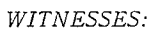


1,060,789.

2 SHEETS--SHEET 1.



Groffing Holt,
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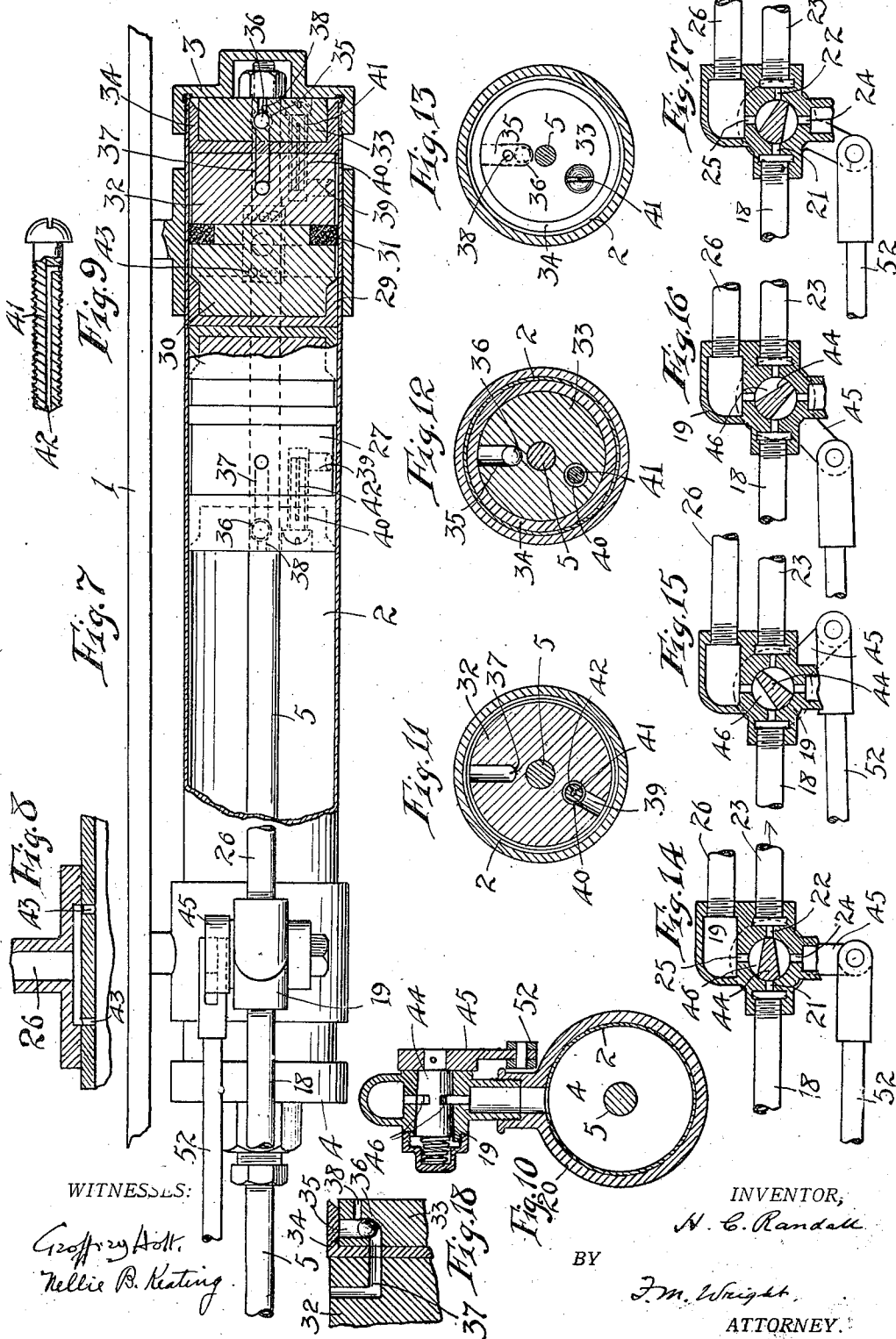
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MOTOR FOR OPERATING DOORS.
APPLICATION FILED JULY 13, 1908.

1,060,789.

Patented May 6, 1913.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

HORATIO C. RANDALL, OF SAN FRANCISCO, CALIFORNIA.

