J. F. McELROY.

DOOR MOTOR.

APPLICATION FILED MAR. 7, 1911.

1,002,596.

Patented Sept. 5, 1911.

4 SHEETS—SHEET 1.

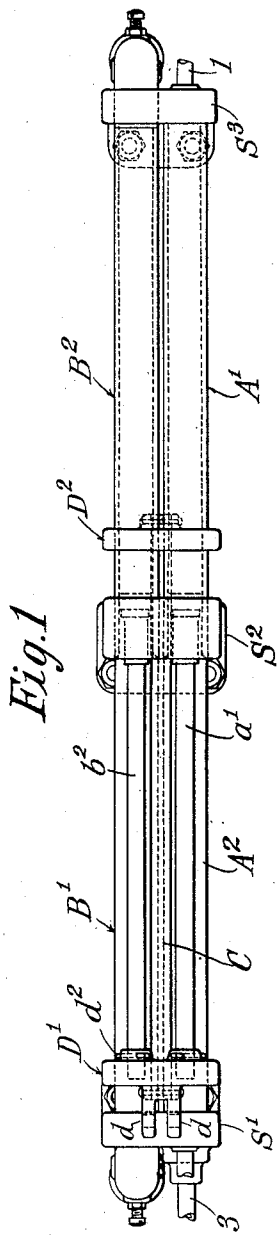

Fig. 1

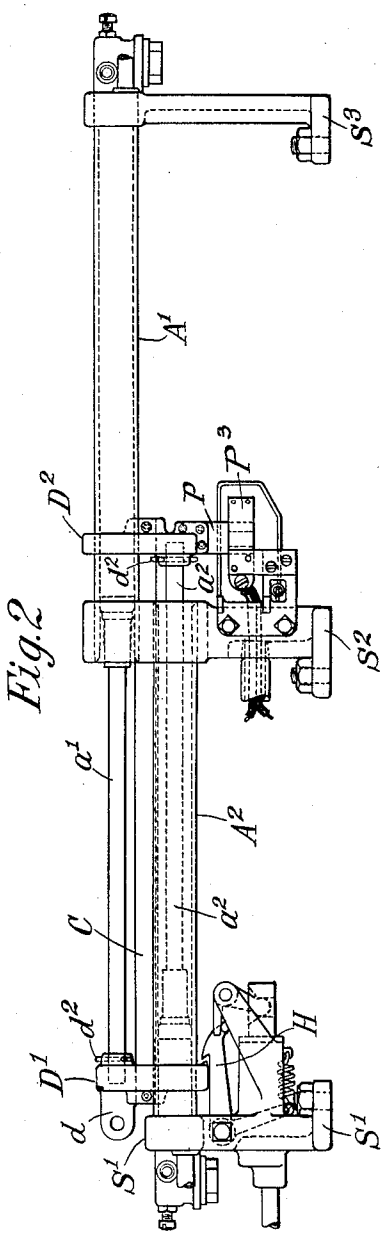

Fig. 2

WITNESSES:

Raphael Netter

L. I. Shaw

INVENTOR

James F. McElroy

BY E. M. Bentley

ATTY.

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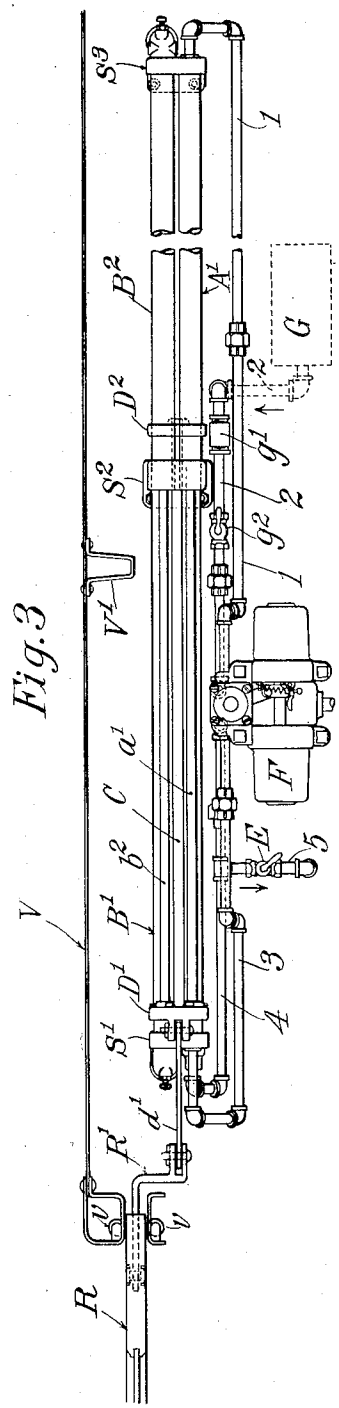

