March 10, 1925. 1,529,434

L. P. HYNES

ELECTRIC DOOR CONTROL

Filed July 30, 1923 3 Sheets-Sheet 1

Fig. 1

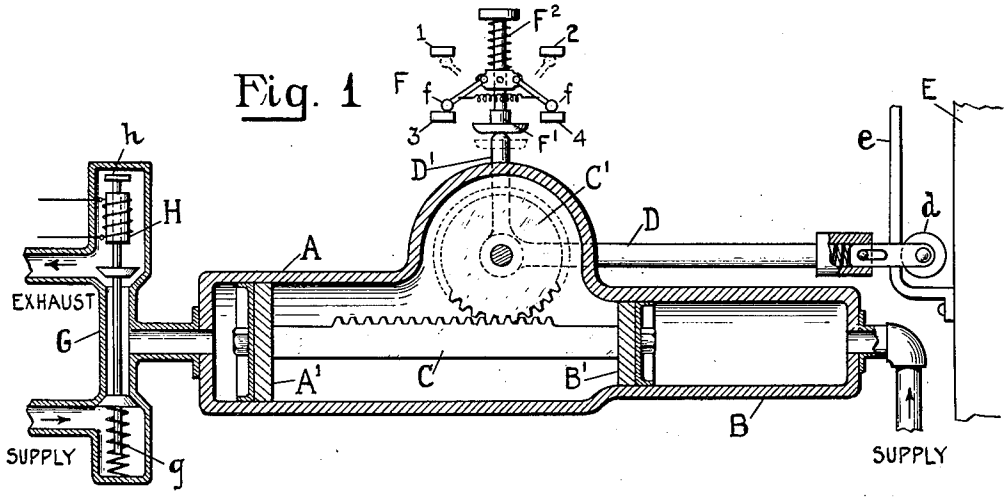
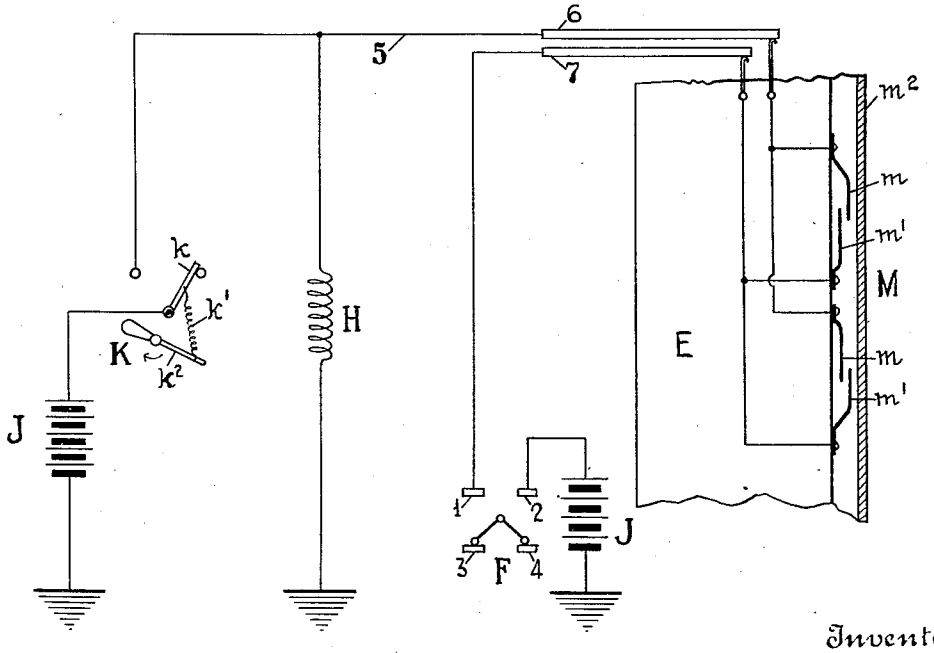