MOTOR FOR OPERATING DOORS.

1,060,789.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed July 13, 1908. Serial No. 443,352.

To all whom it may concern:

Be it known that I, HORATIO C. RANDALL, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Motors for Operating Doors, of which the following is a specification.

The object of the present invention is to provide an improved mechanism for controlling the passage of pressure fluid, such as compressed air, steam, water under pressure, or the like, to and from a working cylinder, which mechanism may be actuated at the will of the operator to admit the pressure fluid to the cylinder, which, upon the release of the actuating device by the operator, automatically acts to reverse the direction of movement of the piston, and which, finally, after such reversal has been effected, automatically sets the parts in such a position as to prevent any leakage of the pressure fluid while the device is in disuse.

The invention is especially adapted for use in controlling elevator doors and I have herein shown it arranged for such purpose, but it may be used in other relations.

In the accompanying drawings, Figure 1 is a broken front view of the apparatus; Fig. 2 is an enlarged plan view of a portion thereof; Fig. 3 is an enlarged vertical section taken in front of the locking hook; Fig. 4 is an enlarged broken plan view of a portion of the apparatus, the locking hook being broken away; Fig. 5 is a detail perspective view of the slide block; Fig. 6 is a vertical detail sectional view, showing the mechanism for controlling the device by the car; Fig. 7 is an enlarged broken plan view of the cylinder, a part of the piston being shown in section; Fig. 8 is a broken vertical section through one of the inlets for the compressed air; Fig. 9 is a detail broken view of the adjusting screw; Fig. 10 is a cross section through the controlling valve; Fig. 11 is a cross section of the cylinder through the vent passage; Fig. 12 is a cross section of the cylinder through a check valve in the piston; Fig. 13 is a cross section of the cylinder showing the piston in end view; Figs. 14, 15, 16 and 17 are transverse sectional views of the valve casing in four positions of the valve; and Fig. 18 is a detail longitudinal section through the piston.

Referring to the drawing, 1 indicates a plate adapted to be secured on the frame

above an elevator door. Upon said plate is secured a cylinder 2, having at one end a closed head 3, and at the other end an apertured head 4, through which passes a piston rod 5. The heads 3 and 4 are interchangeable in position, so that the piston rod can be arranged to travel through either end of the cylinder. Said piston rod 5 is connected by a removable pin 6 to a slide block 7, which slides between slideways 8, supported by posts 9 on the plate 1. Upon said slide block is secured a threaded pin 10 upon which is screwed a nut 11, and which can move in a slot 12 in a lever 13, pivoted at its lower end, as shown at 14 to an elevator door 15, and having at its upper end a slot 16 for connecting it to a pivot 17 on the frame of the elevator shaft.

The compressed air is supplied by a pipe 18, which is screwed into a valve casing 19, secured on a band 20 surrounding the cylinder at one end. Said valve casing has an inlet passage 21 through which the compressed air is admitted to the interior of said casing, an outlet passage 22 which connects with an exhaust pipe 23, a passage 24 connecting with the nearer end of the cylinder and a passage 25 connected by a pipe 26 with the farther end of the cylinder. Within said cylinder slides a compound piston 27, each half of which comprises, at the inner end a cup leather 29, next, a wooden piston section 30, having at its outer end an annular mortise to receive a ring 31 of felt, a second wooden piston section 32, a cup leather 34, and a brass disk 33. Said disk 33 is formed with a radially extending socket 35, terminating at its inner end in a valve seat, into which is dropped a ball check valve 36. Said valve seat communicates by a passage 37 through the brass disk 33, cup leather 34, and wooden piston section 32, with the annular space between said piston section 32 and the cylinder 2. Above said valve seat and ball valve, the socket 35 communicates with the outer side of the brass disk by an exhaust passage 38. A vent 39 is also formed in the wooden piston section 32 in a radial direction which vent connects with a passage 40 at right angles thereto in a direction parallel with the axis of the piston and terminating in the end of the piston, which passage 40 is variably obstructed by a screw 41 having a contracted passage 42.

