

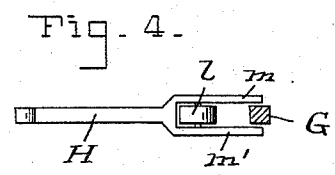
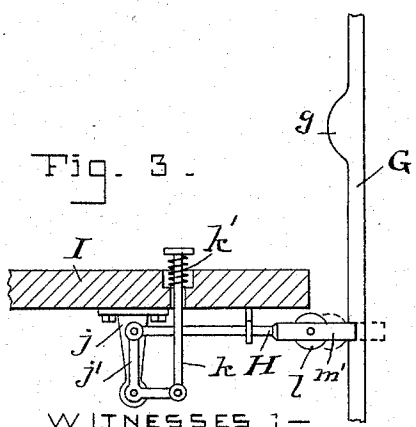
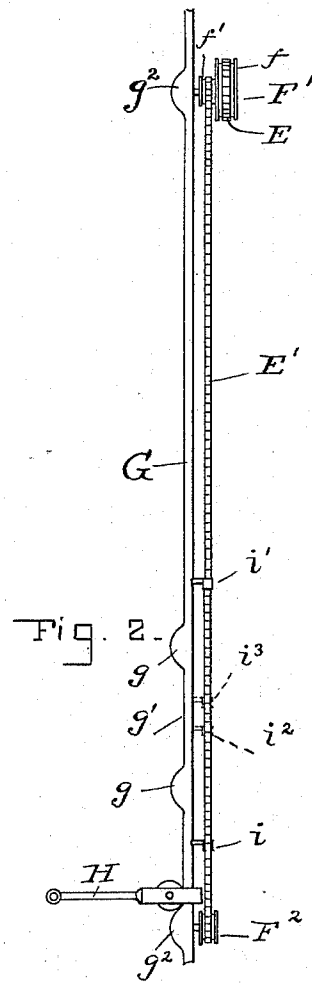
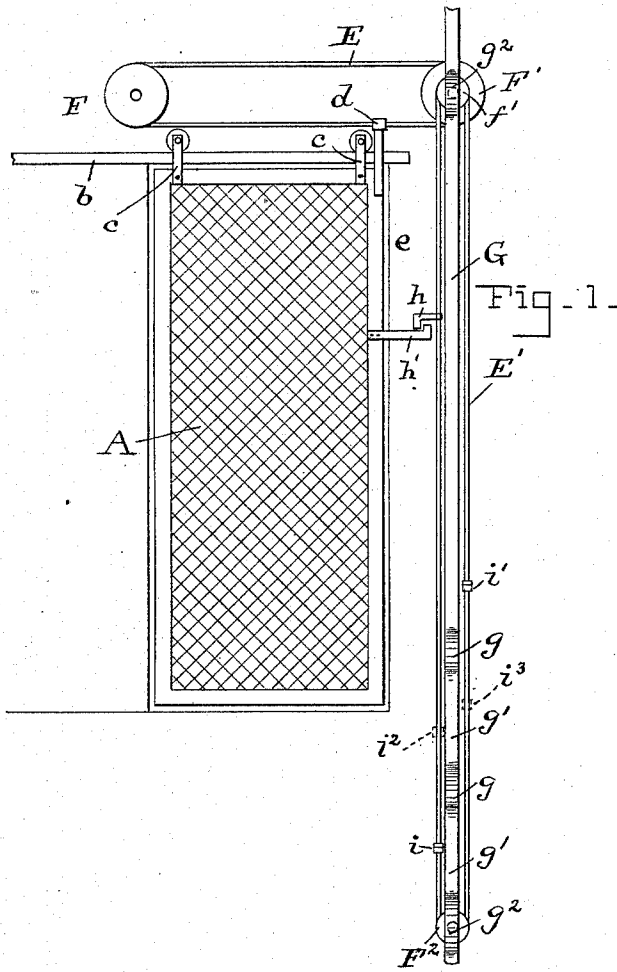
(No Model.)

W. J. FERGUSON.

DEVICE FOR OPENING OR CLOSING ELEVATOR DOORS.

No. 527,366.

Patented Oct. 9, 1894.



WITNESSES :-  
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# UNITED STATES PATENT OFFICE.

WILLIAM J. FERGUSON, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF TO WILLIAM G. H. STUMP, OF SAME PLACE.

## DEVICE FOR OPENING OR CLOSING ELEVATOR-DOORS.

SPECIFICATION forming part of Letters Patent No. 527,366, dated October 9, 1894.

