

(No Model.)

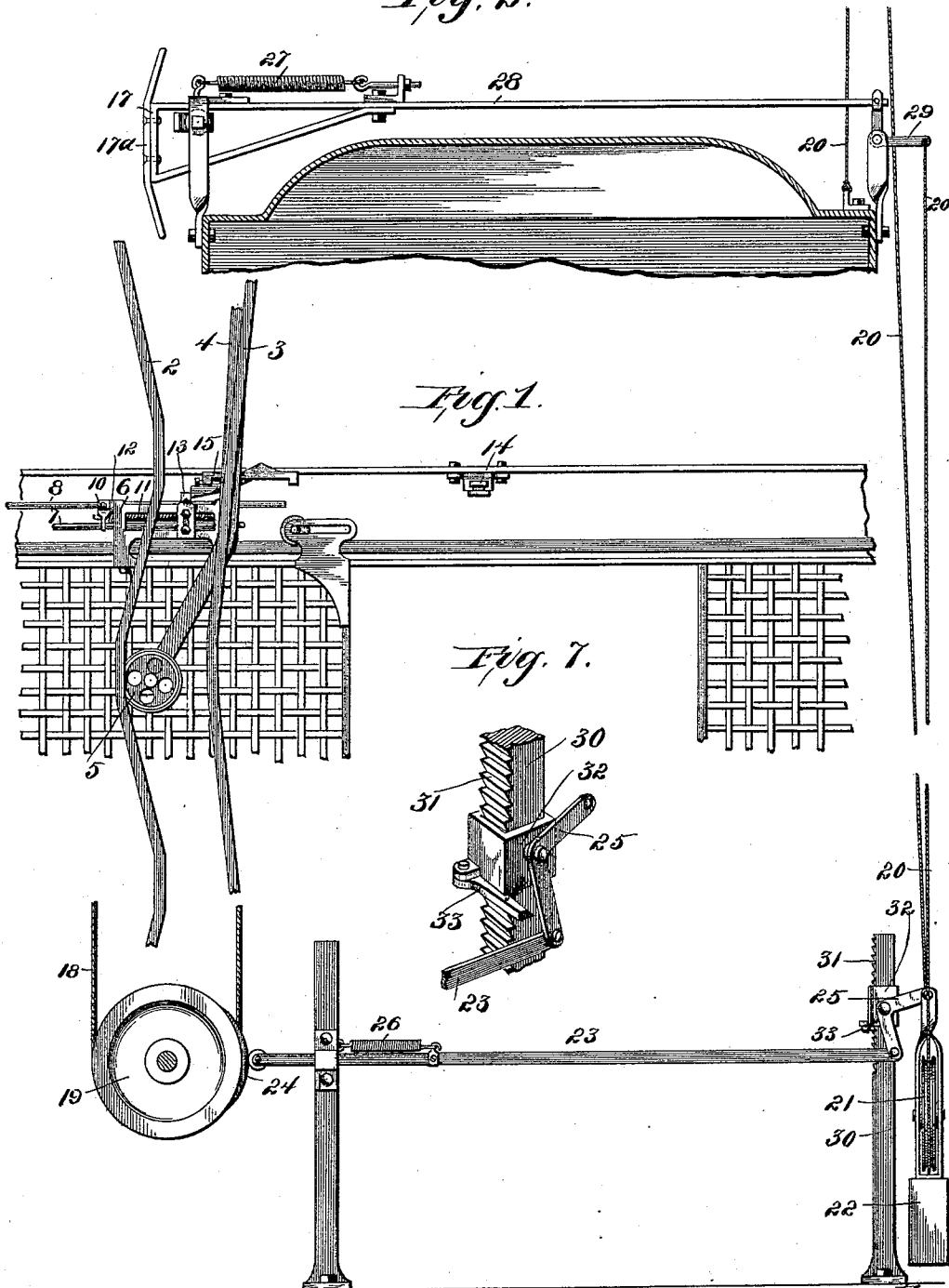
2 Sheets—Sheet 1.

