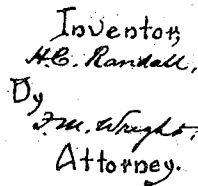


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3 SHEETS--SHEET 1.



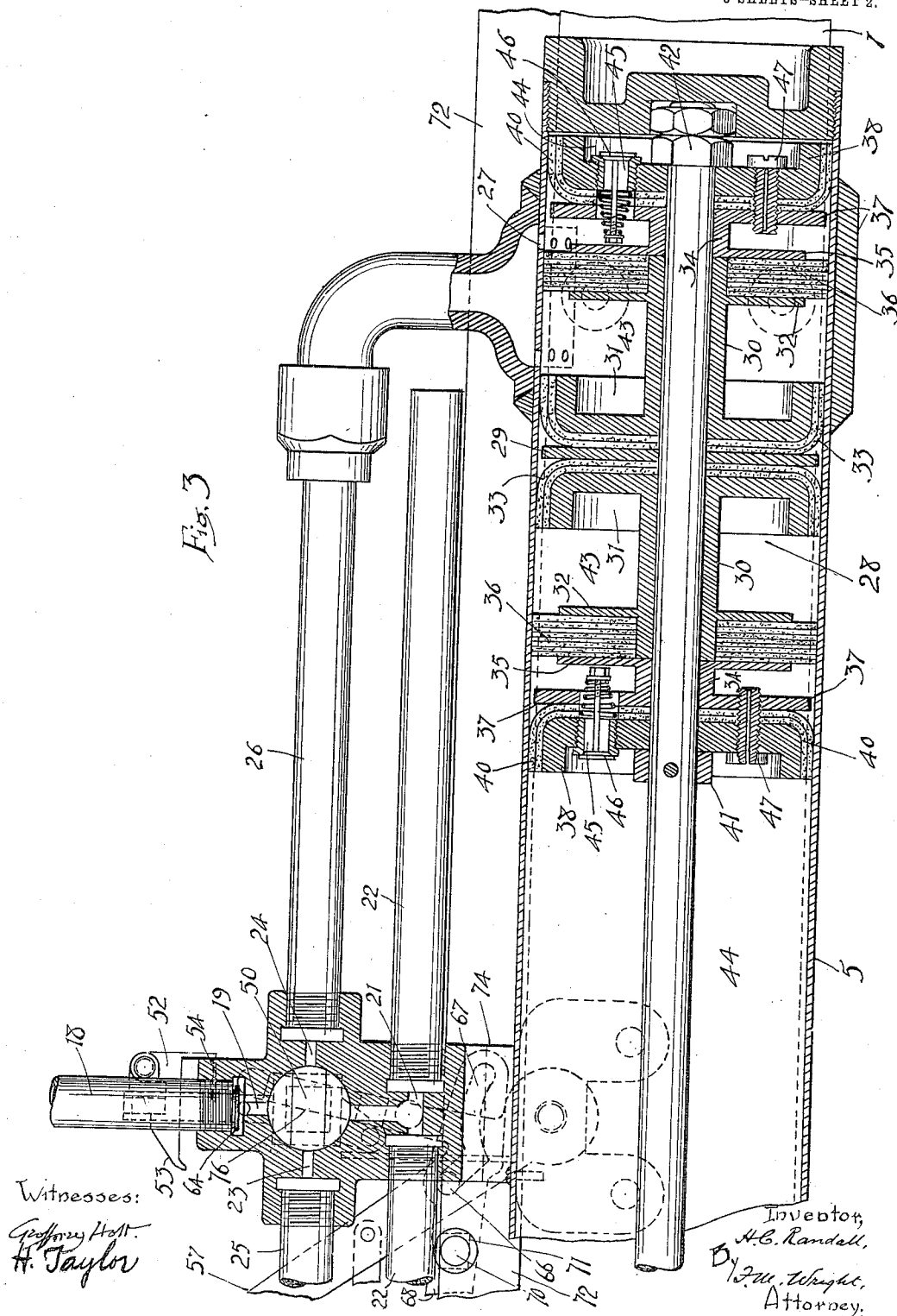
Gregory Holt.
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CONTROLLING MECHANISM FOR WORKING CYLINDERS,
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3 SHEETS-SHEET 2.