Fig. 2



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ELECTRIC DOOR CONTROL

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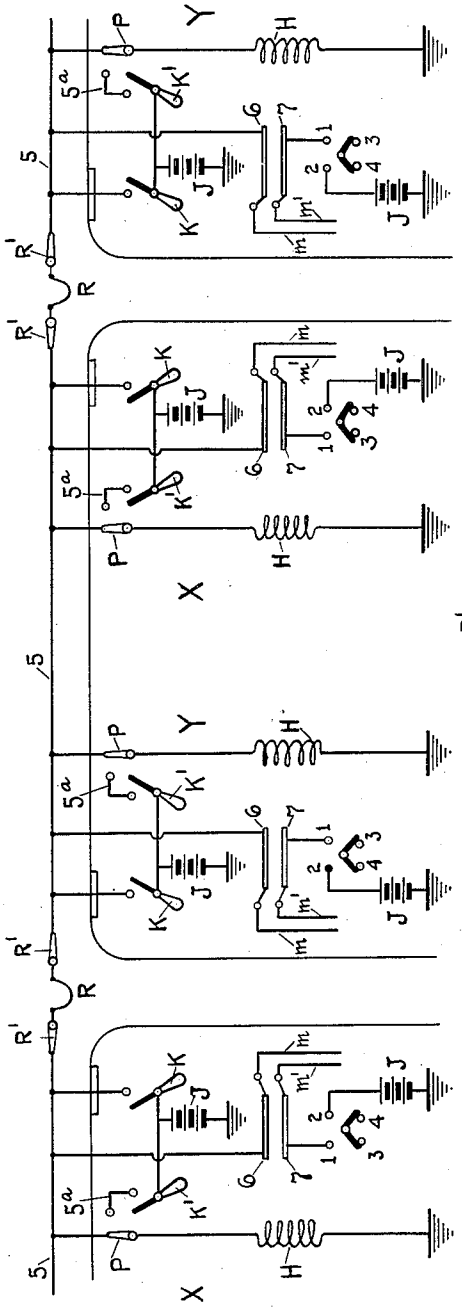