The pipe 26 and passage 24 connect with

the interior of the cylinder each by means of two groups of three port holes 43, each group connecting with the reduced annular space around the piston at a side of the felt ring 31. The operation of this portion of the apparatus is therefore as follows: Supposing the parts to be in the position in which the door is closed, and that compressed air is then admitted to the farther end of the cylinder, the air passes into the annular space around the outer wooden piston section 32, and between the felt ring 31 and the outer cup leather 34, and thence passes by the passage 37 to the ball valve 36, raising said valve from its seat, and escaping by the passage 38. Compressed air is thus admitted to open the door. When the piston arrives at the end of its stroke, in opening or closing the door, the outer cup leather 34 passes the port leading to the corresponding end of the cylinder, and the air is then confined in said end of the cylinder, since it cannot pass along the passage 37, on account of the check valve 36. Said air thus confined, and compressed by the motion of the cylinder, acts as a cushion to prevent the too rapid terminal movement of the door. By means of the vent 39 the air gradually escapes from the chamber in which it was confined, and, as it escapes, the door is slowly moved to its terminal position. Thus the closing and opening of the door are effected without jar.

The interior of the valve casing is cylindrical, and therein rotates a conical or tapering valve 44, connected at the outside with an arm 45. In the transverse plane through the inlet, outlet, and connecting passages, 21, 22, 24, 25, the valve is recessed on opposite sides, as shown at 46, to form ports. The bottom surfaces of these recesses or ports converge toward each other, so that, in the plane of said ports, the valve is considerably thicker at the rear side, adjacent to the inlet passage 21 than at the front side, adjacent to the outlet passage 22. The object of this construction is to shut off the compressed air before the passage to exhaust is closed.

The lower end of the valve arm is connected to a rod 52, which is jointed to a swinging arm 47, which latter is, in its turn, jointed to a link 48, jointed to the arm 49 of a bell crank lever 50. Said bell crank lever has secured thereon two arms 54, 51, of which the arm 51 is outside the elevator shaft, while the arm 54 is within said shaft. To said arms 51, 54, are attached suitable pull cords 53. By depressing the outer end of either of these arms, the upper end of the arm 49 of the bell crank lever is moved toward the cylinder, thereby rocking the arm 45 and moving the valve to open the near end of the cylinder to exhaust and connect its remote end with the compressed air. The move-

ment of the compressed air to the farther end of the cylinder actuates the piston to propel the rod through the head 4 of the cylinder and move the slide block along the slide to open the door.

In order to prevent the door being opened except when the compressed air is so admitted, there is pivoted upon the rear side of the slide block, as shown at 55, a hook 56, which has a tooth 57, which, when the door is closed, engages a square shoulder 58 formed upon a post 59 projecting from the plate. 1. Consequently, the door cannot ordinarily be opened directly by hand, and without admitting compressed air in the manner above described. But, when the bell crank lever is actuated to admit compressed air to open the door, said hook 56 is at the same time automatically raised. This is effected by means of a rod 60 pivoted to the arm 47 and which is at its free end supported by means of a pin or reduced extension 61 of the post 59 passing into a slot 62 in said rod 60. Said rod 60 is also formed near its free end with a rounded socket 63 into which can drop a roller 64 carried on the free end of the hook 56. Therefore, when the bell crank lever is actuated to admit compressed air, the same movement through the arm 47 causes the rod 60 to move toward the cylinder, and raises said roller 64 out of said socket 63, thereby raising the tooth 57 on the hook 56 above the shoulder 58 upon the post 59, so that the slide block is free to move, and the compressed air is therefore free to act to open the door. As, in the movement of the slide block, the roller 64 passes out of contact with the end of the rod 60 and is no longer supported thereby, the hook 56 drops upon a stop 65 projecting rearwardly from the slide block. As soon as the pull cord is released, the bell crank lever is returned by means of a spring 66 attached to the swinging arm 47. This has the effect of returning all of the parts so actuated by the bell crank lever, through their central or normal positions, as shown in Fig. 1, to the other side thereof, so that the action of the valve is now reversed, and the compressed air is admitted to the near end of the cylinder, and the remote end thereof is connected with exhaust. The door then automatically closes. As it closes, and the slide block returns, the roller 64 rides upon the inclined upper surface 68 of the end of the rod 60, and thereby raises the hook 56 to clear the post 59. The stop 65 upon the slide block abuts against the end of the rod 60, and, in the closing movement of the door, moves said rod to the right against the action of the spring 66. The effect of the first part of this movement is to close the inlet passage 21 in the valve casing and shut off the compressed air from the near