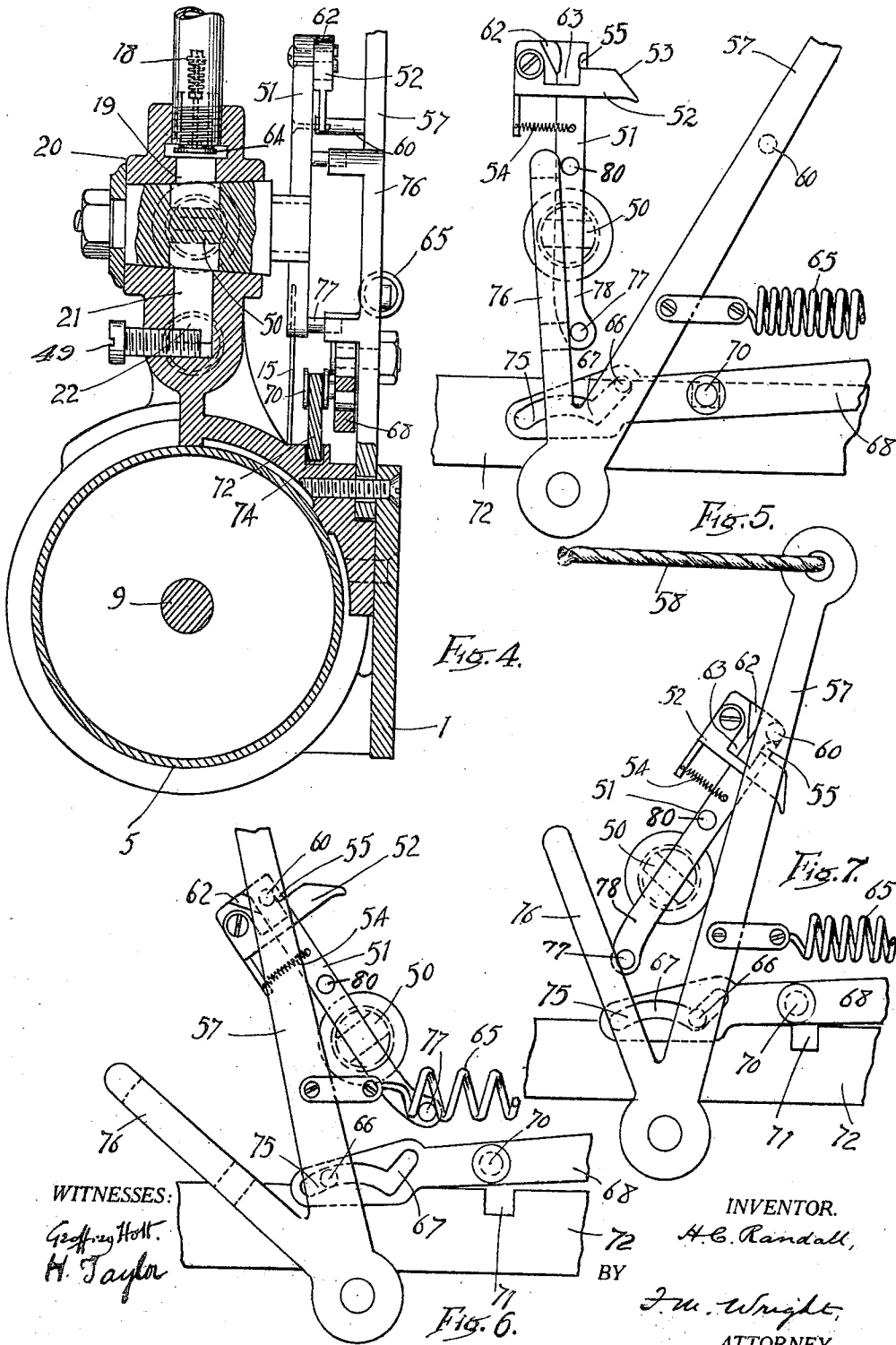


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3 SHEETS-SHEET 3.



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CONTROLLING MECHANISM FOR WORKING CYLINDERS.

971,143.

Specification of Letters Patent. Patented Sept. 27, 1910.

Application filed April 17, 1907, Serial No. 368,617. Renewed March 10, 1910. Serial No. 548,494.

