H. ROWNTREE.

COMBINED DOOR AND STEP OPERATING MECHANISM.

APPLICATION FILED JULY 1, 1910.

1,067,787.

Patented July 15, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

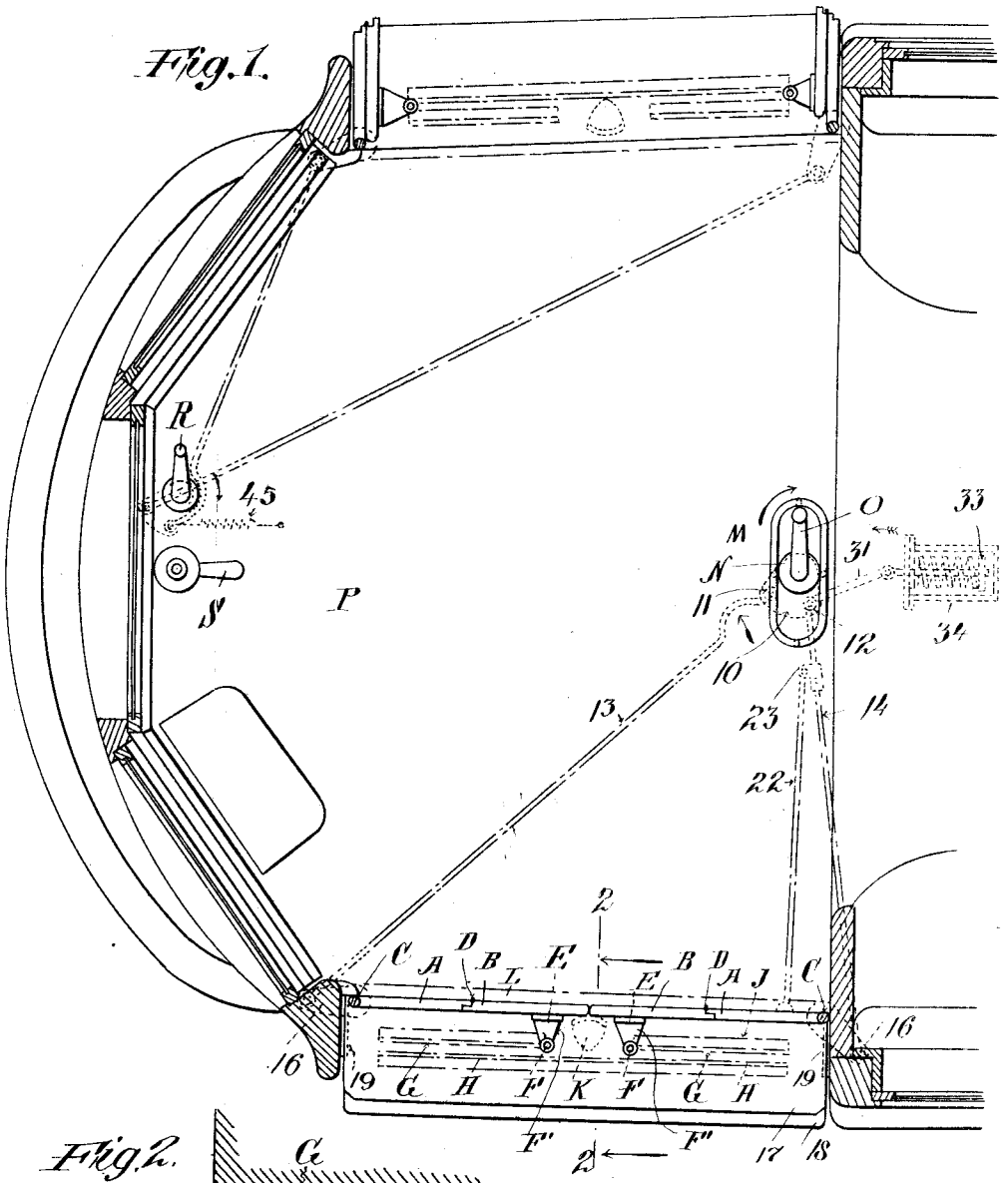
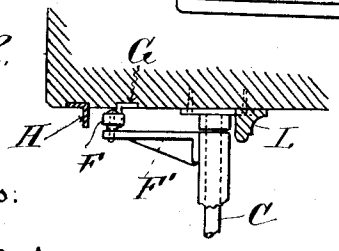


Fig. 2.



