

(No Model.)

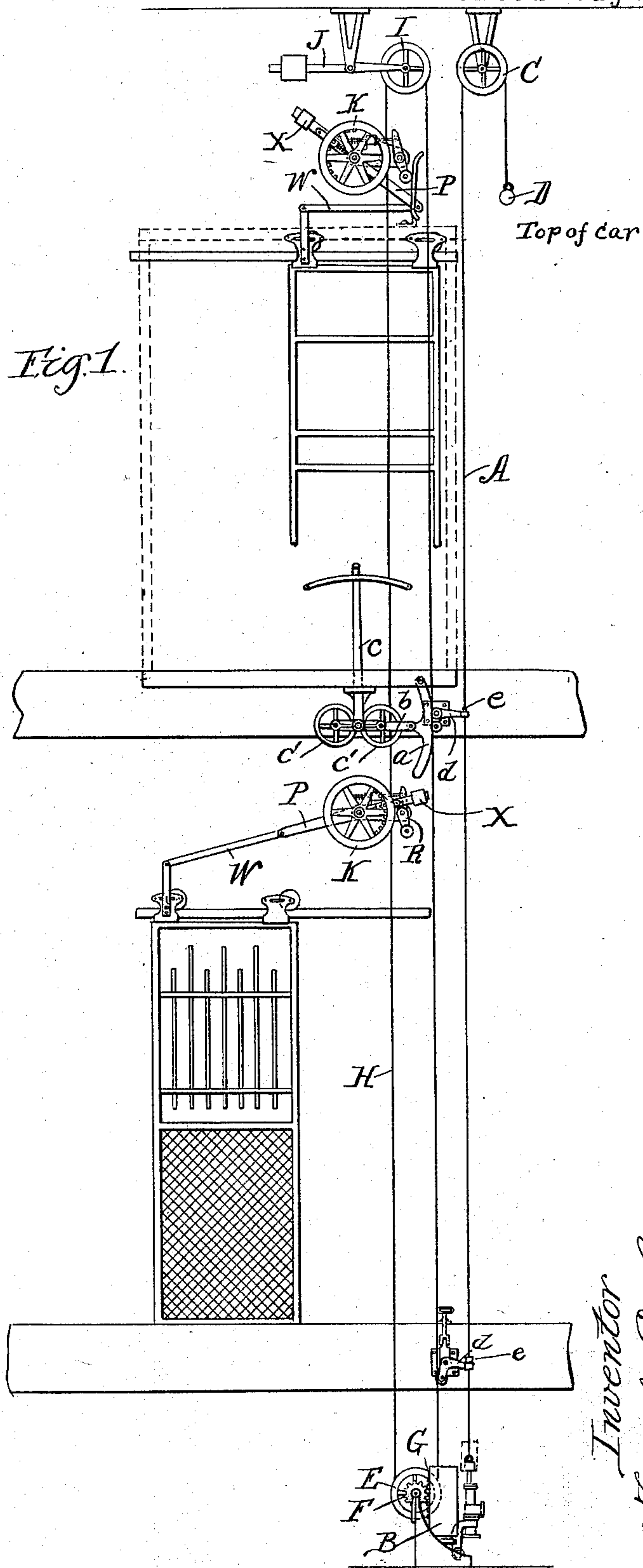
3 Sheets—Sheet 1.

F. E. HERDMAN.

AUTOMATIC DOOR OPENING AND CLOSING DEVICE FOR ELEVATORS.

No. 559,528.

Patented May 5, 1896.



Witnesses:  
S. M. D. D. D.  
Ray White,

Inventor  
Frank E. Herdman  
by Raymond S. D. D. D.  
Attys

(No Model.)