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 Controlling Mechanism for Working Cylinders, 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 therefore resides in the novel construction, combination, and arrangement of parts for the above purposes hereinafter fully specified and particularly pointed out in the claims.

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 elevation, showing the apparatus applied to an elevator door; Fig. 2 is a detail front view of the cam lever and the parts coöperating therewith; Fig. 3 is an enlarged longitudinal section of a portion of the cylinder; Fig. 4 is a transverse section through the cylinder and valve; Figs. 5, 6, and 7 are detail broken rear views of the valve operating mechanism.

Referring to the drawing, 1 indicates a plate, provided at the ends with holes 2 for securing it in place, as on the frame above an elevator door, said plate having a portion 3 reduced in width to serve as a slide plate. Upon said plate is secured, by means of screws 4, a cylinder 5, having at one end a closed head 6, and at the other end a head 7 having a stuffing gland 8 through which passes the piston rod 9. The heads 6 and 7 are interchangeable in position so that the piston rod can be arranged to work through either end of the cylinder. Said piston rod is secured to a block 11 which is in turn se-

cured to a slide 12 which slides upon the narrow portion 3 of the plate 1. The piston rod 9 is connected by suitable devices to the parts which it is desired to control; in the present case, when used for controlling elevator doors; the slide 12 has secured thereon a pin 13, which moves in a slot 14 in a lever 15 having at its lower end a hole 16 for connecting to the elevator door 10 and at its upper end a slot 17 for connecting it to a pivot 48 on the frame of the elevator shaft.

The pressure fluid is supplied by a pipe 18 which is connected through a check valve 64 with an inlet opening 19 in the top of a valve casing 20 of a four-way valve. Opposite to the inlet opening 19 is an exhaust opening 21 connected with pipes 22 for discharging the exhaust fluid; said exhaust opening being adjusted by a screw 49; and at right angles to said openings 19, 21, are ports 23, 24, which are connected with pipes 25, 26, which lead to opposite ends of the cylinder 5, the fluid passing thereinto by holes 27 in the wall of the cylinder. Within said cylinder slides the compound piston 28, which comprises the central disk 29, the two sleeves 30 having at their inner ends cup shaped disks 31, and near their outer ends flanges 32, the cup leathers 33 secured between the central disk 29 and the cup shaped disks 31, sleeves 34, the ends of which abut against the ends of the sleeves 30 and have flanges 35, between which flanges and the flanges 32 are contained packing rings 36, said sleeves 34 having also flanges 37 at their other ends, and cup shaped disks 38, between which disks 38 and the flanges 37 are cup leathers 40, the collar 41 for securing in position the cup-shaped disks 38 at one end, and the nuts 42 for securing in position the cup-shaped disks 38 at the other end. The flanges 32, being spaced from the disks 31, provide chambers 43 for the pressure fluid, and chambers 44 are also formed between the disks 38 and the ends of the cylinder, by reason of said disks being cup shaped. Connecting these two chambers 43, 44, at each end, is a passage 45 of a check valve 46. Also connecting said chambers is a thimble 47 apertured axially to form a relief conduit.

Connected with the stem of the valve 50 is a lever 51 upon the upper end of which is pivoted a guide 52, having an upper curved surface 53, and normally raised by means of a spring 54, said surface abutting

against a lug 55 formed on the upper end of the lever.

57 indicates an operating arm which is connected at its outer end with a cord 58, leading to a convenient point to be pulled by the operator, and said arm 57 carries a pin 60, which, when said arm is operated by the pulling of the cord, rides upon the curved surface 53 of the guide, depressing the same against the action of the spring 54, and thereby permitting said pin to pass over said curved surface and beneath said lug 55. The pin then abuts against a stop 62, formed upon the end of the valve lever opposite to the lug 55, so that, in the continued movement of the arm 57, the lever 51 moves with it. The guide 52 is formed with a recess 63 behind said curved surface 53, so that, when the pin 60 abuts against said stop 62, said guide can be raised by the spring 54, so as to resume its normal position contacting with the lug.

