

Jan. 5, 1926.

O. P. McGEE

1,568,461

SAFETY AUTOMATIC ELEVATOR DOOR EQUIPMENT

Filed May 26, 1924

5 Sheets-Sheet 1

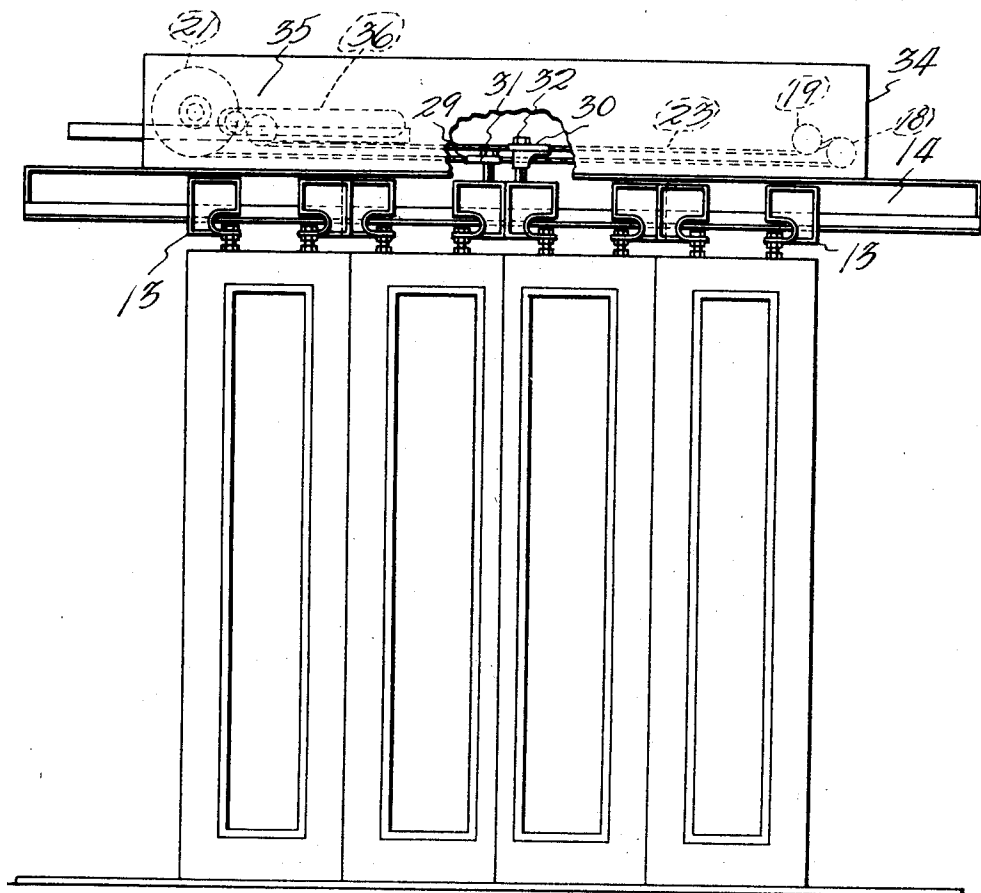


Fig. 1.

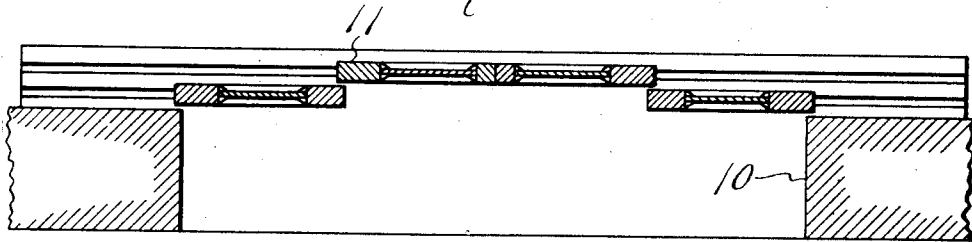


Fig. 2.

Inventor

O. P. McGee

By

J. K. Ashley

Attorney

Jan. 5, 1926.