Fig. 3

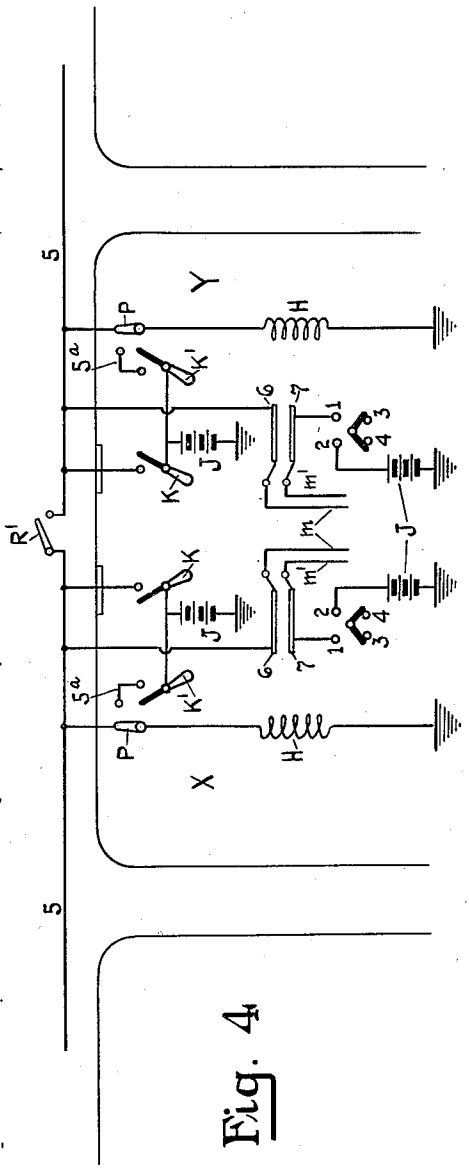


Fig. 4

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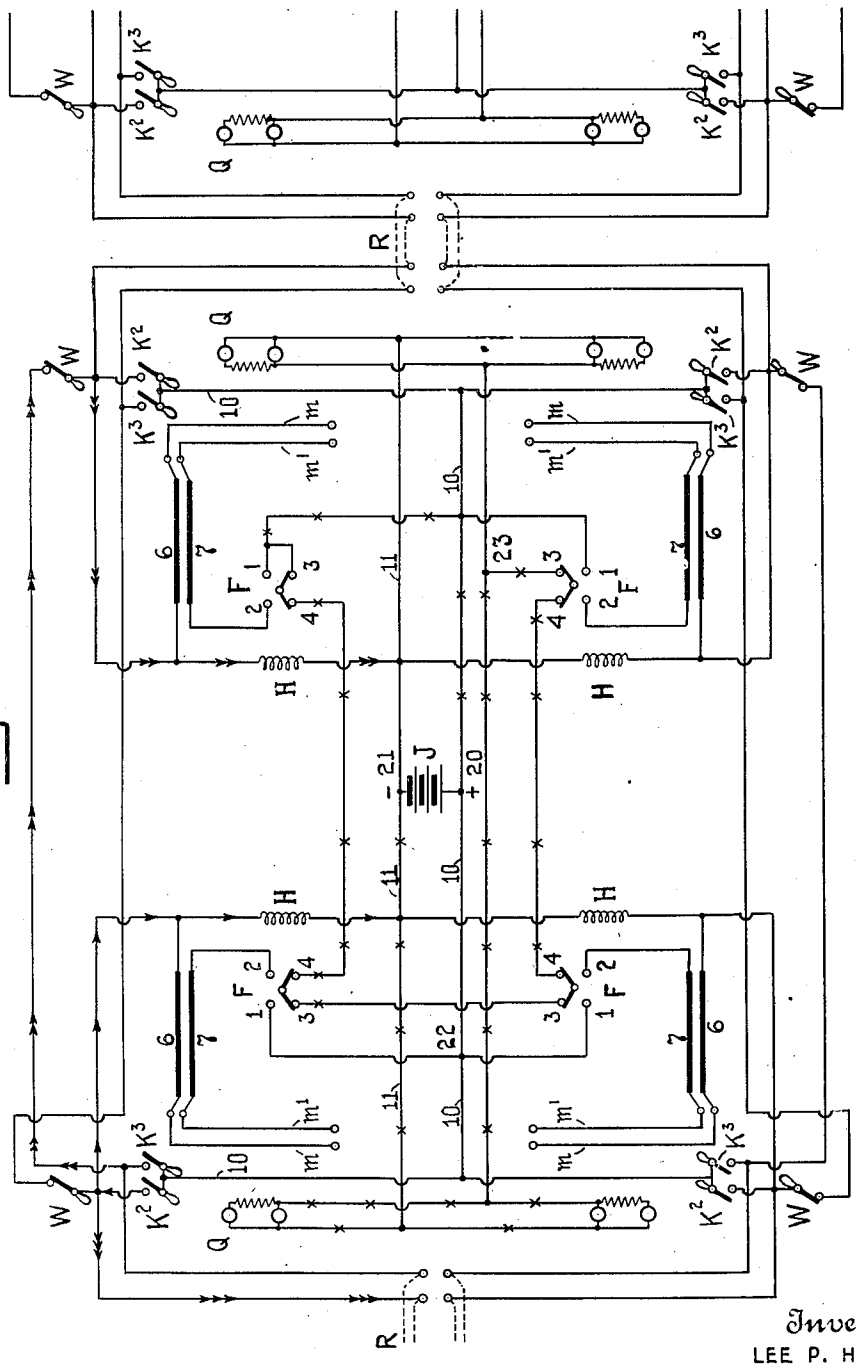
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Fig. 5



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UNITED STATES PATENT OFFICE.

