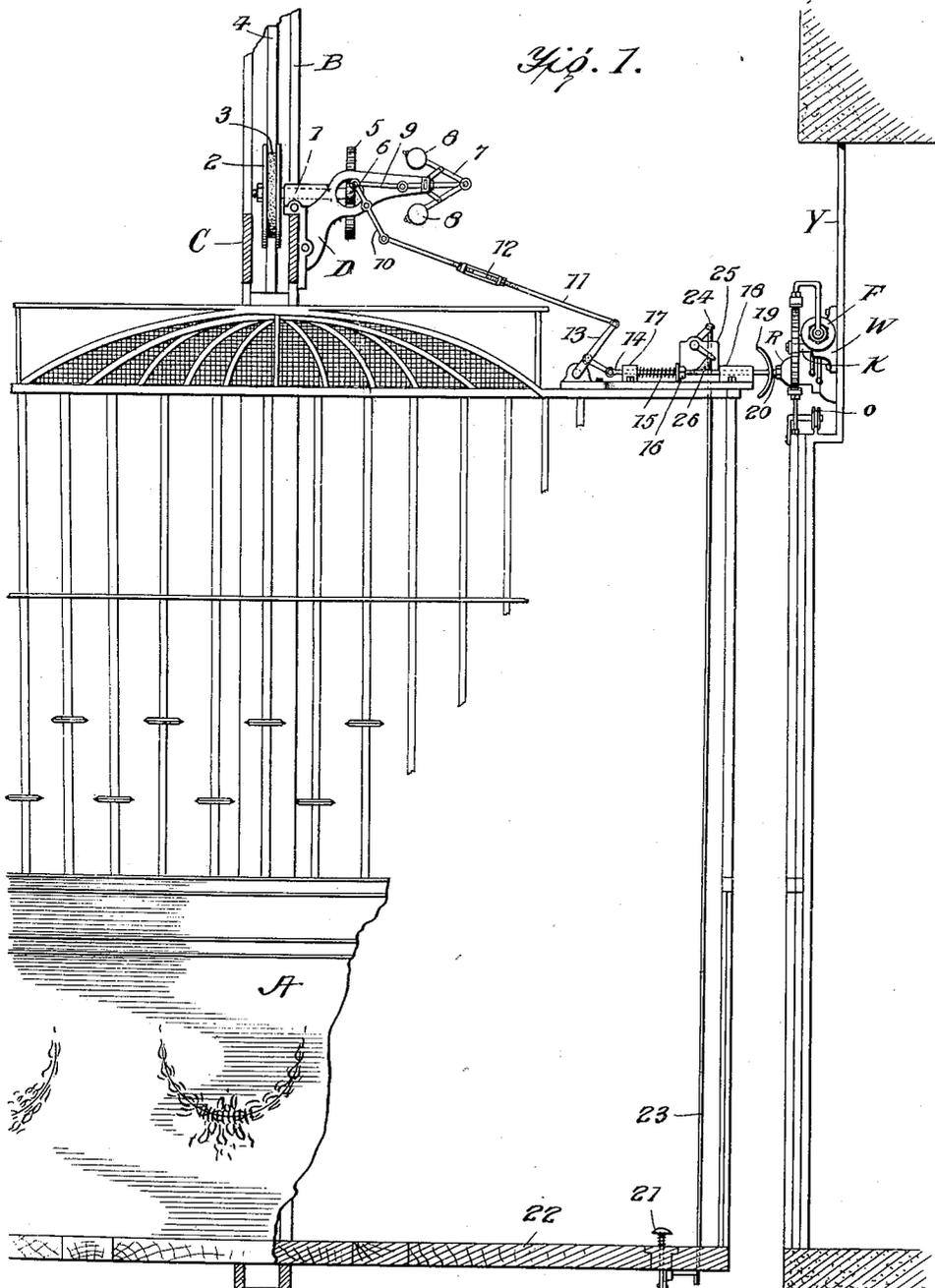


F. F. BOYD.
 AUTOMATIC SAFETY ELEVATOR DOOR OPENER AND CLOSER.
 APPLICATION FILED JAN. 8, 1909.

942,770.

Patented Dec. 7, 1909.

3 SHEETS—SHEET 1.



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Fig. 7.

