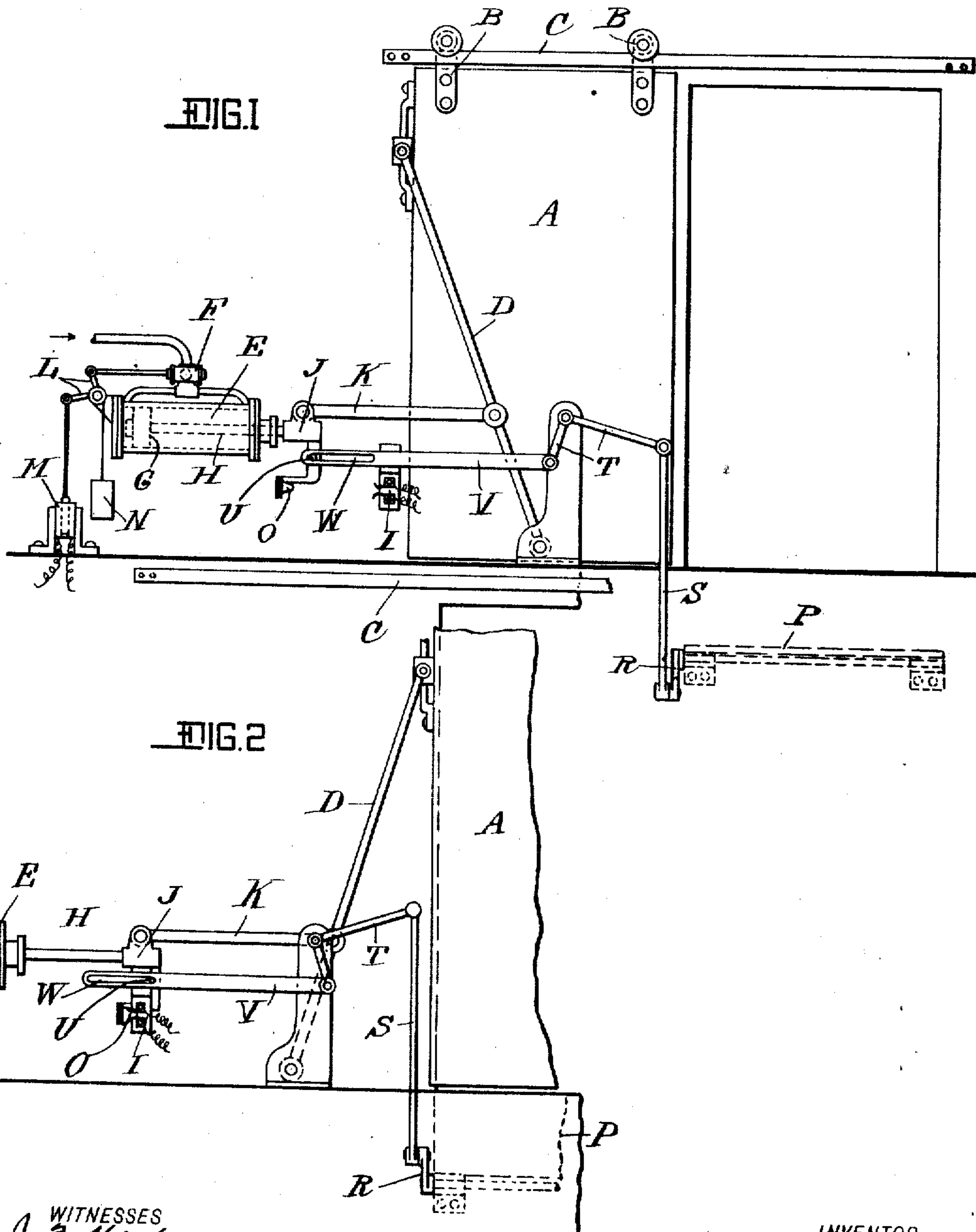


H. ROWNTREE.
ELECTRICALLY CONTROLLED DOOR OPERATING MECHANISM FOR STREET OR RAILWAY CARS.
APPLICATION FILED SEPT. 20, 1906.