Fig. 3

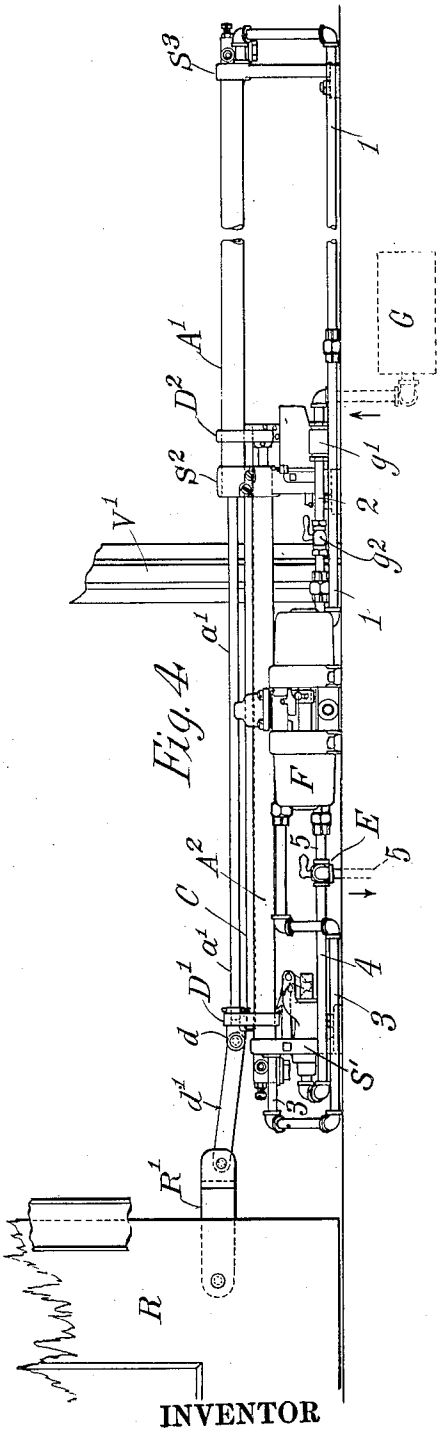

Fig. 4

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4 SHEETS—SHEET 3.

