pallet in position to engage the switch 202b, the said switch is closed and the solenoid 200b is energized to bring the stop members 196b to pallet-engaging position by the connections shown in Figure 13. The magnets 200c, 200d, etc. are similarly actuated by the switches 202c, 202d, etc. the

operation of each depending upon the actuation of the one previous.

Upon the actuation of the magnet M14 the timing mechanism of the time interval contactor C14 is set in motion. When a sufficient time has elapsed to permit a pallet travelling upon the conveyor flights 26a to reach a clear position, the contactor C14 operates to close a circuit for the actuation of magnet M3 as follows: L1, C1, 241, LS8, 304, C14, 305, M3, 242, C2, L2. The energizing of magnet M3 operates contactor C3 for starting the loaded pallet delivery motor 184 to lower the pallet upon the conveyor flights 26a.

The starting of motor 184 permits limit switch LS10 to come to closed circuit position and also closes the interlock 232 carried upon contactor C3. The said interlock and limit switch are connected by a line 306 and the opposite terminal of the limit switch is connected to a branch of the line 304. Thus the circuits for the pallet stop solenoids and for the time relay magnet M14 are maintained even though the circuit in limit switch LS8 may be broken.

When the pallet has been lowered a sufficient distance to be deposited upon the conveyor flights 28a, the engagement of the pallet with the roller 222 is broken and the limit switches LS8 and LS9 return to their normal positions. In this position, the circuit in limit switch LS9 is again closed so that the continuous conveyor motor 179 again operates. The circuit in limit switch LS8 is opened but, as previously stated, this has no effect upon the circuits which were initiated by the said limit switch. When the pallet supports again reach their normal position in the operation of the motor 184, the arm 224 actuates limit switch LS10 to open its circuit. The pallet stop solenoids 200a, etc. and the time relay magnet M14 are, therefore, deenergized. Such pallets as have been stopped upon the conveyor are then free to move thereon and the time relay contactor C14 drops to normal position. Magnet M3 is, thereby, deenergized, stopping motor 184. The cycle of operation is thereby complete and subsequent cycles automatically follow until the operation of the apparatus is stopped by actuation of the stop push button 248 or until the repress machine is stopped.

From the foregoing description, it will be apparent that the off-bearing machine may continue to function automatically as long as the repress is in operation and that the operation of the off-bearing machine is automatically timed with the operation of the repress. This timing is accomplished primarily through the actuation of limit switch LS1 which receives its impulses from mechanical members directly connected to the repress. The actuation of the several motors of the off-bearing machine is entirely dependent upon the circuits set up in the successive positions of the limit switch LS1.

Alternative forms

While the foregoing description illustrates a satisfactory form of the invention, many changes may be made therein without departing from the invention in its broader sense. For example, the wiring diagram and connections have been described as those required for compound wound direct current motors. However, with slightly different wiring, alternating current motors may be used equally as well. Certain of the motors have been shown with solenoid brakes attached thereto and others without. In adapting the machine to various speeds of repress operation and

to various sizes of pallets and brick, it is necessary in some cases to apply such brakes to motors to which no braking is applied in the foregoing description. It is also desirable in certain cases to apply dynamic braking as well as solenoid braking. Since the application of dynamic braking is well known in the art, it is not thought necessary to describe it in the present specification.

Another variation which is possible is the substitution of solenoid operation for motor operation in certain of the movements. An example of this is shown in Figures 14 and 15 wherein there is illustrated an alternative form of apparatus for moving pallets from the magazine to the intermittent conveyor. In the said figure, a pair of angle support members 307 correspond to the angle support members 71 in the previous description and serve to support and guide the pallet in its movement through the various brick-receiving positions. A sprocket chain 308, trained about a sprocket 309, serves the same purpose as the intermittent conveyor chain 80 in the previous description. The said sprocket is carried upon a shaft 310 in turn supported upon bearings 311 beneath the angle supports 307. The said supports 307 are carried upon a framework consisting of vertical members 312 and horizontal members 313. The said framework also supports a pair of angle members 314 forming a magazine for a plurality of pallets 315.