920,183.

Patented May 4, 1909.
2 SHEETS—SHEET 1.



WITNESSES
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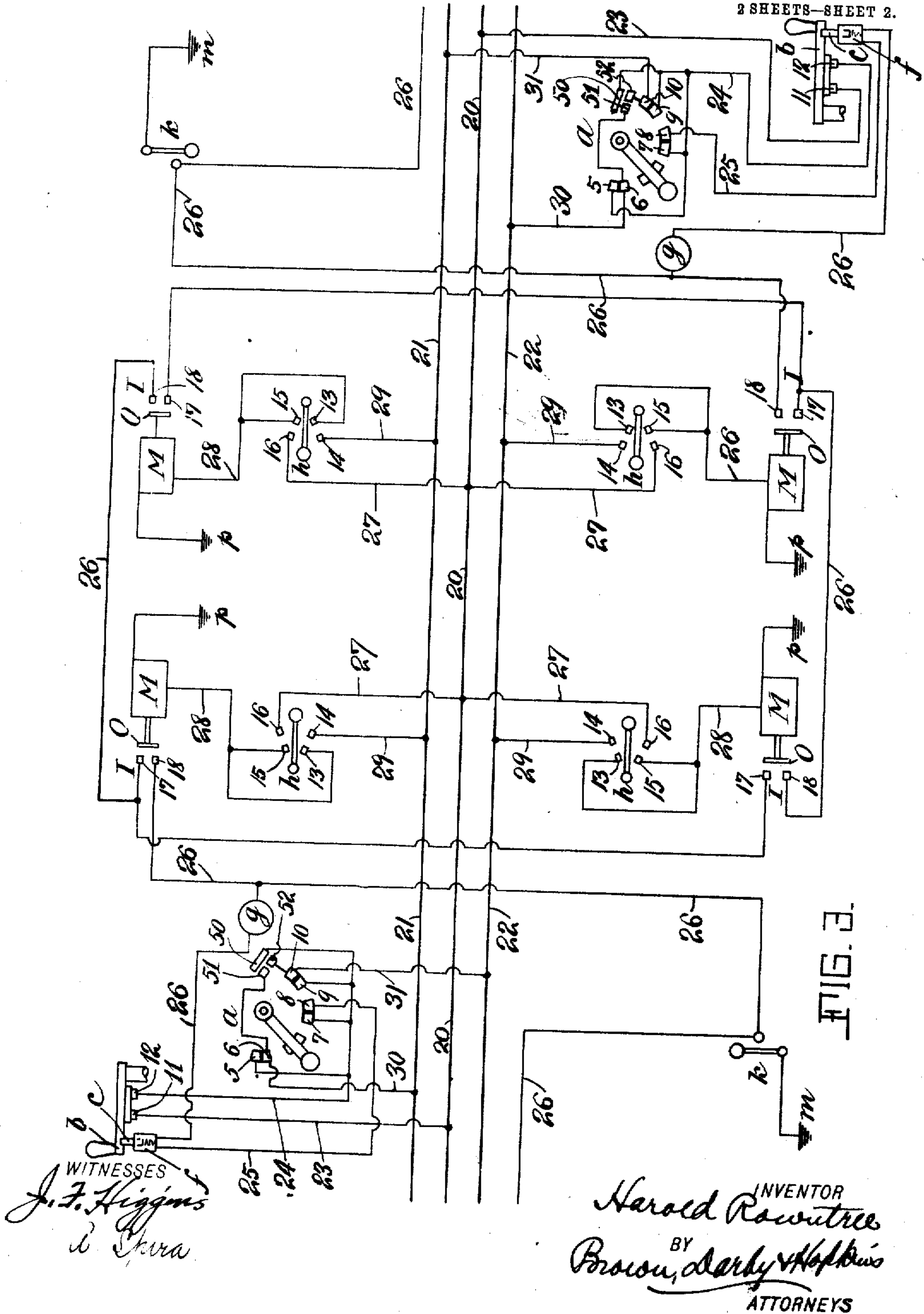
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UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF CHICAGO, ILLINOIS, ASSIGNOR TO BURDETT-ROWNTREE MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTRICALLY-CONTROLLED DOOR-OPERATING MECHANISM FOR STREET OR RAILWAY CARS.