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2 SHEETS—SHEET 2.

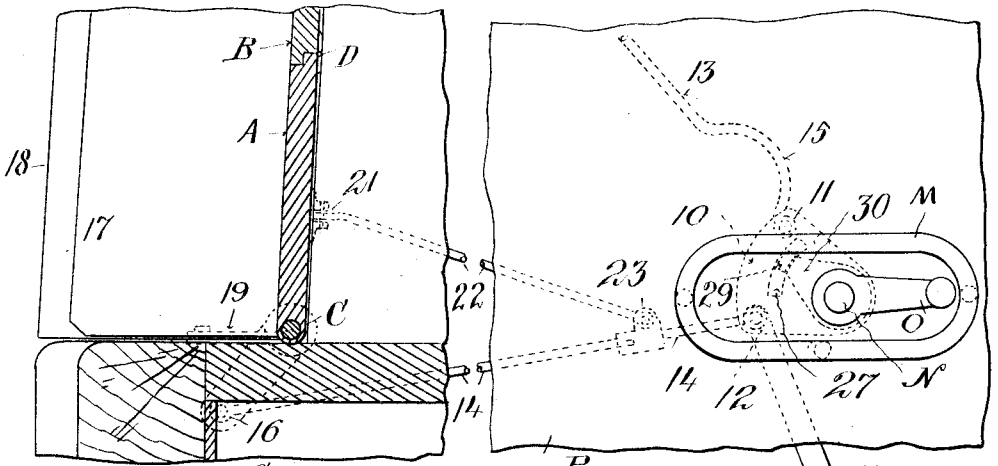


Fig. 3.

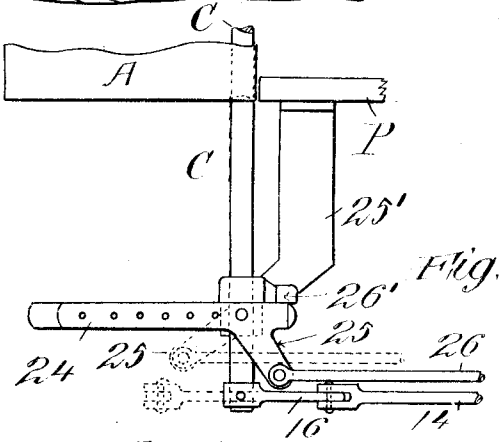
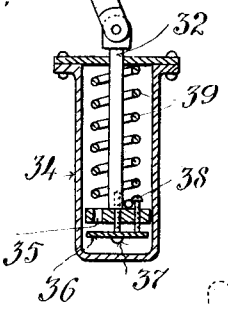


Fig. 5.



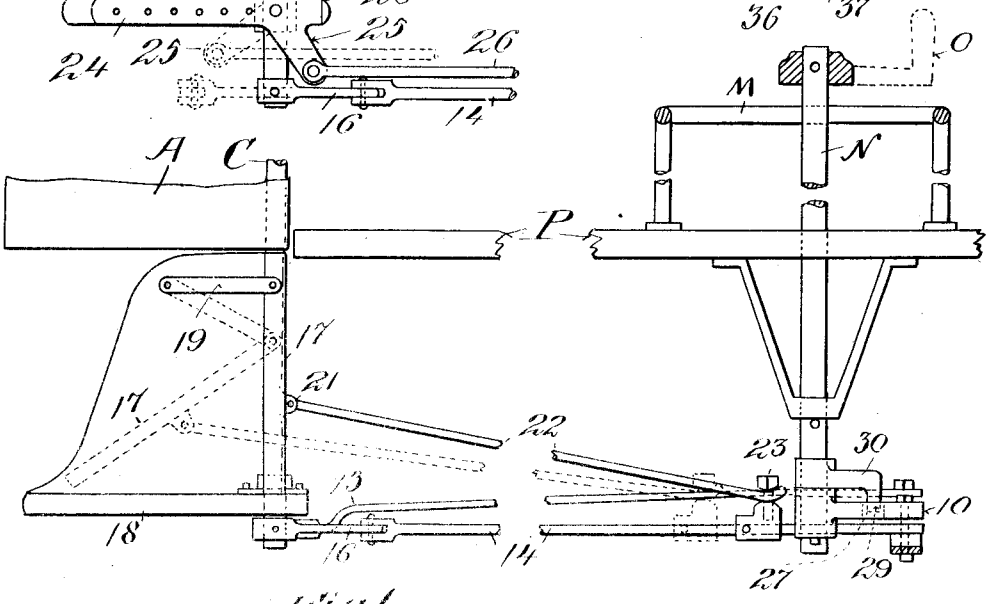


Fig. 4.