H. ROWNTREE.

DEVICE FOR OPERATING ELEVATOR DOORS.

No. 479,956.

Fig. 2. Patented Aug. 2, 1892.



Witnesses
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(No Model.)

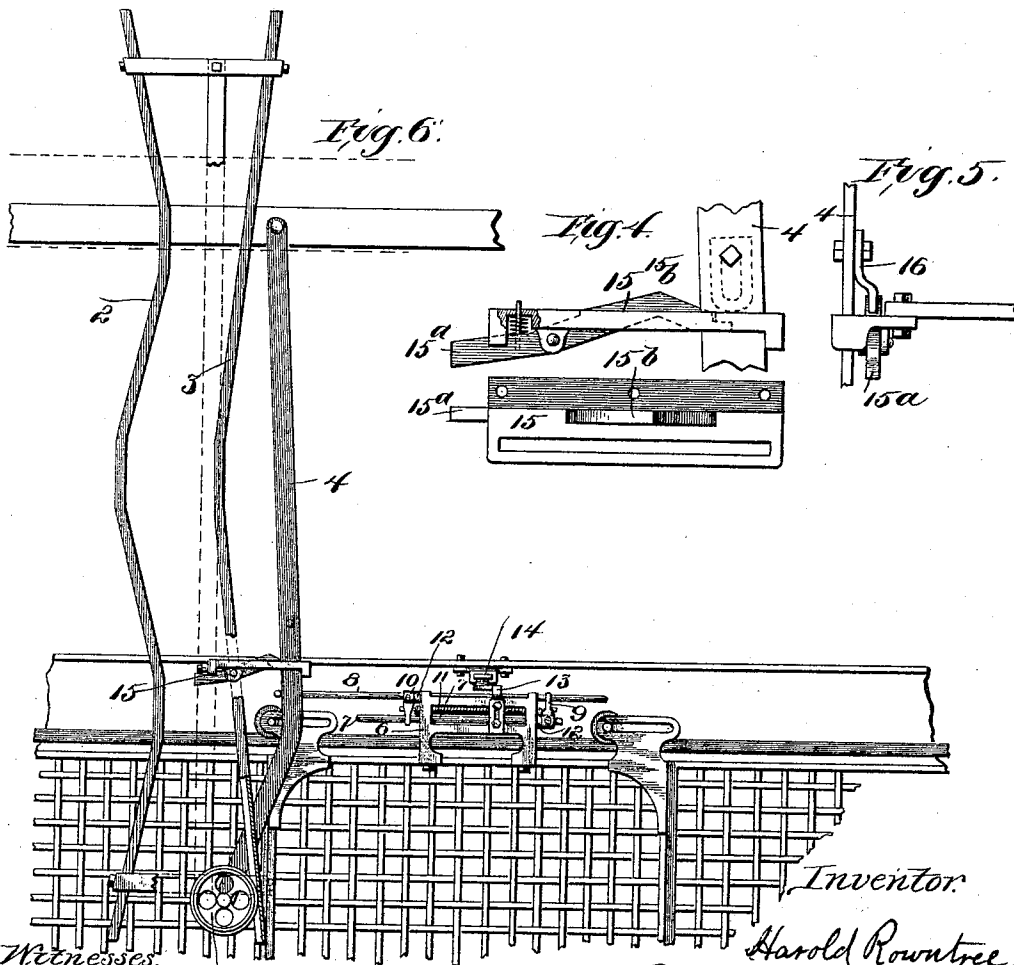
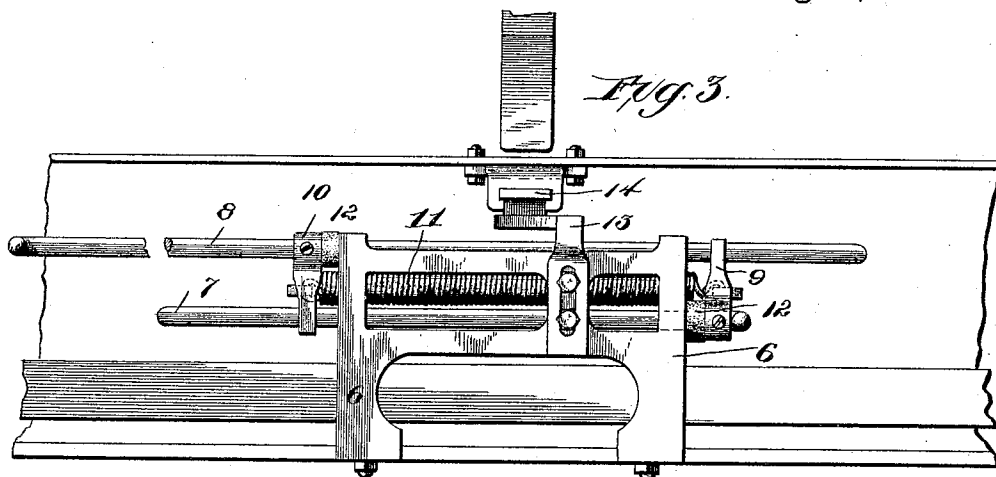
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UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF KANSAS CITY, MISSOURI, ASSIGNOR OF ONE-HALF
TO J. B. BURDETT, OF SAME PLACE.

