Aug. 18, 1931. H. E. WHITE ET AL 1,819,491

MERCHANDISING ESTABLISHMENT

Filed March 20, 1930 4 Sheets-Sheet 1

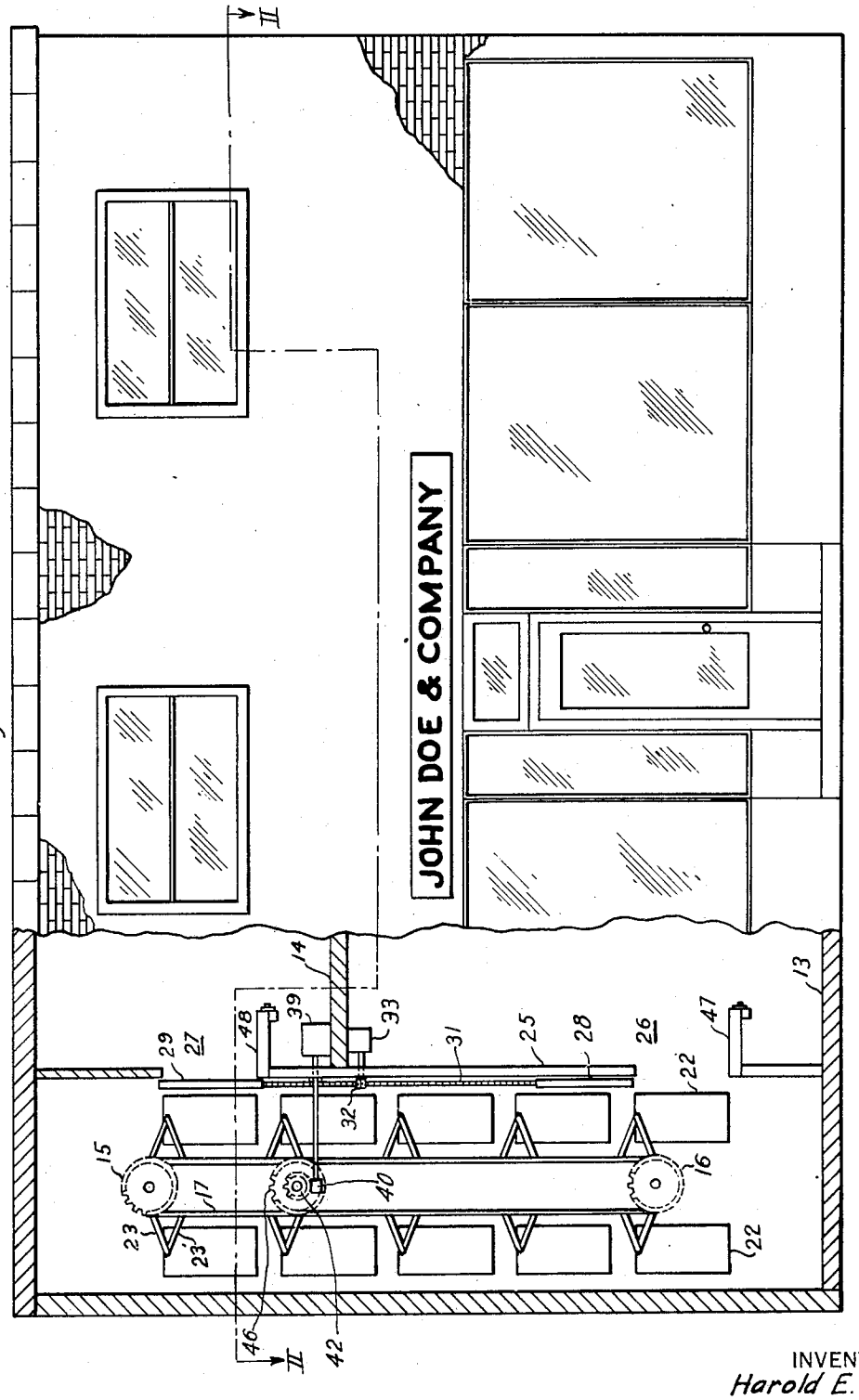


Fig. 1.