end of the cylinder, the remote end of said cylinder being, however, still open to exhaust, owing to the tapering form of the valve in the plane through the openings. 5 The compressed air thus contained in the near end of the cylinder then acts solely by expansion, and the door continues its closing movement until the rod 60 has been returned to its normal position, in which the roller 64 drops into the socket 63 and the hook 56 again engages the shoulder 58 on the post. 10 The valve has now been returned to its initial position in which both the inlet and outlet to the valve casing are closed.

15 Should the compressed air apparatus get out of order, the door may be operated by hand, by removing the pivot pin 6 of the knuckle joint which connects the piston rod with the slide block. The door will then 20 still be controlled by the locking lever, and the effect of pulling either pull cord will be to release said locking lever.

It is to be observed that should the locking hook on the slide block not have been 25 engaged by the stop, and it is attempted to open the door by hand, by sliding the slide block, the effect will be to automatically turn on the compressed air to close the door, for this will be accomplished by means of 30 the spring which then, on account of the rod being no longer engaged by the extension on the slide block, operates the swinging arm to turn the valve to permit compressed air to the near end of the cylinder and close 35 the door.

I provide means for preventing the opening of the elevator door except when the elevator car is at the door. For this purpose there is provided a slide rod 70 sliding 40 through the plate 1 and also through a front plate 71, carried by a bracket 72, secured on said front plate. Said rod normally obstructs the movement of an arm 74 on the pivot pin of the bell crank lever, and thus 45 prevents the opening of the door, except when the car is at the door. Said rod 70 has a head 73 in which is carried a roller 85, and also has an extension 86 which slides upon the pivot pin of the bell crank lever, for the 50 purpose of maintaining the roller in the proper vertical plane. Said head is normally pressed outward by means of a coiled spring 83, but upon the arrival of the elevator car 78 at the door, a wedge or cam 79 55 upon said car, engaging the roller 85 presses inward said slide rod, so that a recess 80, formed in said slide rod 70, is in the same plane with the arm 74 upon said pivot pin. When in this position said arm can pass 60 freely through said recess, and the bell crank lever can be operated. I also provide means

whereby the movement of the door operates any suitable safety or power controlling device in the basement. For this purpose there is attached to the slide block, a depressor rod 65 84, which when the slide block moves outward, engages the upper end of a lever 86, and first rocks said lever, and then maintains it in the position to which it has so 70 rocked, so long as the slide rod is out of its normal position corresponding to the closed position of the door. The other end of said lever is attached to a pull rod 87 attached to a bell crank lever 88 to which is attached a pull rod or wire 89 which is connected to 75 a switch 90 for controlling the current of electricity used to operate the car, in case the car is so operated, or to a valve when the car is operated by fluid pressure.

While for brevity and convenience the 80 mechanism is referred to in the claims as used for operating a door, it is to be understood that the word "door" is here used, not in its limited sense, but broadly to indicate any closure which it may be desired to control by the said mechanism. 85

I claim:—

1. In a motor for controlling a movable element, the combination of a cylinder, a piston therein having in each end a radially 90 extending socket terminating at its inner end in a valve seat, a ball check valve on said seat, said piston having a passage leading from said socket above said ball to the end of the piston, and a second passage leading 95 from below the ball to an intermediate point in a side of the piston, the cylinder having a port arranged to communicate with said passage when the piston is at the end of the cylinder, and a piston rod secured to said 100 piston and operatively connected to the movable element, substantially as described.

2. In a motor for controlling a movable element, the combination of a cylinder, a piston therein, and means movable with the piston 105 for shutting off the compressed air from access to the rear end of the piston before the piston reaches the end of its stroke, while maintaining the exhaust open, whereby the piston then operates solely by expansion to 110 move said element to the end of its path, and a piston rod secured to said piston and operatively connected to the movable element, substantially as described.

In testimony whereof I have hereunto set 115 my hand in the presence of two subscribing witnesses.

HORATIO C. RANDALL.

Witnesses:

FRANCIS M. WRIGHT,
D. B. RICHARDS.