O. P. McGEE

1,568,461

SAFETY AUTOMATIC ELEVATOR DOOR EQUIPMENT

Filed May 26, 1924

5 Sheets-Sheet 2

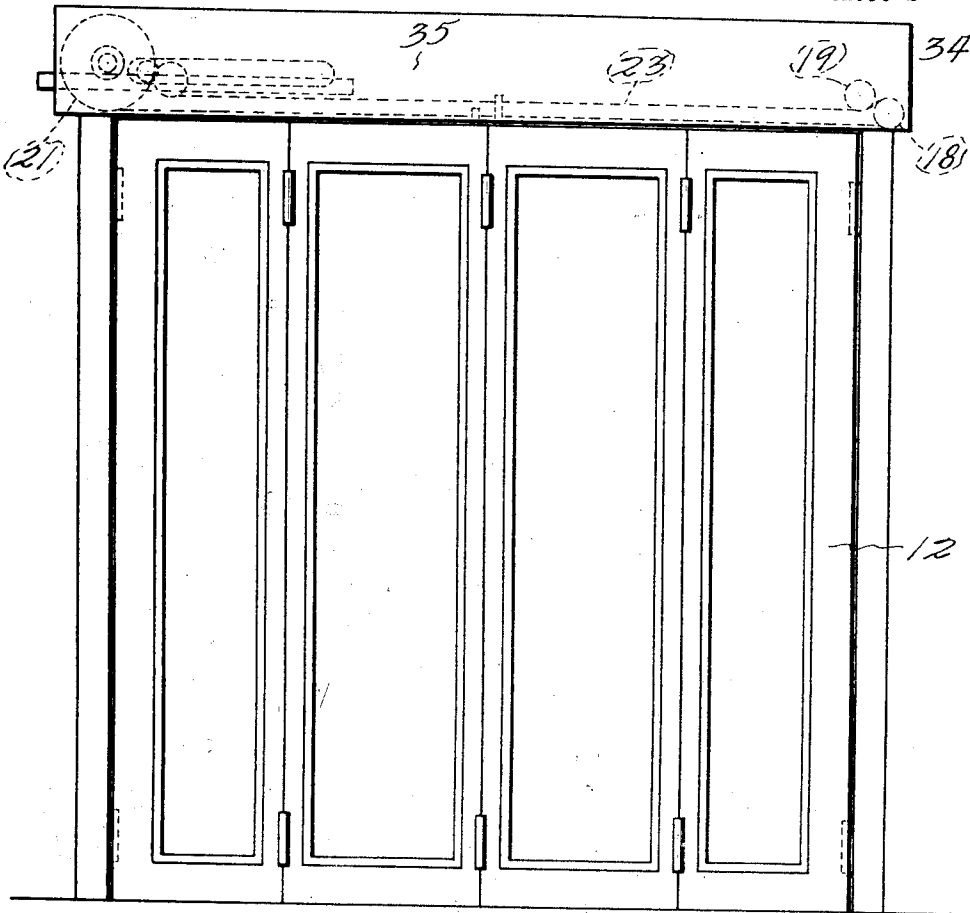


Fig. 5

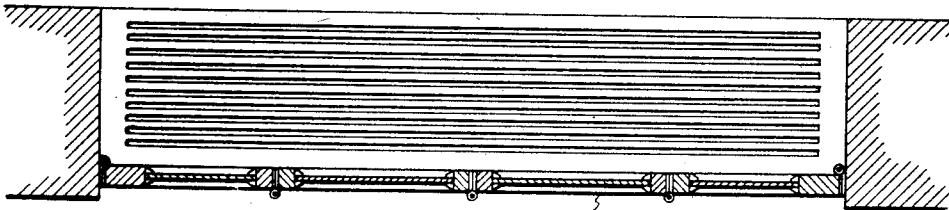


Fig. 4

Inventor
O. P. McGEE

By

Jack A. Oakley
Attorney

Jan. 5, 1926.