Fig. 7

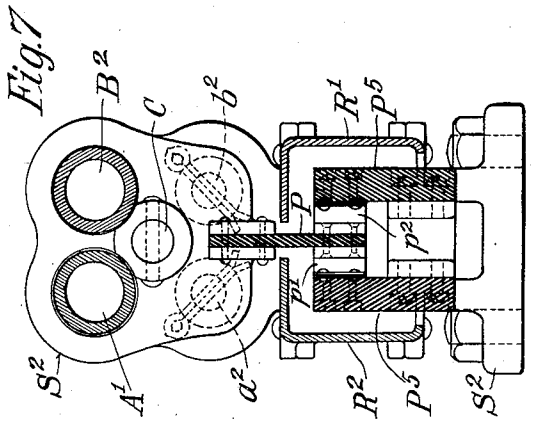


Fig. 5

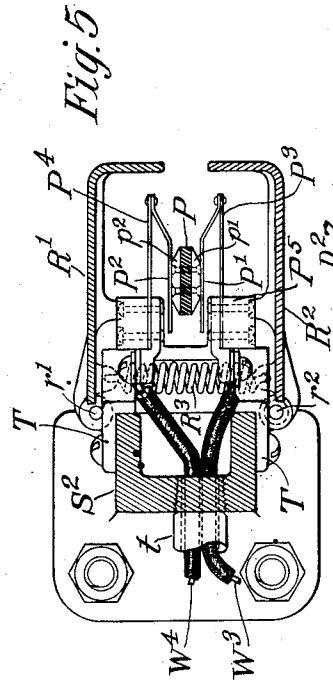
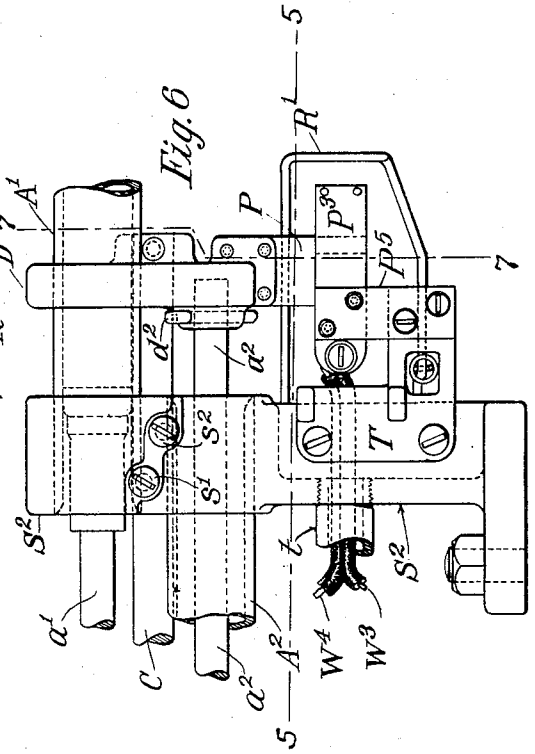


Fig. 6



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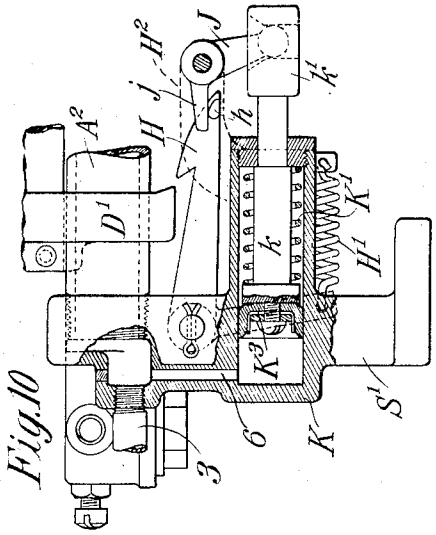