LEE P. HYNES, OF ALBANY, NEW YORK, ASSIGNOR TO CONSOLIDATED CAR-HEATING COMPANY, OF ALBANY, NEW YORK, A CORPORATION OF WEST VIRGINIA.

ELECTRIC DOOR CONTROL.

Application filed July 30, 1923. Serial No. 654,772.

To all whom it may concern:

Be it known that I, LEE P. HYNES, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Electric Door Controls, the following being a full, clear, and exact disclosure of the one form of my invention which I at present deem preferable.

For a detailed description of the present form of my invention, reference may be had to the following specification and to the accompanying drawings forming a part thereof wherein—

Fig. 1 shows the door engine,

Fig. 2 is an elementary diagram of my new system,

Fig. 3 shows my system applied to a train of cars having end doors, and

Fig. 4 shows it applied to a similar train.

Fig. 5 shows it combined with a signal system.

My invention relates to a new arrangement for operating the doors of a railway car or train which materially simplifies previous arrangements practically employed for that purpose.

Referring to the drawings there is shown in Fig. 1 the door engine used in my present system. A shows in cross section a cylinder closed at its left-hand end and at its right-hand end opening into a central chamber. B is a cylinder having a decidedly smaller piston area than A, but arranged opposite A and symmetrically therewith. A^1 and B^1 are the respective pistons which are rigidly connected by a rack C that engages a pinion C^1 on the shaft of the door-arm D. On the outer end of D and connected therewith by the usual yielding joint is a roller *d* which engages a vertical rod *e* on the rear edge of the door E. On the arm D is an offset D^1 projecting at right angles therefrom at its shaft end. This projection D^1 serves to operate a toggle-switch F whenever the arm D comes to its horizontal position as shown in Fig. 1, the door being then closed. At that time the switch-rod F^1 is lifted by the offset and the contacts *f*, *f* of the switch snap into engagement with contacts 3 and 4 connecting them electrically. When the door arm D turns from the position shown, in order to open the door, the offset D^1 moves out from under the switch-rod F^1 and a spring F^2 forces the switch-rod down and the contacts *f*, *f* snap away from 3 and 4 into contact with 1 and 2, thus connecting 1 and 2 electrically.

The smaller cylinder B is permanently connected to the air supply system while the larger cylinder A is connected thereto whenever it is desired to open the door. Then the air pressure on the larger piston area of A will overcome the permanent pressure in B and the engine will rotate door-arm D to open the door, allowing switch F to close switch contacts 1 and 2 as above described at the beginning of the movement. The control-valve for A is shown at G. Normally it is held by a spring *g* in its lifted position shutting off A from the air supply and opening it to the exhaust as shown in Fig. 1. When, however, magnet H is energized and draws down its armature *h*, the valves are shifted to shut off A from the exhaust and open it to the air supply. Thus the energizing of magnet H causes the opening of the door and so long as it remains energized the door will remain open. Whenever it becomes de-energized, either during or subsequent to the opening movement, the engine will start on its door-closing action, the cylinder A being then open to exhaust and shut off from the air-pressure supply, while cylinder B, being connected to the air-pressure supply at all times, will be able to act and close the door.

The aforesaid door-opening magnet H, I place in a circuit which may be supplied with current either by an operator's switch or by the closure of contacts by a door-shoe. The latter supply-circuit also contains the aforesaid contacts 1 and 2 of switch F and will be operative only so long as the said contacts are closed by the departure of the door-arm D from its door-closing position as above described. So long as the door is closed the said contacts 1 and 2 will be disconnected and the door-shoe contacts will be impotent to supply current to magnet H. Referring to Fig. 2, the circuit arrangement just mentioned is shown therein diagrammatically. The said door-closing magnet H is connected to a circuit wire 5 to which current may be admitted from battery J either by the operator's switch K at the left or by the door-shoe contacts at the right. The operator's switch K is a simple, single pole snap-switch, its blade *k*

being operated by a spring k^1 the outer end which is moved to the right or left of its dead-center position by the lever hand k^2. It is to be understood that but one battery J is used, but for the purpose of avoiding confusion in the diagrammatic illustrations the showing of the battery is duplicated.

