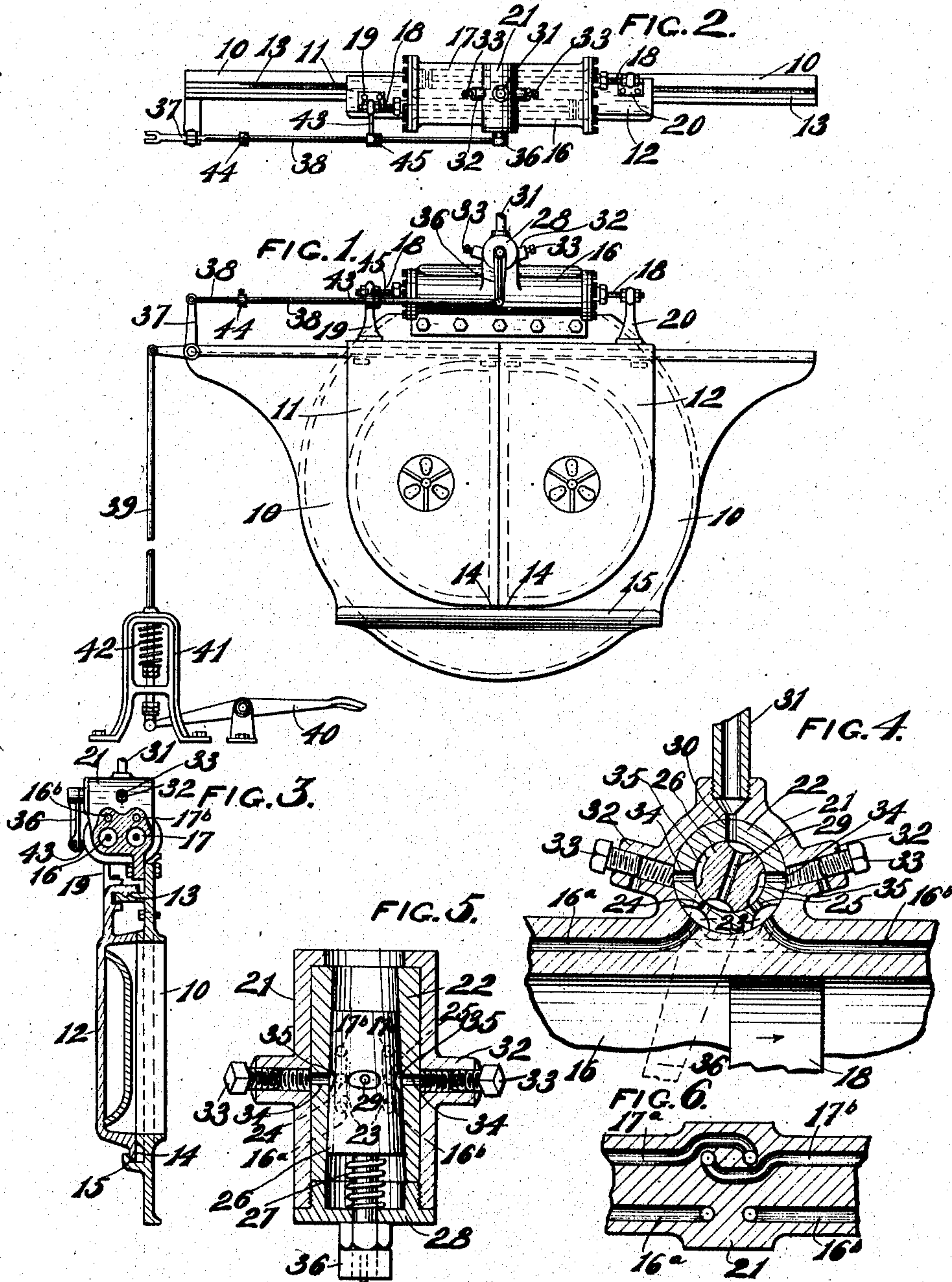


W. J. ROHAN.
FURNACE DOOR OPENER.
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Patented Aug. 16, 1910.



WITNESSES.

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WILLIAM J. ROHAN, OF RACINE, WISCONSIN.

FURNACE-DOOR OPENER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM J. ROHAN, residing in Racine, in the county of Racine and State of Wisconsin, have invented new and useful Improvements in Furnace-Door Openers, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

10 This invention has for its object to provide a door opener for locomotive furnaces and the like which will be automatic in its operation and controlled as to its movements by the foot of the fireman, so that the doors 15 need not be opened until he is ready to throw coal upon the fire and may be instantly closed as soon as that is accomplished thus avoiding the doors being kept open longer than is absolutely necessary.

