Dec. 8, 1925 1,565,143

H. J. FEAR

ELEVATOR DOOR CONTROL

Filed Oct. 6, 1924 2 Sheets-Sheet 1

Fig. 1.

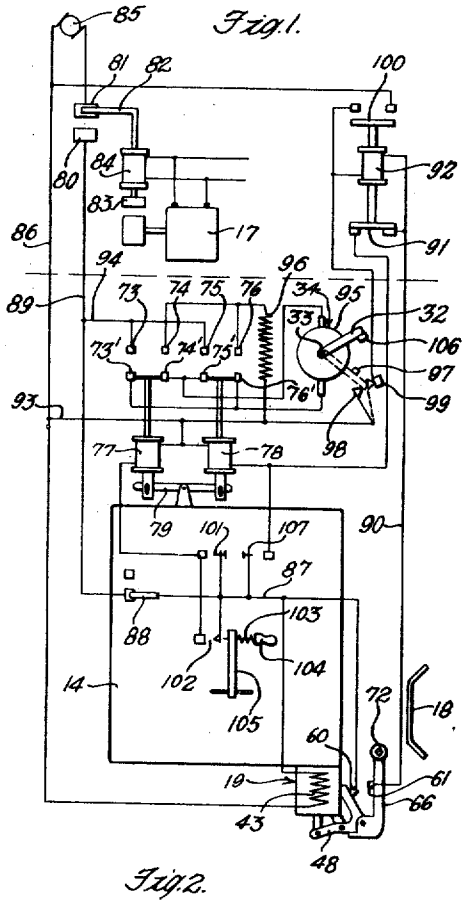


Fig. 2.

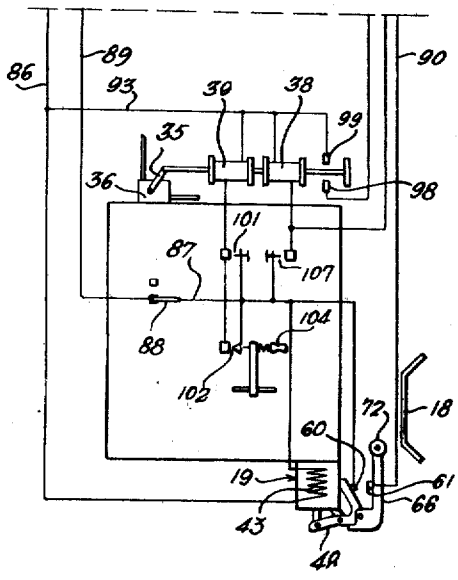


Fig. 3.

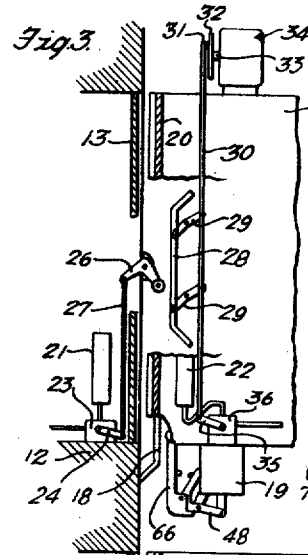


Fig. 11.

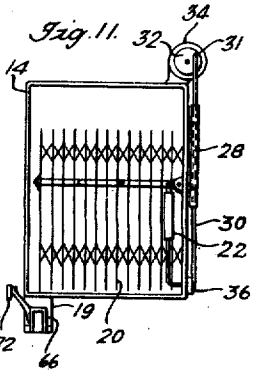


Fig. 4.

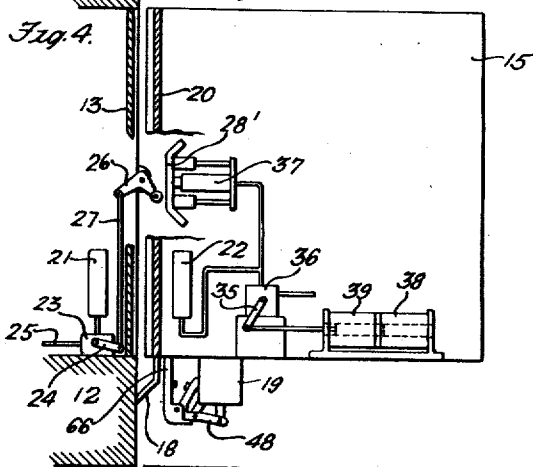
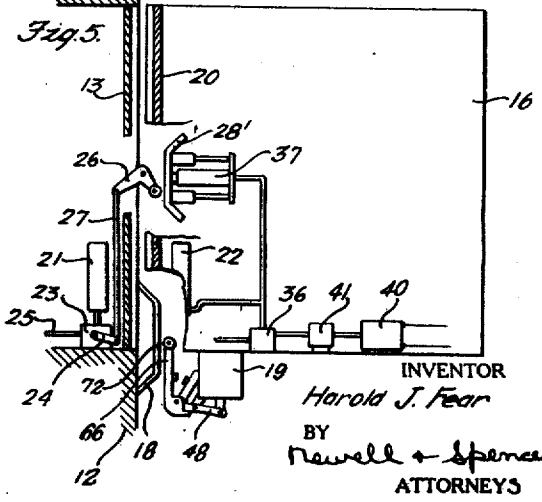


Fig. 5.