The door-shoe contacts are of the kind shown in my pending application Serial No. 439,072, filed January 22, 1921, and are here represented in outline as comprising two sets of springs, m and m^1 which are connected respectively to the opposite sides of the circuit so that the contact of any spring m of one set with any spring m^1 of the other set will close the circuit. The two sets of springs are arranged in a vertical series on the front edge of the door back of a rubber door-shoe m^2. Thereby, if the door in closing should encounter a passenger, or any other obstacle the yielding of shoe m^2 at any point will force one or more of the springs m against one or more of the springs m^1 and also close the circuit. The two sets of springs are connected respectively to the stationary rods 6 and 7 by contact brushes mounted on the door but sliding on the rods according to well known practice. The rod 6 is connected to the aforesaid wire 5 and rod 7 is connected to contact 1 of the aforesaid switch F, the other contact 2 of that switch being connected to battery J.

The foregoing describes the essential features of my present mode of door-control and its extreme simplicity will be recognized by those familiar with this art. A single wire may serve for the control of all the doors on one side of a single car, or of two or more cars forming a train. A single magnet and valve are all that is required for each door-engine, while the door-shoe control adds merely an alternative supply branch for admitting current to the main supply wire 5. In operation it may be assumed that the door or doors are closed. Then to open them the operator moves his switch K to its circuit-closing position. That admits current from battery J to line 5 and to the one or more magnets H connected thereto. Each magnet H lifts its valve G and causes the engine to make its door-opening stroke as above described and close, at contacts 1 and 2 of its switch F, its door-shoe circuit, preparatory to any emergency reversal of the engine by the door-shoe. The door or doors will then remain open so long as the operator's switch K remains in its circuit-closing position. If the door-shoe contacts on any door should at this time be closed, it has no effect, since the door is already open. The current will remain on wire 5 during this period and on the one or more magnets H connected thereto, but that is an insignificant matter, for the open-door period is temporary and brief. To again close the door or doors, the operator again moves his switch K back to its circuit-opening position. Thereupon the line 5 will be deprived of current and the one or more magnets H connected thereto will be de-energized, each dropping its valve G to its door-closing position. If during the resulting door-closing action of the engine, the door should encounter an obstacle, the aforesaid shoe-contacts m and m^1 would come together. Since at this time the wire 5 is not receiving current and the switch F has closed its contacts 1 and 2, current will be again admitted to wire 5 and the magnet H will lift its valve G to door opening position. The door will then be retracted until the door-shoe contacts are again separated, when it will automatically resume its closing movement. If it should again encounter the obstacle the action will be repeated, the door moving forwards and backwards alternately for a space of a foot or less until the obstruction is removed. Obviously all the magnets H at unclosed doors which are on the same wire 5 will partake of the same alternating action. If that should be considered objectionable, it may be readily avoided by isolating any door that may be thus obstructed in ways known to the art. Since, however, it is usually arranged that the train shall not be started until the last door is closed, it would cause no train delay if other doors were delayed in closing to the same extent as the obstructed one.

In Fig. 3 I show a circuit-diagram for three cars of a train equipped with my present system. Each magnet H is provided with a switch P by which it may be disconnected from the main wire 5 and connected to a similar wire 5^a for separate operation by a separate switch K^1, somewhat as an electric lamp may either be operated in a group with others or separately by an individual switch. The same operation may be extended to one or more additional cars, as may be desired, by the usual jumpers R, or a switch R^1.