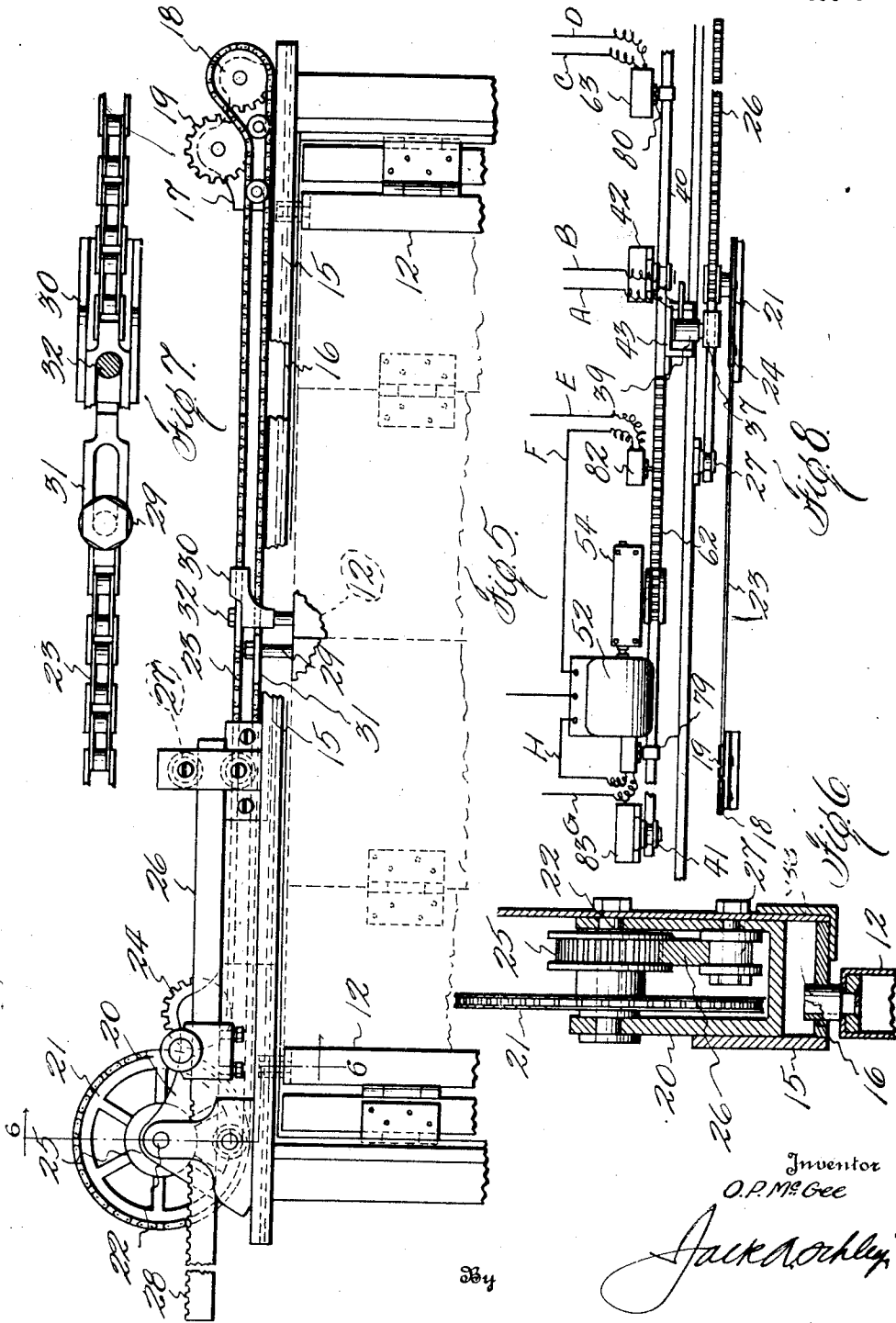
O. P. McGEE

1,568,461

SAFETY AUTOMATIC ELEVATOR DOOR EQUIPMENT

Filed May 26, 1924

5 Sheets-Sheet 3



Inventor
O. P. McGee

Jack Rockley

Attorney

Jan. 5 , 1926.