DEVICE FOR OPERATING ELEVATOR-DOORS.

SPECIFICATION forming part of Letters Patent No. 479,956, dated August 2, 1892.

Application filed September 9, 1891. Serial No. 405,180. (No model.)

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, residing at Kansas City, in the county of Jackson, State of Missouri, have invented new and useful Improvements in Devices for Operating Elevator-Doors, of which the following is a specification.

My invention relates to mechanism for opening and closing the elevator-doors which are located at the several floors or landings of buildings and which serve to permit ingress to and egress from the elevator car or cage.

The object of my invention may be stated in general terms to be a provision of devices by which the elevator-landing door will be automatically opened and closed as the car is brought to rest at and departs from the landing.

By my invention the operation of the doors is made entirely automatic, no specific attention whatever on the part of the attendant being necessary, the only duty devolving upon him being the starting and stopping of the car by means of any of the usual devices therefor.

In embodying my invention I have the further object in view of providing mechanism which shall open and close the door with certainty and at a regulated speed, so that undue noise and jar are avoided, whether the car approaches or leaves the landing slowly or quickly.

Subsidiary to the general object of my invention is a provision of means whereby the proper action of the mechanism is insured under various conditions of temperature and moisture, notwithstanding the shortening or lengthening of the operating cables or connections for such purpose.

My invention consists in the parts and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 represents a portion of the landing-door and its attached operating mechanism and also a portion of the mechanism carried by the car, the latter not being shown for the reason that it would interfere with the view of the working parts. Fig. 2 in its upper portion is a vertical cross-section of the top portion of the car, to which is attached the mechanism forming the connection between the elevator-control devices and the door-operating devices.

The lower portion of this figure, appearing at the bottom of the sheet, represents the remaining part of the devices forming the connection between the door-operating mechanism and the control devices, a part of the latter, sufficient for the illustration of my invention, being shown at the left. Fig. 3 is a view, on an enlarged scale, of a part of the door-operating mechanism hereinafter described in detail. Figs. 4, 5, and 7 illustrate details of the said door-operating mechanism. Fig. 6 corresponds to Fig. 1, the elevator-door being closed, however.

The door-operating mechanism may be seen in Figs. 1 and 6. It consists of a pair of bent guides 2 3, carried upon the side of the car adjacent to the landing-door. At each landing is pivoted a depending lever-arm 4, which carries at its lower end a rubber-tired wheel 5, so that said wheel projects within the space between the guides 2 3 as they pass it. Secured to the door is a frame 6, (see also Fig. 3.) in which are supported two slides 7 and 8. These slides have inwardly-bent ends, which project sufficient to make contact with the lever-arm 4 as the latter is swung by the guides 2 3, one slide being moved as the lever-arm swings to the right and the other as the lever-arm swings to the left. Attached to the guides 7 and 8, respectively, are fingers 9 and 10, to which the opposite ends of a spring 11 are attached. Between the fingers 9 and 10 and the frame 6 are interposed cushions 12, of rubber, leather, or other comparatively soft material.