Fig.10

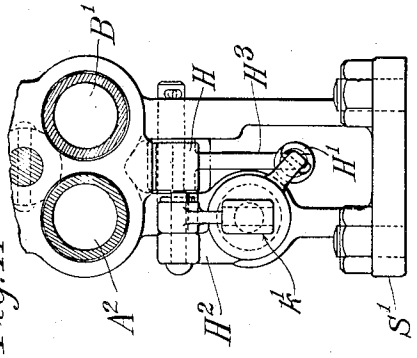

Fig.11

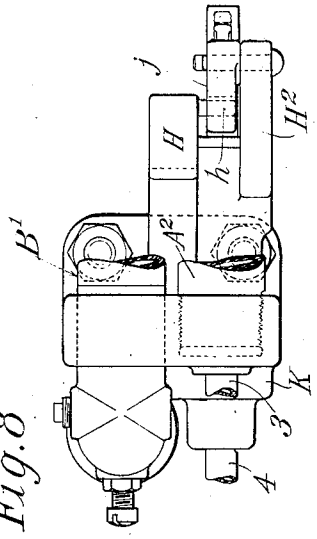

Fig.8

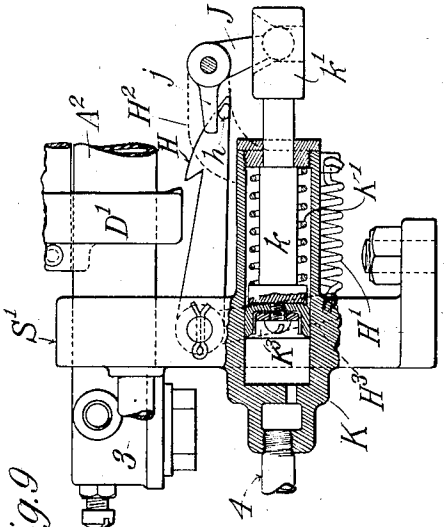

Fig.9

WITNESSES:

Raphael Netter

L. T. Shaw

INVENTOR

James F. McElroy

BY E. M. Bentley

ATTY.

UNITED STATES PATENT OFFICE.

JAMES F. McELROY, OF ALBANY, NEW YORK, ASSIGNOR TO CONSOLIDATED CAR HEATING COMPANY, A CORPORATION OF WEST VIRGINIA.

DOOR-MOTOR.

1,002,596. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed March 7, 1911. Serial No. 612,811.

To all whom it may concern:

Be it known that I, JAMES F. McELROY, a citizen of the United States, residing at Albany, county of Albany, State of New York, have invented certain new and useful Improvements in Door-Motors, 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, which illustrate my invention.

Figure 1 is a plan view and Fig. 2 a side elevation of my improved door motor; Fig. 3 is a plan of the same, together with the piping, and Fig. 4 is a side elevation of Fig. 3; Fig. 5 is a section on line 5—5 Fig. 6. Fig. 6 is an enlarged detail illustrating the improved electro contacts; Fig. 7 is a section on line 7—7 Fig. 6. Figs. 8, 9, 10 and 11 show in detail the automatic lock.

My present invention involves certain improvements in my four-cylinder door motor, which is now largely used for the pneumatic operation of car doors, and the leading features of improvements consist particularly in a new form of electric contact and in an automatic lock which is preferably so arranged as to reëngage after a predetermined time-interval, so as to lock the door in the event of the door failing to open and the operator neglecting to turn the handle to the door-closing position. Various features of structural detail and arrangement are also to be included in the present invention.

Turning to Fig. 1, A^1 and A^2 are two open-ended cylinders, facing each other but upon different levels, as more clearly appears in Fig. 2. B^1 and B^2 are similar cylinders arranged parallel to and at one side of the cylinders A^1 and A^2 respectively. The latter are power cylinders, while B^1 and B^2 are cushioning or dash-pot cylinders, corresponding respectively to A^1 and A^2. A cross-head D^2, connected to the piston rods a^1 and b^2 of the respective cylinders A^1 and B^2, travels on the set of cylinders A^2 and B^1, while a similar cross-head D^2, connected to the piston rods a^2 and b^1, travels on the cylinders A^1 and B^2. The two cross-heads D^1 and D^2 are connected by a rod C, so that the four piston rods and the two cross-heads all move together. The cylinder B^1 acts as a cushioning cylinder or dash-pot for the power cylinder A^1, and, similarly, the cylinder B^2 serves as a cushioning cylinder or dash-pot for the power cylinder A^2. Thus if air is admitted to the right-hand closed end of the cylinder A^1 through the pipe 1, its piston rod a^1 will be forced to the left and at the same time the piston in cylinder B^1 will also move from the right-hand, open end of that cylinder toward the left-hand closed end and tend to compress the air therein, which escapes, however, through a restricted outlet. Conversely, if the air is admitted to the left-hand closed end of cylinder A^2 by the pipe 3, its piston rod a^2 will move to the right and the piston B^2 will similarly move to the right and provide the cushioning or damping effect upon the action of the cylinder A^2. On the cross-head D^1 are two ears d d which, as appears in Figs. 3 and 4, are connected to the door R through link d^1 and the offset link R^1. The arrangement and mode of operation as thus far described are characteristic of my former motor and constitute no part of the present invention, except as regards some of the details hereinafter described and the arrangement of the motor with respect to the door.