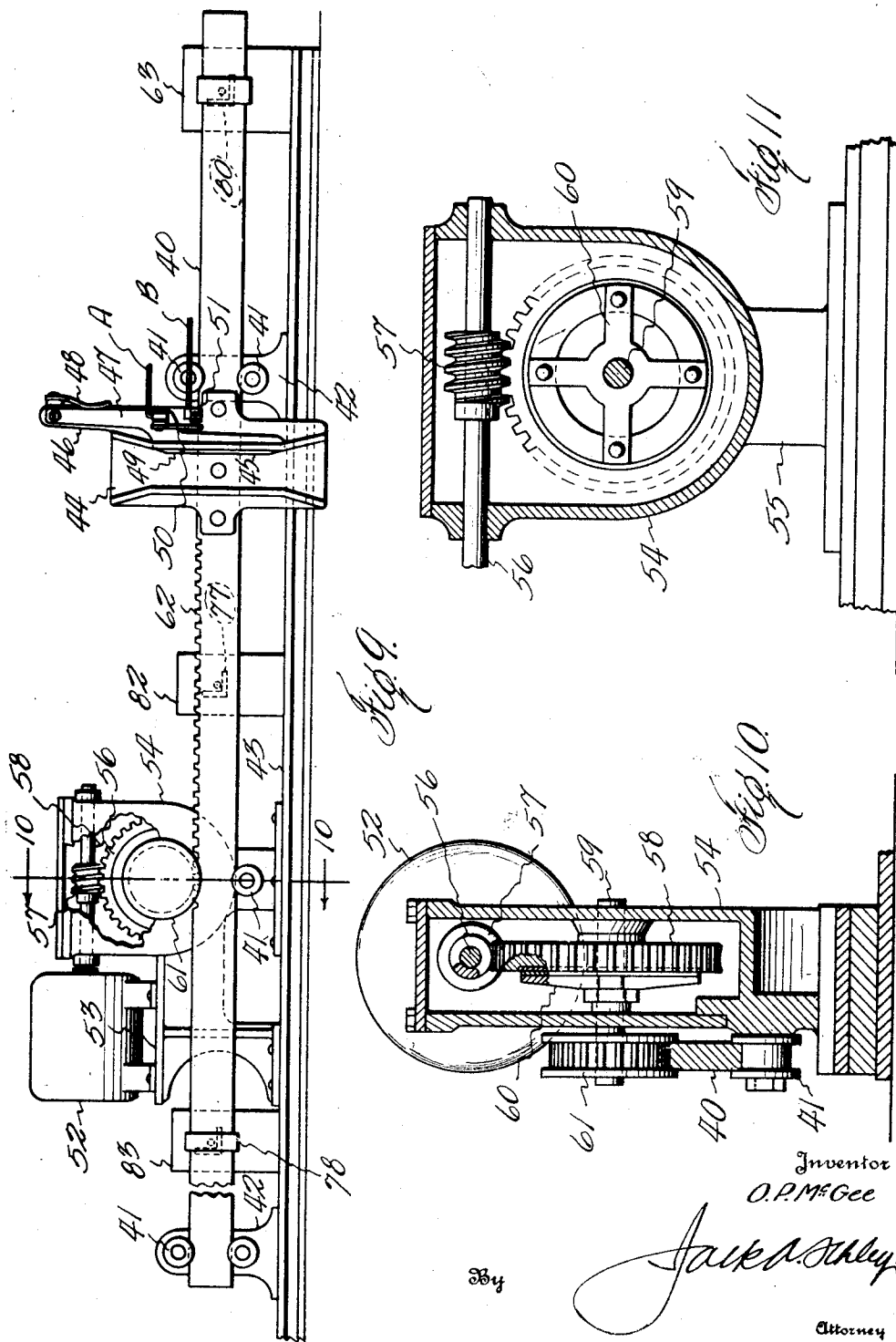
O. P. McGEE

1,568,461

SAFETY AUTOMATIC ELEVATOR DOOR EQUIPMENT

Filed May 26, 1924

5 Sheets-Sheet 4



Jan. 5, 1926.

1,568,461

O. P. MCGEE

SAFETY AUTOMATIC ELEVATOR DOOR EQUIPMENT

Filed May 26, 1924

5 Sheets-Sheet 5

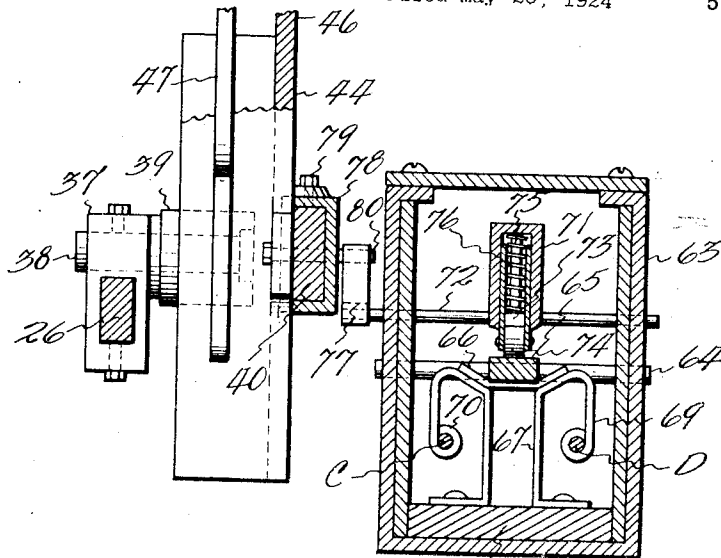


Fig 12.

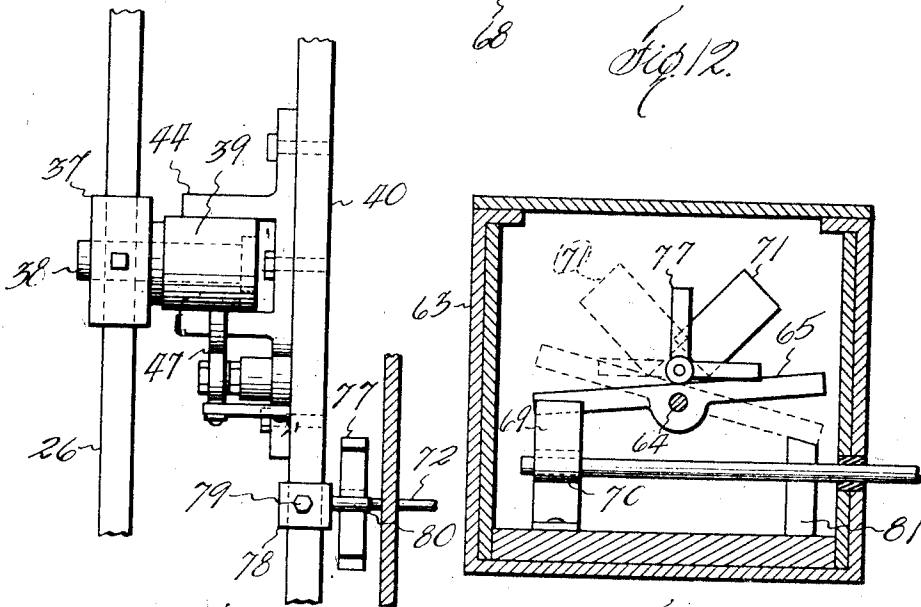


Fig. 13.