20 Another object of the invention is to automatically cushion the opening and closing movements of the furnace doors at the ends of the movements so as to avoid the pounding of parts which would be liable to injure 25 them.

Another object of the invention is to provide such cushioning means of an adjustable nature to time the cushioning effect as desired.

30 Another object of the invention is to provide such a door opening and closing mechanism with means for controlling the speed of its operation.

35 With the above and other objects in view the invention consists in the furnace door opener herein claimed, its parts and combinations of parts and all equivalents.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in the different views; 40 Figure 1 is a front elevation of a furnace door opener constructed in accordance with this invention; Fig. 2 is a plan view thereof with the treadle removed; Fig. 3 is a transverse sectional view thereof; Fig. 4 is a transverse sectional view of the valve mechanism; Fig. 5 is a sectional plan view thereof; and Fig. 6 is a sectional detail view 45 showing the arrangement of the cylinder passages and ports for the valve.

50 In these drawings 10 indicates the front plate of a locomotive or other furnace and 11 and 12 are the two sliding doors thereof which have guide flanges at their upper ends

riding in V-shaped guide grooves 13 on the 55 flange at the top of the front plate 10 and have guide lugs to fit beneath the flange and hold the doors in place and also have guide lugs 14 at their lower ends riding in a guide flange 15 on the front plate 10, as clearly 60 shown in Fig. 3.

Bolted or otherwise secured to the upper edge of the front plate 10 is a casing forming a pair of parallel cylinders 16 and 17, and in each cylinder is a piston 18, the piston 65 of cylinder 16 passing out of one end of the casing and connected to a bracket 19 on the door 11 and the piston of cylinder 17 extending out of the other end of the casing and connected to a bracket 20 on the door 12. 70 By means of these connections the doors are forced to move in their guides by the movements of the pistons, each door having its independent piston in its own cylinder. The casing forming the cylinders also forms a 75 valve casing 21 extending across the cylinders, as shown, and having passageways 16^a and 16^b leading to the left and right ends of the cylinder 16 respectively and passageways 17^a and 17^b leading to the left and 80 right ends of cylinders 17 respectively, the latter passageways crossing each other so that their valve ports will be in the reverse relation to the valve ports of the other passageways, as shown in Fig. 6. 85

Within the valve casing 21 is a tubular bushing 22 having a groove 23 connecting the ports 16^a and 17^b and also having a groove connecting the port 16^b and the port 17^a, the former groove provided with a port 90 24 opening into the interior of the bushing 22 and the latter groove provided with a similar port 25. The bore of the tubular bushing 22 is tapering and a tapering plug valve 26 fits therein and is held tightly in 95 place by means of a coil spring 27 surrounding its stem and bearing upon a cap 28 which is threaded into the end of the valve casing 21 and holds the tubular bushing 22 in place against a shoulder of the casing. 100

The valve plug 26 has a transverse opening 29 adapted to register with a compressed air supply port 30 in the top of the tubular bushing 22 and communicating with a compressed air supply pipe 31 leading from any 105 suitable source of supply, and at the same time said opening connects with either the port 24 or the port 25. The flaring ends of

the opening 29 permit either of these connections, but the valve closes the connection with one of the lower ports before opening the connection with the other so that in the intermediate position of the valve, when the opening 29 is vertical, neither the port 24 nor the port 25 is in communication therewith.

On each side of the valve casing 21 is an exhaust plug 32 having a set screw 33 threaded therein to adjust the degree of opening of the exhaust passage through the plug, there being ports 34 through the tubular bushing 22 connecting with the passages of the exhaust plugs 32 and adapted to be brought into communication with the ports 24 and 25 respectively by means of grooves 35 in the sides of the valve plug. The position of the grooves 35 is such that one serves to connect the port 25 with the exhaust port when the port 24 is in connection with the compressed air supply and the other serves to connect the port 24 with the exhaust port when the valve is in position to connect the port 25 with the compressed air supply, the intermediate position of the valve, when the passageway 29 is vertical, leaving both the ports 24 and 25 out of connection with either the compressed air supply or the exhaust ports.

