J. F. McELROY.

MECHANISM FOR OPERATING CAR STEPS AND DOORS.

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959,873.

Patented May 31, 1910.

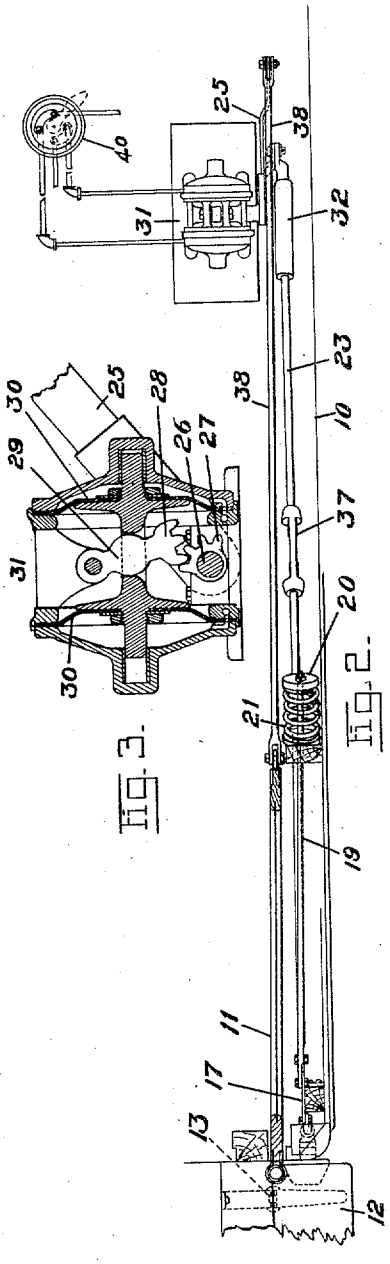

Fig. 3.

Fig. 2.

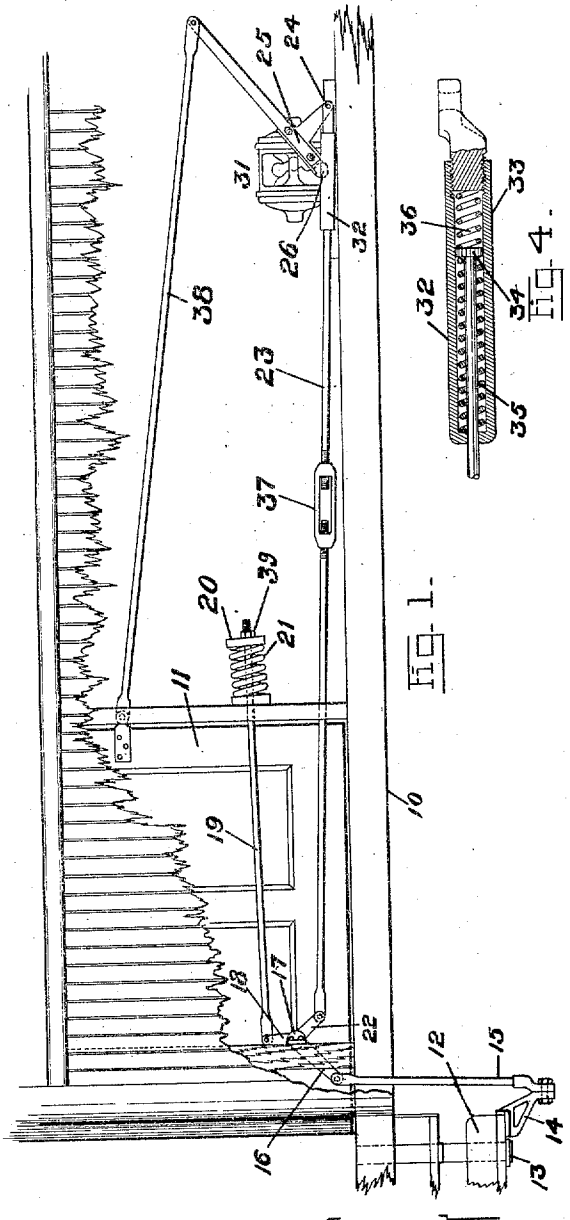

Fig. 1.

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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MECHANISM FOR OPERATING CAR STEPS AND DOORS.

959,873. Specification of Letters Patent. **Patented May 31, 1910.**

Application filed December 13, 1907. Serial No. 406,263.

To all whom it may concern:

Be it known that I, JAMES F. McELROY, 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 Mechanisms for Operating Car Steps and Doors, of which the following is a specification.