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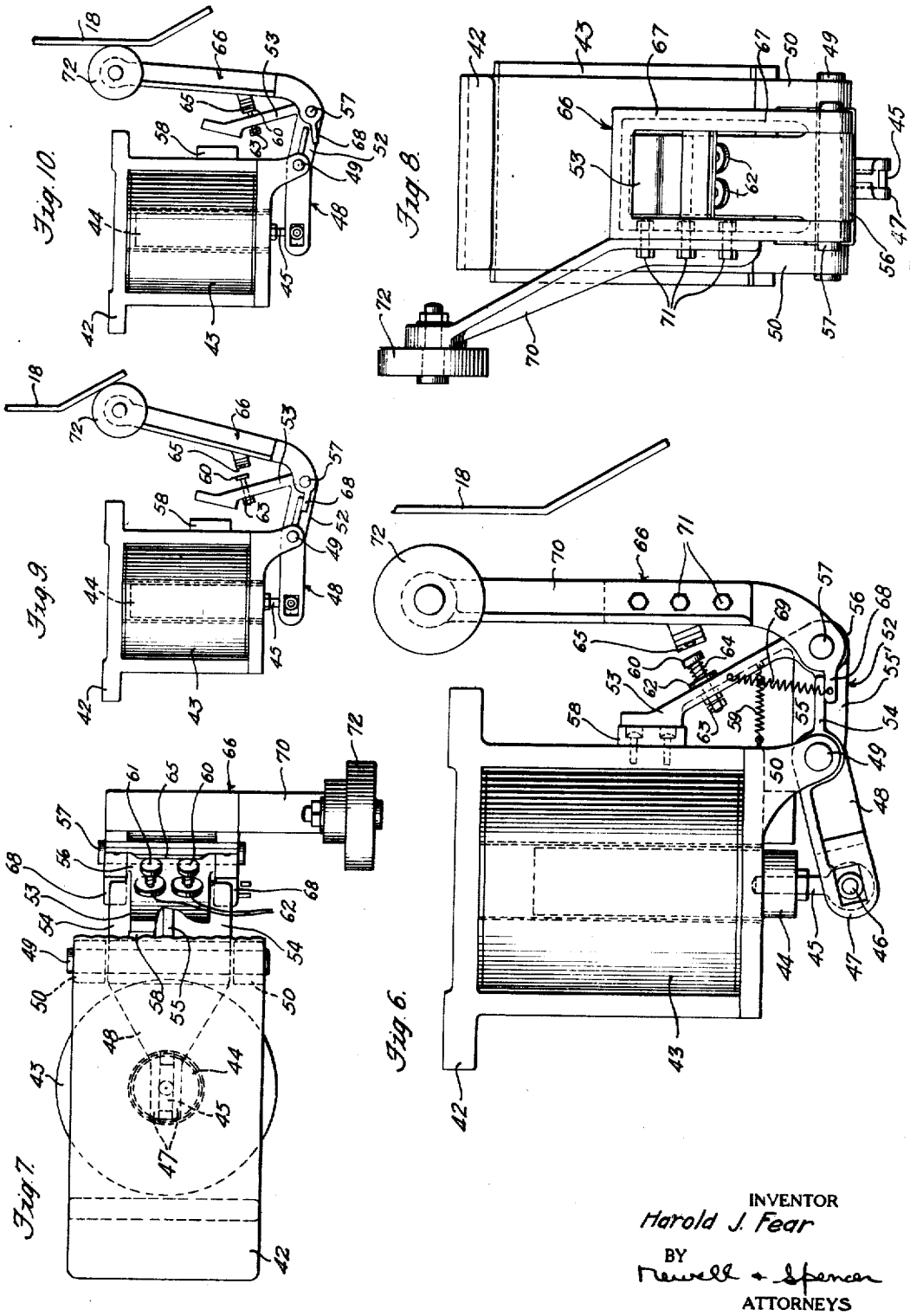

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Patented Dec. 8, 1925. 1,565,143

UNITED STATES PATENT OFFICE.

HAROLD J. FEAR, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO ELEVATOR SUPPLIES COMPANY, INC., OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELEVATOR-DOOR CONTROL.

Application filed October 6, 1924. Serial No. 741,910.

To all whom it may concern:

Be it known that I, HAROLD J. FEAR, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Elevator-Door Controls, of which the following is a clear, full, and exact description.

This invention relates to elevator gate-operating mechanism, and more particularly to the automatic control of such mechanism.

In modern elevator installations the time required by a car to make a trip from the bottom of the hatchway to the top and return is an important consideration, since the number of cars required to handle given traffic depends on this time. This time may be lessened either by increasing the speed of the cars, or by decreasing the time required for stops at the landings. The time spent in opening the gates after the car reaches a landing and closing them as the car leaves is an important factor in the total time required for a trip, especially now that the safety of the passengers often requires the provision of gates on the cars as well as for the openings at the landings.