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MERCHANDISING ESTABLISHMENT

Filed March 20, 1930 4 Sheets-Sheet 2

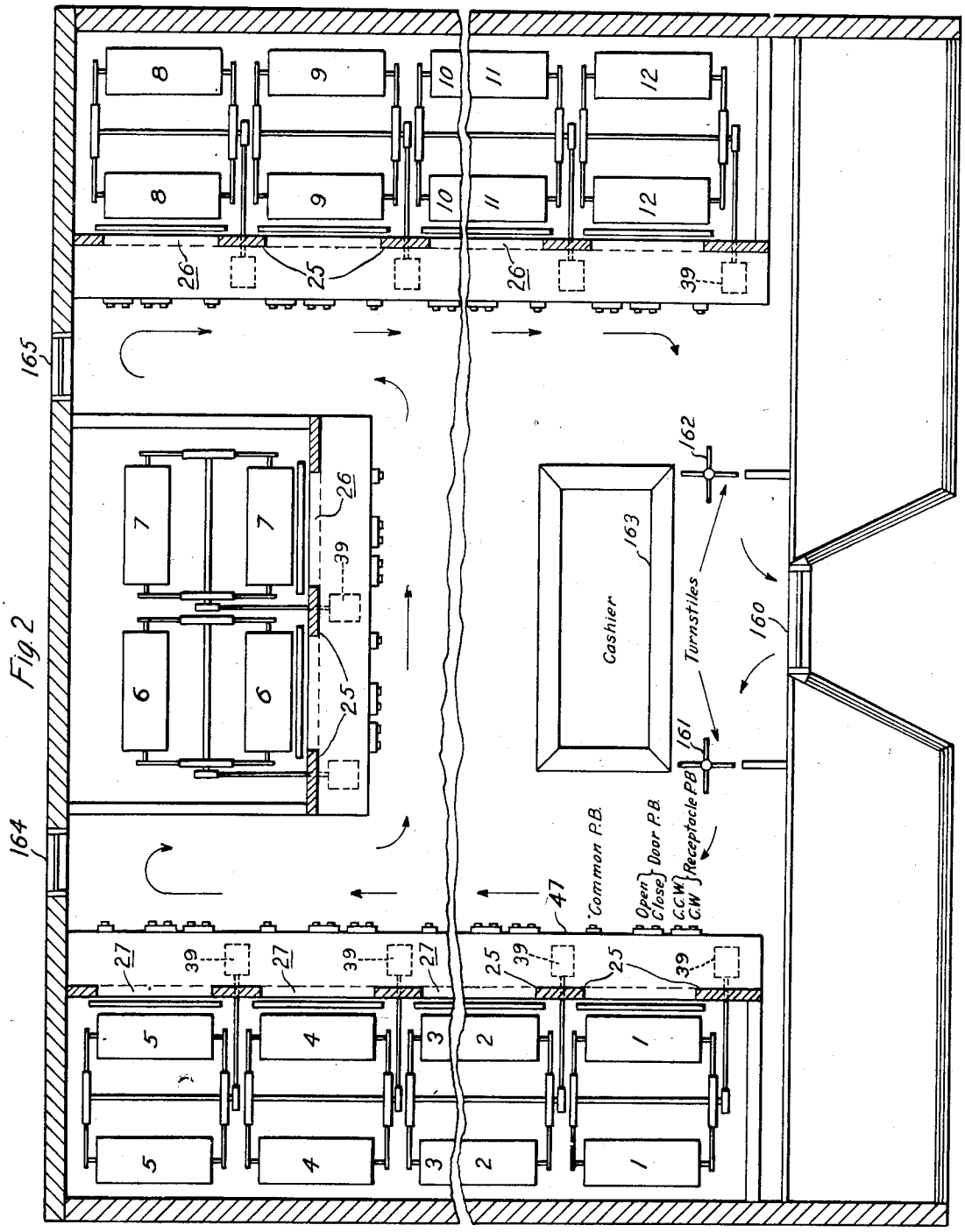


Fig 2

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MERCHANDISING ESTABLISHMENT

Filed March 20, 1930 4 Sheets-Sheet 3

Fig. 3.

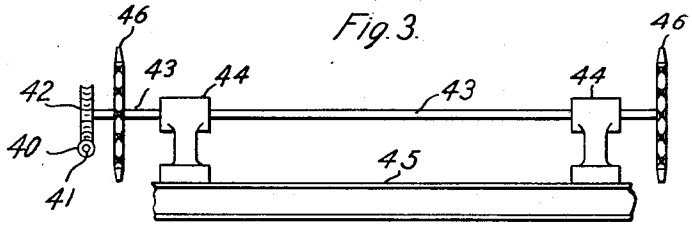


Fig. 4.

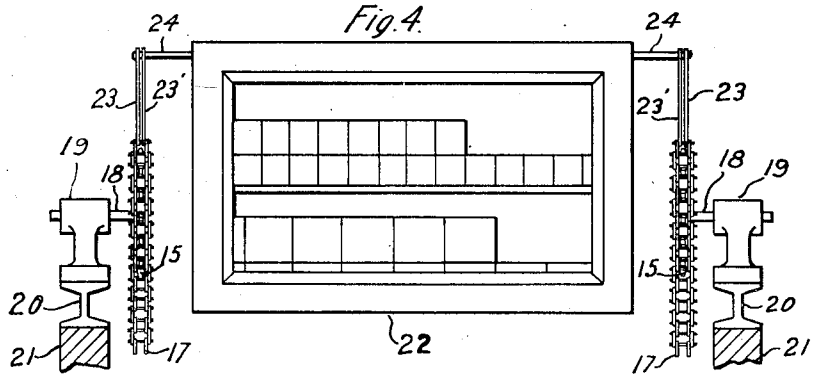
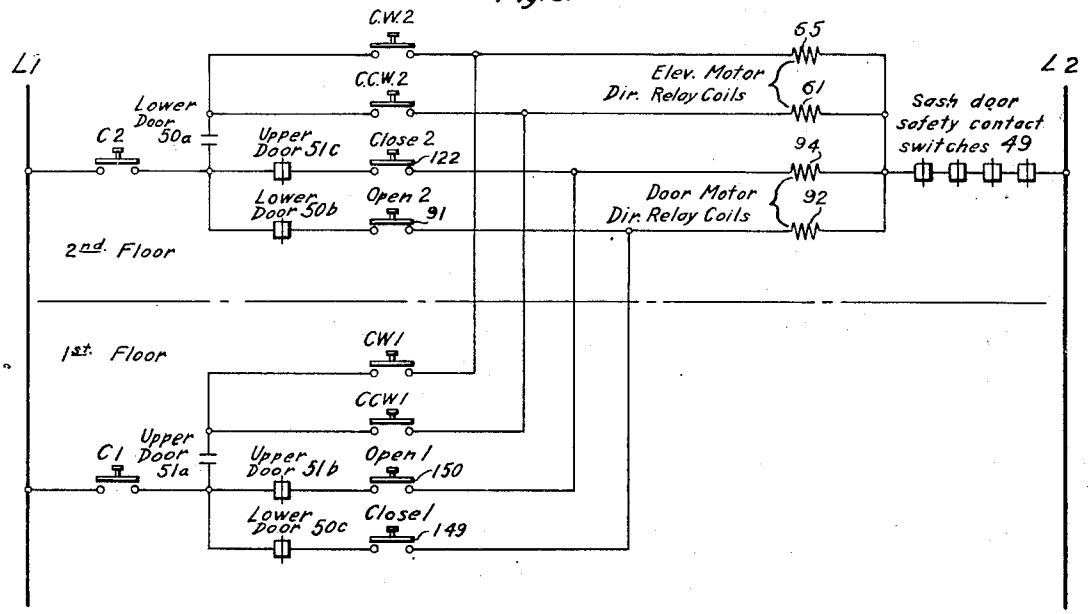


Fig. 5.