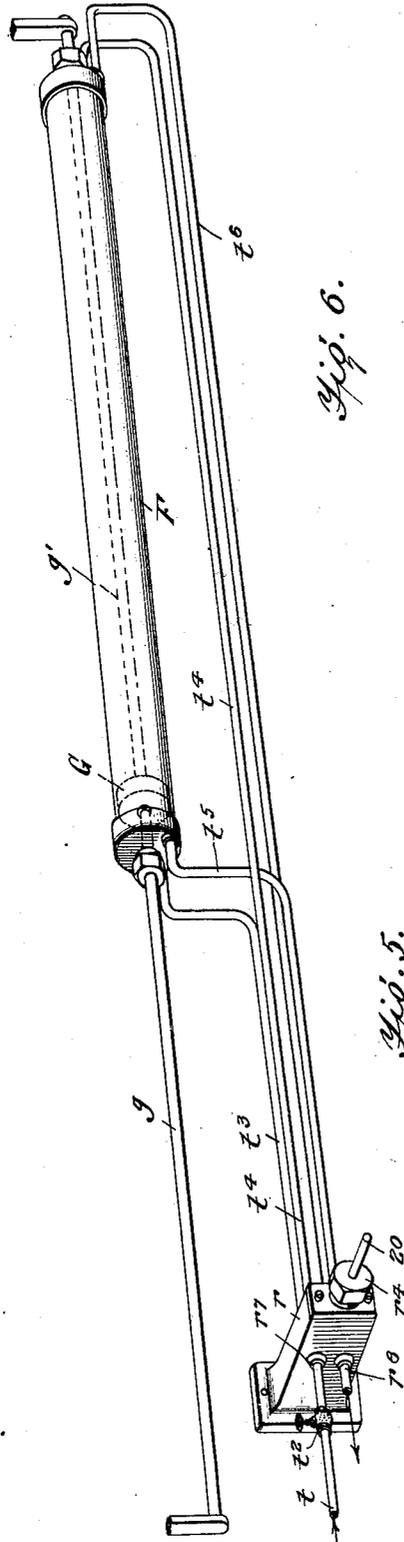


Fig. 6.

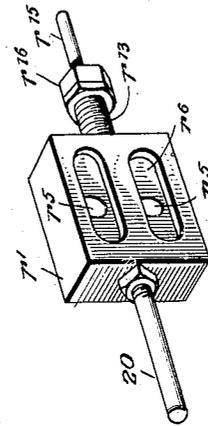
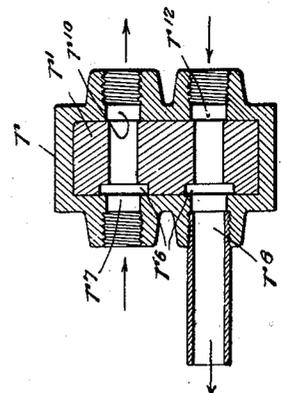


Fig. 5.



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AUTOMATIC SAFETY ELEVATOR-DOOR OPENER AND CLOSER.

942,770.

Specification of Letters Patent.

Patented Dec. 7, 1909.

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To all whom it may concern.

Be it known that I, FRANK F. BOYD, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have made certain new and useful Improvements in Automatic Safety Elevator-Door Openers and Closers, of which the following is a specification.

My invention relates to improvements in means for automatically opening and closing the doors of elevator shafts, and it consists in the constructions, arrangements and combinations hereinafter described and claimed.

The main object of my invention is to provide a device which will be operated by the elevator itself to open the door when the elevator stops at the adjacent floor and to close it immediately when the elevator is moved up or down.

A further object of my invention is to provide means for preventing the accidental opening of the door when the elevator is not in position before it. To this end I have arranged a pneumatic door opener and closer which is positive in action in both the closing and opening operation, thereby rendering the device more certain of operation than other devices which depend upon the release of weights or springs for the opening or closure of the doors.

A further object of my invention is to provide an improved valve for operating in connection with devices on the elevator to admit air pressure at either end of a cylinder which constitutes the motive power for the door operating mechanism.

Other objects and advantages will appear in the following specification and the novel features of the invention will be particularly pointed out in the appended claims:

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

Figure 1 is a view partly in section showing the general operation of the device. Fig. 2 is an enlarged detail view showing the door operating mechanism. Fig. 3 is a sectional detail of the controlling valve. Fig. 4 is a section through the valve along the line 4—4 of Fig. 3. Fig. 5 is a section through the valve casing and valve along the line 5—5 of Fig. 4. Fig. 6 is a perspective view of the sliding valve and Fig. 7

is a perspective view showing the air cylinder and air pipes.