Fig. 14.

Inventor
O. P. McGee

Jackson, N.Y.

Attorney

UNITED STATES PATENT OFFICE.

OSCAR P. McGEE, OF DALLAS, TEXAS, ASSIGNOR OF ONE-HALF TO W. A. SEDWICK, OF DALLAS, TEXAS.

SAFETY AUTOMATIC ELEVATOR-DOOR EQUIPMENT.

Application filed May 26, 1924. Serial No. 715,866.

To all whom it may concern:

Be it known that I, OSCAR P. McGEE, citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Safety Automatic Elevator-Door Equipments, of which the following is a specification.

This invention relates to new and useful improvements in safety automatic door equipments.

The object of the invention is to provide means for mechanically opening and closing elevator doors in a safe manner.

A further object is to provide means for operating elevator doors with a minimum expenditure of labor and quickly, whereby a saving of time is effected and the service is speeded up.

Another object is to provide electrically operated elevator doors arranged so that they cannot be opened until the car floor is approximately flush with the floor landing or nearly so.

A further feature resides in the provision of means for mechanically operating elevator doors connected with the car circuits in such a manner that the car cannot be moved if the doors are open or partially so.

Still another object of the invention is to provide a motor operator carried by the elevator car in combination with door operating means at the floor landing, inoperative until engaged by said operator.

A still further object of the invention is to provide means whereby the door operator element which engages with the door operating means, cannot be moved out of its proper position when not engaged with said means.

Another object is to provide a trip switch operated by the door actuating means to break the car circuit when the doors are opened and requiring that the doors be fully closed before the car circuit is restored.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompany-

ing drawings, in which an example of the invention is shown, and wherein:

Fig. 1 is an elevation of a sliding door equipment and its operating means constructed in accordance with my invention,

Fig. 2 is a cross-sectional view of the same.

Fig. 3 is a view similar to Fig. 1 showing folding doors,

Fig. 4 is a cross-sectional view of the same,

Fig. 5 is an elevation of the door opening and closing mechanism,

Fig. 6 is an enlarged cross-section on the line 6-6 of Fig. 5,

Fig. 7 is a detail of the chain and door connections,

Fig. 8 is a plan view of the operator and the door actuating means, connected,

Fig. 9 is an elevation of the operator mounted on the car,

Fig. 10 is an enlarged transverse vertical sectional view taken on the line 10-10 of Fig. 9,

Fig. 11 is a sectional detail of the worm drive,

Fig. 12 is an enlarged transverse sectional view showing the operator stud wheel in engagement with the shoe of the door operating mechanism and the automatic cut-out,

Fig. 13 is a plan of the stud and shoe mechanism, and

Fig. 14 is a sectional view of the cut-out.

In the drawings the numeral 10 designates the doorway at the floor landing of elevator shaft. In Figs. 1 and 2 I have sliding doors 11, while in Figs. 3 to 6 inclusive I have shown folding doors, the invention not being limited to any particular style of door. The doors 11 of Figs. 1 and 2 part at the center and slide in pairs in the usual manner. These doors are suspended from hangers 13 mounted upon a suitable track 14. The style of door best suited for the building or desired by the owner may be used.

The invention has to do with means for mechanically opening and closing the doors by means of mechanism automatically operated by an electric motor, simply by closing the circuit to said motor. This

mechanism is divided into two main parts which are, door actuating or opening and closing means, carried in shaft wall at the door; and an operator and control carried
 5 on the elevator car and arranged for coupling with the said mechanism for actuating the door.

I will first describe the door actuating means. A lintel is formed over the door-
 10 way 10 by a longitudinal angle member 15 having a slot 16 extending over the doors. At the right hand end (Fig. 5) of the member 15 is mounted a bracket 17 in which are journaled sprocket wheels 18 and 19 respec-
 15 tively; while at the opposite end of the said member a bracket 20 is located. In the bracket 20 is mounted a large sprocket wheel 21 rotatable upon an axle 22 fastened in the bracket. An endless sprocket chain 23 has
 20 one end mounted on the wheel 18 and the other engaged around the wheel 21. A sprocket wheel 24 mounted in the bracket 20 co-acts with the wheel 19 in holding the lengths of the chain in superposed parallel
 25 relation.