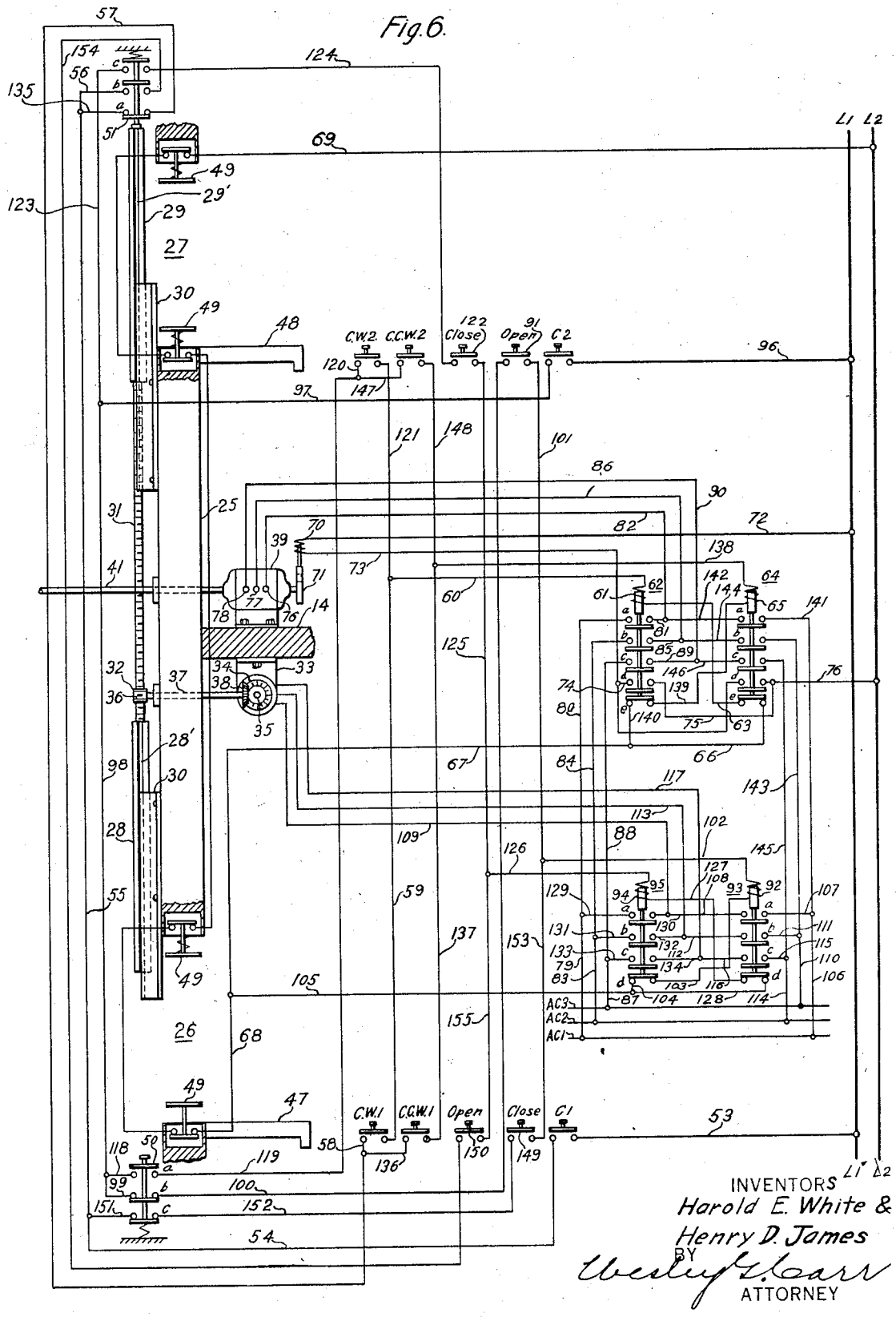
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MERCHANDISING ESTABLISHMENT

Filed March 20, 1930 4 Sheets-Sheet 4

Fig. 6.



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UNITED STATES PATENT OFFICE

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MERCHANDISING ESTABLISHMENT

Application filed March 20, 1930. Serial No. 437,439.

Our invention relates to merchandising establishments, such as grocery stores, particularly to stores of the self-service type in which the customer takes the merchandise desired from the shelf of the store and pays for it as he leaves, and, more particularly, to a self-service merchandising establishment having a plurality of circuitous elevators adapted thereto as a substitute for the usual shelving.

In the larger stores of the existing self-service type which have large volumes of business, it frequently happens that the merchandise on the shelves is depleted during a rush hour of purchasing, and considerable time must be consumed, with consequent delay and inconvenience to customers, in replenishing the supply of merchandise at the sales floor from upper storage floors or other storage places.

Our invention provides a means for replenishing the store of merchandise in a simple manner and with great rapidity and also provides a means for compact storing of merchandise whereby the storage space required is a minimum, and whereby the size of a store or merchandising establishment may be greatly reduced. This latter feature of our invention is of great advantage, particularly in down-town areas in which the ground space is exceedingly valuable.

Our invention contemplates a building having a lower sales floor and one or more upper storage floors, and a plurality of circuitous elevators disposed to move therebetween past panels or openings at the various floors. Each circuitous elevator has a plurality of receptacles for holding merchandise and these receptacles are movable in a circuitous path successively past the panels or openings at the various floors.

Doors for opening and closing the openings at the various floors and a control system for individually operating the circuitous elevators and the doors at the various floors associated therewith, from the various floors are provided.

It is an object of our invention, therefore, to adapt circuitous elevators to a merchandising establishment, whereby the ordinary shelving is eliminated and a more compact and space-economizing method of storing is effected, as well as a means for replenishing the stock of merchandise for a lower sales floor with ease and rapidity.

Another object of our invention is to provide mechanically interlocked doors at a lower floor and an upper floor simultaneously operable by a common motive means, the one to open as the other closes, and vice versa.

It is a further object of our invention to provide a control system for the circuitous elevator-motive means and the door-motive means operable from the several floors.

It is a still further object of our invention to so interlock the movement of the doors with the movement of the circuitous elevators that operation of the control is not effective at one floor if the door at the other floor is open.