One object of this invention is to provide gate-operating mechanism which will shorten the time spent after the car reaches the landing in operating the gates, and thereby cut down the time required for a round trip of the car.

Elevator operators in their anxiety to make better time frequently open the car gates while the car is still a considerable distance from the landing, or even fail to close the car gates at all, thereby defeating the purpose of the car gates, which is to increase the safety of the passengers. Various expedients have been suggested to end this practice, but, so far as known, all constructions that prevent opening of the gates before the car reaches the landing delay the car and are thus uneconomical.

Another object of this invention is to provide controlling means for the gate-operating mechanism which wholly eliminates the temptation of the operator to open the gates prematurely, while enabling the car to make as good time as if no car gates were employed.

In accomplishing these objects, the invention contemplates the removal from the operator of the duty to open the gates as the car stops at a landing, and the provision of automatic means to control the opening of the gates at the proper time. Since it is sometimes necessary to reopen the gates after they have been closed, operator-controlled means are also provided for opening the gates, but in order to prevent a premature opening, the operator's controlling means are preferably designed to be inoperative until the hoisting motor is cut out.

It is well known that the fastest gate operation may be achieved by the use of pneumatic engines to move the gates, and the invention has therefore been illustrated in connection with such operating means, but the invention may also be used to advantage in connection with gates operated by other means.

In order to decrease the time required to leave a landing, the closing movement of the gate-operating means is preferably controlled by a button located in the handle of the operator's switch lever which controls the hoisting motor. The operator is then ready to start the car as soon as he has operated the gate-closing button, and furthermore need never remove his hand from the lever.

Some of the desirable results attained by the invention may be realized in elevator installations where the cars are without gates, only the openings at the landings having gates.

In the drawings:

Fig. 1 is a circuit diagram of the invention employing an electric motor to actuate the gate-operating mechanism;

Fig. 2 is a similar diagram showing solenoids instead of a motor;

Figs. 3, 4 and 5 are vertical elevations of various types of mechanism for controlling the operation of the gates according to this invention;

Fig. 6 is a side elevation of an electromagnetic switch carried by the car, in its normal position occupied while the car is running past a floor;

Fig. 7 is a plan view of the switch shown in Fig. 6;

Fig. 8 is a front elevation of the switch;

Fig. 9 is a view on a reduced scale showing the switch of Fig. 6 in the position occupied as the car slows down to stop at a floor;

Fig. 10 shows the switch in the position

occupied while the car is standing at a floor; and

Fig. 11 is a view showing the front of a car as seen from the left of Fig. 3.

In Figs. 3, 4 and 5 there are shown three floor landings 12 having doorways which may be closed by gates or doors 13. Three cars 14, 15 and 16 travel in the hatchway under the control of hoisting motors one of which is shown diagrammatically at 17 in Fig. 1. At each floor landing there is positioned a cam 18 projecting into the hatchway and having a vertically extending face, the length of which determines the length of the zone within which the car must come to a stop in order that the doors shall open automatically. Near the right-hand front corner of each car there is secured to the under frame, below the floor, an electromagnetically operated switch 19. The cars are also preferably provided with car gates 20. The gates at the floor landings are opened by pneumatic engines 21 which are connected thereto by any desired type of linkage (not shown), in such a manner that the admission of air to the engine will open the door, while upon the opening of an exhaust port a spring contained within the engine will close the door. The engines 21 which operate the landing gates 13 are controlled by valves 23 having operating levers 24 arranged to connect the engine cylinders with an exhaust port when in the position shown in Figs. 3, 4 and 5, and to admit compressed air from the line 25 when moved counter-clockwise as seen in said figures. In order to render the landing gate valves controllable from the car, there is provided a false trip 26 consisting of a bell crank lever pivotally secured in the hatchway at each landing. The left-hand arm of each bell crank 26 is linked to the free end of its valve lever 24 by a link 27.

Each car is provided with a movable cam to actuate the false trip at any landing when the gates at that landing are to be opened. This cam is shown at 28 in Fig. 3 and at 28′ in Figs. 4 and 5. The cam 28 is pivoted to the left-hand ends of two bell cranks 29 pivoted to the side of the car, while the right-hand arms of the cranks 29 are pivoted to a rod 30 which hangs from a pin 31, eccentrically mounted on a disk 32, which is supported for rotation with the shaft 33 of a torque motor 34. When the car is equipped with a car gate, the lower end of rod 30 is pivoted to the free end of a lever 35 which operates the car gate valve 36 to operate the engine 22 which opens and closes car gate 20. In Figs. 4 and 5, the cam 28′ is operated pneumatically by an engine 37 to which air is admitted through the car gate valve 36 from the same pressure line which admits air to the car gate engines 22. In Fig. 4 there is shown a solenoid having an opening coil 38 and a closing coil 39, which actuates the car gate valve lever 35 by attracting the magnetic core which is connected to said lever as shown. In Fig. 5 the valve 36 is actuated by a motor 40 which rotates the movable portion of the valve through reduction gearing 41 to open or close the valve in accordance with the direction of rotation of motor 40. It will be observed that whether or not car gates are used, there is provided an electromagnetic device to control the movement of the movable cam, either directly as in Fig. 3 or pneumatically as in Figs. 4 and 5. Whichever type of cam is employed will, when advanced by operation of its electromagnetic controlling means, strike the false trip and thereby open the gate at the landing which the car is near. The length of the movable cam 28 or 28′ defines a zone within which the car must stop to open the landing gate, as it is obvious that the cam cannot strike the false trip until the car has come sufficiently near the landing that the false trip is in the path of movement of the cam when operated.