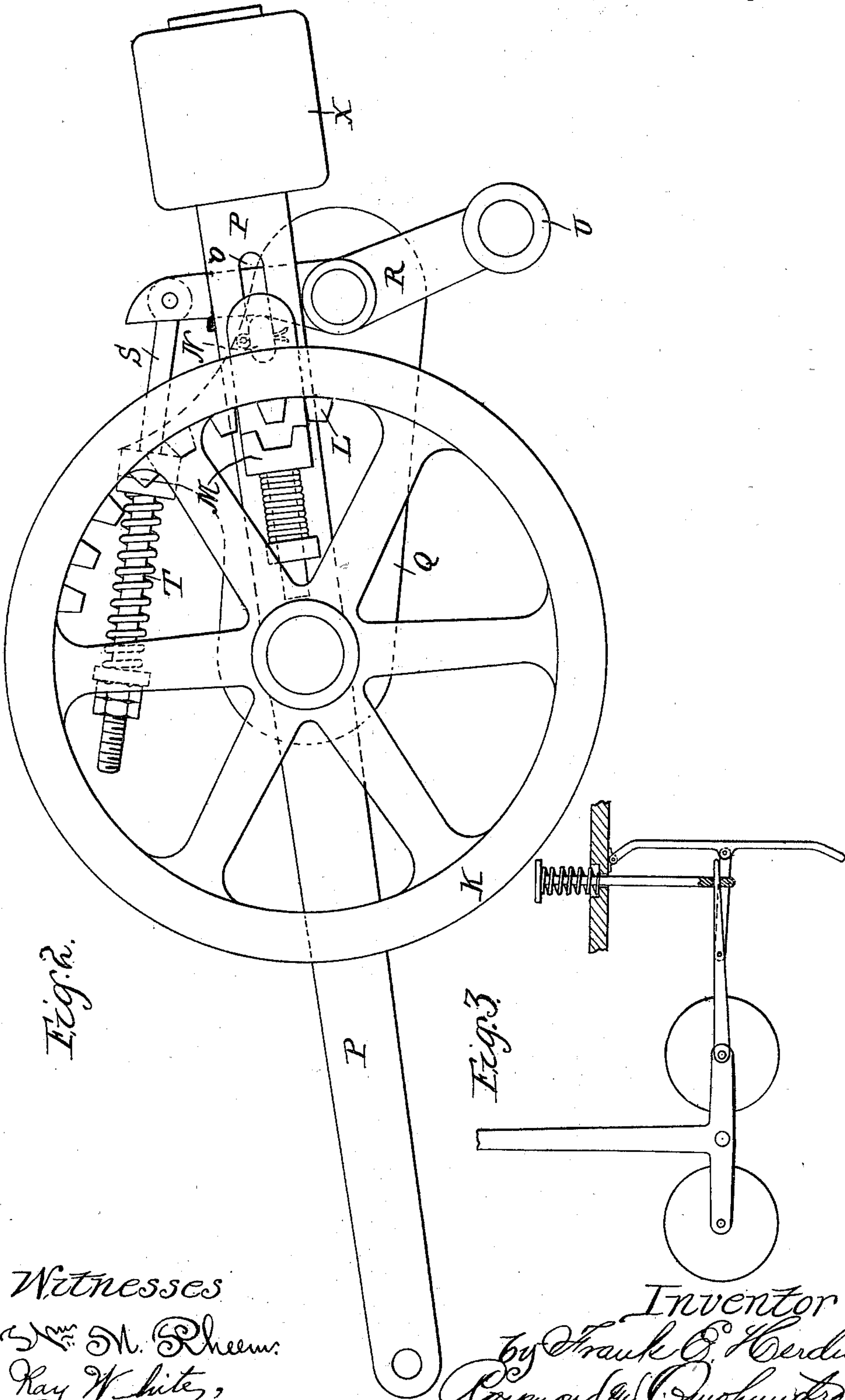
3 Sheets—Sheet 2.

F. E. HERDMAN.

AUTOMATIC DOOR OPENING AND CLOSING DEVICE FOR ELEVATORS.

No. 559,528.

Patented May 5, 1896.



Witnesses

Sam M. Rheem,  
Ray White,

Inventor

by Frank E. Herdman  
Raymond S. Quohundro Att'y's

(No Model.)

3 Sheets—Sheet 3.

F. E. HERDMAN.

AUTOMATIC DOOR OPENING AND CLOSING DEVICE FOR ELEVATORS.

No. 559,528.

Patented May 5, 1896.