The connection of the spring 11 to the slides, which has just been described, is such as to effect the expansion of the spring whenever either slide is moved by the lever-arm 4, the tension thus put upon the spring being transmitted to the frame 6 and thence to the door. From the frame 6 projects a finger 13, which engages, when the door is closed, with a catch 14, affixed to the railing or wall forming a part of the elevator-well. Said finger 13 engages, when the door is open, with a catch 15, also secured to the wall or grating of the elevator-well. The catch 15 is shown in detail in Figs. 4 and 5. The finger 13 engages with the outer end 15^a of the catch when the door is opened, the door being thus held open until the catch is released. The release of the catch is ef-

affected by the movement of the lever-arm 4 inwardly as the car moves away from the landing, the swinging of the lever-arm being effected by the bent guide 2. The movement of the catch 15 by the lever-arm 4 is effected through the projection 16, attached to the lever-arm, (*vide* Fig. 5,) which operates upon the upwardly-curved face 15^b of the catch, the inner end of the catch being thus depressed and the outer end elevated. The catch 14, with which the finger 13 engages when the door is closed, retains the latter in its closed position, except when it has been released by the devices hereinafter explained. The operation of the door-operating mechanism will be described, however, before proceeding to the description of the other mechanism.

It is obvious that as the elevator passes each landing (the doors all being supposed to be closed) the swinging lever-arm 4 will be moved outwardly by the bent guide 3 and the spring 11 will, through the slide 8, be put in tension. The elevator-door will, however, not be opened unless the catch 14 be released, which is only done when the elevator-control mechanism is shifted so as to bring the elevator-cage to rest at the landing. Supposing, however, that the release has been effected by devices hereinafter described, the door will, under the influence of the spring 11, be opened and the finger 13, passing beyond the end of the catch 15, will retain the door in its open position. The position of the several parts while the cage is at rest at the landing is shown in Fig. 1. As the car leaves the landing the inwardly-bent end of the guide 2, either above or below its central part, will swing the lever-arm 4 inward, thus putting the spring 11 in a state of tension through the slide 7. As soon as this has been done the continued movement of the lever-arm 4, acting upon the catch 15, releases the finger 13 and the door is free to close, the catch 14 yielding to permit the finger 13 to pass and then springing outward to lock the door. It is not necessary for effecting the complete opening of the door and its closure that the movement of the spring 11 be as great as the movement of the door, it being only necessary that a sufficient momentum be imparted to the door to complete its movement. The strength and size of the spring 11 can be regulated to suit the weight and travel of the different doors to which it may be attached, and adjustment of the amount of tension imparted to it may be made by shifting the slides 7 and 8 through their respective fingers 9 and 10. The force given to the door can thus be regulated so as to be just sufficient to insure its proper closure and opening without undue shock or jar. The release of the finger 13 from the catch 14, so as to permit the door-operating mechanism to act, is effected by a movable contact-piece 17, (*vide* Fig. 2,) attached to the car and connected to the control devices, through which the stopping, starting, and reversing of the car is governed. Said contact-piece is so connected to

the control devices as to be retracted when the latter are in the position which causes the car to move either up or down and to be projected whenever the control devices are moved so as to bring the car to a state of rest.

The devices for projecting and retracting the movable contact-piece, which are herein illustrated, are such as are adapted to co-operate with the ordinary hand-rope; but the connection between the movable contact-piece and the control-gear will of course be varied if other handling-gear is used, and such changes in connection may be made without departing from the main features of my invention, as hereinafter claimed.

