A. G. ELVIN & F. W. MARTIN.

AUTOMATIC CLOSING DEVICE FOR FIRE DOORS.

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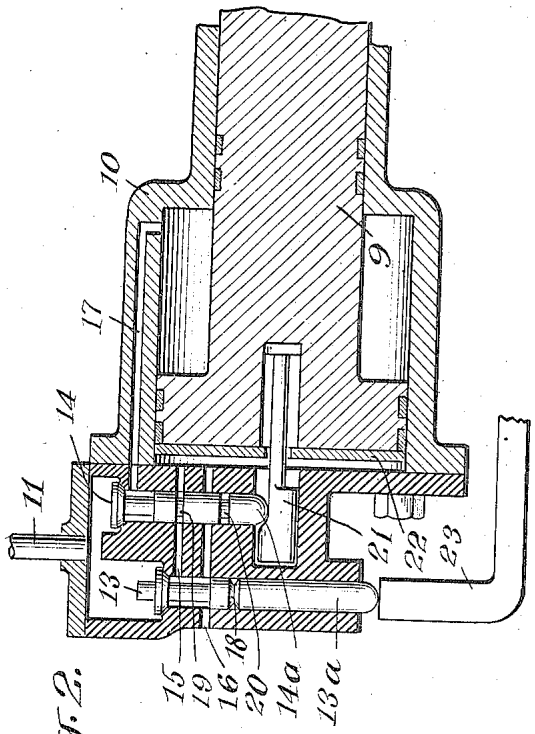

Fig. 2.

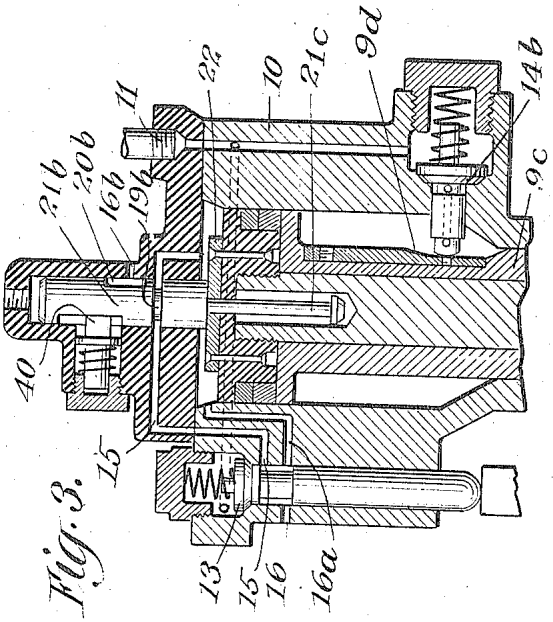

Fig. 3.

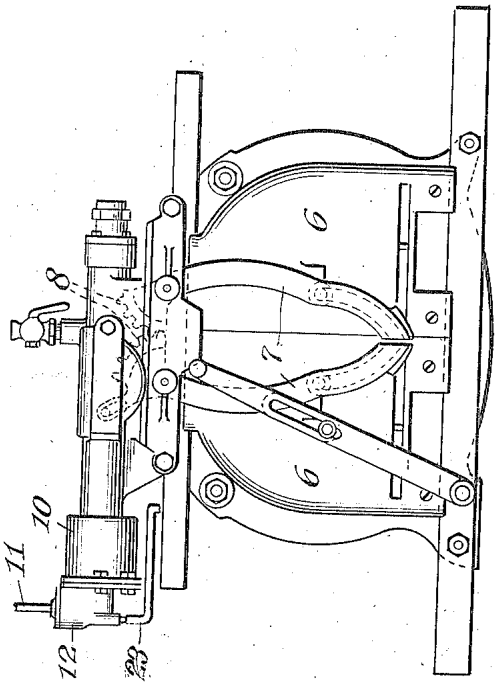

Fig. 1.

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AUTOMATIC CLOSING DEVICE FOR FIRE-DOORS.

1,264,168. Specification of Letters Patent. Patented Apr. 30, 1918.

Original application filed October 26, 1914, Serial No. 868,611. Divided and this application filed January 22, 1916. Serial No. 73,599.

To all whom it may concern:

Be it known that we, ALBERT G. ELVIN, of Somerville, in the county of Somerset and State of New Jersey, and FREDERICK W. MARTIN, of the borough of Manhattan, in the city, county, and State of New York, have invented a certain new and useful Improvement in Automatic Closing Devices for Fire-Doors, of which improvement the following is a specification.

