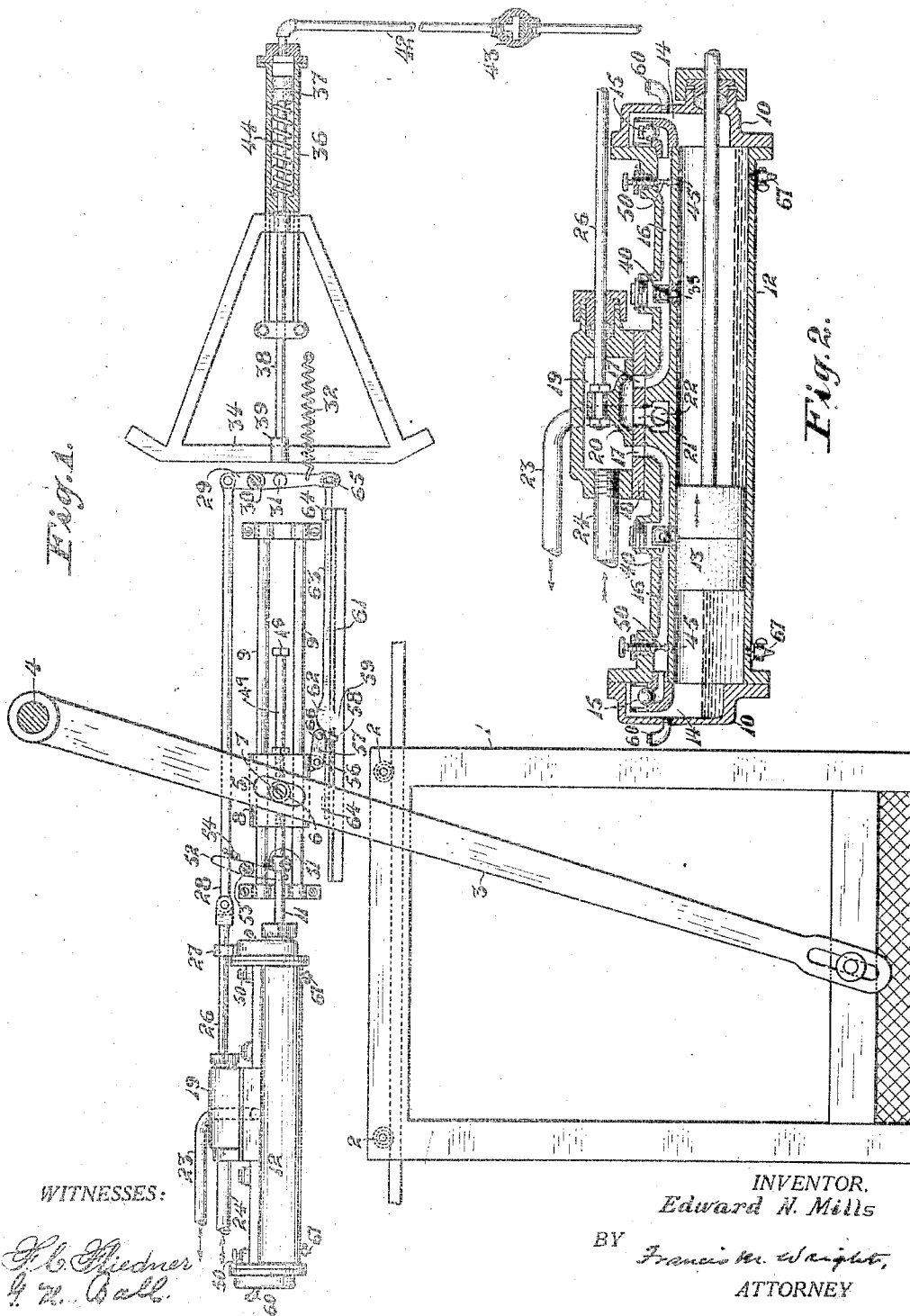


E. N. MILLS.
 FLUID DOOR CONTROLLER.
 APPLICATION FILED JUNE 30, 1913.

1,098,535.

Patented June 2, 1914.



WITNESSES:

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 ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD N. MILLS, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO WESTERN DOOR CONTROL COMPANY, A CORPORATION OF CALIFORNIA.

FLUID DOOR-CONTROLLER.

1,098,585.

Specification of Letters Patent.

Patented June 2, 1914.

Application filed June 30, 1913. Serial No. 776,569.

To all whom it may concern:

Be it known that I, EDWARD N. MILLS, 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 Fluid Door-Controllers, of which the following is a specification.