No. 920,183.

Specification of Letters Patent.

Patented May 4, 1909.

Application filed September 20, 1906. Serial No. 335,375.

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing in Chicago, county of Cook, State of Illinois, have made a certain new and useful Invention in Electrically-Controlled Door-Operating Mechanism for Street or Railway Cars, of which the following is a specification.

The invention relates to electrically controlled door operating mechanism for street or railway cars.

The object of the invention is to provide an electrically controlled door operating mechanism, for street and railway cars, which is simple in construction, and efficient in operation, and wherein the control of the door operating mechanism is so arranged as to efficiently guard against accident through an untimely opening of the doors.

A further object is to provide means for controlling the operation of all the doors from a single point.

A further object is to provide means for indicating when all the doors on the car, or train of cars, are closed, so that the car or train may not be started until such indication is received.

A further object is to provide means whereby all the doors of a car or train may be controlled from the same point while at the same time individual doors are capable of being independently controlled for emergency use.

A further object is to provide means for preventing the car or train motor from being put into operation until all the doors of the car or train are closed.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference signs appearing thereon:—Figure 1 is a broken-view in elevation of an operating mechanism for a street or railway car door, the door being shown in its open position, and embodying the principles of my invention. Fig. 2 is a similar view showing the door in its closed

position. Fig. 3 is a diagram showing the electrical connections of the control and signal or indicating mechanisms.

The same part is designated by the same reference sign wherever it occurs throughout the several views.

A, designates a door mounted to slide into open or closed position, and to this end, said door may be suspended by hangers B, from a track C, in the usual, or any suitable or convenient manner. Pivotaly mounted at one end to a fixed part of the car, is a swinging arm D, the other end of said arm having sliding connection with the door. Any suitable or convenient power mechanism may be employed to operate the swinging arm D. In the particular form shown, to which, however, my invention is not to be limited or restricted, I employ a compressed air motor in the form of a cylinder E, suitably supported in convenient position upon the wall of the car, a valve operating in a valve-casing F, serving to control the supply and exhaust of air to and from each end of the cylinder. Within the cylinder operates a piston G, to the rod H, of which is connected a cross head J, which is connected to the swinging arm D, by a connecting rod K, so that when the power mechanism is operated in one direction the door is positively moved to opened position, and when the power mechanism is operated in the opposite direction the door is positively moved to closed position. The valve ports through which the power medium is admitted to or exhausted from the cylinder are made of small area so that the speed of operation of the door will be comparatively slow.

The operation of the power motor may be controlled in many specifically different ways. I have shown a simple and efficient control, in the example of my invention illustrated in the drawings, wherein the valve which controls the supply and exhaust of the operating medium to and from the motor, is connected through its stem, to one arm of a bell crank lever L, to the other arm of which is connected the core of a solenoid M, in such manner that when the solenoid is energized its core is drawn down thereby rocking the bell crank lever L, in a direction to shift the valve to admit the operating medium to the front end of the motor cylinder.

der, and to open the rear end of the cylinder to exhaust, thereby operating the swinging arm D, in a direction to move or shift the door to opened position. The valve may
 5 be moved in the opposite direction to reverse the action of the motor in any suitable or convenient manner, as, for instance, by gravity, spring or weight, as indicated at N, which, when the solenoid is deenergized,
 10 shifts the valve in the opposite direction thereby admitting the operating medium to the rear end of the cylinder, and hence effecting a positive movement of the door to closed position.