For operating the wheel 21 to move the chain a flanged pinion 25 (Fig 6) mounted to revolve on the axle 22 is attached to the hub of the wheel 21. A rack bar 26 (Fig.
 30 5) mounted on guide rollers 27 has teeth 28 on its upper edge engaging with the pinions. By moving the bar longitudinally the pinion is revolved and the chain 23 caused to move. The upper and lower lengths of the chain
 35 move in opposite directions. Where the doors are to slide as in Figs. 1 and 2, a stud 29 is attached to one of the central hangers 13 of one of the middle doors, while a bracket 30 is fastened to the other middle
 40 door.

The chain lengths as is shown best in Fig. 7 are provided with slotted links 31, in offset relation. The stud 29 is fastened in the slot of the lowest link. The bracket 30 is yoke
 45 shape so that the lower length of the chain may pass freely therethrough. This bracket has a stud 32 fastening the link 31 of the upper chain length thereto. It will be seen that when the chain is operated the links
 50 31 will be moved in opposite directions and the door thus slid. Where the doors are hinged the same connections are employed. In order to make an easy and smooth operation the stud 29 and the shank of the bracket
 55 30, are provided with roller sleeves 33 traveling in the slot 16 of the angle member 15, which may be properly lubricated. When the chain is moved in one direction the doors are opened and when moved in the opposite
 60 direction, the doors are closed.

The door actuating mechanism is enclosed in a housing 34 having a cover plate 35 provided with a slot 36 (Figs. 1 and 3). On the rack bar 26 is clamped a block 37 (Figs.
 65 5, 12 and 13) which is slidable on the bar.

This is fastened in the desired position and carries a transverse headed pin 38 on which is mounted a stud roller 39 projecting through the slot 36. Means carried by the
 70 elevator car is arranged to engage the roller 38 and move the same along said slot, whereby the rack bar is moved longitudinally and the door mechanism actuated.

This operating means comprises a rack bar 40 disposed to be positioned parallel to
 75 the bar 26 when the car is stopped at the floor landing (Fig. 8). The bar is supported between flanged guide rollers 41 mounted on standards 42 carried upon a base member 43 suitably supported on the top of the elevator
 80 car (not shown). A vertical channelled shoe 44 is fastened on the rack 40 (Fig. 9) in position to receive the stud roller 39 of the door actuating mechanism. The upper and lower ends of the channel of the shoe
 85 are flared so that it will more readily receive the roller. One of the side walls of the shoe is slotted to receive a vertical contact lever 45. The shoe has an upright standard 46 at one side to the upper end of which is pivoted
 90 the upper end of the shank 47 of the contact lever. A leaf spring 48 bearing against the shank holds the lever to its normal position, whereby its face 49 projects into the channel of the shoe so as to be engaged and
 95 displaced laterally by the stud roller 39.

The displacing of the lever causes a depending spring contact arm 50, carried there-
 100 by, to engage a contact 51 fastened to the shoe, whereby the door operating circuit is closed. A circuit wire A leads from the arm 50, while a circuit wire B, leads from the contact 51. For operating the rack bar an electric motor 52 is mounted on a stand 53
 105 secured to the member 43. This motor drives the rack bar through the agency of a transmission shown in detail in Figs. 10 and 11. The transmission comprises a case 54 mounted on a pedestal 55 secured to the base member 43. The armature shaft 56 of
 110 the motor 52 is extended through and suitably mounted in the upper end of the case. A worm screw 57 is fastened to the shaft 56 and drives a worm gear 58. The gear is loosely mounted on a transverse shaft 59 extending through the casing. A friction
 115 clutch plate 60 fastened on the shaft engages the side of the gear and is revolved thereby. On the shaft 59 outside of the case is secured a flanged pinion 61 which rides in the teeth
 120 62 of the rack bar 40. It will be seen that if the rack bar 40 should fail to move or catch on any obstruction, the clutch plate 60 will permit the gear 58 to continue revolving
 125 without injury to the motor.

It is obvious that when the stud roller 39 is engaged in the shoe 44 and the rack bar
 40 is moved longitudinally the doors will be opened and a reverse movement of the bar
 40, will close the doors. The shoe is of
 130

such length that the car floor must be within a couple of inches of the landing floor, for the roller 39 to be within the shoe and in engagement with the face 49 of the lever 45.

8 The wires A and B of the contacts 50 and 51 are suitably connected in the circuit to the motor 52, in which circuit is also included a switch (not shown) in the car for closing said circuit. It will be seen that
10 the motor circuit cannot be closed while the car is between floors and only when the roller 39 is in the shoe. Thus the shoe cannot be moved out of registering position with the said roller and the doors cannot be
15 opened except when the car is at the floor landing.