Other objects of our invention will, in part, be obvious and will, in part, be made apparent by the following description of our invention, wherein

Figure 1 is a view in front elevation, of a merchandising establishment having a portion broken away to illustrate the disposition of the circuitous elevators therein;

Fig. 2 is a plan view of the structure shown in Fig. 1, but partially in section on the line II—II of the figure;

Fig. 3 is a detail view illustrating the method of driving the sprocket wheels which engage the endless chains of the circuitous elevator;

Fig. 4 is a detail view illustrating the method of supporting the endless chains at the top of the building structure, as well as the method of attachment of the receptacles to the endless chains;

Fig. 5 is a schematic diagram of the control system included in our invention for each individual circuitous elevator, and

Fig. 6 is a full-line control diagram illustrated schematically in Fig. 5 for each individual circuitous elevator.

Referring to Figs. 1 and 2, it will be seen that our invention comprises a series of circuitous elevators numbered 1 to 12, inclusive, disposed in a building having a lower floor

13 and an upper floor 14. Each circuitous elevator is similar in structure and, referring to Fig. 1, elevator No. 1 comprises a pair of upper sprocket wheels or sheaves 15 and a pair of lower sprocket wheels or sheaves 16, the separate sprocket wheels or sheaves of each pair being disposed apart with an endless chain 17 having the contour of a loop with two straight vertical sides moving around corresponding upper and lower sprocket wheels or sheaves.

The method of supporting the upper sprocket wheels or sheaves 15 is illustrated in detail in Fig. 4. Each sprocket wheel or sheave is keyed to a stub shaft 18 that is suitably mounted and retained in a bearing 19. Each bearing 19 is, in turn, supported from a structural member 20 constituting a portion of the building structure 21.

A plurality of receptacles 22 are pivotally supported from, and between, the two endless chains by bracket arms 23 and 23′. One end of each of the arms 23 and 23′ is attached pivotally to points on the endless chain 17 spaced a suitable distance apart, and the other ends are jointed together to constitute a pivotal joint for supporting the pins 24 attached to opposite ends of each receptacle.

The means for moving the circuitous elevators is simple and comprises a motor 39 (Figs. 3 and 6) driving a worm gear wheel 40 keyed to its shaft 41. The worm gear wheel 40, in turn, engages a worm wheel 42 keyed to a shaft 43, disposed at right angles to the shaft 41 of the motor 39 and suitably supported in bearing members 44 at each end thereof. The bearing members 44 are, in turn, supported by a structural member 45 disposed between the vertically movable columns of receptacles and attached to the building structure. Sprocket wheels 46 are keyed at opposite ends of the shaft 43, and are in spaced relation to engage the respective parallel endless chains from which the receptacles 22 are supported. Movement of the receptacles can thus be effected in either of two opposite directions.

Referring to Fig. 2, a plurality of circuitous elevators 1 to 5, inclusive, are disposed along one side of the building. Circuitous elevators 6 and 7 are located at the back wall of the building, and elevators 8 to 12, inclusive, are disposed on another side of the building.

A total of twelve circuitous elevators are shown, but it will be appreciated that any number may be employed depending upon the depth of a building and any disposition of the elevators suitable for the particular floor plan of a building may be made.

In order to separate the circuitous elevators from the open portions of the floors, suitable partitions or walls 25 are provided, having suitable openings 26 (Fig. 1) at the lower floor and openings 27 at the upper floor aligned with each individual elevator, so that access to the receptacles of each elevator may be obtained through these openings. A door 28 is provided for each elevator at the lower floor and a similar door 29 is provided for each elevator at the upper floor for closing these openings.

The structure of these doors is illustrated in detail in Fig. 6. Vertically disposed Z-bars 30 engage slots 28′ and 29′ on each side of the doors 28 and 29, respectively, and constitute a guideway in which the doors move reciprocally. Rigidly connecting the lower door 28 and the upper door 29 of each elevator, are rods 31, one of which, disposed at one side of the openings 26 and 27, is threaded. Engaging this threaded rod 31, is a motor-driven worm-nut 32 which is suitably mounted rotatably in a fixed vertical position upon the wall 25. The worm-nut 32 is driven by the motor 33 through the bevel gear 34 mounted on the shaft 35 of the motor 33, through the bevel gear 38 which engages the bevel gear 34, and the worm gear 36, which engages the worm-nut 32 and is mounted on the shaft 37 to which the bevel gear 38 is keyed.

The rotation of the worm-nut 32 causes the threaded rod 31, rigidly connecting the lower door 28 and the upper door 29, to move vertically up or down, depending upon the direction in which the worm-nut 32 is rotated. If the threaded rod 31 is moved upwardly, the door 29 closes the opening 27 at the upper floor, and the door 28 at the lower floor opening 26 is opened. Similarly, if the threaded rod 31 moves downwardly, the door 29 at the opening 27 is opened, and the door 28 closes the opening 26 at the lower floor.

A continuous ledge or counter 47, for assisting the customers in removing articles of merchandise from receptacles of the circuitous elevators, is disposed below the openings 26 at the lower floor 13 and a similar ledge or counter 48 is disposed below the openings 27 at the upper floor 14.

The push buttons for controlling the movement of the circuitous elevators and the movement of the doors 28 and 29 are located at the edge of these ledges or counters in alignment with the corresponding circuitous elevators.

Sash or threshold safety swtiches 49 are provided at the top and bottom of each of the openings 26 and 27. These switches comprise a continuous strip extending along the sash or threshold and operable to open contact members when depressed toward the sash or threshold. The switches are provided in order to stop the movement of the circuitous elevator, should an article of merchandise or other object become jammed between the sash or threshold of the openings 26 and 27 and a moving receptacle.

A limit switch 50, operable by the lower door 28 and a limit switch 51, operable by

the upper door 29, are provided in order to cut off the supply to the motor 33, motivating the doors, when they reach extreme positions, respectively, and also to prevent the effective operation of the elevator push buttons at one floor when the door at the other floor is open.

Each of the circuitous elevators is similarly constructed and each has an individual control system, as illustrated in Fig. 6. In order to understand the structure of the control system and its operation, a hypothetical case will be assumed, and the structure and operation of the control system explained in connection therewith.