15 P, designates a movable car step having connection through a crank arm R, and link S, to one arm of a bell crank lever T, to the other arm of which is connected a rod V, having a longitudinally extending slot W,
 20 in which works a pin or stud U, carried by the cross head J. Also connected to move with the cross head or other convenient movable part of the motor or its connections is an insulated contact O, adapted, when the
 25 door is moved to closed position, to enter a switch box I, and to close an electric circuit to be presently referred to.

I do not claim herein the construction and arrangement of car step and operating mechanism therefor associated as shown and
 30 described, with the door operating devices.

By the provision of the slot W in the step operating rod V, with the cross head pin U, operating therein, it will be observed that
 35 when the door is in closed position, see Fig. 2, the step is positively held in its retracted position, and when the door commences its opening movement the step is instantly released and as the door continues its opening
 40 movement, the step is free to move by gravity or otherwise into position for use, and attains its operating or usable position before the door completes its opening movement, and that when the door is in its completely
 45 open position, as shown in Fig. 1, the step is locked in its position for use.

The operation of the construction so far described will be readily understood from the foregoing description, taken in connection
 50 with the accompanying drawings.

I have described the construction and arrangement of operating mechanism of, and equipment for, only one door and it is to be understood that all of the doors of a car, are
 55 to be similarly constructed and equipped.

In Fig. 3 I have shown a diagram of electrical connections of one car provided with four doors, two at each end, for controlling the door operating mechanism and signal devices. It is to be understood, however, that my invention is not to be limited with respect to the number of doors nor the location thereof on a car. It is also to be understood that where a train of cars is employed each
 65 car of the train is to have a similar arrange-

ment of wiring connections with suitable conductor couplings between adjacent cars in the train.

Reference sign *a*, designates a control switch for the door operating and signal
 70 mechanisms. This switch when moved into one position effects a closure of circuit between the contacts 5, 6, and when moved into another position effects a closure of circuit between contacts 7, 8, and when moved
 75 into a third position effects a closure of circuit between contacts 9, 10, and when moved into a fourth position closes circuit between a contact 50, and cooperating contacts 51, 52, and when moved into a fifth position opens
 80 all of the circuits controlled by said contacts. This switch *a*, is to be located in convenient position to be under the control of the motorman, by whom the car motor is also controlled. Thus, where one car is employed, a
 85 switch *a*, is located at each end of the car, and in case of a train, then in the cab or other compartment or space occupied by the train motorman, or, in a train of cars of the multiple unit system, then on both the front and
 90 rear ends of each car of the train. Also located at the point from which the car or train motor is controlled whether for a single car, or a train of cars, as above explained, is the motorman's controller, the handle of
 95 which is indicated at *b*, and which, when in "off" position is designed to close circuit between contacts 11, 12, and to be locked in such position by a lock or latch *c*, controlled by a solenoid *f*. Also located at each motor
 100 control station is a suitable signal device *g*, such, for instance, as a lamp. Adjacent each door is a switch *h*, by which circuit may be closed between contacts 13, 14, or between contacts 15, 16. The solenoid M, through
 105 its control of the door operating motor of each door, also controls the contact O, which opens or closes circuit between contacts 17, 18 in the switch box I, and which I will call a signal switch. At each end of each car is
 110 also arranged a switch *k*, adapted to close a circuit to earth at *m*.

From the foregoing description, therefore, it will be seen that on each car there will be associated with each door the operating
 115 mechanism therefor and its power mechanism, the solenoid for controlling the power mechanism, a switch for controlling the circuit of such solenoid, and a signal switch. There will also be at each end of each car,
 120 whether operated singly or in a train, of the multiple unit system, or, in case of other kinds of trains, in the motorman's cab at the front end of the train a motorman's motor control switch, a motorman's door control
 125 switch, a signal device, and a ground control switch.