It is important that the circuit to the car elevating motor, which is known as the power circuit, be cut off while the doors are open or partially so. To accomplish this I
20 mount a cut-out switch on the base member 43. This switch comprises a box 63 having a transverse shaft 64 fulcrumed thereon. A switch arm 65 is centrally fastened on the
25 shaft 64 and has a transverse contact strip 66 at one end. A pair of spaced contact standards 67 are mounted on an insulating base 68 in the box. The standards are spaced apart so as to be engaged by the
30 wings of the strip 66 and the circuit therebetween closed. Each standard has a depending hanger 69 with a wire receiving eye 70 at its lower end. Power circuit wires C and D entering the box are fastened in the
35 eyes.

Directly over the center of the bar 65 is a vertical tubular housing 71 having elongated trunnions 72 extending through the walls of the box and located in the same vertical
40 plane, as the shaft 64. A spring plunger comprising a head 73, a roller 74 and a reduced shank 75 are mounted in the housing. The roller bears on the bar 65, while the shank extends through the top of the hous-
45 ing. A coiled spring 76 confined in the housing about the shank presses against the head and thus holding the roller on the bar. To one of the trunnions 72 is fastened a right angular tripping lever 77, its legs di-
50 verging from said trunnion. This lever is outside of the box and adjacent the rack bar 40 at one end thereof, as is shown in Figs. 8 and 9. A tripping block 78 slidable upon the bar 40 is fastened in position by a
55 set screw 79 and carries an outwardly directed tripping pin 80.

The lever 77 is normally positioned (Figs. 12 and 14) with one leg vertically in the path of the pin 80 and the other leg directed
60 horizontally toward the pin. The housing 71 is inclined so that the plunger depresses the bar 65, whereby the contact strip 66 is in engagement with the standards 67, thus closing the power circuit, and permitting the
65 elevator car to be operated. When the rack

bar 40 is moved a short distance, say an inch, the pin 80 engages the upstanding leg of the lever 77 and swings the same, whereby the housing 71 is swung to an upright position and then to the opposite inclination.
70 The roller 74 riding on the bar 65, will swing the same, just as soon as it passes the center of said bar. The spring plunger will impel the roller and complete the swing of the bar, which is limited by a stop post 81.
75 This movement will also complete the swing of the lever 77 so that the leg which was normally horizontal, will be vertical and in the path of the pin 80 upon the reverse movement of the bar 40.
80

When the bar 65 is swung the power circuit is broken and the car cannot be moved. It will be seen that the pin 80 will not engage the lever 77 upon the closing movement of the doors, until such movement is
85 nearly completed.

In order to automatically stop the motor 52 when the doors have reached the end of their opening and also when they have reached the end of their closing movement, so as not to injure any of the parts and to eliminate manual manipulation, I provide
90 cut-out switches 82 and 83. In these latter switches the parts are substantially duplicated and the same reference numerals may apply, except that wires E and F lead from the box 82, while wires G and H lead from the box 83. The wires E, F, G and H are
95 connected in a three-way circuit including the motor 52 and the switch in the car. This circuit may be supplied with current from the lighting circuit of the elevator car. The trip pins 80 are located on the bar 40 so that the initial movement thereof will trip the lever 77 of the power circuit switch
100 box 63 and cut off the power to operate the car.

The switch boxes 82 and 83 with their trip levers 77 are arranged so that when the circuit is closed at one box it is open at the
110 other. When the doors are closed the circuit through the switch box 82 is opened and the circuit through the box 83 is closed. Upon the initial movement of the bar 40 to open the doors, the lever 77 of the box 82
115 is tripped, whereby the switch is closed. It will be necessary to use a controlling switch in the car having one pole connected with the box 82 and another pole connected with the box 83. To operate the door, connection is made through the box 83. When the bar
120 40 reaches the end of its opening movement, it will trip the lever 77 of the box 83 and open this switch, whereby the motor will be stopped. Upon closing the circuit through
125 box 82, the bar 40 will be moved in the opposite direction and the levers 77 of the box 83 will be tripped, thus closing said switch and as said bar completes its movement, the
130 lever 77 of the box 82 will be tripped, thus

stopping the motor. By this arrangement the motor will be automatically stopped when the bar reaches each end of its stroke.

What I claim is:

5 1. In an elevator door operating apparatus, means located at the door for opening and closing the same, electrically operated means carried by the car and located to en-
10 gage the door actuating means at the floor landing only, the electrical circuit of the operating means being normally open, and means for closing said circuit when the operating means engages the door actuating means.