The electromagnetically operated switch 19, which is carried below the car may be of any suitable construction, but preferably, as shown in Figs. 6 to 10, consists of a frame 42 within which is mounted a solenoid winding 43 within which is mounted a magnetic core piece or armature 44. The armature is supported on a screw-eye 45 journalled on a pin 46, mounted in two ears 47 at one end of an armature lever 48. Lever 48 is journalled on a pin 49 carried in ears 50 which depend from opposite sides of the front of frame 42. The armature lever has a forward extension 52 from the free end of which extends a preferably integral arm 53. In order to make the forward arm 52 of the armature lever light and strong, it is preferably formed as a flat horizontal sheet 54 having a central flange 55 projecting upwardly near its center and a similar flange 55′ projecting downwardly below the first flange. The free end of lever arm 52 is enlarged to form a boss 56 which carries a transverse pin 57. The upper end of extension 53 of the armature lever is shaped to rest in contact with a cushion 58 mounted on the frame. The weight of armature 44 is sufficient to retract the armature lever and hold the same in the position shown in Fig. 6 when coil 43 is deenergized, but a spring 59 may, if desired, be stretched between the frame and extension 53 to hasten retractile movement of the armature.

Two movable contacts 60, 61 are mounted in insulating bushings 62 transversely spaced on extension 53 of the armature lever. The contacts 61 are preferably threaded at their lower ends to receive nuts 63 to which con-

ductors may be secured, and are normally held in the position shown in Fig. 6 by compression springs 64. To complete the circuit between contacts 60 and 61 there is provided a conducting plate 65 carried by a second lever movably mounted on the armature lever. This second lever designated as a whole by 66 should be of the lightest construction consistent with necessary strength, and therefore preferably consists of a more or less rectangular yoke 67, the lower ends of which are pivotally supported on pin 57 carried by boss 56 of the armature lever. As seen in Fig. 6, the pivot arms have fingers 68 which normally engage the lower face of sheet 54 to limit movement of the contact plate 65 away from the spring contacts 60, 61. A spring 69 connects extension 53 with one of the fingers 68 normally to hold lever 66 in the position shown in Fig. 6, in which plate 65 is removed from the spring contacts, and the circuit therebetween is thus interrupted. In order that lever 66 may be moved to close the circuit between contacts 60 and 61 by the cams 18 situated at the landings in the hatchway, an upwardly and outwardly extending bracket 70 is secured as by bolts 71 to the outer vertical face of frame 67. A cushion roller 72 is suitably journalled at the end of bracket 70 in any desired manner.

From the foregoing description of the structure of the electromagnetically operated switch 19, it will be apparent that so long as magnet coil 43 is deenergized the lever 66 and its roller 72 will be held in a position to avoid landing cams 18 as the car travels in the hatchway and the switch will be open. When coil 43 is energized, the armature 44 is attracted and moves both armature lever 48 and the second lever 66 so as to throw roller 72 into position to engage the cam 18 at the landing which the car next reaches. Until the roller strikes the cam, the parts are in the position shown in Fig. 9 and the switch is still open. As soon as the roller 72 rides up on the face of the cam, armature lever 48 being still held in its attracted position by the energized coil 43, lever 66 is rotated counter-clockwise until conducting plate 65 bridges contacts 60 and 61 to close the switch and complete a circuit to be described. If while the car is at a landing with roller 72 resting on a cam 18, coil 43 is deenergized, armature lever 48 will be retracted to open the switch at once. Moreover, the roller 72 will be withdrawn from engagement with the cam by bodily movement of lever 66 caused by the counter-clockwise rotation of the armature lever.