The above-mentioned cylinders are supported as clearly appears in Fig. 2. The standard S^1 at the left supports the left-hand ends of cylinders A^2 B^1 and also carries the lock hereinafter described. The central standard S^2 carries the inner free ends of both sets of cylinders and also the electric contact device hereinafter described, while the standard S^3 at the right carries the outer closed ends of the cylinders A^1 B^2. The several cylinders are mounted in the central standard S^2 in such a way as to be readily detachable therefrom. The cylinders, which are preferably of brass, are not screw threaded at the point where they enter the head of the standard S^2, but are merely inserted in openings in the standard and are secured therein by screws s^1 s^2, as shown in detail in Fig. 6. These screws s^1 s^2 pass through the wall of the standard S^2 and also through grooves or notches cut in the outside of the cylinders, so that after the cylinders are inserted in the standard and the screws are in place they cannot be withdrawn. By merely removing the screws,

however, the cylinders are left free to be withdrawn from their position in the standard. Since the end standards S^1 and S^3 are separate from the central one S^2, these end standards, together with the cylinders secured thereto, can thus be easily drawn away from the central standard. The open ends of the several cylinders are flared or beveled, as clearly appears in dotted lines in Figs. 1, 2 and 6. The piston rods are connected to their respective cross-heads D^1 and D^2 by means of sockets formed in the cross-heads, into which sockets the rods enter and abut against the bottoms thereof. Cotter pins d^2 are then passed through the rods and through the projecting flanges around the edges of the sockets. These cotter pins are not essential, since the pressure of the pistons acts in every case to push the piston rod into its socket, but they are present as a matter of precaution. This arrangement renders it very easy to remove a piston and piston rod, since it only involves the withdrawing of the cotter pin and the moving aside of the cross-head, assuming that the cross-head is first disconnected from the rod C, which joins the two cross-heads together and is connected thereto in a similar way.

My improved electric contact arranged upon the central standard S^2 is shown in Fig. 2 and the details thereof are shown in Figs. 5, 6 and 7. The purpose of this contact is to close an electric circuit when the door reaches its closed position, so that when all the doors are closed, the circuit will be finally completed and a signal thereby given to the motorman. Turning to Figs. 5, 6 and 7, P represents a plate of insulating material carried by the cross-head D^2 and having at its lower end metallic contact pieces p^1 p^2 connected by metallic rivets adapted to secure them in place (see particularly Figs. 5 and 6). When the door is in its closed position these contacts enter between two metallic shoes P^1 and P^2, which are riveted to the extremities of the springs P^3 and P^4. The springs P^3 and P^4 are mounted on insulating blocks P^5 and connected respectively to wires W^3 and W^4 by small connection castings. The blocks P^5 are supported by brackets T on the standard S^2. The contact shoes P^1 and P^2 are of copper and are practically rigid, but have an elastic support by their mounting on the springs P^3 P^4 which are of phosphor bronze. The shoes P^1 P^2 overlap the connecting castings at the base of each of the springs P^3 and P^4 by which those springs are connected to the wire W^3 and W^4, and therefore have but a limited extent of side play. The result is that any side play of the moving contact pieces p^1 and p^2 will not force either of the shoes P^1 P^2 so far to either side that it will not still remain in contact with the other shoe. In other words, the traveling contact pieces are maintained in engagement with both of the shoes P^1 P^2 so long as the door is in its closed position. While this may appear to be a matter of somewhat minute detail it is of considerable practical importance. Outside of the electric contacts just described and inclosing those contacts are two spring doors R^1 and R^2 of a box form which are pivoted respectively at the points r^1 r^2 and are drawn together by a spring R^3. These doors R^1 and R^2 embrace the electric contacts, being of the box form, but remain separated from each other a sufficient distance for the entrance between them of the plate P. They therefore form a split casing for the contacts and serve to protect the contacts, while they also render them easily accessible. If a person desires to get at the contacts from either side, he simply pulls open the door or cover on that side and, when his inspection or manipulation is completed, he simply lets go the cover, which immediately swings back to position against a stop and is held in that position by means of the spring R^3.