A main supply conductor 20, extends throughout the length of the car, and if desired of the train, and receives current from
 130

any suitable or convenient source. Similarly, conductors 21, and 22, extend the full length of the car, or of the train, and are supplied with current from the main supply conductor as will be explained. One member of each pair of contacts 5, 6, 7, 8; and 9, 10, and also contact 50, is connected to the main conductor 20. In the form shown each of the contacts 5, 7, 9 and 50, are thus connected. Instead of this connection being direct it is effected by conductor 23, to contact 11, thence only when the motor controller handle *b*, is in "off" position, to contact 12, thence through conductor 24, to the contacts 5, 7, 9 and 50, as above stated. Thus it will be seen that circuit from the main supply conductor 20 can be closed to the contacts 5, 7, 9 and 50, only when the car motor controller is in "off" position, that is when the car motor circuits are broken. When the car motor controller is in "off" position, it is locked in such position by a latch *c*, as above explained, which is controlled by a solenoid *f*, the circuit of which includes a conductor 25, from contact 8, the circuit continuing from solenoid *f*, through conductor 26, which extends throughout the car, or throughout the train of cars, and to ground at *m*, and in which are included the signal devices *g*, all the signal switch contacts 17, 18 of the car or train and the ground control switches *k*. Therefore, in order to complete this circuit to release the latch *c*, it is necessary to close the circuit between contacts 7 and 8, and also between all the contacts 17, 18, that is, all the doors must be closed, since the closing of circuit between contacts 17 and 18, is effected only by closing the doors. It is also necessary, in order to complete the circuit of solenoid *f*, to close a ground switch *k*.

In practice a switch *k* is located at each end of each car but all these switches are left open except the one at the rear end of the car or train, which is closed. Each switch *k*, controls the circuit connection of a door mechanism controlling solenoid *M*, either from the main supply conductor 20, through connection 27, to contact 16, thence, when the switch *k*, is thrown in the proper direction, to contact 15, and connection 28, through solenoid *M*, to ground at *p*, or else from conductor 21, or 22, through connection 29, to contact 14, thence, when the switch *k*, is thrown in the other direction, to contact 13, connection 28, solenoid *M* to ground.

When any switch *k* is in position to break all circuits controlled thereby the door with which such switch is associated is "dead", that is, it is no longer under the influence of the control system and remains positively closed. This is sometimes desirable when the front or rear doors of a car, or the doors at the front end and the rear end of a train of

cars are to be left closed while all the other doors are operable. The circuit through conductor 21, or 22, is controlled by the motorman through switch *a*. By throwing this switch into position, to close circuit between contacts 5 and 6, the circuit is closed from main conductor 20, through connection 23, contact 11, contact 12, (when the car motor controller is in "off" position) connection 24, contact 5, contact 6, connection 30, to conductor 21, thence through all the solenoids *M*, on one side of a car or train, supplied from said conductor 21, and to ground provided the door switches *h*, on that side of the car or train are all in position to close circuit between contacts 13, 14. By this arrangement it will be readily seen that by placing all the switches *h*, on one side of the car or train in position to close circuit between their contacts 13, 14, the circuits of all the solenoids *M*, supplied from conductor 21, are controlled by the motorman manipulating his door control switch *a*, provided the car motor controller *b*, is in "off" position. In other words the operation of all the doors on one side of the car, or of a train, controlled by conductor 21, is under the direct control of the motorman through switch *a*, but only when the car motor controller is in "off" position. At the same time any particular door may be operated independently when the occasion therefor arrives, by a guard or attendant at the particular door to be operated throwing the switch *h*, at that door into position to close circuit between contacts 15, 16, thereby closing the circuit of solenoid *M* of that door directly from the main conductor as above explained.

The foregoing description applies to the arrangement of doors on one side of the car. Ordinarily each car is provided with four doors, two at each end, one of which is on one side of the car and the other on the other side of the car. This is the usual arrangement throughout the train. The foregoing description while applicable to the doors on one side of the train is equally applicable to the doors and their associated equipment and control on the other side of the car. This is why I employ two conductors 21 and 22. The one is employed in the circuit connection of the solenoids on one side of the car or train and the other is employed in the circuit connection of the solenoids on the other side of the car or train. The switch *a*, wherever located, that is, whether at one or both ends of a car or at the front end of a train, or elsewhere, controls circuit connection from the main supply conductor 20 to either conductor 21, or 22, according to whether the switch closes connection between contacts 5 and 6, or 9 and 10, the contact 10, being electrically connected to conductor 22, through connection 31.