The upper horizontal frame members 313 carry a pair of bearing members 316 in turn carrying a horizontal shaft 317 to which there are fastened a pair of levers 318 extending in one direction and a longer lever 319 extending in the opposite direction. Each of the levers 318 has attached at its outer end a link 320, each of which is in turn pivotally attached to the plunger 321 of a solenoid 322. The said solenoids are also supported upon the upper frame members 313. A vertical stem 323 is slidably guided in bearings 324 suitably supported upon a portion 325 of the frame. The said stem carries a pin 326 engaging a slotted opening 327 in the upper end of the lever 319. The stem also has attached to the bottom thereof an armature 328 carrying electromagnets 329 corresponding in function to the pallet lift magnets 70 previously described.

A solenoid 330 is supported by a pair of the horizontal frame members 313 and is fitted with a plunger 331 to which there is connected a link 332. The link 332 is in turn connected to an arm 333 fastened upon a horizontal shaft 334. The shaft 334 has fastened thereto a pair of upwardly-extending members 335, the upper ends of which are bent in a goose-neck form, as shown at 336, to extend over the pallets 315 in the storage magazine. Each of the goose-necks 336 carries rollers 337. A tension spring 338 is fastened at one end to each of the members 335 and at the opposite end to one of the frame members 313. The said springs serve to maintain the goose-necks in the position illustrated in Figure 14 with a portion thereof against a stop rod 339, so long as the solenoid 330 is not energized. If the solenoid 330 is energized, however, the shaft 334 is rocked to bring the goose-necks 336 to the position shown in broken lines in Figure 14.

In the operation of this form of apparatus, the magnets 330 and 322 are normally energized, thus maintaining the goose-necks in the position as shown in broken lines in Figure 14 and maintaining the stem 323 in the upraised position shown in Figure 15. At the proper time in the cycle of

operation to supply a pallet to the supports 307, the solenoids 322 are deenergized, allowing the stem 323 and the magnets 329 carried thereby to drop by gravity to a position resting upon the uppermost pallet in the magazine. At or before this time, the magnets 329 are energized to cause the uppermost pallet to adhere thereto. The solenoids 322 are then energized to lift the stem 323, magnets 329 and the pallet 315a carried thereby to the position shown in Figures 14 and 15. The solenoid 330 is then deenergized, permitting the springs 338 to pull the goose-necks into the solid line position of Figure 14. The magnets 329 are then deenergized, permitting the pallet to drop upon the rollers 337. The pallet rolls freely upon the rollers 337 until its leading edge reaches the angle support 307 at the right in Figure 14. In this position, the trailing edge of the pallet still rests upon the last of the rollers 337. The solenoid 330 is then energized to withdraw the goose-neck 336 and rollers 337 from beneath the pallet, allowing the same to drop to its normal position upon its support members 307. The control of the various solenoids and magnets herein shown is accomplished by suitable wiring, by means of which the operation thereof is timed with the other operations of the off-bearing machine. The said wiring is similar in principle to that by which the pallet turn and pallet lift motors and magnets 70 are actuated in the preceding illustration. These wiring circuits, therefore, will not be described in detail.

While the foregoing description has been limited to the use of the invention in collecting brick from a repress machine and placing the same upon pallets to be carried to a dryer, it is to be understood that the invention is not limited to such use. For example, it is possible to use the same in connection with any common form of packaging machine adapted to deliver packages or other articles to a conveyor, such as the off-bearing conveyor 91, when it is desired to collect the said articles upon some such transporting device as the pallets 28.

The invention claimed is:

1. In an off-bearing machine having a pallet storage magazine and a conveyor adapted to transport pallets, the combination of a magnet, power means for moving said magnet to engage a pallet in said magazine and for thereafter moving the same with a pallet adhering thereto to a position from which said pallet may move by gravity to said conveyor a separate power means for moving said conveyor, and a switch electrically connected to said magnet and operated by movement of said second power means to deenergize said magnet at a predetermined point in the movement of said conveyor for permitting said pallet to move by gravity to said conveyor.

2. In combination, a pallet-storage magazine, a pallet support adjacent thereto, a magnet, means for moving said magnet downward to engage the uppermost pallet in said magazine and for thereafter raising the same with said pallet adhering thereto, a guiding device insertable between said magazine and said pallet when so raised, and a switch electrically connected to said magnet and adapted to deenergize the same for dropping said pallet onto said guiding device, said guiding device being adapted to guide said pallet to said support.