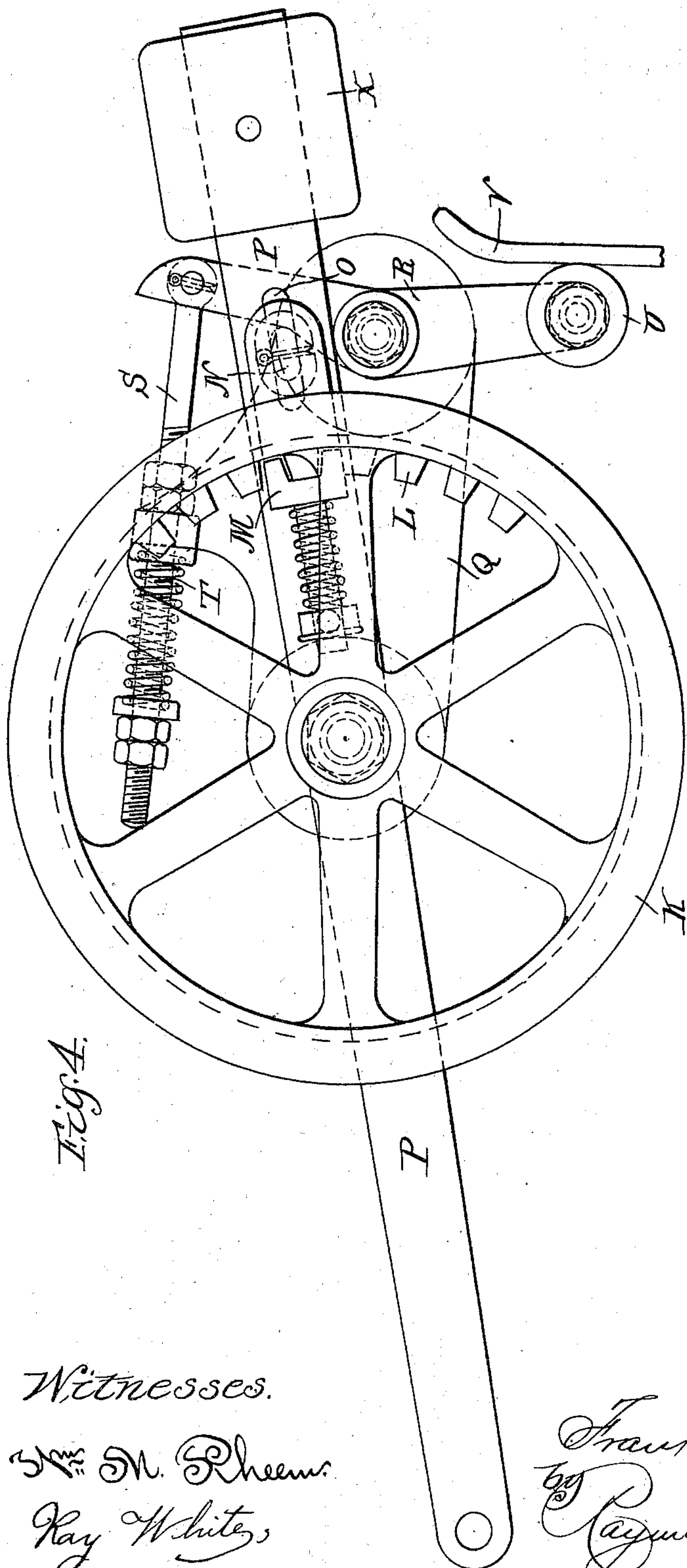


Fig. 4.