Assuming that a customer is standing before an opening 26, corresponding to one of the circuitous elevators for which the door 28 is open, the fact that the door being open is an indication to the customer that the circuitous elevator is in a condition for operation. Standing facing the opening, the customer closes the push-button switch C1 with one hand and the clockwise push button switch CW1 with the other. The two push button switches C1 and CW1 are located such distance apart that the customer must, of necessity, use both hands to operate the elevator control to effect movement of the elevator. The requirement that the customer use both hands in operating the control switches is a safety feature, in that it prevents his getting his hands into the opening 26 and being injured by the moving receptacles.

Ordinarily only one direction of rotation of the circuitous elevator is necessary, but, in the event of over-travel or in an emergency, it is desirable to have the circuitous elevators move in an opposite direction of rotation, and, therefore, the counter-clockwise push-button switch CCW1 is provided. This push button is also spaced apart from the common push button C1 so that both hands must be utilized.

Assuming then that the customer has simultaneously pushed the push-button switches C1 and CW1 which control the movement of the circuitous-elevator driving motor 39, the energizing circuit closed thereby is as follows: from line L1, through conductor 53, push-button switch C1, conductors 54, 55 and 135 in succession, contact members "*a*" of the door limit switch 51 (closed when the door 29 is in a raised or closed position), through conductors 57 and 58, push-button switch CW1, conductors 59 and 60, coil 61 of the clockwise-direction relay 62, conductor 63, normally closed contact members "*e*" of the counter-clockwise-direction relay 64, conductors 66, 67 and 68, contact members of the four threshold switches 49 in series, and, through conductor 69, to the line L2. The energization of the coil 61 of the direction relay 62 causes that relay to be actuated to a closed position, closing the normally open contact members "*a*", "*b*", "*c*", and "*d*" and opening the normally closed contact members "*e*" of that relay.

The opening of the contact members "*e*" of direction relay 62 prevents the energization of the coil 65 of the direction relay 64 because it is in series therewith. Similarly, contact members "*e*" on the relay 64, in series with coil 61 of relay 62, prevent energization of coil 62 when coil 65 of relay 64 is energized. Thus, the relays 62 and 64 are interlocked so that only one can be energized at a time.

The closing of the contact members "*d*" closes the energizing circuit through the magnet coil 70 of the brake 71 associated with the shaft 41 of the driving motor 39. The circuit is as follows: from line conductor L1, through conductor 72, brake-magnet coil 70, conductor 73, conductor 74, contact members "*d*" of the direction relay 62 and conductors 75 and 76, to the line conductor L2. The brake 71 is of the type that is operated to an open or released position against spring pressure by the energization of its magnet coil from a normally set or braking position. Therefore, the energization of the magnet coil 70 releases the brake 71 and allows the driving motor 39 to rotate when energized.

The closing of the contact members "*a*", "*b*", and "*c*" of the direction relay 62 closes the energizing circuit to the driving motor 39 from the three-phase alternating-current supply lines AC1, and AC2, and AC3. The connection to the terminal 76 of one phase of the three-phase induction motor 39 is established from line AC1, through conductors 79 and 80 through contact members "*a*" of the direction relay 62, conductors 81 and 82, to the terminal 76. The connection to the terminal 77 of the second phase of the driving motor 39 is established from the line AC2, through conductors 83 and 84, contact members "*b*" of the direction relay 62 and conductors 85 and 86, to the terminal 77. The connection to the terminal 78 of the third phase of the driving motor 39 is established from the line AC3, through conductors 87 and 88, contact members "*c*" of the direction relay 62 and conductors 89 and 90, to the terminal 78.

The motor 39 then rotates in a direction to move the receptacles in a clockwise direction. The customer holds the push-button switches C1 and CW1 closed until the next receptacle reaches the opening. If he desires any article of merchandise therein, he releases one or both of the push buttons, and the circuitous elevator stops with that receptacle aligned with the opening 26 and the brake 71 is set. Should he not desire any article in the next receptacle, which he observes as it passes the opening, he continues to hold push buttons C1 and CW1 closed, which permits

continuation of the movement of the receptacles until a receptacle, that contains the particular article of merchandise he desires, reaches the opening. The release of one or both of the push buttons then effects the stopping of the circuitous elevator and the setting of the brake, as before described.

Now let it be supposed that the supply of merchandise in the receptacles of a particular circuitous elevator is depleted, and it is desired to replenish the supply thereof. In order that an employee of the store on the second floor may operate the control push buttons for the circuitous elevator at that floor, he must first close the opening 26 at the lower floor and open the opening 27 at the upper floor. To do this, he closes the door-opening push-button switch 91 at the second floor and the common push button C2. The closing of these push-button switches energizes the coil 92 of the door down-direction relay 93, the contacts *a*, *b*, and *c* of which, on closing, effect the energization of the three-phase induction motor 33 for moving the doors. The circuit is as follows: from line conductor L1, through conductor 96, push-button switch C2 which must be closed simultaneously with the closing of the push-button switch 91, conductors 97, 98 and 99, contact members "*b*" of the limit switch 50, operable to open when the door 28 completely closes the opening 26, through conductor 100, opening push-button switch 91, conductors 101 and 102, through the coil 92 of the door down-direction relay 93, conductor 103, normally closed contact members "*d*" of the door up-direction relay 95, conductors 104, 105 and 68, through the four threshold safety switches 49 in series and through conductor 69, to line L2.

The energization of the coil 92 of the door direction relay 93 causes the relay 93 to close, closing the normally open contact members "*a*", "*b*" and "*c*" and opening the normally closed contact members "*d*" of that relay. The closing of the contact members "*a*", "*b*", and "*c*" of the door direction relay 93 closes the energizing circuit to the door motor 33 from the three-phase supply lines AC1, AC2 and AC3 as follows: The connection to the first phase of the motor 33 is established from line AC1 through conductors 106 and 107, contact members "*a*" of the door direction relay 93, and conductors 108 and 109. The connection to the second phase of the door motor 33 is established from the line AC3, through conductors 110 and 111, contact members "*b*" of the door direction relay 93 and conductors 112 and 113. The connection to the third phase of the door motor 33 is established from line AC2 through conductors 114 and 115, contact members "*c*" of the door direction relay 93 and conductors 116 and 117.