3. In combination, a pallet-storage magazine, a pallet support adjacent thereto, a magnet, a pivotally-mounted device having downwardly-sloping portions normally extending over the top

of said magazine and terminating at said pallet support, means for pivotally moving said device to remove said portions from above the magazine, means operable thereafter for moving said magnet downward to engage the uppermost pallet in said magazine and for thereafter raising the same with said pallet adhering thereto, means operable thereafter to return said pivotally-mounted device to initial position with said sloping portions interposed between said pallet and said magazine, and a switch electrically connected to said magnet and adapted to deenergize said magnet for dropping the pallet upon said sloping portions to be guided thereby to said pallet support.

4. In combination, a pallet-storage magazine, a pallet support adjacent thereto, a magnet, a vertically-slidable member supporting said magnet, a solenoid, connections between said solenoid and said vertically-slidable member by means of which said member is allowed to fall by gravity to bring said magnet into engagement with the uppermost pallet in said magazine when said solenoid is deenergized and by means of which said member and magnet are elevated with a pallet adhering to said magnet when said solenoid is energized, a guiding device insertable between said magazine and said pallet when so raised, and a switch electrically connected to said magnet and adapted to deenergize the same for dropping said pallet onto said guiding device, said guiding device being adapted to guide said pallet to said pallet support.

5. In combination, a relatively stationary pallet support, means for advancing a pallet on said support to successive article-receiving positions, mechanism for depositing articles on said pallet at each of said positions, a hingedly-movable pallet support located to receive the pallet from said stationary support in the movement of said pallet-advancing means, a conveyor beneath said movable support, and mechanism automatically actuated by said depositing mechanism upon the deposition of articles upon said pallet at the last receiving position to lower said hinged support to permit said pallet to be engaged and transported by said conveyor.

6. In combination, a pallet support having at least a portion thereof mounted for upward and downward movement, means for advancing a pallet on said support to successive article-receiving positions, mechanism for depositing articles on said pallet at each of said positions, a conveyor beneath a portion of said support, and mechanism automatically actuated by said depositing mechanism upon the deposition of articles on said pallet at its last receiving position to lower at least a portion of said support to permit said pallet to be engaged and transported by said conveyor.

7. In combination, a pallet support having at least a portion thereof mounted for upward and downward movement, mechanism for advancing a pallet on said support to an article-receiving position, for depositing articles on said pallet at said positions, a conveyor beneath a portion of said support, and mechanism automatically actuated by said first mentioned mechanism at a predetermined point in the movement of said pallet to lower at least a portion of said support to permit said pallet to be engaged and transported by said conveyor.

8. In combination, a pallet support having at least a portion thereof mounted for upward and downward movement, means for moving a pallet upon said support to an article-receiving position, an article-moving apparatus at said position adapted in its movement to place articles upon said pallet, a conveyor beneath a portion of said support, and mechanism automatically actuated by said article moving apparatus at a predetermined point in the movement thereof to lower at least a portion of said support to permit said pallet to be engaged and transported by said conveyor.

9. In combination, a pallet support having at least a portion thereof mounted for upward and downward movement, means for moving a pallet upon said support to an article-receiving position, an article-moving apparatus at said position adapted in its movement to place articles upon said pallet, a conveyor beneath a portion of said support, a solenoid, mechanical connections between said solenoid and support movable in one direction when said solenoid is energized and in the opposite direction when said solenoid is deenergized and by means of which at least a portion of said support is lowered to permit said pallet to be engaged and transmitted by said conveyor when said connections are moved in one direction, and an electric switch and connections for energizing and deenergizing said solenoid operated by engagement with said article-moving apparatus at a predetermined point in its travel.

10. In combination, a conveyor, a frame mounted for movement about an axis above and transverse to the direction of movement of said conveyor, an article-supporting device carried by said frame, said device being movable transversely of said conveyor, power means for moving said device to draw an article thereon, conveying apparatus for bringing an article into engagement with said device to be drawn thereon in the movement of said device, means for stopping said article when drawn upon said device, and mechanism for moving said frame about said axis to bring said supporting device below the level of said conveyor for depositing said article thereon.

11. The combination as set forth in claim 10, characterized by the addition of a switch member actuatable upon engagement of said article therewith, and means for stopping the movement of said article-supporting device upon actuation of said switch member.