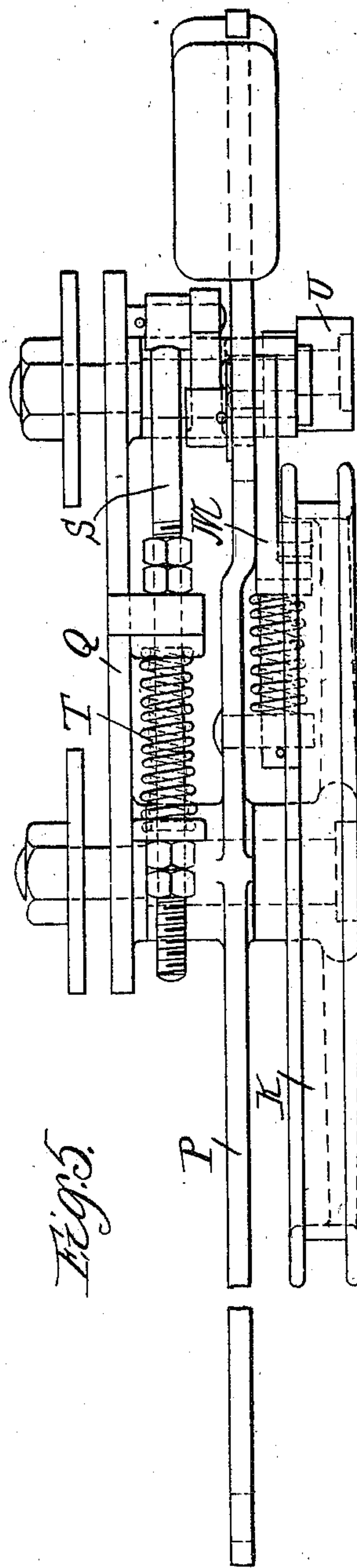


Fig. 5.

Witnesses.

Wm. M. Rheems.  
Ray White,

Inventor  
Frank E. Herdman  
by Raymond A. Quinlan.  
Atty's



# UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF WINNETKA, ILLINOIS.

AUTOMATIC DOOR OPENING OR CLOSING DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 559,528, dated May 5, 1896.

Application filed September 27, 1895. Serial No. 563,886. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, and a resident of Winnetka, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Door Opening or Closing Devices for Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in automatic door opening and closing devices for elevators, and has for its prime object the control of the door opening and closing devices through the operating-lever of the elevator-car.

Another object is to have the opening and closing devices of such character that any door may be opened independent of all of the others and without manual effort upon the part of the operator in the car.

These and such other objects as may hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a diagrammatic elevation of two floors of a building, showing one door of the elevator-shaft closed and the other open and the position of the elevator-car at the open door. Fig. 2 is an enlarged detail view of the door-opening apparatus, showing the same in its normal position; Fig. 3, a detail view showing means whereby the control-cable may be actuated by foot-power; Fig. 4, an enlarged detail of the door-actuating mechanism moved in working position, and Fig. 5 a plan view thereof.

Similar letters of reference indicate the same parts in the several figures of the drawings.

For a better understanding of my invention I will first describe the general features thereof without reference to the particular parts.

My apparatus embraces a control-cable and means carried by the car and connected with the operating-lever of the car whereby at any floor of the building the control-cable may be actuated to open the valve of a motor which works the operating-cable of the door opening and closing devices. This operating-cable is connected with the door opening and closing

devices at each floor, which latter embrace clutch mechanisms which are thrown into and out of gear by a shoe upon the car, so that only the door is opened where the car happens to stop or only at that landing will the door opening and closing mechanisms be in gear.

Referring now to the drawings, A indicates the control-cable, which is connected at one end in any suitable manner with the valve of a motor B, preferably a hydraulic motor, and at its upper end runs freely over a pulley C, being held taut by a weight D, suspended at the upper end thereof. The motor shown has a drum E, a pinion F thereon, and a rack G on the cylinder of the motor, which in this instance is movable, while the piston is fixed. Of course these parts may be reversed or be of any construction that will give to the drum the necessary rotary motion. Trained around the drum is the lower end of the operating-cable H of the door opening and closing mechanism, which is given a suitable number of turns or bights around the drum for driving purposes, and at the upper end of the elevator-shaft said cable is trained over an idle-pulley I on a suitably-weighted equalizing-lever J, which serves to maintain the cable taut, the cable being of the endless type.

At each landing, above the door, is located the door opening and closing mechanism, and as such mechanism is duplicated at each floor a description of one will serve for all. Each of such mechanisms comprises a wheel or pulley K, around which the operating-cable is trained for one or more turns and is preferably fastened thereto in some suitable manner to prevent slip. This wheel K carries or has cast thereon a sector-rack L or one or more suitable projections adapted to be engaged by a locking-bolt M, provided with a socket adapted to engage a tooth of the sector or one of the projections on the wheel, said sector-rack and lock-bolt forming a clutch mechanism. This locking-bolt is spring-actuated and provided with an extension beyond the periphery of the wheel, which has thereon a lateral lug or end N entering a slot O in a lever P, loosely journaled upon the pivot of the wheel K. The lock-bolt M is thus slidably secured to the lever P, and the lever and wheel are loosely journaled upon a bracket or frame-plate Q,



attached at some stationary portion of the elevator-shaft, such as the wall, or preferably the caging inclosing the elevator-shaft.