Means heretofore adopted for avoiding shock or jar from the closing of doors, especially those of elevators, have heretofore not been found to be compatible with a rapid closure thereof.

It is the object of my invention to provide means whereby the total time occupied in the closing of the door may be very small, and yet no shock or loud noise will be experienced at the instant of final closure.

In the accompanying drawing, Figure 1 is a broken side elevation of my apparatus applied to a door, certain parts being shown in section; Fig. 2 is a longitudinal section of the controlling cylinder thereof.

Referring to the drawing, 1 indicates a door, adapted to travel on rollers 2 and to be actuated by a lever 3, pivoted at 4. Said lever is formed with a slot 5, into which extends a roller 6, on a stud 7, screwed into a block 8, slidable on parallel guides 9, adapted to be secured above, and parallel with, the top of the door. Into said block is screwed an end of a piston rod 11, passing through one end of a cylinder 12, and connected to a piston 13 therein. The heads 10 of said cylinder are hollow and are formed with transverse upward extensions 14, with which severally communicate through non-return valves 15 conduits 16 leading respectively from ports 17, in a bed 18 of a chamber 19 for a slide valve 20, said bed 18 being secured upon a side of the cylinder. In said bed, between said ports 17, is a port 21, communicating with an exhaust conduit 22 leading to an exhaust pipe 23. The valve chamber 19 is connected by a pipe 24 with a source of supply of pressure fluid, such as compressed air. The slide-valve 20 in said valve chamber 19 can slide over the ports 17 and 21, and is connected to a valve rod 26, which moves through a guide 27 and the outer end of which is connected to one end of a rod 28, of which the other end is connected to a lever 29, pivoted at 30, and carrying a stud 31 in line with the piston rod 11, said lever being attached

to one end of a coiled spring 32, the other end of which is fixedly secured.

When used for controlling elevator or other doors the lever 29 is preferably automatically operated by a shoe 34 connected to a head 39 of a piston rod 38 of a piston 37 in a cylinder 36, said head 39 being adapted to engage said stud 31, said piston being adapted to be actuated by compressed air admitted by a pipe 42, controlled by a three-way valve 43, and to be returned to its normal position by a coiled spring 44 around the piston rod 38. When, with this latter construction, the operator desires to open the door, he turns the three-way valve 43 to such a position that the pipe 42 is disconnected from the atmosphere and connected to a source of supply of compressed air, so that said air is admitted to the cylinder 36, and the piston 37 therein is pushed outwardly, compressing the spring 44 and forcing the head 39 of the rod 38 against the stud 31. The lever 29 is then rocked, so that the rod 28 moves to the right, which causes the valve 20 to be moved to the right, admitting compressed air from the valve chamber 19 to the conduit 16 on the left, and to the left-hand end of the cylinder 12, at the same time connecting the port 17 on the right with the port 21, so that the right-hand end of the cylinder is open to the atmosphere by means of the conduit 16, ports 17 and 21 and conduit 22. The compressed air then admitted propels the piston 13 to the right, causing the block 8 to slide upon the guides 9, rocking the lever 3 and opening the door 1. The slide valve remains in this position, and compressed air is admitted to the left-hand end of the cylinder and the right-hand end is open to the atmosphere so long as pressure is applied by the head of the rod 38 to the stud 31 against the action of the coiled spring 44. But as soon as the operator turns the three-way valve 43 so as to connect the pipe 42 with the atmosphere and disconnect it from the source of supply of compressed air, then the spring 44 operates to withdraw the head 39 of the rod 38 from the stud 31, and the coiled spring 32 acts to move the lever 29 so that the rod 26 moves to the left far enough to shift the slide valve 20 to a point such that compressed air enters the right-hand end of the cylinder and its left-hand end is in communication with the atmosphere, whereupon

the piston is propelled to the left, closing the door.