12. In combination, a conveyor, a frame mounted for movement about an axis above and transverse to the direction of movement of said conveyor, an article-supporting device carried by said frame, said device being movable transversely of said conveyor to draw an article thereon, conveying apparatus for bringing an article into engagement with said device to be drawn thereon in the movement of said device, a common power means for operating said conveying apparatus and for moving said device independently of the movement of said frame, means for stopping said article when drawn upon said device, and mechanism for moving said frame about said axis to bring said supporting device below the level of said conveyor for depositing said article thereon.

13. In combination, a conveyor, a shaft having its axis transverse to the direction of movement of said conveyor and in a plane above said conveyor, a frame mounted for free oscillating movement upon said shaft, an endless conveyor carried by said frame and movable transversely of said first-mentioned conveyor, conveying apparatus for bringing an article into engagement with

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

- said second-mentioned conveyor to be drawn thereon by the movement thereof, power means for rotating said shaft, an operating connection between said second-mentioned conveyor and
- 5 said shaft for moving said conveyor independently of the position of said frame, and mechanism for rocking said frame upon said shaft to bring said second-mentioned conveyor below the level of the first for depositing said article thereon.
- 10 14. In combination, a conveyor, article-supporting members normally positioned above said conveyor, apparatus for delivering an article thereto, power means for lowering said members to deposit said article on the conveyor, stop apparatus located clear of said article-supporting
- 15 means for stopping articles travelling upon said conveyor before passing beneath said supporting members, and a device engageable by said article upon arrival upon said supporting members and adapted to initiate the actuation of said power
- 20 means and to actuate said stop apparatus.
15. In combination, a conveyor, article-supporting members normally positioned above said conveyor, apparatus for delivering an article
- 25 thereto, power means for lowering said members to deposit said article on the conveyor, stop apparatus located clear of said article-supporting means for stopping articles travelling upon said conveyor before passing beneath said supporting
- 30 means, a device engageable by said article upon arrival upon said supporting members and adapted to initiate the actuation of said power means and to actuate said stop apparatus, and a timing device interposed between said article-engageable
- 35 device and said power means and adapted to delay the operation of said power means a predetermined time to permit an article which may have passed said stop apparatus to reach a clear position.
- 40 16. In combination with an apparatus for intermittently supplying articles, a conveyor for carrying a succession of pallets to article receiving positions adjacent said supplying apparatus, motive means for said conveyor, electrical control means for said motive means initiating and
- 45 stopping the movement of said conveyor to bring each pallet from one article receiving position to another, and parallel electrical control means for said motive means initiating and stopping the
- 50 movement of said conveyor between the last receiving position of one pallet and the first receiving position of the next.
17. In combination with an apparatus for in-
- termittently supplying articles, a conveyor for carrying a succession of pallets of article receiving positions adjacent said supplying apparatus, motive means for said conveyor, electrical control means for said motive means initiating and stop-
- 80 ping movement of said conveyor between successive loading positions of each pallet and movement thereof from the last loading position of one pallet to the first loading position of the succeeding pallet, said control means including independent apparatus for stopping each of said
- 85 movements.
18. In combination with an apparatus for intermittently supplying articles, a conveyor for carrying a succession of pallets to article receiving positions adjacent said supplying apparatus, motive means for said conveyor, control means for said motive means operable by the operation of said article supplying apparatus in supplying articles to said pallets to initiate movement of said conveyor, a second control means
- 90 for said motive means operable to stop said movement when a pallet has moved from one article receiving position to another, and a third control means for said motive means operable to
- 95 stop said movement when said pallets have been moved from the last article receiving position of one pallet to the first receiving position of the succeeding pallet, said second and third control means being independent of each other.
- 100 19. In combination with an apparatus for intermittently supplying articles, a conveyor for carrying a succession of pallets to article receiving positions adjacent said supplying apparatus, motive means for said conveyor, and electrical control apparatus for said motive means including a group of electrical switch members successively closed and opened by movement of said conveyor, one of which being in closed position at
- 105 each article receiving position and opened at the next succeeding position, and a second group of electrical switch members each connected to a corresponding one of said first group and successively actuated by the operation of said article supplying apparatus, each of said second
- 110 group when so actuated completing a circuit through the corresponding member of the first group for actuating said motive means, said circuit being broken by said first group member upon arrival of said conveyor and pallet at the
- 115 next succeeding article receiving position.

GRAFTON E. LUCE,
REX G. COX.

55 130

60 135

65 140

70 145

75 150