The rotation of the motor 33 causes the door 28 to close the opening 26 and to open door 29 at the opening 27, simultaneously, by means of the structure and driving mechanism previously described. When the door 28 reaches a completely closed position, it operates the limit switch 50 to open the contact members "*b*" and "*c*" and close the contact members "*a*" of that switch. The opening of the contact members "*b*" opens the energizing circuit through the coil 92 of the door direction relay 93 and the motor stops. It also prevents further effective operation of door-opening push-button switch 91. The closing of the contact members "*a*" of the limit switch 50 establishes the circuit, so that the push buttons controlling movement of the circuitous elevator from the upper floor can, at this time, be effective.

The opening of contact members "*c*" of the limit switch 50 prevents further effective operation of door-closing push-button switch 149 at the lower floor.

In order to move the circuitous elevator to bring the empty receptacles to the opening 29, so that the employee may replenish the supply therein, the employee closes the push-button switches C2 and CW2 at the upper floor. Push button switches C2 and CW2 are also spaced to require both hands of an operator for their simultaneous effective operation. The energizing circuit is thereby established through the coil 61 of the direction relay 62 as follows: from the line conductor L1 through conductor 96, push-button switch C2, conductors 97, 98 and 118, through contact members "*a*" of the limit switch 50, conductors 119 and 120, through the push-button switch CW2, conductors 121 and 60, through the coil 61 of the clockwise-direction relay 62 to line conductor L2, as previously traced for the clockwise push-button switch CW1 at the first floor. When the proper receptacle reaches the opening 27, the employee releases one or both of the push buttons and the circuitous elevator stops, and the brake is set on the driving motor.

Now let it be assumed that, after the employee has completed his task of replenishing the receptacles in a particular circuitous elevator, he desires to close the opening 27 at the upper floor and open the door at the lower floor so that the circuitous elevator may be in readiness for subsequent operation thereof by customers at the lower floor. He closes the door-closing push-button switch 122 at the upper floor and the common push-button switch C2. This energizes the coil 94 of the door up-direction relay 95.

The circuit is as follows: from line conductor L1 through conductor 96, push-button switch C2, conductors 97 and 123, contact members "*c*" of the limit switch 51 (closed when the door 29 is in a lowered or open position) conductor 124, closing push-

button switch 122, conductors 125 and 126, coil 94 of the door up-direction relay 95, conductor 127, normally closed contact members "*d*" of the door down-direction relay 93, conductors 128 and 105, through the four threshold switch 49 in series, and through conductor 69 to line conductor L2.

The energization of the coil 94 closes the normally open contact members "*a*", "*b*", and "*c*" and opens the normally closed contact members "*d*" of the door direction relay 95.

Contact members "*d*" of relays 93 and 95 serve to interlock the two relays so that only one can be energized at a time.

The circuit to the door motor 33 is established through contact members "*a*", "*b*" and "*c*" of the relay 95 from the alternating-current supply lines AC1, AC2, and AC3, respectively, as follows: The connection to the first phase of the door motor 33 is established from line AC1, through conductors 79 and 129, contact members "*a*" of the door direction relay 95, and conductors 130 and 109. The connection to the second phase is established from line AC2 through conductors 83 and 131, through contact members "*b*" of the door direction relay 95 and through conductors 132 and 113. The connection to the third phase is established from line AC3 through conductors 87 and 133, contact members "*c*" of the door direction relay 95, and through conductors 134 and 117.

The motor 33 rotates in a direction to move the upper door 29 upwardly to a closed position and the lower door 28 upwardly to an open position. When the upper door 29 reaches a position completely closing the opening 27, it operates the limit switch 51 to close its contact members "*a*" and open its contact members "*b*" and "*c*". The opening of the contact members "*c*" opens the energizing circuit through the coil 94 of the door direction relay 95 and stops the motor with the doors held in this position and prevents further effectual operation of door closing push-button switch 122.

The opening of contact members "*b*" of limit switch 51 prevents further effectual operation of the door-opening push-button switch 150 at the lower floor.

The closing of contact members *a* of the limit switch 51 allows the elevator push-button switches CW1 and CCW1 to now be effectively operated.

Now let it be assumed that the customer, in operating the circuitous elevator from the lower floor, has allowed the receptacle to over-travel the opening 26 and desires to bring it back into alignment therewith. He closes the push-button switches C1 and CCW1. The closing of these push-button switches closes the energizing circuit through the coil 65 of the elevator counter-clockwise direction relay 64. The circuit is as follows: from line conductor L1, through conductor 53, push-button switch C1, conductors 54, 55, and 135, through contact members "*a*" of the limit switch 51, through conductors 57 and 136, through the counter-clockwise push-button switch CCW1, through conductors 137 and 138, coil 65 of the elevator counter-clockwise direction relay 64, conductor 139, normally closed contact members "*e*" of the elevator clockwise direction relay 62, conductors 140, 67 and 68, contact members of the four threshold switches 49 in series, and through conductor 69 to line conductor L2. The energization of the coil 65 of the elevator direction relay 64 causes that relay to close its normally open contact members "*a*", "*b*", "*c*", and "*d*" and opens its normally closed contact members "*e*".

Contact members "*d*" of the elevator direction relay 64 are connected in parallel with contact members "*d*" of the elevator direction relay 62, and the closing of the contact members "*d*" of the elevator direction relay 64 effects the energization of the magnet coil 70 for the brake 71 of the driving motor 39 by the circuit substantially as traced for the contact members "*d*" of the elevator direction relay 62. Therefore, the brake 71 is released when the contact members "*d*" of the elevator direction relay 64 close. The energizing circuit to the motor 39 is established through contact members "*a*", "*b*", and "*c*" of the elevator direction relay 64 from the three-phase alternating-current supply lines AC1, AC3, and AC2, respectively, as follows: The connection to the terminal 76 of the driving motor 39 is established from line AC1, through conductors 106 and 141, through contact members "*a*" of the elevator direction relay 64, conductors 142 and 82 to the terminal 76. The connection to the terminal 77 of the second phase is established from the supply line AC3, through conductors 110 and 143, through contact members "*b*" of the elevator direction relay 64, through conductors 144 and 86 to the terminal 77. The connection to the terminal 78 of the third phase is established from line AC2, through conductors 114 and 145, through contact members "*c*" of the elevator direction relay 64 through conductors 146 and 90 to the terminal 78.