This invention relates to fire door apparatus operated by fluid pressure, and has for its principal object to provide means for automatically effecting a positive closing of the fire door within a predetermined interval after the same has been opened, and thereby prevent the fireman from holding the door open for a longer period.

In this fire door apparatus as used on locomotives, the fluid pressure motor for actuating the doors is usually controlled by a valve operated by a pedal device, and it has been the practice of some firemen to hold the foot upon the pedal with the door open a sufficiently long period of time to deliver several shovelfuls of fuel into the furnace. This practice is objectionable, as large drafts of cold air are admitted to the furnace at such times through the wide open door, which tend to cool the fire and chill the water heating surfaces. With our improvement this is positively prevented, as the door will be promptly closed after a predetermined time even though the fireman retains his foot on the pedal.

In the accompanying drawings: Figure 1 is a front elevation, and Fig. 2, a vertical section of the fluid pressure motor, of one form of fire door apparatus embodying our improvement; and Fig. 3, a similar vertical section showing a modification.

According to the construction shown in Figs. 1 and 2, our improvement is applied in connection with horizontally sliding doors, 6, operated by pivoted arms, 7, having intermeshing gears, 8, and one of said arms being connected to the piston, 9, movable in the horizontal cylinder, 10, of the motor. Fluid under pressure, such as compressed air, is supplied from pipe, 11, to the valve casing, 12, containing valves, 13 and 14, supply port, 15, and exhaust port, 16. Port, 17, leads from valve, 14, to the opposite end of the cylinder. The arm, 23, adapted to be connected with a pedal device (not shown) operated by the foot of the fireman, engages the end of the stem, 13^a, of the valve, 13, for actuating the same. This stem, 13^a, also has a small groove, 18, adapted to register with the exhaust port, 16, in the open position of the valve. The stem, 14^a, of valve, 14, is provided with grooves, 19 and 20, and is operated by a rod, 21, having an inclined face at one end, and a head at the opposite end located in a recess in the piston, 9, and adapted to engage the plate, 22, on the piston head when near the outer end of its stroke.

When the arm, 23, is raised by the fireman for the purpose of opening the furnace door, the valve, 13, is opened to admit fluid through port, 15, and around groove, 19, in stem, 14^a, into the cylinder, thereby moving the piston, 9, through its outward traverse, and opening the door. In this position of the valve stem, 13^a, the small groove, 18, communicates with the exhaust port, 16, which is, however, closed by the stem, 14^a, thereby preventing escape of fluid. As the piston, 9, approaches the end of its traverse, the plate, 22, engages the head on the end of rod, 21, and the rod, 21, is actuated to raise the valve, 14, and stem, 14^a, to the position in which port, 17, is open to the supply, port, 15, is closed, and groove, 20, communicates with the port, 16. Fluid is thus admitted through port, 17, to the opposite end of the cylinder to return the piston to the closed position, but the capacity of the exhaust port, 16, is restricted by the small groove, 18, in stem, 13^a, whereby the fluid first admitted to the front end of the cylinder escapes very slowly, thereby retarding the closing movement of the piston. In this manner the piston will be automatically returned to its inner position, and the door closed in a predetermined time even though the fireman retains his foot on the pedal with the valve, 13, open. If he should at any time release the pedal and drop valve, 13, to its closed position, the exhaust port, 16, would be fully opened, since the reduced portion of the stem is then opposite the exhaust port, and the piston and door would immediately be returned to the closed position. When the piston is

returned to its inner position, the rod, 21, is actuated to permit the stem, 14^a, to drop and close the valve, 14. This again closes the port, 17, and the exhaust port, 16, nd opens the supply port, 15. There is no further movement, however, as the supply port remains closed by valve, 13, until the pedal arm, 23, is again operated. This period of time required for the automatic closing of the door depends upon the capacity of the restricted groove, 18, in valve stem, 13^a, and this may be readily fixed to suit different conditions.

The construction shown in Fig. 3 is similar to that of Fig. 2, except that the intermediate valve, 21^b, is connected directly to the valve rod, 21^c, actuated by the striking plate, 22, on the piston, 9^c, while the valve, 14^b, for admitting fluid to the opposite side of the differential piston is operated directly by the piston through the engagement with the inclined surface, 9^d. The valve, 21^b, is provided with a groove, 19^b, for controlling the inlet port, 15, and a cavity, 20^b, for connecting the cylinder port to the restricted exhaust port, 16^b, to the atmosphere when the piston reaches the open position. To prevent the cylindrical valve, 21^b, from turning in its chamber, a spring actuated detent, 40, may be employed, engaging a groove in the valve. This also serves to hold the valve in position and prevent the same from falling into the cylinder when the piston moves downward and the shoulder of the valve is not supported by the plate, 22, of the piston.