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UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF CHICAGO, ILLINOIS, ASSIGNOR TO NATIONAL PNEUMATIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

COMBINED DOOR AND STEP OPERATING MECHANISM.

1,067,787. Specification of Letters Patent. Patented July 15, 1913.

Original application filed May 5, 1910, Serial No. 559,491. Divided and this application filed July 7, 1910. Serial No. 569,844.

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have made a certain new and useful Invention in Combined Door and Step Operating Mechanism, of which the following is a specification.

This invention relates to mechanism for operating the doors and steps or step covers of street cars.

The object of the invention is to apply a combined car door and step cover operating mechanism in a car of the pay-within type wherein the door and step cover operating mechanism is controlled from a fare prepayment station within the door inclosure.

A further object of the invention is to provide a combined folding door and step cover operating mechanism, having the characteristics and arrangement referred to.

A further object is to provide means which are simple and efficient for locking the apparatus in position to hold the doors open or closed and the step or cover in corresponding position.

A further object is to provide means in a manually operated apparatus of the character referred to for retarding the final movements of the door or door and step cover.

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 plan view, parts in horizontal section of a portion of the end of a car showing a combined door and step or step cover operating mechanism having a construction, arrangement and relation embodying the principles of my invention. Fig. 2 is a broken view in vertical section on the line 2, 2, Fig. 1, showing the guide roller and guides for the inner folding door section. Fig. 3 is a broken view in top plan, parts in horizontal section, showing a cushioning arrangement embodying my invention. Fig. 4 is a broken view in elevation. Fig. 5 is a similar view showing a slightly modified arrangement.

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

In my Patent No. 937,870, dated Oct. 26, 1909, is shown described and claimed, a construction of twin folding doors, the folding movements of the door sections being effected by means of intermeshed gears. In the use of apparatus embodying the construction of said patent, however, different patterns and castings are required for each width of door.

It is among the special purposes of my present invention to provide door operating means which are simple and efficient, and which are of standard uniform construction whatever may be the differences in width of the doors.

In carrying out my invention I provide doors made in sections or panels hinged together and designed to fold upon each other to open the doorway and to straighten out into substantially the same plane when closed, the folding movement of the one section or panel upon the other in opening being effected by means of a guiding roller or device connected to the folding section or panel of the door and operating in a guiding way or track.

In the drawings, reference letters A and B designate respectively the outer and inner panels or sections of each door. Each outer section A is secured at its outer edge to a vertical rock shaft C, to rock or swing therewith. Each inner section or panel B, is hinged at its outer edge to the inner edge of its coöperating door section A, as indicated at D. Secured to each door section B, is a bracket or shoe E, carrying a guiding device, in this instance a roller F, arranged to be received and to operate in a way or track, indicated at G, formed in or connected to the under surface of the ledge or frame immediately over the doorway. This guide way or track may be of any suitable construction and arrangement. I have shown a simple embodiment wherein angle plates H, J, are provided and separated sufficiently from each other to afford a trackway there-

between. The plate H, extends practically all the way across the doorway while the plates J, are short and terminate with their proximate ends considerably separated at the center of the doorway. A block or shoe K, is attached to the framing beam above the doorway at the center of the doorway, and is provided with somewhat rounding or curved side edges.