In order to prevent the movement of the valve lever 51 by mere friction when the pin 60 on the operating arm rides upon the top of the curved guide 52, and before said pin impinges against the stop 62, a spring 56 is provided, restraining said valve lever against such movement, until said lever is positively advanced with the operating arm by means of said pin and stop. The continued movement of the arm 57, carrying with it the valve lever 51, turns the valve to the position shown in Fig. 6, in which the pressure fluid is admitted to one end of the cylinder behind the piston. Upon the operator releasing the cord, a spring 65 immediately acts to withdraw the arm 57, thereby also withdrawing the lever 51, and turning the valve to the position shown in Fig. 7 in which the pressure fluid is now admitted to the outer end of the cylinder, causing the piston and the parts actuated thereby to move in the opposite direction.

Upon the arm 57 is secured a pin 66 which engages a cam slot 67, in a cam lever 68, pivoted upon a block 69, secured upon the base or frame of the cylinder. Said cam slot is so formed that, upon the first part of the motion of the operating arm, before it actuates the valve, the pin 66 moving in said slot 67 raises said cam lever, and thereby raises a roller 70, carried by said cam lever, out of engagement with a recess 71, formed on the upper edge of a narrow plate 72, secured to the slide 12 and moving therewith and with the piston. Thereby said piston is unlocked and is free to move. The plate 72 slides in a bearing 74 formed in the valve block. When the operating arm 57 has come into operative engagement with the valve lever, so as to move the valve, the pin 66 then moves into an idle part 75 of the slot, curved in a circle having at its center the center of the valve lever 51, so that, in

the further movement of said lever, said roller is maintained in its raised position. The reverse movement of the operating arm continues until an arm 76 formed integral with said arm 57, impinges upon a pin 77, carried upon a downwardly extending arm 78 of the valve lever, and at this time also the pin 66 on the operating arm moves out of the idle portion 75 of the slot and into the working portion thereof, so that, when the recess 71, in the edge of the plate 72 arrives at the roller 70, said roller can immediately drop into said recess, thereby locking the piston in the position of disuse. At this time also the operating arm has arrived at such a position, as shown in Fig. 7, that the pin 60 carried thereby escapes over the top of the lug 55 on the end of the valve lever, whereupon the continued motion of the arm 76, acting upon the pin 77 moves the upper part of said valve lever 51 backward, until a pin 80 on the upper part of said lever 51 abuts against the arm 76, when the valve lever is arrested in such a position that the valve completely shuts off the passage of pressure fluid to either end of the cylinder. Thus the device is left in such a position, shown in Fig. 5, that no leakage can take place. The speed of closure of the door is regulated by the rapidity with which the air can escape through the exhaust 21, which is for this purpose adjustably obstructed by the screw 49. When the piston arrives near the end of the stroke, it compresses the air or other fluid in the end of the cylinder which thus forms a cushion or check. The rapidity with which the air can escape from the compartment thus closed by said head is determined by means of the adjustable valve 47. When the compressed fluid is admitted to the cylinder at either end, it passes into the space behind the corresponding head through the check valve 46 thus furnishing pressure behind said head. The roller 70 falling into a recess 71 in the plate 72 acts as a positive stop to prevent the door, when closed being pushed open without actuating the operating arm by means of the cord. If, for any reason, the door has not been completely closed, in consequence of which the roller has not dropped in the recess 71, then the check valve 64 is of service, for then should any one attempt to open the door by pushing it to one side, the corresponding movement of the piston in the cylinder would compress the air therein, since it could not escape back in the pipe 18 on account of the check valve 64, and this air, thus compressed, would act as a stop to prevent the opening of the door.

In the following claims, the word "door" is to be taken in its broadest sense of any closure for an opening, and would therefore include a window, a gate, a transom, or the like.

I claim:—

1. In an apparatus of the character described, the combination of a cylinder, a piston sliding therein, a piston rod therefor, cushion heads carried by said rod and adapted to form at the end of the cylinder fluid cushions for the piston, each cushion head having a vent therethrough, means for variably obstructing said vent, and means for admitting pressure fluid alternately to opposite sides of the piston, substantially as described.

2. In an apparatus of the character described, the combination of a cylinder, a piston sliding therein and having a piston rod, cushion heads carried by said piston rod, said heads being spaced from the piston and adapted to form at the ends of cylinder fluid cushions for the piston, each cushion head having a check valve opening away from the piston, and means for admitting pressure fluid alternately at opposite sides of the piston, substantially as described.