The operating circuits for the mechanism shown in Fig. 3 are indicated diagrammatically in Fig. 1. From the description of the mechanism it will be apparent that if torque motor 34 is rotated a fraction of a turn (usually three-quarters of a turn), rod 30 will be lowered, thereby opening the car gate valve 36 to open the car gate, and throwing out cam 28 to strike false trip 26 which opens landing gate valve 23 and thereby opens the landing gate. To control the operation of torque motor 34 there is provided a reversing switch having fixed contacts 73, 74, 75 and 76, and movable contacts 73′, 74′, 75′ and 76′. The movable contacts 73′ and 74′ are mounted on an insulating base carried by the plunger of a solenoid 77 arranged when energized to close the movable contacts against the fixed contacts. Contacts 75′ and 76′ are similarly controlled by a solenoid 78. The two solenoid plungers are linked together by a pivoted lever 79 which prevents the closing of both sets of contacts at the same time, even though both coils 77 and 78 are energized. In order that the circuit for torque motor 34 may be automatically completed when the car nears a floor at which it is to stop, there is provided a switch, here shown as a fixed contact 80, and a movable contact 81 operated by a member 82 movable with the brake 83 of the hoisting motor 17 which hoists the car. The operation is as follows: When the car approaches floor 12, it may be stopped by opening the energizing circuit of motor 17 at the operator's control handle 105. When the hoisting motor 17 is cut out, brake magnet 84, which is usually connected in the hoisting motor circuit, deenergizes and closes contact 81 against contact 80. A circuit is thereby completed to energize coil 43 of electromagnetic switch 19, which may be traced from a source of power 85 through conductor 86, coil 43, conductor 87, switch 88, and conductor 89 to the opposite pole of the source of power. Armature lever 48 is thereby moved to throw operating member 66 into position to engage the cam 18 at the landing. When the car comes within the gate-opening zone of the landing, roller 72 moves switch-operating member 66 counter-clockwise to close contacts 60, 61 in the manner previously described. The closing of this switch establishes an energizing circuit for opening coil 78 which may be traced from the right-hand side of the source of power 85, contacts 81, 80, conductor 89, switch 88, conductor 87, contacts 60, 61, conductor 90, switch contacts 91 of a relay 92, coil 78, conductors 93 and 86 to the left-hand side of the source of power. Opening coil 78 in energizing closes contacts 75, 75′ and 76, 76′ to operate torque motor 34 over a circuit which may be traced from the right-hand side of the source of power 85, contacts 81, 80, conductor 94, contacts 75, 75′, armature 95, contacts 76′, 76, field winding 96 of the motor, conductors 93 and 86 to the left-hand side of the source of power. The path of the cur-

rent through the armature and field winding, just traced, rotates the armature with its shaft 33 in a counter-clockwise direction until arm 32 strikes a stop 97. During this fractional turn of the torque motor, rod 30 is lowered and the car and landing gates are consequently opened in the manner previously described. Arm 32 of the motor near the completion of its turn strikes a movable contact 98 and moves it into engagement with a fixed contact 99, as shown in dotted lines in Fig. 1, thereby completing an energizing circuit for relay 92 which may be traced from the left-hand side of the source of power, conductors 86 and 93, contacts 98, 99, winding of relay 92, conductor 90, switch contacts 61, 60, conductors 87 and 89, and the brake magnet contacts to the right-hand side of the source of power. Relay 92 in lifting its plunger opens switch contacts 91 and closes switch contacts 100. It will be recalled that the circuit for opening coil 78, which was automatically completed as the car reached the floor, extended through contacts 91 of relay 92 so that the opening of these contacts prevents a second automatic energization of opening coil 78, and thereby prevents a second automatic opening of the gates so long as contacts 91 remain open. In order that these contacts may be held open as long as the car stands at the floor, irrespective of the position of the torque motor and contacts 98, 99, there is provided a holding circuit for relay 92 which places this relay under the control of the brake magnet 84, so that relay 92 will remain energized until the car leaves the floor. The holding circuit may be traced from the right-hand side of the source of power, through the brake magnet contacts, conductors, 89, 87, switch contacts 60, 61, conductor 90, winding of relay 92, and contacts 100 thereof to the left-hand side of the source of power.

The opening of contacts 91 deenergizes opening coil 78, thereby opening contacts 75, 75′ and 76, 76′ to interrupt the circuit for the torque motor. There is thus no loss of power while the car stands at a floor, the only parts of the apparatus drawing current during that time being the coil 43 of electromagnetic switch 19 and the winding of relay 92. These may be made of high resistance so that the current consumption is small. However, if the car is to be left idle for a long period, such as over night, switch 88 may be opened and there is then no current at all being consumed by the gate-actuating mechanism.