The operation of this part of my invention is simple and is as follows: Suppose the doors occupy their closed positions, as shown in Fig. 1, and it is desired to move them to their open position. The shafts C, are rotated thereby swinging the sections or panels A about the axes of said shafts. At the commencement of the rocking or swinging movement of the door sections A, the hinge joints between the door sections A, and B, are bent at D, thereby slightly rocking the door sections B about the bearing points thereof against the shoe K, as a fulcrum. This movement causes the rollers F, to move outwardly a sufficient distance to enable them to enter the guideways or tracks G. The continued swinging movement of the door sections A, toward open position, causes the guide rollers F to be drawn through the guideway or track G, thereby causing the door panels or sections B, to fold back against the panels or sections A, into the complete open positions thereof. By rotating shafts C, in the opposite direction the panels or sections A, are rocked toward their closed position, thereby pushing the guide rollers F along the guideways G, toward the inner ends thereof. The extreme inner edges of the sections B, are eventually brought into engagement with the rounded or curved sides of the shoe K, and thereby guided firmly and securely into their completely closed positions against the stop or head L, as the joints between the panels A, B, straighten out, the extreme inner edges of the panels B being forced into the space between the shoe K, and the head L.

It will be observed that I am enabled to employ straight instead of curved guideways which have usually been employed and which are a source of trouble by reason of the guides becoming wedged therein in case of the slightest inaccuracy in forming the curve on the exact radius of curvature. By employing straight guideways, and offsetting from the door sections the guides which coöperate therewith, I am enabled to produce an arrangement which is exceedingly simple and economical to make and install, and wherein an easy action of the door section or panel movements is secured without binding or wedging.

The movements of the door sections or panels to open or closed positions may be effected in many different ways, by power or manually operated devices, and from any convenient point. In the particular arrangement shown, to which, however, my invention in its broadest scope, as defined in the claims, is not to be limited or restricted, I provide manually operated devices for moving the door sections or panels, and where the doors are applied as side doors for street or other car platforms, as in the case illustrating my invention as shown in the drawings, I propose, in accordance with the principles of my invention to locate the point of control of the doors on one side of the platform in such relation to the car body and platform as to define separate entrance and exit passages to and from the interior of the car body across the platform from and to the side doorway. To this end I employ a stand M, at the point referred to, within which is arranged a vertical operating shaft N, having an operating handle O, at its upper end by which said shaft may be rotatively actuated. The operating shaft N, extends below the floor P, of the platform, and at its lower end is suitably connected to the rock shafts C, in such manner that when the operating shaft N, is rocked, a corresponding rocking movement is imparted to the shafts C, and, consequently, also to the door panels or sections A, and B, as above explained. A simple and efficient arrangement is shown wherein a crank arm 10, is mounted on shaft N, said crank arm having a broadened free end, as shown. To the two corners of the broadened free end of this crank arm are pivotally connected, as at 11, 12, operating rods 13, 14. In order to prevent interference in the proper operation of these devices, I prefer to attach one of these operating rods 13, 14, to the upper side of crank arm 10, and the other to the lower or under side thereof, as most clearly shown in Fig. 4. I also suitably curve or bend one of the rods, as indicated at 15, so that said rod will not be prevented by shaft N, from properly operating to the required extent to perform its full function. The other ends of the rods 13, 14, are pivotally connected to crank arms 16, respectively connected to the door section or panel operating shafts C, and respectively extending in opposite directions, so that when operating shaft N, is rotated the door section carrying shafts C are simultaneously rotated in opposite directions with respect to each other.

It is desirable, where my invention is applied to street cars, to provide means for preventing passengers from attempting to get on or to hold on to the car when it is in motion or when the platform side door is closed. To accomplish this result I propose to employ a cover for the car step, so arranged and operated that whenever the doors are in closed position the step

cover is in operative relation to cover the car step and to prevent any one from jumping or hanging on the step. A simple arrangement is shown wherein a plate or panel 17 is arranged to form a riser for the car step 18, when the doors are open as shown in Fig. 4 but is designed to be shifted or swung outwardly, as indicated in dotted lines in said Fig. 4, and in full lines in Figs. 1 and 3, to form a cover for the step 18, when the doors are closed. To permit and to accomplish the swinging movements of the riser panel 17, coincidently with the door movements, I pivotally connect the riser at the upper part of each end thereof to one end of a link 19, the other end of said link being pivotally secured to a fixed part of the step structure or car body, say, for instance, to the side brackets or hangers 20, of the step. To the rear side of the riser panel 17, is pivotally connected, as at 21, one end of an operating rod 22, the other end of said rod being suitably connected as at 23 to one of the door shaft operating rods, as, for instance, rod 14. With this arrangement it will be seen that whenever the operating shaft N, is operated to open or close the doors the step riser panel 17, is coincidently operated into position to form a step riser, or a step cover as the case may be.