This invention relates to mechanism for operating adjustable car-steps or conjointly operating car doors and steps and one of its objects is to enable a folding or hinged step to be moved with a small expenditure of power and with an easy and regular motion which will tend to prevent slamming, especially when the same motor is employed to operate both the step and the car door.

Another object is to furnish connections of a simplified nature between the step and its operating motor such that the motor may have a motion additional to or greater in extent than that required to operate the step, which extra motion may be a part of that required to give the door its full travel. The connection between the motor and step preferably includes one or more resilient elements so disposed as to remain under pressure when the step is up or down.

My invention further involves the disposal of the door and step connections in a novel manner with respect to the motor in order that the motor may separately operate these members and in order that the connections themselves may be more compactly arranged in an out-of-the-way position.

Of the accompanying drawings, Figure 1 represents a side elevation of a mechanism embodying my invention for operating car steps and doors. Fig. 2 represents a plan view thereof. Fig. 3 represents a vertical section of the motor. Fig. 4 represents a horizontal section of the telescopic connection between motor and step.

In the drawings, 10 is the framing of the car, 11 is a sliding door and 12 is a step located below the door-opening and made adjustable into and out of operative position by hinging it at 13 to fold down into a horizontal position when the door is open or into an upright position when the door is closed. This step is a stair step enabling the passenger to climb to or descend from the car platform, and it is supported by the adjacent framework of the car in the usual manner to bear the passenger's weight when extended. A bracket 14 on the step is connected by a rod 15 with an arm 16 of a three-armed lever 17 which may be pivoted as shown on one of the uprights of the car framing, just above the sills and next to the outer sheathing of the car body. When the step is down the arm 16 and rod 15 have a considerable angle so that when the arm is swung upwardly to raise the step its arc of motion is nearly in line with the rod and the movement of the step takes place quickly by a nearly uniform angular movement of the arm.

A second arm 18 on the lever 17 is attached to a rod 19 having a head 20 between which and one of the beams of the car body is interposed a spring 21 having an adjusting nut 39, the effect of this spring being to counterbalance the weight of the step. I could of course arrange the counterbalance in some other position or employ an equivalent for the spring 21. The adjustment 39 enables the spring tension to be regulated according to the normal weight of the step or to allow for any change of weight such as would be caused by adding or removing a leaden tread. The use of a counterbalance as described permits the employment of a smaller operating motor than would otherwise be required since practically the only resistance to be overcome is that of friction, and it also conduces to a smooth working of the step and of both the step and the door when these are operated by the same motor as hereinafter described. In such a case, when the door performs part of its movement without an accompanying movement of the step, the motion tends to be arrested or slackened when the step begins to move, if its weight is not counterbalanced, and thereafter when the step is in motion the step and door tend to complete their movement with a slam. The counterbalance overcomes this tendency in an effective manner and enables the entire movement of the door and step to be accomplished more smoothly.

A third arm 22 on lever 17 is connected by a rod 23 with a pivotal point 24 on an operating lever 25. As shown in Fig. 3 the fulcrum shaft 26 of this lever has a gear segment 27 meshing with a complemental segment 28 on the end of a short lever 29 which is engaged by the common stem of two diaphragms 30, 30, the whole consti-

tuting a double motor 31 which may be operated by compressed air under control of a valve 40 for alternately charging and discharging the diaphragm chambers. The rod 23 contains a telescopic joint 32 shown in detail in Fig. 4 and including a sleeve 33 on the rod section which is connected with lever 25, and a head 34 on the rod section which is connected with lever 17. In said sleeve is a spring 35 pressing in a direction to shorten the rod and a spring 36 pressing in the opposite direction to lengthen the rod. In the rod 23 is shown a turn-buckle 37 for adjusting its length, although this is not essential. The long arm of lever 25 is connected by a rod 38 with the rear edge of the door 11.

When the operating lever 25 has the position shown in Fig. 1 the radius from fulcrum 26 to point 24 which is the mechanical lever "arm" connecting with rod 23, is substantially parallel with or doubled on said rod. The spring 35 is then under tension and tends to hold the step 12 down in horizontal position and to hold the operating lever 25 in its most retracted position as shown in Fig. 1 so that no exertion of air pressure is needed to keep the step down and the door open.