15 2. In an elevator door operating apparatus, means located at the door for opening and closing the same, electrically operated means carried by the car and located to en-
20 gage the door actuating means at the floor landing only, the electrical circuit of the operating means being normally open, means for closing said circuit when the operating means engages the door actuating means, and means actuated by the operating means
25 for breaking the power circuit to the car when the doors are opened.

3. In an elevator door operating apparatus, door opening and closing means hav-
30 ing a movable door actuating member of a power circuit switch for the elevator car, means carried by said member for actuating said switch to open the circuit upon move-
35 ment thereof and to close said circuit upon a reverse movement of said member, and circuit switches for the door operating means, and means carried by the member for oper-
40 ating said door circuit switches located to operate one switch when the doors are open and to operate the other switch when the doors are closed.

4. As a sub-combination in an elevator door operating apparatus, a longitudinally movable operating member, a switch box, a contact bar in the box, a contact normally
45 engaged by said bar, a spring plunger bearing on said bar, a trip connected with said plunger to shift it to raise said bar from the contact, and means carried by the operating member for operating the trip upon move-
50 ment of said member.

5. As a sub-combination in an elevator door operating apparatus, a longitudinally movable rack bar, an electric motor con-
55 nected with said rack bar for operating the same, and a shoe carried by said rack bar for engaging a door opening and closing means.

6. As a sub-combination in an elevator door operating apparatus, a longitudinally movable door operating member, an electric motor connected with said member for oper-
60 ating the same, a shoe carried by said member for engaging a door opening and closing means, and a switch carried by the shoe and connected in the motor circuit nor-

mally holding said circuit open, said switch being arranged to be closed when the shoe engages a door actuating device.

7. In an elevator door operating apparatus, the combination with a door opening and closing means having an actuating stud, of an electrically driven operating member, a shoe mounted on the member to receive the stud, and an electrical switch controlling the operating circuit of the operating member carried by the shoe and closed by the stud when the latter is received in the shoe. 75

8. In an elevator door operating apparatus, the combination with movable elevator floor landing doors, of a common operating member connected with said doors for opening and closing the same, means for actuating said member, a connecting element carried by actuating means, a motor operated actuator carried by the elevator car and located to engage the connecting element, and means for cutting off the power circuit of the car automatically operated by said actuator. 80

9. In an elevator door operating apparatus, the combination with movable elevator floor landing doors, of an endless chain at each floor connected with said doors for opening and closing the same, means for actuating said chain, a connecting element carried by actuating means, a motor operated actuator carried by the elevator car and located to engage the connecting element, and means automatically operated for stopping the motor of the actuator when the doors are fully opened and fully closed. 85

10. In an elevator door operating apparatus, the combination with movable elevator floor landing doors, of a common operating member connected with said doors for opening and closing the same, means for operating said member, a reciprocating rack bar actuating said means, a stud carried by the bar, and a motor operated actuator carried by the elevator car and located to engage said stud to reciprocate the rack bar. 100

11. In an elevator door operating apparatus, the combination with movable elevator floor landing doors, of an endless chain having its oppositely movable lengths connected to doors to be parted, a gearing for operating said chain, a rack bar engaging said gearing, a stud carried by the rack bar, and a motor operated actuator carried by the elevator car located to engage said stud. 105

12. As a sub-combination in an elevator door opening and closing apparatus, a horizontal endless chain, a door stud connected to lower length of the chain, and a door bracket straddling the lower chain length and connected to the upper length of the chain, and means for operating the chain to cause the bracket and stud to move in opposite directions. 110

13. In an elevator door operating appara- 115

5 tus, a reciprocating rack bar, a shoe carried by the rack bar, a base member, supports for the bar mounted on the base member, an electric motor mounted on the base member, and a transmission connected to the motor and engaging the rack bar and including a friction clutch. 25

10 14. In an elevator door operating apparatus, a reciprocating rack bar, a vertical shoe carried by the bar, a switch contact arm mounted in the shoe, a base member, supports for the bar mounted on the base member, an electric motor mounted on the base member, and a transmission connected to the motor and engaging the rack bar and including a friction clutch. 30

15 15. In an elevator door operating apparatus, a reciprocating bar, a shoe carried by the rack bar, a base member, roller supports for the bar mounted on the base member, an electric motor mounted on the base member, a transmission case mounted on the base member, a worm gear in the case attached to the motor shaft, a pinion driving the rack bar, and a friction clutch between the worm gear and the pinion. 35

16. In an elevator door operating apparatus, the combination with movable floor landing doors, of an endless chain having its oppositely movable lengths connected to the doors to be parted, a sprocket wheel for actuating said chain, a gear connected with said wheel at one side thereof, a reciprocating rack bar engaging and revolving said gear, a stud carried by said rack bar, and a motor operated actuator carried by the elevator car located to engage said stud to reciprocate the rack bar.

In testimony whereof I affix my signature.

OSCAR P. McGEE.