Instead of employing a step cover, as above explained, the step itself may be rocked or folded up against the side of the car, when the doors are closed, or down into position for use as a step when the doors are opened. In Fig. 5, I have shown an example of this arrangement, the step 24, being provided with a crank arm 25, to which is connected an operating rod 26, designed to be connected to and operated by the door operating rod 14, in the same manner as above explained with reference to the riser operating rod 22. When the step is in position for use it may be braced therein by a suitable stop, as indicated at 26'.

In the operation of doors and steps and particularly in the case of car doors and steps, it is desirable to lock the doors or steps in the limits of their movements to open or closed positions. This result is accomplished in the structure embodying my invention as illustrated in the drawings, by so arranging the parts that when the doors are in their fully closed positions, or the step is folded up against the side of the platform, or the riser projected or swung out to form a step cover, the points 11, 12, of pivotal connection of the rods 13, 14, to the crank arm 10, are respectively, in substantially a dead center line with the axis of operating shaft N, and the points of pivotal connection of said rods with the crank arms 16, on the door operating shafts C, thereby locking the doors closed. If desired a similar relation is established when the doors are in their completely open position and the step in position for use or the riser panel withdrawn into position to form a step riser, the crank arm 10, in that case occupying a position turned one hundred and eighty degrees from the position thereof when the doors are closed.

It is desirable to cushion the final movements of the doors and steps to open or closed positions. Where power operated means are employed for this purpose the cushioning may be easily and readily accomplished, but in the case of manually operated devices the difficulty becomes more serious, as the manual operation of the doors requires the expenditure of considerable effort on the part of the operator, and any retarding or cushioning device that might be employed would require just that much more physical effort. Moreover, if the cushioning or retarding action is only slight a strong vigorous operator might cause the doors to slam notwithstanding the use of the cushioning or retarding means, and if the cushioning or retarding action is strong then a less vigorous operator might fail to completely open or close the door, thereby inviting danger of accident. In accordance with the principles of my invention, I propose to obviate these difficulties, and to provide means for efficiently retarding or cushioning the final movements of the doors whether operated by power mechanism or manually, and, in case of manual operation without imposing too great an additional strain on the operator. A simple arrangement as illustrative of the principles involved is shown, wherein the crank arm 10, is loosely mounted on shaft N, and is provided with a curved slot 27, the curvature being on a radius with the axis of operating shaft N, as a center, in which slot operates the bent end 29, of a crank arm 30, secured to and rocking with the shaft N. Also connected to the arm 10, is one end of a link 31, the other end thereof being connected to the rod 32, of a piston 33, operating in a cylinder 34. The piston 33, is provided with a hole or opening 35, therethrough which is closed when the piston moves in one direction by a flap valve 36, loosely carried by a stud 37, and adjusted by a set screw 38. When the piston moves in the other direction the flap valve 36, uncovers the opening 35. A spring 39, is interposed between the piston 33, and one end of the cylinder 34.

The operation of this feature of my invention is as follows: When the operating handle O, is turned, thereby turning the shaft N, the end 29 of the crank arm 30, moves through the slot 27 in arm 10, without doing any work until the end of slot 27 is reached whereupon the arm 10, is thereafter rocked with arm 30. This movement, starting with the parts occupying the

positions thereof indicated in Fig. 3, that is, in their normal positions with the doors closed, causes the piston 33 to be moved in cylinder 34, against the action of spring 39, until the arm 30 has moved through a distance somewhat greater than ninety degrees, or until the link 31, has passed its dead center point. Thereafter the physical effort of the operator in completing the door movements to open position, is aided by the tension of spring 29, which now tends to complete the swing of arm 10, thereby very materially relieving the operator in accomplishing the work. When the operating handle has moved to its extreme position the crank arm 10, will lack somewhat of being in its extreme position owing to the lost motion in the slot in the crank arm, and, therefore, when the operating handle O, has been moved to its extreme position the door will lack somewhat of being in its completely opened or closed position. The spring 39, acting against the air in the cylinder 34, which is compelled to escape through the opening 35, which is nearly closed by the flap valve 36, will gradually move the crank arm 10 into its complete dead center position, thereby completing the movement of the door into its final open or closed position. No matter, therefore, how rapidly or violently the operator may move his crank arm to its final position, he cannot cause the door to slam as the final movement of the door will be accomplished by the spring acting against the dash pot, the lost motion in the slot of the crank arm 10, rendering it impossible for the operator by main strength to force the door to its completely closed or open position. It will also be seen that the same operation takes place when the handle O, is operated in the reverse direction to close the doors. It will also be seen that the spring 39, holds the crank 10 in the extreme limits of its movements, with the door operating rods 13, 14, in their dead center or locked positions, whereby the danger is avoided of the door locking means being jarred or jolted loose in the case of street or railway car operation, or other rough usage.