With the relations and dimensions here given, lever 25 has an arc of movement of about 104° and during the first part of this movement to the left from the position shown in Fig. 1 the point 24 is rising on a nearly vertical arc which would have no substantial effect in raising the step 12 even if the telescopic joint 32 were omitted and the rod 23 rigid. The first half of the swing of lever 25 to the left is devoted to moving the door 11 without raising the step, but when the door is about half closed and the point 24 has entered on a more horizontal arc of movement the spring 35 loses its tension by a shortening of the rod 23 and compression is then exerted on said rod against the resistance of spring 36 to swing the three-armed lever 17 and lift the step 12 into its upright folded position where it is out of danger of contact with external objects and cannot be used by passengers. This latter half of the movement of lever 25 also completes the closing movement of the door 11, and when the door is closed and the step folded up the spring 36 may be under some compression from the motor to hold said step in its upright position. Both of the springs 35, 36 tend to insure the seating of the step against its stops at the two extreme positions. If desired, the pressure of spring 21 may be so adjusted as to slightly predispose the step to rise, and in that case no pressure from the motor 31 is required to start the step from its horizontal position. In opening the door the movements are the reverse of those described, lever 25 swinging to the right and the step 12 being depressed into operative position during the first part of the opening movement of the door, the latter half of said movement taking place without further moving the step but serving to put spring 35 under compression.

It will be seen that the operating lever 25 on the motor shaft has independent connections with the door and with the step so that should it be desired to operate either the door or the step independently the connection with the other member can simply be disabled. I consider this an advantage in the way of simplicity and compactness, the connections all being at a low point and out of the way as will be noted, with the motor 31 preferably under one of the car seats. In case the door should become jammed or otherwise disabled requiring it to be operated by hand or left open, the step may still be operated by the motor since its connection to the motor is independent of the door, and the step in such a case could also be left permanently in a lowered position without destroying its connection with the motor.

I claim:—

1. In combination, a hinged step having counterbalancing means which substantially neutralizes the effect of the weight of the step in resisting pivotal movement, a door, a device for conjointly operating the door and step, and connections whereby the door is caused to perform the first part of its closing movement without substantial movement of the step.

2. The combination of a car-body, a door mounted to slide longitudinally of said body, a step hinged at its rear edge to move into an inoperative upright position or an operative horizontal position, connections for raising and lowering the step, a motor, a lever oscillated thereby in a plane parallel to that of the door, and separate rods 38 and 23 connecting said lever with the door and the step-operating connections respectively.

3. In combination, an adjustable step, a motor therefor, and a connection between the motor and step including a spring.

4. In combination, a door, an adjustable step, operating rods for said door and step, and an operating lever having an arm connected with the door-operating rod at a point whose arc of movement is substantially in line with the rod and a second arm connected with the step-operating rod at a point whose arc of movement is partly across said rod and partly in substantial line therewith.

5. In combination, a door, an adjustable step, operating rods for said door and step, and an operating lever having an arm connected with the door-operating rod and a second arm connected with the step-operating rod and substantially parallel therewith when the door is fully open.

6. In combination, a door, an adjustable

step, an operating device for said door and step, a telescopic connection between said device and step permitting the door to fully open after the step is extended, and a spring in said connection put under pressure by the last part of the door-opening movement.

7. In combination, an adjustable step, an operating device therefor and an extensible operating connection including a spring put under pressure when the step is extended so as to hold it in extended position.

8. In combination, an adjustable step, an extensible operating rod therefor, a spring put under pressure by extension of said rod, and an operating lever having an arm substantially parallel with said rod when the step is extended.

9. In combination, a folding step, an operating device therefor, a counterbalancing device, and a lever having three arms connected respectively with the step, the operating device, and the counterbalancing device.

10. In combination, a hinged car-step, a counterbalancing device therefor, means for adjusting the power of said device, a fluid pressure motor for swinging the step into and out of usable position, and a door also operated by said motor.

11. In combination, a hinged car-step, a fluid-pressure motor for swinging said step into and out of usable position, a spring for counterbalancing the weight of the step and decreasing the resistance imposed on the motor, and means for adjusting the pressure of said spring to compensate for weight added to or taken from the step.

12. In combination on a car, a door, a hinged stair-step mounted below the doorway for permitting the passengers to ascend to or descend from the car platform, a fluid-pressure motor connected to operate said door and step, and resilient means in the connection between said motor and step for permitting the door to move after the step has reached either of its extreme positions.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses, the 9th day of December, 1907.

JAMES F. McELROY.

Witnesses:

BEULAH CARLE,

WILLIAM A. MORRILL, Jr.