It may sometimes be desirable to control

all the doors of the car or train simultaneously, that is, the doors on both sides of the car or train. To accomplish this result I provide the set of contacts 50, 51 and 52.

5 The contact 50, is included in circuit with conductor 24, while contacts 51, and 52, are respectively connected to contacts 6 and 10. Therefore, when switch *a*, is moved into position to close circuit from contact 50, to the
10 contacts 51, and 52, the circuit from the main supply conductor 20, is closed through 23, 11, 12, (when controller *b*, is in "off" position) 24, 50, where it divides one branch continuing through 51, 6, and 30, to 21, and
15 thence on, as before described, through the solenoids *M*, on one side of the car or train, if the switches *h*, on that side are closed, the other branch continuing from 50, to 52, 10, and 31, to 22, and thence on as before described through the solenoids *M*, on the other
20 side of the car or train, if the switches on that side are closed. Thus all the doors of the car or train may be simultaneously controlled by the manipulation of switch *a*,
25 while at the same time permitting the doors to be individually controlled through the manipulation of switches *h*.

I have shown and described the construction and arrangement of door operating
30 mechanism for only one door and the wiring connections and circuits for only one car but it is to be understood that all the doors are to have a construction and arrangement similar to that above described and the wiring
35 connections of all the cars of a train are the same as above described.

It is believed that the operation of a construction and control system embodying my invention will be readily understood from the
40 foregoing description, and, briefly, is as follows: Suppose it be desired to control the operation of all the doors of all the cars of a train from the car or train motorman's cab.

All the switches *h*, are moved into position
45 to close circuit through their associated contacts 13, 14, and the ground switch *k*, at the rear end of the car or train is closed. Under these conditions all the doors of the car or train are placed under the control of the
50 motorman, and may be opened by placing switch *a*, so as to close circuit from 50, to 51 and 52, or all closed by breaking circuit between said contacts. Now suppose all the
55 doors throughout the car or train are closed and the car or train is moving in its regular operation. When a station or stopping point is approached the motorman manipulates his motor controller *b*, to shut off current from the car or train operating motor, that is, he
60 moves controller *b*, to "off" position to stop the train or car and to apply the brakes in the usual manner. In its "off" position the controller *b*, is locked by spring catch or latch *c*, and in position to close circuit between
65 contacts 11, and 12. When the car or train

finally stops the motorman operates the switch *a*, to close circuit between contacts 5, 6, or 9, 10, according as the doors on one side or the other of the car or train are to be
70 opened or from 50, to 51 and 52, if all the doors are to be opened. Suppose the switch *a*, is moved to close circuit between contacts 5 and 6; thereupon the circuits of all the solenoids *M*, on one side of the train or car,
75 are completed thereby energizing the solenoids, and operating the valves of all the door operating motors on that side of the car or train, to admit operating medium to the motors *E*, and hence operating the motors in
80 a direction to cause all the doors to be positively moved into open position, and the steps associated therewith, if any are employed, to move into position for use. When the motorman receives his signal to proceed,
85 his first act is to move the switch *a*, into position to break circuit between contacts 5 and 6, and to close circuit between contacts 7 and 8. The breaking of circuit connection
90 between contacts 5, and 6, breaks the circuit of all the solenoids *M*, and hence said solenoids become deenergized and consequently the door operating motor controllers, are shifted in the other direction to cause said
95 motors to move the doors positively into closed position and to shift or move the steps into retracted or withdrawn position. By closing circuit between contacts 7 and 8, the circuit of the latch controlling solenoid *f*, and of signal device *g*, is put in condition to be
100 closed as rapidly as the doors are closed, that is, as rapidly as the contact *O*, closes the circuit between the contacts 17 and 18. When all the doors throughout the car or train are closed, the ground switch at the rear end of the car or train being already closed, and not
105 before, the signal circuit is completed and the latch *c*, released. The operation of the signal device informs the motorman that the doors are all closed and that his car or train motor-controller *b*, is released. He then
110 manipulates said controller to start up the car or train thereby breaking circuit between contacts 11 and 12, and hence breaking the circuit from the main supply conductor.