Application filed June 12, 1894. Serial No. 514,282. (No model)

### To all whom it may concern:

Be it known that I, WILLIAM J. FERGUSON, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Devices for Opening or Closing Elevator-Doors, of which the following is a specification.

This invention relates to certain new and useful improvements in devices for opening and closing elevator doors.

The object of the invention is to provide a simple device by means of which the conductor in an elevator car may cause the doors located at the various floors to be opened or closed as desired as the elevator ascends or descends the elevator shaft.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view of an elevator door located on a floor and the mechanism connected with the door for opening and closing it. Fig. 2 is a side view showing the stationary retractor which is located alongside of each door, the vertical endless chain, and the trip-arm on the car which traverses the retractor and actuates the said vertical chain. Fig. 3 is a detail view of the trip-arm and showing its relative position with respect to the retractor. Fig. 4 is a top or plan view of the trip-arm.

The letter A, in the drawings designates one of the doors of an elevator shaft located at each floor and which, as usual, slides back and forth on a horizontal track, *b*, from which it is suspended by hangers, *c*. The door has at its top an upward projecting arm, *d*, made fast to a horizontal endless chain, *E*, above the door by which the door is opened and closed as hereinafter described. This horizontal chain passes over a pulley, *F*, at one side of the door and also over one step, *f*, of a cone pulley, *F'*, at the other side of the door. The cone pulley has position above the elevator door and adjacent the door jamb, *e*. A pulley, *F<sup>2</sup>*, has position some distance below the lower end of the door and in a direct vertical line below the cone pulley, *F'*, and a vertical endless chain, *E'*, connects between the lower pulley, *F<sup>2</sup>*, and the step, *f'*, of the cone pulley. The vertical chain serves to actuate the hori-

zontal chain and cause it to open and close the door in the manner hereinafter described.

The pulleys, *F*, *F'*, over which the horizontal chain, *E*, passes, are relatively larger than the pulleys, *f'*, *F<sup>2</sup>*, over which the vertical chain, *E'*, passes. By this construction and arrangement, a certain movement of the said vertical chain will result in a much greater movement of the said horizontal chain which shifts the door, and this latter movement will produce a momentum sufficient to fully open the door.

The vertical chain, *E'*, carries a downturned hook-lip, *h*, which engages with an upturned hook-lip, *h'*, on the elevator door, and the two hook-lips when engaged serve as a catch to hold the door closed. The vertical chain also carries two knocker blocks, *i*, *i'*, one block on each stretch of the chain, upon which a trip-arm, *H*, acts, said trip-arm being carried by the car, to move the said vertical chain.

The vertical retractor, *G*, is stationary and has two projecting curved faces, *g*, separated from each other by a straight face, *g'*. This bar has position forward of and in a vertical line between the two stretches of the vertical chain, *E'*. The retractor bar also has a curved face, *g<sup>2</sup>*, adjoining each of the pulleys, *F'*, *F<sup>2</sup>*, which prevents the trip-arm from coming in contact with either of the pulleys when it is projected at that point.

The trip-arm, *H*, has a yoke-end or bifurcated end provided with a roller, *l*, journaled between the two arms, *m*, *m'*, and said two arms project beyond the roller. This trip-arm is carried on the elevator car, the bottom, *I*, of which has a bracket, *j*, depending from it and a bell-crank lever, *j'*, is pivoted to the bracket. To one end of this bell-crank lever is attached a foot rod, *k*, which projects up through the floor of the car, and to the other end of the bell-crank lever the trip-arm is connected. A spiral spring, *k'*, around the foot-rod, *k*, tends to keep the rod in a normal raised position and the trip-arm retracted. The ends of the yoke-arms, *m*, *m'*, of the trip-arm, take on each side of the vertical retractor bar, *G*, so that the roller, *l*, when the arm, *H*, is retracted will pass close by the outer edge

of the curved faces, *g*, when the trip-arm is not employed to open the elevator door.