I will next refer to the automatic lock which is mounted on standard S^1 as shown in Fig. 2 and is illustrated in detail in Figs. 8, 9, 10 and 11. On the standard S^1 is pivoted a hook or latch H which in its elevated position will engage the lower edge of the cross-head D^1 and lock it in position at the left-hand end of its range of travel when the door is shut. The latch H is in the form of a bell-crank lever with a downwardly projecting branch H^3 which is engaged by an operating spring H^1 that always tends to throw the latch upward into engagement with the cross-head D^1. On the standard S^1 there is also formed a cylinder K, in which is a piston K^3, whose piston rod k carries at its outer end a bearing block k^1 in which is loosely pivoted one end of a stop lever J. The stop lever J is also of bell-crank form and has a horizontal branch j constituting a stop for the latch H by engagement with a lug h at the tip and on one side of the latch H. The lever J is journaled in a bracket H^2 which is shown in plan in Fig. 8 and in an end elevation in Fig. 11, but in Figs. 9 and 10 it is merely indicated by dotted lines. The piston K^3 in cylinder K acts against a spring K^1 which tends to force the piston to the left, when the air pressure back of the piston is released, and thereby operate the stop lever J to release the latch H and allow the latch to rise so as to engage with the cross-head D^1 when the latter moves into its door-closing position. In Figs. 9 and 10 the piston K^3 is shown at the right-hand end of its stroke with the stop j engaging the lug h on the latch H. This is the condition when air pressure is present in cylinder K and if the latch H should be at any time raised

into its latching engagement with cross-head D^1, the admission of air to cylinder K would force the piston K^3 to the right against the force of the spring K^1 and thereby turn the stop lever J and cause the stop *j* to engage the lug *h* and thereby force down the latch H to release the cross-head D^1. The cylinder K with its piston K^3 forms a supplementary pneumatic motor for operating the lock.

It will be understood that while the door is moving to its closed position there may be no air pressure on the cylinder K, so that when the door is nearly closed the cross-head D^1 will strike the latch H and passing over the hooked end thereof will first depress it against the force of its spring H^1 until the door is fully closed when the latch will rise again behind the cross-head D^1 and lock the door. By this arrangement the door will be retained in its closed position not only by the air pressure in the operating motor, but also by the latch H. This prevents the door from opening after the train has started and also renders it impossible for a passenger to open the door if the air should be cut off from the motor. To release the door it is obviously necessary to admit air pressure to the cylinder *k* and I show two methods for accomplishing this. In Fig. 10 there is a duct 6 which puts the rear end of the motor cylinder A^2 in communication with the cylinder K, as a consequence of which the admission of air to cylinder A^2 by means of the pipe 3 to open the door, will simultaneously admit air to the cylinder K, which will act in the way I have described to draw down the latch H and release the door so that the air pressure in cylinder A^2 may act in a normal way to move the door from its closed to its open position. The preferable arrangement, however, is shown in Fig. 9, wherein the air is admitted to cylinder K by means of a special pipe 4. The relation of this pipe 4 to the rest of the piping in the system requires a reference to Figs. 3 and 4, wherein the piping is shown. In these figures G represents an air reservoir from which the air passes by pipe 2, first through a strainer g^1, then through a stop cock g^2 to the inlet side of the controlling valve F, which it is not necessary to describe in detail, it being well understood that such a valve will act to admit the air to either the cylinder A^1 by means of the pipe 1, or to the cylinder A^2 by means of the pipe 3. In the former case it will also connect the pipe 3 to the exhaust, while in the latter case it will also connect pipe 1 to the exhaust, so that when air is admitted to the working end of one cylinder the working end of the opposite cylinder is connected to the exhaust.