As above pointed out any particular door
115 may be operated independently at any time by means of its switch *h*, which not only completes a direct circuit connection from the main supply conductor through the solenoid controlled by such switch but also, at the
120 same time removes the operating motor of such door temporarily from the control of the motorman.

Having now set forth the object and nature of my invention and a construction arrangement and system embodying the principles thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent is:—

1. The combination of a railroad car, a car 130

motor controller, a door, power mechanism for moving the door, and means for preventing the power mechanism from operating the door to open position while the controller occupies its "on" position.

2. The combination of a railroad car, a car motor controller, a door, means operative only when the controller is in "off" position for controlling the movements of the door; retaining means for the car motor controller when in "off" position said retaining means being controlled by the opening and closing of the door.

3. The combination of a railroad car; a car motor controller, a door, means operative only when the controller is in "off" position for controlling the movements of the door; retaining means for the motor controller when in "off" position, said retaining means being operative when the door is open.

4. The combination of a railroad car, a car motor controller, a door, means operative only when the controller is in "off" position for controlling the movements of the door; electrical devices for retaining said motor controller in "off" position, and a circuit therefor, said circuit being controlled by the opening and closing of the door.

5. The combination of a railroad car, a car motor controller, a door; means for moving the door, electrical devices for controlling the door moving means, a circuit therefor, said circuit arranged to be controlled by the motor controller whereby when the motor controller is in "off" position the door operating means are made operative to open the door.

6. The combination of a railroad car, a car motor controller, a door, pneumatic means for operating said door, a valve for controlling said pneumatic means, electrical devices under the control of said car motor controller for controlling the action of said valve; and means for locking the motor controller against movement while the door is open.

7. The combination of a railroad car, a car motor controller, a door, a motor for operating said door, an auxiliary motor for controlling said door operating motor, said auxiliary motor being controlled by said car motor controller, and means for locking the motor controller in "off" position while the door is open.

8. The combination of a railroad car, a car motor controller, a door, an operating motor therefor, electrical devices for controlling said door operating motor, circuits for said electrical devices, said circuits being controlled by said car motor controller, and means for locking the motor controller in "off" position while the door is open.

9. The combination of a railroad car, a car motor controller, a door, an operating motor therefor, means for controlling said motor,

electrical devices for controlling said motor controlling means, said car motor controller also controlling the circuit of said electrical devices, and means for preventing operation of the motor controller to "on" position while the door is open.

10. The combination of a railroad car, a propelling motor therefor, a door, a motor for opening and closing the same; means for controlling the motor from a distant point, means for preventing the operation of the car propelling motor while the door is open; and independent means at the door for controlling the door operating motor.

11. The combination of a railroad car; a car propelling motor controller; a plurality of doors, a motor for opening and closing each door, means controlled by the car motor controller for controlling simultaneously the operation of all the door operating motors, and means for locking the car motor in "off" position while any door is open.

12. The combination of a railroad car; a propelling motor controller, a plurality of doors, a motor for operating each door; means for controlling all of said motors from a single point, means for locking said controlling means while any door is open; and means adjacent each door for independently controlling each door operating motor.

13. The combination of a railroad car; a plurality of doors, a motor for operating each door, electrical devices for controlling said motors, means for simultaneously opening and closing the circuits of said devices, means for locking said circuit controlling means against operation while any door is open; and means adjacent each door for independently opening and closing the circuit of each device.