When it is desired to open a door, A, the conductor presses his foot upon the end of the rod, *k*. This actuates the bell-crank lever, *j'*, which projects the trip-arm, H, and causes it to take the position shown in Fig. 2 wherein the roller, *l*, is in direct contact with said bar, G. Now the roller, *l*, will traverse up or down on the retractor bar, G, and when the car is going up the arm, *m*, of the trip-arm will come in contact with the knocker block, *i*, on the vertical chain, E'. Thus the knocker block will be carried up by the arm, and the vertical chain carrying the hook-lip, *h*, caused to move upward and the horizontal chain, E, to slide the door, A. The movement of the vertical chain releases the hook-lip, *h*, from the hook-lip, *h'*, on the door, and leaves the door free to be opened. The knocker block, *i*, is carried up by the engagement of the trip-arm until the roller of the trip-arm in the upward traverse runs upon the lower projecting curved face, *g*, when said arm will be forced back to its normal position, shown in full lines in Fig. 3, which releases it from the knocker block. The momentum acquired by the door on being moved will cause the door to draw on both the horizontal and vertical endless chains so as to move them. The knocker block, *i*, on the stoppage of the vertical chain at the time the door is fully open, will have the position designated, *i'*, adjoining the second straight face, *g'*, as indicated in Fig. 1. At this stage the elevator car will stop with its bottom, I, even with the floor of the landing. It will be understood that as the knocker block, *i*, ascends the knocker block, *i'*, on the other stretch of chain will descend and upon the stoppage of the vertical chain, the relative positions of the two knocker blocks will be as indicated by dotted lines, *i''*, *i'''*, in Fig. 1.—*i. e.*, the knocker block, *i'*, will have position just above the knocker block, *i*. Now on starting to continue the upward traverse of the car, the conductor replaces his foot on the rod, *k*, which will project the trip-arm above the knocker block, *i*, and below the other knocker block, *i'*. When the trip-arm, *m'*, engages the knocker block, *i'*, the continued traverse upward will reverse the movement of the vertical chain, E', and the horizontal chain, E, and close the door, A; the hook-lip, *h*, will be lowered to engage with the hook-lip, *h'*, and the door thus will be locked; and the knocker-blocks, *i*, *i'*, respectively, returned to their normal positions as they were before the door was opened.

The operation just described will be substantially the same with the elevator car descending the shaft. In this instance, however, the trip-arm will engage the knocker block, *i'*, to open the door, and to close the door the knocker block, *i*, will be engaged.

In the present instance the trip-arm is shown as intended to be operated by the pres-

sure of the conductor's foot, but it is obvious that it may be operated in any other manner.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device for opening and closing the doors of elevators, the combination of the horizontally-sliding elevator door; a horizontal endless chain having position above the door and connected directly therewith and moving in the same direction that the said door slides, so that in moving said chain will carry the door with it; a vertical endless chain to transmit motion to the said horizontal chain; the vertically-moving car; and a laterally-movable trip-arm on the car which is projected horizontally out from the car to engage and move the vertical chain and is automatically disengaged from said chain when the latter has been moved a sufficient distance to cause the opening or closing of the door.

2. The combination of a sliding elevator door; a horizontal endless chain, E, connected with the door; a vertical endless chain, E', adapted to transmit motion to the horizontal chain and carrying one or more knocker blocks; a vertically-moving car carrying a movable trip-arm; means for engaging the trip-arm with said knocker-block to move the vertical chain, whereby the horizontal chain is operated to open or close the door; and further means to automatically disengage the trip-arm from the knocker-block when the horizontal chain has moved the door to a full open or closed position.

3. In a device for opening and closing the doors of elevators, the combination of the sliding elevator door having a catch; a horizontal endless chain, E, connected with the door; a vertical endless chain, E', connected so as to transmit motion to the horizontal chain and carrying a catch to engage with said catch on the door when the door is closed, and also carrying one or more knocker blocks; a vertically-moving car; and means attached to the car for engaging the said knocker blocks, whereby the vertical chain is caused to move and engage its catch with or disengage it from the catch on the door, and also actuate the horizontal chain which in turn operates to open and close the elevator door.

4. The combination of a sliding elevator door; a horizontal endless chain, E, connected with the door; a vertical endless chain, E', connected so as to transmit motion to the horizontal chain and carrying one or more knocker blocks; a stationary retractor bar, G, arranged in a line between the two stretches of the said vertical chain and having a number of curved projecting faces, *g*; a vertically-moving car carrying a projectible trip-arm having two arms, *m*, *m'*; and means for projecting the trip-arm so that its two arms will straddle the retractor bar in position for engaging either of the knocker blocks, whereby when the car moves the trip-arm engages the

knocker block and the vertical chain will be moved until the arm encounters one of said curved faces of the retractor bar, substantially as described.

5 5. The combination of the horizontally-sliding elevator door; a vertical endless chain, E', passing over suitable pulleys adjacent to one side of the door; a horizontal endless chain, E, connected with the door and passing  
10 over pulleys which are relatively larger than those over which the said vertical chain passes,—said horizontal chain being actuated

by the vertical chain, whereby a certain movement of the said vertical chain will result in a greater movement of the horizontal chain; a  
15 vertically-moving car; and means on the car for actuating said vertical chain, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM J. FERGUSON.

Witnesses:

CHARLES B. MANN, Jr.,  
C. CALVERT HINES.