Referring now to Fig. 1, I have shown therein the elevator cage which I have denoted in general by A. This cage is suspended in the usual manner and runs along the guides B. Secured to the main suspending beam C is a frame D, a portion of said frame constituting a bearing for a shaft 1, having on one end a grooved friction wheel 2 provided with a rubber contact surface 3 and arranged to bear upon the central flange 4 of the guide rails B. The opposite end of the shaft 1 bears a gear 5 which meshes with a smaller gear 6, which drives the governor 7, the balls 8 of which are caused to spread apart by centrifugal action due to the movement imparted by the wheel 2, when the elevator is in motion. Attached to the governor 7 by means of the link 9, is the lever 10, which is pivotally connected with a rod 11 bearing a turn buckle 12. The lever 13, which is pivotally connected to the rod 11, is for the purpose of increasing the power exerted through the latter and is pivotally connected by means of a link to a rod or plunger 14. The latter is acted on by a coil spring 15, whose tension may be regulated by the nut 16. The rod or plunger 14 is arranged for reciprocation in the bearings 17 and 18 attached to the top of the elevator. The outer end of the rod 14 bears an arc-shaped contact member 19 arranged to engage the stem 20 of a valve R in the manner hereinafter described.

It will be seen that with the above described construction the revolution of the governor will cause the balls 8 to fly apart by centrifugal action and through the link and rod connections will cause the plunger 14 and its contacting member 19 to be drawn inwardly. As soon as the elevator stops, however, the spring 15 will cause the plunger to be pushed outwardly and the balls 8 will approach each other. In order to operate the plunger 14 manually I provide the foot rod 21 in the floor 22 of the elevator, which, on being depressed, pulls the rod 23 and the latter operates a bell crank lever 24 carried by a bracket 25. One arm of the bell crank lever 24 engages a lug 26 on the rod 14, thereby pushing the latter inwardly out of engagement with the rod 20.

Referring now to Fig. 2 I have shown therein the mechanism for operating the

doors. In this figure I have shown double overlapping doors, but it will be understood that the same principle might be applied to single doors or doors of other construction than those herein described. The motor proper consists of a cylinder F having a piston G with the piston rods g and g' connected to it on either side. An upper rack bar H is arranged to engage the pinions K and L while a lower rack bar M is arranged to be engaged by the pinions to move the doors P and P'. These doors are suspended from rails O and are provided with the angle irons or lugs Q, Q', so that when the door P is opened, the lug Q will engage the lug Q', thereby opening the door P'.

The controlling valve is shown at R and is of a peculiar construction to enable it to cooperate with the other elements of the mechanism. The construction of this valve is shown in detail in Figs. 3, 4, 5 and 7. It consists of a metal casing r within which is disposed the valve proper r' . The end of the casing is closed by means of the bonnet r^2 , which bears the stuffing box r^3 , upon which the gland nut r^4 is adjustably secured. The valve r' consists of a block of metal arranged to slide within the casing and provided with openings r^5 communicating with recessed portions r^6 at the ends thereof. On one side of the valve are two openings, one an inlet r^7 and the other an outlet r^8 , clearly shown in Figs. 2 and 5. Immediately opposite the inlet opening r^7 are two openings r^9 and r^{10} , clearly shown in Fig. 4, while opposite the opening r^8 are two openings or ports r^{11} and r^{12} , as shown in Fig. 3. One end of the valve proper is secured to the rod 20 which as before explained is arranged to be engaged by the contact member 19 on the end of the plunger 14. On the opposite side of the valve there is a nipple r^{13} containing a spring r^{14} arranged to be engaged by the plunger r^{15} , the latter being guided by a lock nut r^{16} .

Referring now to Figs. 2 and 7, it will be seen that I have provided a supply pipe T which communicates with the air compressor, which may be located in any convenient place in the building. The branch pipe t communicates with the port r^7 , a valve t^2 being provided for cutting off the supply. A pipe t^3 leads from the port r^9 and enters the left hand end of the cylinder F, while a similar pipe t^4 leads from the port r^{10} and enters the right hand or opposite end of the cylinder. An exhaust pipe t^5 leads from the left hand end of the cylinder and communicates with the port r^{11} and another exhaust pipe t^6 leads from the opposite end of the cylinder and communicates with the port r^{12} .

The doors P and P' are suspended from the rails O by means of the rollers o . The rack M is adjustably secured to the door P by means of the bolts p . The gears K and

L are mounted on the shafts k and l carried by the brackets W which are secured to the door frame Y as shown in Fig. 1. The bracket W also supports the cylinder F.