In Fig. 4 I show the same system applied to three cars of a train wherein the main car-doors are at the center, instead of the ends, of a car. The operator, of course, is usually stationed at the main doors of a car when he can observe the ingress and egress of passengers and know when to open or close the doors. If the main doors are at the ends, he stands there, usually on the platforms between two adjacent cars, if at the center he stands in the car midway between its ends. That has been the custom for many years. In applying a system such as described herein to center-door cars, the system itself remains unchanged; it is merely shifted a half-car length along the

train, to bring each operator's station from the end to the middle of a car. Thus in Fig. 4 the stations X and Y are in the middle of the car, whereas in Fig. 3 the same stations are on the adjacent ends of two cars respectively. Wherever the stations may be located, the operator can from any station operate as many doors either in front of or behind him as may be desired, the extent of his control being determined by the length of the train-wire that may be connected up by the jumpers R or switches R^1.

In Fig. 5 I show the working diagram of an installation of my present system as it is used on the Illinois Central Railway. This figure also shows how my aforesaid switches F are combined with the signal system. It illustrates, moreover, the flexibility of my system in meeting a wide variety of cases. In this instance each car has four doors, two on each side near the ends of the car. It is desired to operate each door separately from either end of the car and also to extend this operation at will to adjacent cars.

Referring to the operator's station at the upper left-hand corner, he there has two handles K^2 and K^3 by which he can admit current (coming to the handles from the battery J by wires 10, 10) to the valve-magnet H of the door near him, or to the corresponding magnet H of the door at the opposite end of the car, or to both. Thus if he closes K^2, current from battery wire 10 will go, via the route indicated by single barbs, to the valve-magnet H of the adjoining door. If he closes K^3 the current will flow, via the route indicated by double barbs, to the valve-magnet H of the door at the opposite end of the car. He may also close both switches simultaneously. Moreover, if he connects up the jumpers to the next car, the closure of K^2 will also admit current, via the route indicated by triple barbs, to the corresponding valve-magnet H on the next one or more cars. Similarly the other jumper will permit K^3 to control corresponding valve-magnets H on one or more other cars of the train. Furthermore the door-shoe contacts m and m^1 will also, if brought into contact, admit battery current from point 22 on wire 10 to the magnet H via switch F and rods 6 and 7 provided the contacts 1 and 2 of switch F are closed, in the way I have described. I also call attention to contacts 3 and 4 of my aforesaid switch F, which contacts I described as connected electrically when the door arm is in its door-closing position and the contacts 1 and 2 electrically disconnected. This Fig. 5 shows how I make use of my aforesaid switch F to control the signal circuit. At each of the four doors in Fig. 5, the contacts 3 and 4 are shown as electrically connected, it being assumed that the doors are all closed. There is thus completed a circuit which, starting from the battery J at point 20, will follow the route I have indicated on the drawing by crosses, and pass successively through the contacts 3 and 4 of each of the switches F in series to the point 23. There the current branches to the signal lamps Q at the opposite ends of the car, the two branches uniting at the point 21 on the negative battery-wire 11. Only when the doors are all closed, and the contacts 3 and 4 are thereby closed at all of the switches F can this signal circuit be completed and the lamps lighted. It is the purpose in this installation that the starting notice to the motorman shall be given by a train dispatcher at the station, when he sees, by observing the lamps on each of the several cars of the train, that all the doors on every car have been closed. In other cases a similar signal circuit will contain a lamp in the motorman's compartment at the head of the train, the motorman receiving his starting signal directly by the lighting of his lamp. By means of the switches W shown at each operator's station the control of each door from the opposite end of the car can be cut off. Thereby an operator at one end can work both doors without a chance of his own door being irregularly worked from the other end.

It is understood that my invention is essentially independent of its use on one car, or on two or more cars having jumpers to extend the operation from a single car to one or more additional cars by electrical means. In the illustrated embodiment the preferred arrangement would be one omitting the jumpers leaving each car to have its doors worked separately, and, in case two such cars are associated in a train, a single operator, stationed at one end of a car where he can watch the door-control means of two adjacent cars, will operate the separate apparatus of both without resort to jumpers for electrically connecting the two systems. But the jumpers may be used if desired.