When the car conductor desires to leave the floor he should manually close a switch which will actuate the gate-operating mechanism to close the gates. Preferably two switches are provided for this purpose, one a push-button 101 and the other a pair of normally open contacts 102 which are in alignment with a pin 103 upon which is mounted the handle 104 of the lever 105 which controls the supply of current to the hoisting motor 17, when the lever 105 is in its off position, which is should occupy while the car is standing at a floor. The conductor without removing his hand from the control lever presses handle 104 so that pin 103 closes contacts 102. The closing coil 77 is thereby energized over a circuit which may be traced from the right-hand side of the source of power, brake magnet contacts, conductor 89, switch 88, contacts 102, closing coil 77, conductors 93 and 86 to the left-hand side of the source of power. Upon the energization of the closing coil, contacts 73, 73′ and 74, 74′ are closed to complete a circuit for the motor which may be traced from the right-hand side of the source of power, brake magnet contacts, conductors 89, 94, contacts 73, 73′ through the armature 95, contacts 74′, 74, field winding 96, and conductors 93 and 86 to the left-hand side of the source of power. This circuit causes the motor to rotate in a clockwise direction until arm 32 abuts a stop 106. Such rotation of the motor raises rod 30 to withdraw cam 28 from contact with false trip 26, thus permitting means such as a spring, not shown, to restore landing gate valve 23 to normal position, as a result of which the landing gate closes. Rod 30 in being lifted also restores car gate valve 36 to normal position, and the car gate closes. At the beginning of the rotation of the motor arm 32 it opened contacts 98, 99, thereby interrupting the initial energizing circuit for relay 92, but this relay remains energized over the previously traced holding circuit through its contacts 100. The operator, having pressed handle 104 to close contacts 102, releases the pressure and the contacts open to deenergize closing coil 77.

Should the conductor for any reason desire to again open the gates, he may press pushbutton 107 to energize opening coil 78 over a circuit which may be traced from the right-hand side of the source of power, brake magnet contacts, conductor 89, switch 88, switch 107, coil 78, conductors 93 and 86, to the left-hand side of the source of power. The gates may be closed again by pressure on handle 104 or pushbutton 101, so that once the car has stopped at a floor and the gates have been opened automatically, they may be controlled at will by the operator through opening and closing switches.

As the car conductor shifts lever 105 to cut in the hoisting motor, brake magnet 84 is energized, opening contacts 80 and 81 to deenergize coil 43 of the electromagnetic switch 19. The holding circuit for the relay 92 is interrupted at the same time, so that relay 92 deenergizes and closes its contacts 91 preparatory to the automatic completion

of the circuit for opening coil 78 for the next stop at a landing. Switch coil 43, in deenergizing, opens contacts 60, 61 and withdraws roller 72 from position to strike cams 18, so that all parts of the operating circuits for the gates are in normal position, and no power is being consumed.

The operating circuits just described in connection with gate-operating mechanism actuated by a torque motor 34, are identical in every respect when there is substituted a motor 40 (see Fig. 5) making a number of revolutions in order to open valve 36 by means of the reduction gearing 41, but the arm 32 which closes contacts 98, 99 when the valve is fully open must be mounted on a rotating part of the valve instead of on the motor shaft.

The circuits employed with the structure shown in Fig. 4, in which valve lever 35 is moved to open valve 36 by an opening coil 38 and to close the valve by a closing coil 39 of a solenoid, are shown in Fig. 2. It will be observed that opening coil 38 is placed in circuit as a substiutute for opening coil 78 of the reversing switch, and closing coil 39 is placed in the circuit as a substitute for closing coil 77 of the reversing switch. The parts above the dotted line are exactly as shown in Fig. 1, and have not therefore been reproduced. As the car stops at a floor, opening coil 38 is automatically energized over the same circuit traced in Fig. 1 for opening coil 78, but in this case coil 38 itself moves the plunger to the left and opens valve 36. At the end of the stroke of the plunger a conducting disk carried by the plunger interconnects contacts 98 and 99 for the purpose previously described in connection with Fig. 1. To close the gates the conductor operates switch 101 or handle 104 to energize closing coil 39 which closes valve 36 and thereby closes the gates. The right-hand movement of the solenoid plunger also opens contacts 98, 99.

In the constructions shown in Figs. 4 and 5 the car must be supplied with pressure fluid, such as air, and a valve 36 to control cam 28', even though no car gates are employed, but in the construction shown in Fig. 1 the car needs no air supply since cam 28 is thrown out mechanically by rod 30. The invention may be used with any of the other well-known types of door-actuating apparatus, but in all cases there will be some electromagnetic device to perform the function of the torque motor 34 shown in Fig. 3, the solenoid windings 38, 39 shown in Fig. 4, or the motor 40 shown in Fig. 5. The circuit for the electromagnetic switch 19 will be completed either by brake magnet contacts or by some movable member, so that the circuits described will serve to automatically open the landing gates, and car gates when provided, whenever the car stops at a landing, regardless of the particular mechanism employed to apply power to the gates.

What I claim as new is:

1. In combination, a hatchway having floor landings, gates at the landings, a car, a hoisting motor and means to cut out the same, gate operating mechanism at the floors, a relay to control the gate opening movement of said mechanism, an operating circuit for said relay including a normally open switch carried by the car, cams at the landings, a member to close said switch normally held out of line with the cams, and means operated when the hoisting motor is cut out for throwing said member into position to strike the cam and close the switch as the car reaches the landing.

2. In combination, a hatchway having floor landings, cams at the landings, a car and hoisting means therefor, means for controlling the hoisting means, a switch on the car, means responsive to the closing of the switch for opening the gate at the landing which the car is near, a lever to close the switch upon engagement with one of the cams, said lever being normally out of position to engage a cam, and means operated when the hoisting means is cut out for moving the lever into position to engage a cam.