In the foregoing description I have referred to the arrangement of the doors only on one side of the car platform, and to the operation of the same from a point embodying the pay-within fare prepayment principle as applied to street cars. It is obvious that the platform may be equipped with doors on both sides, or the doors may be arranged as bulk head doors, that is, transverse the car, and still operated and controlled by the apparatus above described. In Fig. 1 I have shown both sides of the platform equipped with folding doors, guided and operating as above described. In the case of street cars, however, it may be desirable to employ one side of the rear platform of the car for both ingress and egress of passengers, while the doorways at the other side of said platform remain closed. Or it may be desired to similarly equip each end of the car so that the rear end may be employed both for ingress and egress of passengers, while the front or motorman's end may be employed only for the egress of passengers and either end may be a motorman's end. To enable this arrangement to be employed I similarly equip both sides of the platform at one or both ends of the car, and arrange the control of the doors on one side of the platform in accordance with the pay-within principle, as above explained, while the doors on the other side of the platform are arranged to be controlled from a point convenient to the motorman's controller S, as indicated at R, the arrangement construction and operation being otherwise the same as above described.

While I have shown and described a retarding device for the doors, and while such a feature is desirable, it is not absolutely essential, and may be omitted, as indicated in Fig. 1 in the arrangement operated by the motorman. In this case a spring 45, may be employed to retain the operating crank in the limits of its movements.

I do not claim herein the door operating apparatus *per se* as the same forms the subject matter in my application Serial No. 559,491, filed May 5, 1910, of which the present application is a division.

Having now set forth the objects and purposes of my invention, and various arrangements 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. In a car having a platform, and a side doorway for the platform, a door for the doorway, a step for the platform, said step having a riser, and means for moving the riser into and out of position to form a cover for the step in unison with the movements of the door into and out of closed or open position.

2. In a car having a platform, and a side doorway for the platform, a movable door for the doorway, a step for the platform, a horizontally hinged cover for the step, and means located in position to form separate entrance and exit passages across the platform for controlling the coincident movements of the door and cover.

3. In a car having a platform, and a side doorway for the platform, a folding door for the doorway, a hinged step cover, and means for coincidently folding the door and moving the step cover.

4. In a car having a platform, and a side doorway for the platform, a folding door for the doorway, a step cover independent of the door, and means for coincidently

folding the door and moving the step cover, said means located to define separate entrance and exit passages across the platform.

5. In a car having a platform and a side doorway therefor, a door, a step cover independent of the door, an operating shaft located to define separate entrance and exit passages across the platform, a crank arm connected to said shaft, rods connecting said crank arm and door and cover, and means for rocking said shaft.

6. In a car having a platform and a side doorway therefor, a folding door, a step cover independent of the door, an operating shaft having a crank arm and connections between the crank arm and folding door and step cover for coincidently moving the same.

7. The combination of a car and its platform having a side doorway, a shaft journaled at each side of said doorway, door panels connected to each shaft, means for coincidently rocking said shafts, and a step cover, said means also operating to move said cover.

8. The combination of a car and its platform having a side doorway, a shaft journaled at each side of the doorway, door panels connected to each shaft, crank arms on said shafts, an operating shaft having a crank arm, rods respectively connecting the door and operating shaft crank arms, a step cover, and connections between said cover and rods.

9. The combination of a car and its platform having a side doorway and step, a door for the doorway, a movable riser for the step, and means for moving the riser into and out of position to form a cover for the step, said means also operating to move the door.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 9th day of June A. D., 1910.

HAROLD ROWNTREE.

Witnesses:
EDMUND R. DODGE,
MAE W. CLINTON.