The exhaust pipe is shown at 5 and contains an adjustable stop cock E. The exhaust pipe 5 will be connected to the appropriate point of the controlling valve F and a branch 4 therefrom will conduct the air to the aforesaid lock-cylinder K. In other words, the cylinder K receives its air from the exhaust of either of the power cylinders A^1 A^2 by the branch pipe 4 and the aforesaid adjustable stop cock E will determine the air pressure which is thus admitted to the cylinder K by the pipe 4, and will likewise determine the length of time that such air pressure will be maintained in cylinder K, it being remembered that the stop cock E is not wholly closed and that the air in the exhaust pipe 5 and the branch pipe 4 into the cylinder K will ultimately leak out through the cock E at a rate dependent upon the extent of opening the cock. Bearing this arrangement in mind, it will be understood that, assuming the door to be closed and that it is desired to open it, the control valve will be turned in the proper direction to admit air to the door-opening cylinder A^2 and at the same time to connect the door-closing cylinder A^1 to the exhaust. Thereupon the air which has been maintained in the door-closing cylinder A^1 will flow into the exhaust pipe and operate the cylinder K to release the latch and permit the door to be opened. If for any reason this should not take place in a specified time, the air in the cylinder K will leak out through the cock E and allow the latch to come back to its locking position. The object of this arrangement is as follows: Dirt is very apt to collect in the door slides and cause the door to stick, the air pressure being insufficient to open the door against the friction caused by the dirt. Since the door does not open the motorman forgets to throw the controlling valve to the door-closing position and when the train starts the jarring causes the dirt to release its grip on the door, which begins to move open while the train is in motion. In my device there will be no locking of the door, so long as there is no undue friction, but if the door sticks and the man neglects to throw his control valve, the door will again become locked and therefore not jarred open with the moving of the train. However, by reversing the control valve the motorman again admits air to the exhaust pipe and cylinder K and causes the latch to be operated. In other words, my device does not interfere with the regular working of the door, but insures that if the machine does not move within a certain number of seconds the door is re-locked and the lapse of time before the re-locking occurs may be determined by the degree of opening of the stop cock E.

As stated above, the motor operates the door R (see Figs. 3 and 4) by links d^1 and R^1 and the door slides just inside the wall

V of the car, being guided by the friction rollers *v*—*v* and arrested by the stop column V^1. My motor being of a long, narrow form. can be placed under the car seat at one side of the route of travel of the door and its stroke can be equal in length to the travel of the door from open to closed position. Hence the cross-head D^1 can be connected directly to the door by links d^1, R^1 which renders the installation extremely simple and compact, without the complication of devices for multiplying the range of stroke of the motor to give an adequate range of travel of the door. The small diameter of cylinder will give the force required to move the door and also will occupy but little space transversely of the car.

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

1. The combination with a door motor, of electric contacts operated thereby consisting of a traveling contact carried by a movable member of the motor, stationary contacts on each side of the traveling contact, and stops for limiting the side play of said stationary contacts.

2. The combination with a door motor, of an electric contact carried by a moving member thereof, stationary contacts engaged by the movable contact, and a split casing inclosing the stationary contacts but permitting the entrance of the movable contact.

3. The combination with a door motor, of stationary and movable electric contacts, and a split casing inclosing the stationary contacts while permitting the entrance of the movable contact, each side of the said casing being adapted to be opened outward to permit the inspection of the contacts.

4. The combination with a door motor, of movable and stationary contacts, and a split casing for the stationary contacts comprising two spring-operated parts capable of opening outward to permit the inspection of the contacts.

5. The combination with a door motor, of movable and stationary electric contacts engaging each other, side stops for limiting the play of said contacts, and a split casing inclosing the stationary contacts while permitting the entrance of the movable contact.

6. The combination with a door motor, of a contact depending from a movable member of the motor, stationary contact shoes on opposite sides of said movable contact, springs supporting said shoes, and stops for limiting the side play of the shoes.

7. The combination with a door motor, of stationary and movable electric contacts, and box-shaped spring doors embracing the stationary contacts but separated for the entrance of the movable contact.

In witness whereof I have hereunto set my hand, before two subscribing witnesses, this fourth day of March, 1911.

JAMES F. McELROY.

Witnesses:
ERNEST D. JANSEN,
ROBERT McCOCHRANE.