14. The combination of a railroad car; a plurality of doors, a motor for operating each door, electrical devices for controlling said motors, a common circuit for said devices, and an independent circuit for each device, independent means for controlling said circuits, and means for preventing the closing of said common circuit as long as any door remains open.

15. The combination of a railroad car; a car motor controller arranged at the end of the car, a plurality of car doors, electrical devices for controlling the movements of the car doors, said car motor controller arranged to control the circuit of said devices, and means for preventing the operation of the car motor controller to "on" position as long as any door remains open.

16. The combination of a railroad car, a plurality of doors thereon, electrically controlled operating mechanism for said doors, a circuit for the electric controlling mechanism, a signal device, a circuit therefor, contacts arranged in said signal circuit and

adapted to be closed by the closing of the doors, and means for controlling the circuit of the controlling mechanism.

17. The combination of a railroad car, a plurality of doors thereon, electrically controlled operating mechanism for each door, a circuit for the electric controlling means, a signal lamp, a circuit therefor, contacts arranged in said signal circuit and adapted to be closed by the closing of all the doors whereby when any door is open said signal circuit is broken, and means for controlling the circuit of the controlling means for said door operating mechanism.

18. The combination of a railroad car, a plurality of doors thereon, operating mechanism for each door, a signal device, a circuit therefor, each of said doors adapted to open or close said circuit, a ground switch, and a controlling switch also arranged in said circuit and means for controlling the door operating mechanism.

19. The combination of a railroad car, a plurality of doors thereon, operating mechanism for each door, a signal device, a circuit therefor, each of said doors controlling said circuit, and a controlling switch for said circuit, said controlling switch also controlling the door operating mechanism.

20. The combination of a railroad car, a plurality of doors thereon, operating mechanism for each door, electrical devices for controlling said mechanism, a circuit for said devices, a signal, a circuit therefor, contacts arranged in the signal circuit and controlled by each door, and a single switch for controlling both circuits.

21. The combination of a railroad car, a plurality of doors thereon, operating mechanism for each door, electrical devices for controlling said mechanism, a circuit for said devices, a signal, a circuit therefor, each of said doors controlling said signal circuit, a controlling switch for both circuits and a switch independent of said controlling switch for controlling the circuit of the door operating mechanism controlling devices.

22. The combination of a railroad car, a plurality of doors thereon, operating mechanism for each door, electrical devices for controlling said operating mechanism, a circuit for said devices, a car motor controller arranged to complete said circuit only when in "off" position, means for independently closing the circuit for each door, operating

mechanism and means for retaining the car motor controller in "off" position as long as any door is open.

23. The combination of a railroad car, a door thereon, operating mechanism therefor, an electrical device for controlling said mechanism, a circuit therefor, a car motor controller, contacts arranged in said circuit and adapted to be closed only when the car motor controller is in "off" position, means for retaining the car motor controller in "off" position as long as the door is open, and means for independently controlling the circuit of the door operating mechanism controlling device.

24. The combination of a railroad car, a door, operating mechanism therefor, an electrical device for controlling said mechanism, a circuit for said device, a signal, a circuit therefor, contacts arranged in the signal circuit and adapted to be closed only when the door is closed, a car motor controller, contacts arranged in both of said circuits and adapted to be closed only when the motor controller is in "off" position.

25. The combination of a railroad car, a door, operating mechanism therefor, an electrical device for controlling said mechanism, a signal device, circuits for said electrical and signal devices, a car motor controller, contacts arranged in both said circuits and adapted to be closed only when the car motor controller is in "off" position, and electrical devices also arranged in the signal circuit for retaining the car motor controller in "off" position.

26. The combination of a railroad car, a car motor switch, a door, means for retaining the switch in open position, said retaining means being released only when the door is opened.

27. The combination of a railroad car, a car motor controller, a door, means for retaining the door in closed position and means for releasing said retaining means only when the car motor controller is in "off" position.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 14th day of September A. D. 1906.

HAROLD ROWNTREE.

Witnesses:

L. M. SHIELDS,
J. G. MITCHELL.