18 is the handling-gear, already referred to, which passes around a pulley 19 in the ordinary manner, the said pulley being connected to the valve, switch, or other device by which the motor or engine or the connection therewith is controlled. The movement of the pulley 19 is communicated to the contact-piece 17 through a cable 20, traveling with the car and intermediate connections, both ends of the cable being connected to the car directly or indirectly through an attachment to the car. The loops of the cable pass over pulleys (one movable) at the top and bottom of the elevator-well. In the drawings but one of these pulleys is illustrated, as the operation of the device can be fully understood without illustrating the fixed pulley. The pulley 21 is movable and serves to keep the cable 20 normally in a state of tension by means of a weight 22 or its equivalent. The tension on the cable 20 is relieved, however, whenever the control mechanism is shifted so as to stop the car, the device for relieving the tension being a rod 23, acted upon by a cam 24 on the pulley 19 and connected at one end to a bell-crank lever 25. The other end of said bell-crank lever is pivoted to the frame of the pulley 21. The spring 26 serves to maintain contact between the rod 23 and the cam 24 and to retract the rod when the cam is moved. The slacking of the cable 20 permits the contraction of the spring 27, which is connected to the slide 28, carrying the contact-piece 17. The effect of such contraction is to project the contact-piece 17, so that it operates the catch 14. The connection between the slide 28 and the cable 20 consists of a bell-crank lever 29, pivoted to the car and having the cable 20 attached to one end and the slide 28 attached to the other end. When the pulley 19 is shifted so as to start the car in either direction, the cam 24 is withdrawn and the end of the bell-crank lever 25, which is attached to the pulley 21, drops, so as to permit the weight 22 to act. The tension thereby put upon the cable 20 is sufficient to retract the slide 28 and its attached contact-piece 17, so that the latter will not strike the catch 14. The car will thus pass the landing without throwing the door-operating mechanism into action and the door will remain closed. The contact-piece is here illustrated as mounted upon the top of the

car and the door-operating mechanism is shown at the top of the landing-door; but either of these devices may be located elsewhere upon the car and the door, if it is found desirable. In most instances, however, they will be less in the way and can be most conveniently arranged at the top, as shown. If the car be stopped between the floors, the contact-piece 17 will be projected, but will not come in contact with the catch 14. The limits in which the contact-piece will act upon the catch 14 may be regulated by lengthening or shortening its vertical face 17^a. I prefer to make said face of such a length that it will not act upon the catch 14 unless the car is stopped within three or four inches of the floor, as thereby the safety of the passengers is better assured. In order to insure the proper action of the cable 20, notwithstanding variations in temperature or moisture in the elevator-well or the stretch of the cable due to wear, I have arranged the fulcrum of the lever 25 so that it may move to adjust itself to the varying lengths of the cable 20. (See Figs. 2 and 7.) Upon the standard 30 is cut a series of ratchet-teeth 31, and the pivot of the lever 25 is carried by a sleeve 32, surrounding the standard 30. A pawl 33, engaging with the teeth 31, is fixed to the sleeve 32, so as to yield to the upward movement of the sleeve 32, but not permit it to descend while it is in engagement with said teeth. It is thrown out of engagement with said teeth by the movement of the bell-crank lever 25 when the outer end of the latter is depressed under the influence of the weight 22. Thus whenever the elevator-car is started the fulcrum of the lever is free to adjust itself to suit the varying length of the cable 20; but as soon as the lever 25 is moved so as to slacken the cable 20 the pawl 33 comes into action and supports the sleeve upon which the lever is fulcrumed.

The apparatus herein described is capable of many modifications, which cannot be herein described in detail, the general method of operation remaining the same, however. In each of the main divisions of the apparatus modifications may be made without departing from my invention—that is to say, modifications in the control devices, modifications in the door-operating devices, and modifications in connections between the control apparatus and the contact-piece which puts the door-operating devices into action may all be used without affecting the co-operation between the several mechanisms, their action remaining substantially the same as in the specific apparatus herein described and claimed.