3. In combination, a hatchway having floor landings, gates at the landings, cams at the landings, a car and hoisting means, a switch carried by the car, a switch operating lever whose normal path of movement does not intersect the cams, means responsive to the cutting out of the hoisting means for throwing said lever into position to engage a cam as the car reaches a floor, the lever being moved by engagement with a cam to close the switch, and an electromagnetic device operated by closure of the switch to open the gate at the floor at which the car is to stop.

4. In combination, a hatchway having floor landings, gates at the landings, a car, a hoisting motor and means to cut out the same, cams in the hatchway at the floors, an electromagnetic responsive device carried by the car and having a lever normally out of alignment with the cams, means operated when the hoisting motor is cut out to energize said device to move its lever into line with the cams, and means responsive to the engagement of a cam with the lever for opening the gate of the floor at which the car stops.

5. In combination, a hatchway having floor landings, gates at the landings, cams at the landings, a car and hoisting means therefor, a magnet carried by the car, an armature lever for the magnet, a second lever movably mounted on the first lever, normally open contacts on said levers, means for normally holding the second lever in position to avoid the cams as the car travels,

means operated when the hoisting means is cut out for energizing said magnet to attract its armature lever and thereby move the second lever into position to engage a cam when the car nears a floor, the cam in engaging the second lever moving the latter to close the contacts, a relay energized in response to the closure of the contacts, and means for opening the gate of the floor at which the car is to stop in response to the energization of the relay.

6. In combination, a hatchway having floor landings, gates at the landings, a fluid pressure engine to open each gate, a valve to control each engine, a car and hoisting means therefor, a movable cam carried on the car, an electromagnetic device to control the movement of the cam, means automatically actuated when the car approaches a floor with the hoisting means cut out for energizing said electromagnetic device to operate the cam, and means engageable with the operated cam to open the valve for the engine at the floor the car is approaching.

7. In combination, a hatchway having floor landings, gates at the landings, a fluid pressure engine to operate each gate, a valve to control each engine, an operating lever for each valve projecting into the hatchway, a fixed cam at each landing, a car and hoisting means therefor, a member on the car normally clearing the cams but movable into position to engage therewith as the car nears a floor, a movable cam on the car normally clearing the valve operating levers but arranged when displaced to engage and actuate the lever at the floor which the car is near, means automatically actuated when the hoisting means are cut out to operate the movable member on the car, and means responsive to the engagement of said member with a fixed cam for displacing the movable cam on the car, whereby the gate at a floor will be automatically opened as the car stops at that floor.

8. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, a gate at each landing, a gate on the car, an engine individual to each gate to operate each gate, electromagnetically actuated means to control the car gate engine and the engine at the landing which the car is near, and means operated automatically when the car comes within a predetermined distance from a landing with the motor cut out for operating said electromagnetically actuated controlling means to open the gates.

9. In combination, a hatchway having floor landing, a car, a hoisting motor and means to cut out the same, gates at the landings and on the car, gate opening mechanism individual to each gate and means automatically actuated when the car nears a floor with the hoisting motor cut out to open the car gate and the landing gate at that floor only.

10. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, gates at the landings and on the car, gate opening mechanism individual to each gate, and means automatically actuated when the car comes within a predetermined distance of a floor with the hoisting motor cut out for operating the car gate opening mechanism and for thereafter operating the gate opening mechanism at the landing which the car is near.

11. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, gates at the landings and on the car, cams at the landings, a switch on the car, an operating member for the switch normally held out of position to engage the cams, means automatically actuated when the hoisting motor is cut out to move said member into position to engage a cam and close the switch as the car nears a landing, gate opening mechanism, electromagnetic means to control the gate opening mechanism, and an operating circuit for said electromagnetic means completed by the closure of the switch.

12. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, gates at the landings and on the car, pneumatic engines to operate the gates, a valve for each engine, an electromagnetic device to control the operation of the car gate valve, a movable cam on the car operated whenever the car gate valve is operated, linkage actuated by the cam when operated to operate the landing gate valve at the landing the car is near, an electromagnetic device to operate the car gate valve, an operating circuit for said device, a normally open switch on the car to complete said circuit, cams at the landings, a switch operating lever carried on the car normally out of position to engage the cams, and means responsive to the cutting out of the hoisting motor for projecting said lever into position to engage a cam as the car nears a floor and thereby close said switch, whereby the gates will automatically open when the car stops at a floor.

13. In combination, a hatchway having landings, gates at the landings, a car, a hoisting motor and means to cut out the same, gate operating mechanism, an electromagnetic device carried on the car to control the mechanism of the gate at the landing which the car is near, a relay to actuate said controlling means, an operating circuit for the relay completed when the car nears a floor with the hoisting motor cut out, a second relay to interrupt the circuit of the first relay, and a switch operated when said controlling means are actuated

to complete an operating circuit for said second relay.

14. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, gates at the landings and on the car, mechanism to operate the gates, electromagnetic opening and closing coils to control respectively the opening and closing movement of said mechanism, an operating circuit for the opening coil including an electro-magnetic switch carried by the car and the normal contacts of a relay, means controlled in accordance with the travel of the car for closing said switch as the car nears a landing with the hoisting motor cut out and maintaining closed said switch while the car stops at a landing thereby completing the opening coil circuit to open the gates, a contact closed by said mechanism to complete the circuit for said relay thereby interrupting the opening coil circuit, and a circuit including said switch to hold said relay energized to prevent a second automatic opening of the gates while the car stands at a landing.

15. In combination, a hatchway having floor landings, a car, a hoisting motor and means to cut out the same, gates at the landings, pneumatic engines to operate the gates, valves for the engines, mechanism on the car to open the valve of the engine at the landing which the car is near and thereby open the gate at that landing, an electromagnetic device on the car to control said mechanism, an operating circuit for said device automatically completed when the car approaches a landing with the hoisting motor cut out and including the normal contacts of a relay, an energizing circuit for said relay completed when said valve opening mechanism is actuated to open the gate, and a holding circuit for said relay including a switch closed until the car starts, whereby the gate will not automatically open a second time while the car stands at a landing.

16. In combination, a hatchway having floor landings, a car and hoisting means, gates at the landings, an electromagnetic device to control openings of the gate at the landing which the car is near, means actuated when the hoisting means is cut out to prepare a circuit for said gate opening device, and means at a landing to complete the circuit and open the gate when the car comes within a predetermined distance of the landing.

17. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device controlling each gate, a valve for each device, a car and hoisting means, a controller therefor, a cam on each car for actuating said valve and electromagnetically controlled means brought into operation in the neutral position of said controller to move said cam into operative position.

18. In combination a hatchway having floor landings, gates at the landings, fluid pressure devices controlling the said gates, a valve to control said devices, a car and hoisting means therefor, a controller for said hoisting means, a movable cam carried on the car, an electro-magnetic device to control the movement of the cam, means actuated upon moving the controller in its neutral position for controlling said electromagnetic device to cause the cam to be moved into operative position and means engageable with the cam to operate the valve for the fluid pressure devices at the floor the car is approaching to open the gate at this floor.

19. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device for controlling each gate, a valve for each device, a car, hoisting means therefor, a controller for said hoisting means, a contact member carried on the car and movable with relation to the car, a movable element at each floor for engagement with said contact member, connections between said movable element and valve for actuating the valve and means brought into operation upon movement of the controller to neutral position to move said contact member into operative position and thereby actuate the said movable element to open the gate at the landing at which the car is stopped, said means comprising an electro-magnetic device controlled by said controller.

20. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device for controlling each gate, a valve for each device, a car, hoisting means therefor, a controller for the said hoisting means, a contact member on the car and movable with relation to the car into and out of operative position, a movable element at each floor for engagement with said contact member, connections between said movable element and the valve for actuating the valve and means controlled by said controller for moving said contact member into and out of operative position and comprising an electro-magnetic device for moving said contact member in one direction.

21. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device for controlling each gate, a valve for each device, a car, hoisting means therefor, a controller for the said hoisting means, a contact member on the car and movable with relation to the car into and out of operative position, a movable element at each floor for engagement with said contact member, connections between said movable element and the valve for actuating the valve and automatic means controlled

by the position of said controller for moving said contact member into operative position when the controller is moved into neutral position, said last means comprising an electro-magnetic device and a switch therefor controlled by said controller.

22. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device for controlling each gate, a valve for each device, a car, hoisting means therefor, a controller for said hoisting means, a contact member carried on the car and movable with relation to the car, a movable element at each floor for engagement with said contact member, connections between said movable element and the valve for actuating the valve and means controlled by said controller to move said contact member into operative position upon moving said controller to neutral position, and thereby actuate the said movable element to open the gate at the landing at which the car is stopped.

Signed at New York, New York, this 27th day of September, 1924.

HAROLD J. FEAR.

by the position of said controller for moving said contact member into operative position when the controller is moved into neutral position, said last means comprising an electro-magnetic device and a switch therefor controlled by said controller.

22. In combination a hatchway having floor landings, gates at the landings, a fluid pressure device for controlling each gate, a valve for each device, a car, hoisting means therefor, a controller for said hoisting means, a contact member carried on the car and movable with relation to the car, a movable element at each floor for engagement with said contact member, connections between said movable element and the valve for actuating the valve and means controlled by said controller to move said contact member into operative position upon moving said controller to neutral position, and thereby actuate the said movable element to open the gate at the landing at which the car is stopped.

Signed at New York, New York, this 27th day of September, 1924.

HAROLD J. FEAR.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,565,143, granted December 8, 1925, upon the application of Harold J. Fear, of Montclair, New Jersey, for an improvement in "Elevator-Door Controls," an error appears in the printed specification requiring correction as follows: Page 7, line 76, claim 18, for the word "in" read *into;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of January, A. D. 1926.

[SEAL.]

WM. A. KINNAN,
Acting Commissioner of Patents.

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