From the foregoing description of the various parts of the device, the operation thereof will be readily understood. As the elevator ascends or descends the movement of the governor 7, which is imparted by the wheel 2 in the manner already described, causes the plunger 14 to be drawn inwardly. When, however, the elevator comes to a stop, the plunger is forced, outwardly by the spring 15 into contact with the rod 20 of the controlling valve R. The controlling valve is normally in the position shown in Fig. 4. In this position the compressed air enters through the port r^7 , passes through the recess r^6 , opening r^2 , port r^{10} and through the pipe t^4 to the right end of the cylinder, thereby holding the piston G in the position shown in Fig. 2, in which position the doors are closed. Any effort to open the doors will thus be resisted by the compressed air in the piston F. Now when the contact 19 engages the plunger 20, it forces the valve inwardly against the tension of the spring r^{14} . Reference to Fig. 4 will show that the opening r^5 will now be brought into registration with the opening r^6 , which will therefore bring the air pressure against the opposite side of the piston (the air flowing through the pipe t^3) and at the same time will bring the companion opening r^5 through the valve into registration with the port r^{11} , thus furnishing an exit for the air previously confined in the cylinder F through the pipe t^6 , so that the air will escape at the port r^8 .

Under the action of the compressed air the piston G will be moved from the left end of the cylinder to the right and will carry with it the rack bar H, which, being in mesh with the gears K and L, will cause their rotation. The movement of the gear L causes the movement of the rack M, together with its door P in the direction indicated by the arrow, and the engagement of the lugs Q and Q' will cause the door P' to be opened as already described. As soon as the rack M reaches the gear K the teeth of the latter engage the teeth on the rack and aid in imparting motion to the door. The moment the elevator leaves the floor at which it is stopped, the movement of the governor withdraws the plunger 14 and the valve assumes its original position under the influence of the spring r^{14} , thereby opening the right end of the cylinder to the air pressure and the left end of the cylinder to the exit or exhaust pipe. The piston now moves in the opposite direction and the doors will be closed.

In order to insure the positive closing of the doors even before the elevator is in

motion, use may be made of the foot lever 21, which, as before explained, forces the plunger 14 from the valve stem 20 and permits the compressed air to enter the opposite side of the piston. The contact member 19 is arc-shaped so that there will be no danger of this member being broken in coming into engagement with the stem 20 as it might be if it were a plate with a plane surface.

I am aware that other forms of the device based upon the same general principle might be made, but I consider as my own and desire to claim all such modifications as fairly fall within the spirit and scope of the invention.

I claim—

1. In a door opening device for elevators, the combination with a slidable door, of pneumatic means for opening and closing the same, a valve for directing the admission and the exit of air, a contact member carried by the elevator car and arranged to operate said valve, and centrifugal means carried by the elevator car for actuating the contact member.

2. In a door opening device for elevators, the combination with a slidable door, of a rack bar secured thereto, a gear in mesh with said rack bar, a second rack bar, a piston connected with said second rack bar, a cylinder arranged to receive said piston, a valve for admitting compressed air to either end of said cylinder, and a centrifugally controlled contact member carried by an elevator car and arranged to operate said valve.

3. In a door opening device for elevators, the combination with a slidable door, of a rack bar carried thereby, gears arranged to engage said rack bar, a second rack bar, a piston having a piston rod on each side thereof, said piston rods being connected with said second rack bar, a cylinder arranged to receive said piston, a valve for admitting compressed air on either side of said piston, a plunger carried by the elevator car, a friction wheel, a centrifugal governor operated

by said wheel and arranged to actuate said plunger, and a valve stem carried by said valve and arranged to be engaged by said plunger for shifting the valve.

4. In a door opening device for elevators, the combination with a slidable door, of pneumatic means for opening and closing the same, a valve for directing the admission and exit of air, a contact member carried by the elevator car and arranged to operate said valve, the movement of said contact member being automatically controlled by the movement of the elevator car, and centrifugal means carried by the elevator car for actuating the contact member.

5. In a door opening device for elevators, the combination with a slidable door, of a cylinder, a piston disposed therein, a rack bar connected with said piston, means operated by said rack bar for opening and closing said door, a valve for admitting compressed air at either end of said cylinder, a pipe leading from the valve to each end of said cylinder for admitting compressed air, an exhaust pipe leading from each end of said cylinder to said valve and automatic means carried by the elevator car for controlling said valve.

6. In a door opening device for elevators, the combination with a slidable door, of a cylinder provided with two openings at each end, a piston disposed within said cylinder, pipes for the admission of compressed air communicating with certain of said openings at each end of said cylinder, exhaust pipes communicating with other openings at each end of said cylinder, a common valve for controlling all of said pipes, a contact member carried by the elevator car, a plunger carried by the valve casing and adapted to be engaged by said contact member, and a connection between the piston cylinder and the slidable door for operating the latter.

FRANK F. BOYD.

Witnesses:

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