When the valve, 13, is raised from its seat, the exhaust port, 16, 16^a, is closed, and fluid from the supply, 11, and a connecting passage indicated in dotted lines, flows through the inlet port, 15, around groove, 19^b, in valve, 21^b, and into the upper end of the cylinder, where it acts upon the large face of differential piston, 9^c, to move the same downward and open the door or doors, as will be readily understood, there being any suitable form of connections, between the piston and said doors. Where the connection is made to the ordinary "butterfly" type of doors in which the doors swing laterally and vertically, the weight of the doors obviously opposes the downward movement of the piston and assists upward movement of the same. As the piston moves downward, the inclined surface, 9^d, engages and opens the valve, 14^b, thereby admitting fluid from the source of supply to the opposite or smaller area of the piston. As the piston approaches the lower end of its stroke, with the doors fully open, the head of the valve rod is engaged by the plate, 22, of the piston, and the valve, 21^b, is moved downward to its lower position in which the inlet port, 15, is cut off and the cylinder is put into communication with the small escape port, 16^b, through the cavity, 20^b, in the valve. The fluid from the upper end of the cylinder then escapes slowly, and the pressure reduces sufficiently in a predetermined short period of time, so as to be overcome by the pressure upon the opposite or smaller face of the piston. The piston then moves upward and the doors close. As the piston reaches the upper end of its stroke, the plate, 22, engages the shoulder of the valve, 21^b, and returns the same to its upper position, in which the escape port is cut off and the groove, 19^b, again registers with the inlet port, 15. The valve, 14^b, will also be closed when the piston is in this position. If the admission valve, 13, is still held open, fluid will again pass into the upper end of the cylinder, and the operation will be repeated. When, however, the fireman operates the door device in the usual and proper manner, by promptly releasing the pedal after the delivery of each shovelful of coal, the valve, 13, immediately drops to its seat, thereby cutting off the supply of fluid to the admission port, 15, while the stem, 13^a, opens the direct exhaust port, 16^a, whereupon the cylinder exhausts direct to the atmosphere, and the door closes promptly.

The fluid pressure acting on the upper ends of valves, 13 and 14, is ordinarily sufficient to effect a closing of said valves when the stems are released at the bottom, but if more prompt action is desired, springs, such as indicated in Fig. 3, may be employed to assist this movement.

In both of the modifications shown, the operation is such that after the opening of the door, the same begins to close, and will be closed automatically within a certain short interval of time, even though the fireman retains the pedal device open, thereby insuring single shovel firing, or the delivery of but one shovel of fuel into the furnace at each opening and closing of the door.

This application is a division of our former application Ser. No. 868,611, filed October 26, 1914.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. The combination of a cylinder and piston, a manually operated valve for controlling the admission of fluid to, and the exhaust from, said cylinder, and an auxiliary valve means controlled by the movement of the piston at the end of its stroke to automatically cut off the admission and open an exhaust from the cylinder at a predetermined time after the opening of the manual valve to permit a return movement of the piston.

2. The combination of a cylinder and piston, a manually operated valve for controlling an admission passage to said cylinder and an exhaust therefrom, an auxiliary

valve also controlling said admission passage and actuated by the movement of the piston at the opposite ends of its stroke, and means for allowing a gradual escape of fluid from said cylinder to permit a return movement of the piston.

3. The combination of a cylinder and piston, a manually operated valve for controlling an admission passage to said cylinder and an exhaust therefrom, and an auxiliary valve actuated by the movement of the piston in one direction to close said admission passage and open a restricted exhaust from the cylinder, and in the opposite direction to open the admission passage and close said restricted exhaust.

4. The combination of a cylinder and piston, a manually operated valve for controlling the admission of fluid to one end of the cylinder and the exhaust therefrom, other valve means operated by the movement of the piston for cutting off said admission and for supplying fluid to the opposite side of the piston, and means for allowing a gradual escape of fluid from the initial end of the cylinder.

5. The combination of a cylinder and piston, a manually operated valve for controlling the admission of fluid to one end of the cylinder and the exhaust therefrom, an auxiliary valve operated by the movement of the piston for cutting off said admission, means for allowing a gradual escape of fluid from said end of the cylinder, and another valve also actuated by the piston for controlling a supply of fluid to the opposite side thereof.

In testimony whereof we have hereunto set our hands.

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