3. In an apparatus of the character described, the combination of a cylinder, a piston reciprocating therein, a valve casing, a pipe leading thereto from a source of supply of pressure fluid, an exhaust in said casing, means for adjusting the rapidity of exhaust, a pipe leading from said casing to each end of the cylinder, and a four-way valve in said casing connecting said pipe and exhaust alternately in pairs, substantially as described.

4. In combination, a cylinder, a piston sliding therein, a device movable with the piston, a lock automatically engaging said device at one end of its movement to lock the same, means for admitting pressure fluid to the cylinder to reciprocate the piston, and means for automatically removing said lock with the admission of said fluid, substantially as described.

5. In combination, a pressure fluid cylinder, conduits for conducting the fluid to either end thereof, a valve for controlling said conduits, means, adapted to be actuated by an operator, for turning the valve to admit said fluid to one end of the cylinder, and mechanism, operating automatically on the cessation of said actuation, to first admit the pressure fluid to the other end of the cylinder, and then to shut it off from both ends, substantially as described.

6. In an apparatus of the character described, with a cylinder, and a valve for admitting pressure fluid to both ends of the cylinder, of a valve lever, an operating arm for actuating said lever, and means carried by said arm, whereby, in the movement in one direction of said arm, the lever is moved in the same direction as the arm, and, on the return movement of the latter, the lever is first moved with the arm, and is then

moved in the opposite direction thereto, substantially as described.

7. In an apparatus of the character described, the combination, with a cylinder, and a valve for admitting pressure fluid to opposite ends thereof, of a valve lever, an operating arm, and a device carried by said lever and arm and engaging each other, whereby, upon the movement of the arm in one direction the valve is turned from its position shutting off the pressure fluid from both ends of the cylinder, to its position admitting the pressure fluid to one end only of the cylinder, and upon the movement of the operating arm in the other direction, the valve is first turned from the last named position to its position admitting pressure fluid to the other end only of the cylinder, and, then, upon the continued movement of the arm, the valve is turned to its original position, substantially as described.

8. In an apparatus of the character described, the combination, with a cylinder, and pipes for admitting pressure fluid to both ends of the cylinder, of a valve for controlling the passage of pressure fluid through said pipes, a movable device for turning said valve, and mechanism interposed between said movable device and valve, adapted, in one movement of the device, to turn the valve to admit the pressure fluid to one end of the cylinder only, and in its return movement to first turn the valve to admit the pressure fluid to the other end of the cylinder only, and then, in the end of the latter movement, to turn the valve to shut off the pressure fluid, substantially as described.

9. In combination, a cylinder, a piston sliding therein, a device movable with the piston, means for admitting pressure fluid to the cylinder to actuate said piston, and means for simultaneously locking said device against such movement and shutting off said pressure fluid from the cylinder, substantially as described.

10. The combination of a cylinder, a piston therein, a piston rod for said piston, transverse devices carried on said piston rod at a distance from said piston, to form with the cylinder fluid cushions at the ends of the stroke of the piston, and partitions separating the chambers between the piston and said devices, each into two compartments, substantially as described.

11. The combination of a cylinder, a piston reciprocating therein, a piston rod for said piston, devices carried on said piston rod and spaced from said piston, said devices being adapted to form with the ends of the cylinder fluid cushions, and a check valve in each device, substantially as described.

12. The combination of a cylinder, a piston therein, a piston rod therefor, devices

carried on said piston rod for forming with the ends of the cylinder air cushions, and also forming with the piston, fluid chambers, and a transverse partition for each
5 chamber, dividing it into compartments, substantially as described.

13. In an apparatus of the character described, the combination of a cylinder, a
10 piston sliding therein and having a piston rod, two conduits for admitting pressure fluid into said cylinder alternately at opposite sides of the piston, and cushion heads carried by said piston rod and adapted to form at the ends of the cylinder fluid cush-

ions for the piston, said heads being spaced 15 from the piston sufficiently to be on opposite sides of either conduit, to provide an air passage connected with said conduit, each cushion head having a check valve opening away from the piston, substantially as 20 described.

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

HORATIO C. RANDALL.

Witnesses:

FRANCIS M. WRIGHT,
D. B. RICHARDS.