What I claim as new and desire to secure by Letters Patent is:

1. A door-operating system comprising a single engine control magnet, a supply-wire therefor, a source of current, a circuit connection between said magnet and said source of current, said circuit connection including an operator's switch, a door shoe contact, and a circuit connection between said magnet and said door shoe contact, the last mentioned circuit connection including means operated by the door engine for controlling the circuit.

2. A door-operating system comprising a single engine-control magnet for normally controlling both the opening and closing movements of the door-engine, a supply-wire for said magnet, an operator's switch, a

door-shoe contact, a source of current and circuit connections for admitting current from said source to said supply-wire either by said operator's switch or by said door-shoe contact.

3. A door-operating system comprising an engine-control magnet, a supply-wire therefor, an operator's switch, a door-shoe contact, a circuit for said door-shoe contact containing a circuit-closer operated by the door-engine, a source of current, and circuit connections for admitting current from said source to the said supply-wire either by the operator's switch or by the door-shoe contact.

4. A door-operating system comprising a door-engine having a door-closing cylinder under permanent pressure, an opposing and stronger door-opening cylinder, a single magnet normally controlling the supply and exhaust functions of the door-opening cylinder, a supply wire for the said magnet, an operator's switch, a door-shoe contact, a source of current, and circuit connections for admitting current from said source to the said supply-wire by either the operator's switch or the door-shoe contact.

5. A door-operating system comprising for each door a door-engine having a door-closing cylinder under permanent pressure, an opposing and stronger door-opening cylinder, supply and exhaust valves for said door-opening cylinder normally set to exhaust the cylinder, a magnet acting when energized to set the valves to admit pressure to the cylinder, a wire for supplying current to a plurality of said magnets, an operator's switch at each door, a source of current, a door-shoe contact at each door, and circuit-connections for admitting current from said source to said supply-wire either by an operator's switch or by a door-shoe contact.

6. A door-operating system comprising two or more door-engines, each having a door-closing cylinder under permanent pressure and an opposing and stronger door-opening cylinder, valves for each engine normally set to exhaust the door-opening cylinder, a normally-open circuit extending from each magnet to a common central station, operator's switches at the said station for the respective circuits leading thereto, a source of current, circuit connections by which each operator's switch can admit current from said source to its individual circuit, and a door-shoe contact on each door for connecting the corresponding magnet to the source of current.

7. A door-operating system comprising two or more door-engines, each having a door-closing cylinder under permanent pressure and a stronger opposing door-opening cylinder, valves for each engine normally set to exhaust the door-opening cylinder, a normally-open circuit leading from each magnet to a common control-station and there provided with an operator's switch, a source of current, circuit connections whereby each operator's switch may admit current from said source to the normally-open circuit by the switch, a door-shoe contact on each door for also connecting said source to the circuit of the corresponding magnet and means for connecting to said circuit one or more door engines on an adjacent car.

8. A door-operating system comprising a door-engine, a magnet controlling said engine, a normally-open circuit for said magnet, a signal-circuit, a source of current, a door-shoe contact for admitting current to the said normally-open circuit, and a switch operated by the door-engine at starting to close alternately the said signal-circuit and the circuit controlled by the door-shoe contact.

9. A door-operating system comprising a plurality of doors, an engine for each door, a magnet for each engine and a circuit therefor, a signal-circuit, and a switch at each door-engine operated thereby at starting and acting to close alternately a gap in the circuit leading to the corresponding engine magnet and one of a series of gaps in the said signal-circuit.

10. A door-operating system comprising a plurality of doors, an operating engine for each door, a single controlling magnet for each engine, means for separately controlling all of the doors from a station at either end of a car, and a switch for cutting off at one end of the car the control from the station at the opposite end.

Signed at Albany, county of Albany and State of New York, this 25th day of July, 1923.

LEE P. HYNES.