Whenever the lock-bolt M is out of engagement with a tooth or projection on the wheel K, the said wheel will rotate upon its pivot without producing any action whatever; but whenever the locking-bolt is in engagement with the rack L or other projection on the wheel when the wheel is turned the lever P is also turned therewith, and this action is taken advantage of to open and close the door to the elevator-shaft in a manner that will be described further on. To maintain the locking-bolt normally out of engagement with the wheel, I provide a lever R, also pivoted to the bracket Q, one arm of which engages the lug or end N on said bolt and has connected therewith a rod S, working through an eye in the bracket Q and actuated by a spring T, sleeved thereon and confined between a nut on the end thereof and the eye on the bracket. This spring T is stronger than the spring actuating the lock-bolt M, and consequently serves to hold the spring actuating the lock-bolt normally compressed, so as to hold the bolt back out of engagement with the teeth or projections on the wheel K. On the opposite end of the lever R is mounted an antifriction-roller U, or the end may have any other suitable projection, which is adapted and arranged to project into the path of an engaging device consisting of a wiper-arm V, secured to the top of the elevator-car. This wiper-arm, striking the roller U or the end of the lever R, to which it is attached, when the elevator-car reaches a floor, serves to compress the spring T and permit the expansion of the spring actuating the lock-bolt M, which thereby throws said lock-bolt into engagement with the teeth or projections on the wheel K, so that when the said wheel is turned it will carry the lever P along with it. This lever P is connected by a link W with the door, and when the lever is rocked on its pivot the door is correspondingly moved either into or out of closed position. The opposite end of the lever P has a weight X thereon, which serves to hold the door closed and the lever in its normal position on a dead-center with the link W, which arrangement serves as a lock for the door.

On the bottom of the car is pivotally hung a shoe *a*, connected by a link *b* with one arm of a control device for said control-cable, consisting of the operating-lever *c* of the car, such arm of the lever, in conjunction with the link *b*, serving as a toggle to swing the shoe upon its pivot. This lever *c* is adapted to operate the elevator control-cables and for this purpose may be provided with pulleys *c'*, over which said cables (not shown) may be trained. To the wall of the elevator-shaft, at each floor, is pivoted a bell-crank lever *d*, one arm of which engages a button *e* upon the control-cable A, and the other arm thereof carries an antifriction-roller adapted to en-

gage the shoe when the latter is projected, so that its path is crossed by said arm.

It will be observed that the connection of the shoe with the operating-lever of the car is such that whenever the lever is in its central or "stopped" position the shoe will be projected forward, so as to engage the bell-crank lever *d*, and hence cause the operation of the control-cable, and through it the motor, the operating-cable, and the door opening and closing mechanism. When, however, the operating-lever is thrown to either side of the center in running position for going up or down, the shoe will be drawn backward, so as to pass by without engaging any of the bell-crank levers. Of course with an arrangement of this kind the door at any landing where the car is to stop will begin opening as soon as the shoe engages the bell-crank lever and starts the motor, and the door cannot be closed until the elevator has started away from the landing and the shoe is free of the bell-crank, which permits the motor to reverse by the reverse movement of the control-cable under the influence of a suitable weight or spring. I have found it of advantage, however, to add to the mechanism a device such as that shown in Fig. 3, whereby, when desired, the operator may place his foot upon the tread *f*, and thereby withdraw the shoe, so as to permit the closing of the door before the elevator starts away from a floor.

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

1. In an elevator, the combination of the elevator-car, an elevator-shaft door, an operating-cable, a door opening and closing mechanism actuated by said operating-cable and normally out of operative connection with the door, a motor for moving said operating-cable, a control-cable for said motor, an engaging device carried by the car for throwing said mechanism into operative connection with the door, and a control device carried by the car and adapted to actuate said control-cable, substantially as described.