When the piston is moving either to the right or to the left, the rod 11 arrives at a position in which the slide valve 20 closes both ports 17. This is effected when moving to the right by the head 48 of a stem 49 adjustably secured to the slidable block 8 in line with the piston rod 11, engaging the stud 31, and when moving to the left by a finger 51 on the piston rod 11 engaging an arm of a lever 52 pivoted at 53, another arm of which engages a finger 54 secured upon the rod 26. Thereafter by the continued movement in either direction the air pressure in one end of the cylinders is reduced. By reason of the said valve 15 at the other end of the cylinder the air pressure in said other end would begin to increase, if provision were not made for preventing this increase. Such immediate increase of the air pressure is not desirable, as it would begin to check too rapidly the speed of the door in the final portion of its path. I therefore provide, opening into each conduit 16, a short conduit 35 leading from the adjacent portion of the cylinder and controlled by a non-return valve 40. Consequently the pressure of the air in each end of the cylinder cannot begin to rise as the piston is approaching said end until said piston has passed said conduit 40. Furthermore, in order to regulate the rate at which the pressure increases, I provide, leading to each conduit 16 between the conduit 40 and the non-return valve 15, a short conduit 45 controlled by a needle valve 50. Through this conduit 45 a portion of the air which is being compressed, the magnitude of which can be regulated by adjusting the needle valve, escapes, thereby reducing, to a greater or less extent as may be desired, the rate at which the air is compressed in the corresponding end of the cylinder. When the piston has passed the conduit 45, the residual air is confined within the end of the cylinder toward which the piston is approaching and serves as a cushion to arrest the movement of the piston without shock or jar. As an additional means for avoiding shock or jar I inclose in the cylinder, on each side of the piston, equal quantities of any suitable liquid, having found in practice that castor oil is an excellent liquid for the purpose, it being desirable that the liquid should not readily be vaporized, or separated into constituent elements, that its fluidity should not be so great as to cause it to splash too readily, and that its viscosity should not be so great as to seriously increase the power required to operate the piston. With each movement of the piston, the level of the liquid in front of it rises, and when the piston arrives at the end of the cylinder it is met by a cushion of the liquid, which in

turn is supported by a cushion of air under great pressure. 60 indicates a filling tube for said liquid, and 67 drain cocks therefor.

By reason of the improved means which are provided for the cushioning the piston at the end of each stroke, I have found that the piston may be propelled at a very high velocity during the greater portion of its stroke, and yet brought to a state of rest in a very short time without any shock or jar. For instance, I have found that the time occupied in closing the elevator may be reduced to one-quarter of a second, and yet the final closure will be effected without shock, jar, and practically noiselessly.

In order to prevent the door from being opened without authority, there is pivoted at 56 upon the slide block 8 a latch 57 having a finger 58 adapted to enter an aperture 59 in a guide-way 61, thereby locking the door against movement. If the elevator attendant or other person authorized therefor moves the lever 29 to open the door, he thereby moves toward said latch a cam 62 carried by a rod 63 slidable in guides 64 on the guideway, and having a pin and slot connection 65 with the lever 29. Said cam engages a pin 66 upon said latch and thereby raises the finger 58 out of the aperture 59, permitting the door to open.

I claim:—

1. In a device of the character described, the combination of a cylinder, a piston thereon, conduits for conducting pressure fluid to the respective ends of the cylinder, a non-return valve in each conduit, outlet conduits leading from the cylinder between the middle portion of the stroke of the piston therein and the ends thereof each to the corresponding inlet conduit between the non-return valve and the source of supply of pressure fluid, and a non-return valve in each outlet conduit.

2. In a device of the character described, the combination of a substantially horizontal cylinder, a piston therein, liquid in the cylinder on each side of the piston, conduits above the cylinder and connected with the respective ends for supplying pressure fluid thereto, controlling means for alternately supplying one of said conduits with pressure fluid and connecting the other with the atmosphere, a non-return valve in each conduit in close proximity to its connection with the cylinder, an outlet conduit from each terminal portion of the cylinder to that one of the above-named conduits leading thereto, and a non-return valve therein.

3. In a device of the character described, the combination of a substantially horizontal cylinder, a piston therein, liquid in the cylinder on each side of the piston, conduits above the cylinder and connected with the respective ends for supplying pressure fluid thereto, controlling means for alternately

supplying one of said conduits with pressure fluid and connecting the other with the atmosphere, a non-return valve in each conduit in close proximity to its connection with the cylinder, an outlet conduit from each terminal portion of the cylinder to that one of the above-named conduits leading thereto, a non-return valve therein, and an adjustable vent between each outlet conduit and said connection adjacent thereto.

4. In a device of the character described, the combination of a substantially horizontal cylinder, a piston therein, liquid in the cylinder on each side of the piston, conduits above the cylinder and connected with the respective ends for supplying pressure fluid

thereto, controlling means for alternately supplying one of said conduits with pressure fluid and connecting the other with the atmosphere, a non-return valve in each conduit in close proximity to its connection with the cylinder, and an adjustable vent between each outlet and said connection adjacent thereto.

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

EDWARD N. MILLS.

Witnesses:

FRANCIS M. WRIGHT,
D. B. RICHARDS.