The motor 39 then rotates in a direction to move the circuitous elevator in a counter-clockwise direction.

When the receptacle returns to a position in which it is in substantial alignment with the opening 26, the customer releases one or both of the push buttons, and the circuitous elevator stops.

Counter-clockwise movement of the circuitous elevator is effected by operation of the push-button switches C2 and CCW2 at the upper floor also, and the circuit therefor is

traced as follows: from the line conductor L1 through conductor 96, common push-button switch C2 conductors 97, 98 and 118, contact members "a" of the limit switch 50, conductors 119 and 147, through push-button switch CCW2, conductors 148 and 138, through coil 65 of the elevator counter-clockwise direction relay 64 to line L2, as previously traced for counter-clockwise push-button switch CCW1.

Ordinarily, it will be unnecesary for the customer to operate the doors from the lower floor. However, it is desirable that it be possible to do so, in the event that, in an emergency, the necessity to do so arises. The closing push button 149 and the opening push button 150 are provided at the lower floor for this purpose. Assuming that the door 28 is in a raised position and that it is desired to lower it to close the opening 26, the operator (either an employee or a customer) closes the push-button switches C1 and 149. This energizes the coil 92 of the door direction relay 93 through a circuit as follows: from line conductor L1 through conductor 53, push-button switch C1, conductors 54 and 151, through contact members "c" of the limit switch 50, conductor 152, closing push-button switch 149, conductors 153 and 102 through the coil 92 of the door direction relay 93 to line conductor L2, as previously traced.

Assuming that the door 28 is in a lowered position and it is desired to raise it, the operator closes the push-button switches C1 and the opening push-button switch 150. This closes the energizing circuit through coil 94 of the door direction relay 95. The circuit is as follows: from line conductor L1, through conductor 53, push-button switch C1, conductors 54, 55, and 56, contact members "b" of the limit switch 51, conductor 154, opening push-button switch 150, conductors 155 and 126, through the coil 94 of the door direction relay 94 to the line conductor L2, as previously traced.

A schematic control diagram, corresponding to the full-line diagram just described, is illustrated in Fig. 5. Corresponding elements in the two diagrams have been similarly designated, and it will not be necessary to trace the circuits in the schematic diagram, as they can be readily traced from the previous description.

In actual practice, the operation of the merchandising establishment, as a whole, may be briefly illustrated as follows: A customer enters the establishment through the front door 160 (Fig. 2), turns left, passes through the turnstile 161 and approaches the ledge or counter 47 extending from the front of the building to the back of the building adjacent to the elevators 1 to 5, inclusive. Each of the circuitous elevators contains a variety of articles of merchandise, so that the customer, by operation of the elevator, as previously described, causes the merchandise to be moved past the opening 26 successively, so that he may select whatever he desires. Several elevators may contain the same variety of merchandise, so that several persons may be securing similar merchandise simultaneously without delay or confusion. The particular kinds of merchandise contained in any one circuitous elevator are suitably recorded on placards in full view of the customer, so that he may immediately go to the particular elevator containing the kind of merchandise he desires. However, in a large establishment, it is necessary to have a number of circuitous elevators each containing entirely different kinds of merchandise, and, therefore, if the customer desires to make purchases of merchandise contained in a number of different circuitous elevators, it will be appreciated that he must pass before them in a definite path in order to avoid confusion. For this reason, a definite path which a customer would take were he to desire to secure articles of merchandise from each of the elevators containing different types of merchandise, is indicated by the arrows in Fig. 2.

Obviously, he will reach the last circuitous elevator, that is, 12, and then pass through the turnstile 162, incidentally passing the cashier's desk 163, where his purchases are itemized and he receives a bill and pays the amount of his purchases before leaving by the front door 160.

Rear doors 164 and 165 are illustrated to satisfy the requirements for an emergency exit, but they are not ordinarily involved in the contemplated flux of the customers through the store, although, in individual cases, they could very well be used for entrance into and exit from the store.

It is appreciated that numerous modifications or ramifications may be constructed, particularly suited or adapted to different classes of merchandise, different floor plans, and different architectural designs of the buildings without departing from the spirit of our invention, and we, therefore, do not mean to limit ourselves to the particular structure, as shown, except as defined in the appended claims.

We claim as our invention:

1. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means movably supporting said receptacles for movement in a circuitous path successively past the said floors, motive means for moving said receptacles, a door for opening and closing a doorway giving access to the receptacle stopped at the said lower floor and a door for opening and closing a doorway giving access to the receptacle stopped at the said upper floor, the two said doors being rigidly

connected together and simultaneously operable, the one to be opened when the other is closed, and motive means for moving said doors.

2. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means for movably supporting said receptacles for circuitous movement successively past said floors, motive means for moving said receptacles, a door at said upper floor and a door at said lower floor for opening and closing doorways at said floors for giving access to said receptacles, a screw shaft rigidly connecting said doors together, a gear cooperating with said shaft, motive means for rotating said gear in either direction whereby the said doors are operated, the door at said upper floor to close simultaneously with the opening of the door at the lower floor for one direction of rotation of said gear wheel, and the door at the lower floor to close simultaneously with the opening of the door at the upper floor, for the opposite direction of rotation of said gear wheel.

3. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means for supporting said receptacles for circuitous movement successively past said floors, motive means for moving said receptacles, a control system for said motive means comprising a circuit-closing means at the said upper floor and another circuit-closing means at said upper floor in series therewith disposed at least a distance therefrom necessitating the use of both hands of an operator to operate them simultaneously, a circuit-closing means at the said lower floor and another circuit-closing means at said lower floor in series therewith disposed at least a distance therefrom necessitating the use of both hands of an operator to operate them simultaneously, and electromagnetic means operably responsive to the simultaneous operation of the two circuit-closing means at either floor to effect the actuation of said motive means.

4. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means for supporting said receptacles for circuitous movement successively past said floors, motive means for moving said receptacles, a control system for said motive means comprising two circuit-closing means at one of said floors connected in series, and electro-magnetic means operable in response to the simultaneous operation of said two circuit-closing means to effect the actuation of said motive means; said two circuit-closing means being spaced a sufficient distance to necessitate the use of both hands by an operator to control the movement of the receptacles.

5. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means for supporting said receptacles for circuitous movement successively past said floors, motive means for moving said receptacles, a control system for said motive means comprising an electromagnetic means for effecting the actuation of said motive means in either of two opposite directions, two circuit-closing means at said upper floor for selectively controlling the energization of said electromagnetic means to cause said receptacles to move in either of said two directions, two circuit-closing means at said lower floor for selectively controlling the energization of said electromagnetic means to cause said receptacles to move in either of said two directions, a third circuit-closing means at each floor connected in series with each of said two circuit-closing means at the respective floors, the circuit-closing means at each floor being spaced to necessitate an operator using both hands simultaneously in manipulating the circuit-closing means to effect a movement of the receptacles.

6. In a merchandising establishment having a lower floor and an upper floor therein, a station at the said lower floor and a station at said upper floor, a circuitous elevator comprising a plurality of receptacles for merchandise, means for supporting said receptacles for circuitous movement successively past said stations, doors at said stations for controlling access to said receptacles, motive means for moving said receptacles, a control system for said motive means comprising a circuit-closing means at the said upper floor and a circuit-closing means at the said lower floor, electromagnetic means operably responsive to the operation of said circuit-closing means to effect the actuation of said motive means, and switch means selectively controlled by said doors for preventing the effective operation of the circuit-closing means at one floor when the door at the other floor is open.

7. In a merchandising establishment, a lower floor and an upper floor, a station at the said lower floor and a station at said upper floor, a circuitous elevator comprising a plurality of receptacles for merchandise, means for supporting said receptacles for circuitous movement successively past said stations, motive means for moving said receptacles, a control system for said motive means comprising circuit-closing means, electromagnetic means responsive to the operation of said circuit-closing means for effecting the actuation of said motive means, threshold safety-switch means at the said station at the upper floor and a threshold safety-switch

means at the said station at the lower floor, each operative to render the said electromagnetic means ineffective and stop the movement of said receptacles when an object is jammed between a receptacle and the threshold of a station.

8. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means movably supporting said receptacles for movement in a circuitous path successively past the said floors, motive means for moving the said receptacles, doors at the upper and lower floors for controlling access to said receptacles, means rigidly connecting the door at one floor with the door at the other floor so that when one door is opened the other will close, and motive means for moving said doors, a control system for said door-motive means comprising circuit-closing means at said lower floor and circuit-closing means at said upper floor, and electromagnetic means responsive to the operation of either of said circuit-closing means to effect the energization of said door-motive means.

9. In a merchandising establishment having an upper and a lower floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means movably supporting said receptacles for movement in a circuitous path successively past the said floors, motive means for moving the said receptacles, a door for controlling access to a receptacle stopped at the said upper floor, a door for controlling access to a receptacle stopped at the said lower floor, the two said doors being rigidly connected together and simultaneously operable, so that when the one to open is closed the other is open, motive means for moving said doors a control system for said door-motive means comprising electromagnetic means for effecting the energization of said door-motive means to move said doors in one direction, a second electromagnetic means for effecting the energization of said door-motive means to move the said door in an opposite direction, circuit-closing means at both of said floors for selectively effecting the energization of said electromagnetic means.

10. In a merchandising establishment having a lower floor and an upper floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means movably supporting said receptacles for movement in a circuitous path successively past the said floors, motive means for moving said receptacles, doors for controlling access to said receptacles at both floors, means connecting said doors for simultaneous movement so arranged that as one opens the other closes, motive means for moving said doors, a control system for said door-motive means comprising a circuit-closing means at the said lower floor and circuit-closing means at said upper floor, electromagnetic means responsive to the operation of either of said circuit-closing means to effect the energization of said door-motive means, and limit-switch means operable by said doors to deenergize said electromagnetic means and stop said door-motive means when said doors are substantially completely open or closed.

11. In a merchandising establishment having an upper and a lower floor therein, a circuitous elevator comprising a plurality of receptacles for merchandise, means movably supporting said receptacles for movement in a circuitous path successively past the said floors, motive means for moving the said receptacles, at the upper floor and a door at the lower floor for affording access to said receptacles, the two said doors being interconnected for simultaneous operation and so arranged that when one is open the other is closed, motive means for moving said doors, a control system for said door-motive means comprising electromagnetic means for effecting the energization of said door-motive means to move said doors in one direction, a second electromagnetic means for effecting the energization of said door-motive means to move the said doors in an opposite direction, circuit-closing means at said upper floor and circuit-closing means at said lower floor for effecting the energization of one of said electromagnetic means, and circuit-closing means at said upper floor and circuit-closing means at said lower floor for effecting the energization of the other of said electromagnetic means, limit-switch means operable by said door at the upper floor to stop said door-motive means when said door is completely closed and the door at the said lower floor is simultaneously completely opened to render the operation of the said circuit-closing means at either of said floors ineffective to cause further movement of the doors in that direction, limit-switch means operable by said doors at the lower floor to stop said door-motive means when said door is completely closed and the door at said upper floor is simultaneously completely opened to render the operation of the said circuit-closing means at either of said floors ineffective to cause further movement of the doors in that direction.

12. In a merchandising establishment having a lower floor and at least one upper floor therein, a plurality of individually movable circuitous elevators disposed in closely adjacent relation extending past said floors, each of said circuitous elevators comprising a plurality of receptacles for supporting and exhibiting articles of merchandise, means movably supporting the receptacles of each elevator in closely spaced relation for circuitous movement successively

past said floors whereby the articles of merchandise in the receptacles are exhibited thereat, the quantity of merchandise in the receptacles is replenished from one of the floors for exhibition at another floor, and the storage capacity of the establishment is greatly increased.

In testimony whereof, we have hereunto subscribed our names this 12th day of March, 1930.

HAROLD E. WHITE.
HENRY D. JAMES.