Without confining myself to the precise devices herein shown and described, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of operating mechanism connected to the landing-doors of an elevator-well, control mechanism through which the stopping and starting of the car is effected,

and a movable contact-piece upon the car, connected to said control mechanism and adapted to put said door-operating mechanism into action to open the door when the control mechanism is shifted to bring the car to rest opposite the landing, substantially as described.

2. The combination of mechanism attached to the landing-doors of an elevator-well, a movable contact-piece upon the car, adapted to put said door-operating mechanism into action, control mechanism capable of operation from the car to stop and start the said car, and connections between said movable contact-piece and said control mechanism, whereby said contact-piece is shifted to its operative position when the control mechanism is moved to bring the car to a state of rest, substantially as described.

3. The combination of an elevator landing-door, slides carried by said door and provided with fingers, a spring connected to said door through said slides, to the fingers of which the opposite ends of said spring are attached, and catches by which the door is locked in its opened and closed position, all combined substantially as described, and devices adapted to put the said spring in tension in one direction when the door is opened and in the other direction when the door is closed, substantially as described.

4. The combination, with an elevator-door-operating mechanism, of a framework attached to the door, carrying two slides having projections at their opposite ends, fingers attached to said slides, a spring attached at its opposite ends to said fingers, a swinging lever engaging with the projections on said slides, and guides upon the car for operating said swinging levers, whereby the spring is put in tension for opening the door as the car approaches the landing and is put in tension for closing the door as the car recedes therefrom, substantially as described.

5. The combination, with the landing-door of an elevator-well, of a door-closing device consisting of a spring connected to the door, a swinging lever connected to said spring and having a projection, guides upon the car by which said swinging lever is moved to put said spring in tension, and a latch by which said door is locked in its open position and having a curved face coacting with the projection on said swinging lever-arm by which said door is released, substantially as described.

6. An improved door-operating mechanism for elevators, comprising a pivoted catch mounted adjacent to the elevator-door, and having an upwardly-curved face and a swinging lever mounted adjacent to the door, a spring connecting said lever thereto, an adjustable projection on said lever for engaging the curved face of the said catch and moving said catch into position to disengage the door when the latter is to be closed, and devices adapted to move said lever, whereby the spring is put in tension and the catch released, substantially as set forth.

7. The combination, with the landing-door of an elevator-well, of a door-opening mechanism consisting of a spring connected to the door, a swinging lever having connections to said spring, guides upon the car by which said swinging lever is operated, a catch by which said door is locked in its closed position, a movable contact-piece carried by the car, and connections between said movable contact-piece and the elevator-control devices by which the contact-piece is moved in position to act upon said catch when the control devices are shifted to arrest the movement of the car, substantially as described.

8. The combination, with the movable contact-piece carried by the elevator-cage, of a cable running over sheaves at the top and bottom of the well, one of the sheaves being supported in movable bearings and said cable connected with a lever upon the cage, connections between said lever and said contact-piece, an operating-rope for stopping and starting the cage, and connections between the operating-rope and the movable sheave, substantially as set forth.

9. The combination, with the door of an elevator-well, a locking device for said door, and a spring connected to the latter, of means for automatically putting the spring under ten-

sion as the cage approaches each landing, a movable contact-piece carried by the cage, the operating-rope, and connections between the latter and said contact-piece whereby the contact-piece is projected or retracted upon stopping or starting the cage, substantially as set forth.

10. An improved door-operating mechanism for elevators, &c., comprising a movable catch-actuating contact-piece carried by the car-body and a sliding rod operatively connected to said contact-piece, a pull-rope operating the control-valve, and connections whereby said rod may be actuated by the pull-rope to move the contact-piece out of contact with the catch, substantially as set forth.

11. In a device for releasing the doors of elevator-wells, a slide mounted in bearings on the elevator-car, a contact-piece having a straight central portion secured to the forward end of the same, and means for operating said slide, connected to the control devices governing the movements of the car, substantially as described.

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