2. In an elevator, the combination with an elevator-car, the elevator-shaft door, an operating-cable, a motor for moving said operating-cable, a control-cable for said motor, of a door opening and closing mechanism adapted to be actuated by the operating-cable, an engaging device carried by the car and adapted to throw said mechanism into operative position, and a control device carried by the car for actuating the control-cable, substantially as described.

3. In an elevator, the combination with an elevator-car, an operating-cable, a motor for moving said operating-cable, a control-cable for said motor, of a door opening and closing mechanism adapted to be actuated by the operating-cable, and comprising a clutch mechanism normally out of gear, an engaging device carried by the car and adapted and ar-



ranged to throw said clutch mechanism into gear, and a control device on the car adapted and arranged to actuate the control-cable, substantially as described.

5 4. In an elevator, the combination of the elevator-car, the elevator-shaft door, an operating-cable, a door opening and closing mechanism actuated by the operating-cable and comprising a wheel mounted above the elevator-shaft door and provided with one or  
10 more projections, and a slidable lock-bolt adapted to be operated to throw said bolt into engagement with a projection on the wheel, substantially as and for the purpose described.

15 5. In an elevator, the combination of the elevator-car, the elevator-shaft door, a wheel mounted above the elevator-shaft door, an operating-cable trained around said wheel, a slidable lock-bolt adapted to be operated to  
20 engage a projection on the wheel, and a connection intermediate of said wheel and the elevator-shaft door whereby the latter is opened or closed as the wheel is operated, substantially as described.

25 6. In an elevator, the combination of the elevator-car, the elevator-shaft door, a wheel mounted above the elevator-shaft door, an operating-cable trained around said wheel, a lock-bolt adapted to be operated to engage a  
30 projection on said wheel, a lever loosely journaled upon the pivot of the wheel and connected to the elevator-shaft door, and a lug on the locking-bolt arranged in a slot in said lever to operate said lever, substantially as  
35 described.

7. In an elevator, the combination of the elevator-car, the elevator-shaft door, a bracket arranged above the elevator-shaft door, a wheel mounted on said bracket, an operating-cable trained around said wheel, a lever  
40 loosely journaled upon the pivot of the wheel and connected to the elevator-shaft door, a slidable lock-bolt adapted to engage a projection on said wheel, a lug on said bolt arranged in a slot in said lever, a lever R pivoted on  
45 the bracket and having one arm arranged in

engagement with the lug on the lock-bolt, and a spring-controlled rod S connected to said arm and adapted to normally hold the lock-bolt out of engagement with said projection  
50 on the wheel, substantially as described.

8. In an elevator, the combination of the elevator-car, the elevator-shaft door, a control-cable, an operating-cable, a door opening and closing mechanism adapted to be actuated by  
55 the operating-cable, a bell-crank lever pivoted to the wall of the elevator-shaft, and a control device for actuating said control-cable comprising a shoe pivotally supported on the car and adapted to be projected to engage said  
60 bell-crank lever and cause the latter to operate the control-cable, substantially as described.

9. In an elevator, the combination of the elevator-car, the elevator-shaft door, a control-cable, one or more buttons on the control-cable, an operating-cable, a door opening and  
65 closing mechanism adapted to be actuated by the operating-cable, an operating-lever in the car, a shoe pivotally supported on the car, and a bell-crank lever pivoted to the wall of  
70 the elevator-shaft and having one arm arranged in the path of the shoe and the other arm adapted to engage a button on the control-cable, substantially as described.

10. In an elevator, the combination of the  
75 elevator-car, the elevator-shaft door, an operating-cable, a door opening and closing mechanism adapted to be operated by said operating-cable, an engaging device carried by the car and adapted to throw said mechanism into operative position, a control device  
80 carried by the car, a motor comprising a valve and a cylinder, a rack on said cylinder, a drum, a pinion journaled on the shaft of said drum and meshing with the rack, and a control-cable, substantially as and for the purpose set forth.  
85

FRANK E. HERDMAN.

Witnesses:

M. E. SHIELDS,  
O. R. BARNETT.