The end of the stem of valve 26 projects through the screw cap 28 and has a crank arm 36 mounted on it by means of which said valve may be turned, the position of said crank arm preferably corresponding with the position of the opening 29 of the valve so that the crank arm is in a vertical position when said opening is in a vertical position. A bell crank lever 37 is pivotally mounted on the front plate 10 and is connected by means of a connecting rod 38 with the crank arm 36 and by means of a connecting rod 39 with a treadle 40, there preferably being a stand 41 on the floor through which the connecting rod 39 passes to serve as a guide therefor and to contain a coil spring 42 which bears on the rod 39 to give it a tendency to move to the position shown in Fig. 1 where the treadle 40 is held in its upper position. The bracket 19 has a forwardly extending arm 43 which loosely surrounds the connecting rod 38 and is adapted to engage an adjustable stop 44 on said rod when the door 11 is near the end of its opening movement and to engage a similar adjustable stop 45 on said rod when the door 11 is near the end of its closing movement.

In operation, the parts being in the position shown in Fig. 1 where the doors are closed and the valve is in its intermediate position with the passageways of the cylinders neither in communication with the compressed air supply nor with the exhaust ports, it is only necessary for the fireman to place his foot on the treadle 40, so as to

throw the crank arm 36 to the right, when the valve is turned to a position where the port 25 will be connected with the compressed air supply by means of the opening 29 and thus admit compressed air to the right end of cylinder 16 and the left end of cylinder 17 while the other ends of both cylinders will be open to the exhaust by the port 24 being connected by the valve with its exhaust port. This will cause both pistons to be forced outwardly and carry with them the doors 11 and 12. Before the end of the opening movement of the doors, however, the arm 43 strikes the stop 44 and moves it back to its normal position, thereby restoring the valve to its intermediate position where all passageways to the cylinder are closed and the air trapped in the ends of the cylinders serves to cushion the remainder of the movement of the doors to avoid a hammering of the parts. The treadle 40 has been slightly lifted by the engagement of the arm 43 with the stop 44, but the doors will remain open until the fireman removes his foot from the treadle and permits the spring 42 to throw the crank arm 36 to the left of its normal position where the valve is turned to the position shown in Fig. 4. This movement of the valve connects the port 24 with the compressed air supply, the compressed air passing to the left end of cylinder 16 and the right end of cylinder 17 through the passageways 16^a and 17^b, the other ends of the cylinders being open to the exhaust by the port 25 connecting with its exhaust port through the groove 35 of the valve. The compressed air being admitted to the ends of the cylinders in which the pistons are then located causes the pistons to move inwardly to their normal position and carry the doors with them to their closed position, the stop 45 however being engaged by the arm 43 before the closing movement of the doors is completed to swing the crank arm 36 to its intermediate position and shut off the supply of compressed air to the cylinders and also shut off their exhaust connection to again cushion the end of the movements of the pistons by the air remaining in the cylinders at that time. It will thus be seen that by closing the valve before the ends of the movements of the piston a dash pot effect is produced to check the movements of the parts gradually and prevent their pounding. The opening and closing of the doors may therefore be accomplished rapidly without injury to the parts.

The speed at which the doors are moved may be controlled by adjusting the set screws 33 so as to choke the exhaust ports more or less, for with a given pressure admitted to one end of the cylinder the speed of movement of the piston will depend upon the area of the exhaust outlet for the other end of the cylinder. The extent of the cushioning ac-

tion may also be varied at will by adjusting the position of the stops 44 and 45 on the connecting rod 38, they being placed closer together to increase the cushioning action and farther apart to reduce the same.

What I claim as my invention is:

1. The combination with oppositely moving doors, of a door opener comprising a fluid pressure operated means for opening and closing the doors, a valve for controlling the flow of fluid pressure to and from said means, mechanism for moving the valve from a normal closed position to positions for opening and closing the doors, and automatic means controlled by the movement of the doors in either direction for returning the valve to its normal closed position near the end of the movements of the doors.

2. The combination with oppositely moving doors, of a door opener comprising a fluid pressure operated means for opening and closing the doors, a valve for controlling the flow of fluid pressure to and from said means, a spring actuated treadle, a connecting rod between the treadle and the valve, a pair of stops on the connecting rod, and an arm on one of the doors for engaging the stops to return the valve to its normal closed position near the end of the opening and the closing movements of the doors.

3. The combination with oppositely moving doors, of a door opener comprising a cylinder and its piston for each of the doors, the piston being in connection with the door, a valve for controlling the passage of fluid pressure to and from the opposite ends of both cylinders, means for moving the valve out of a normal closed position, and automatic means controlled by the movement of the doors in either direction for returning the valve to its normal position at the end of the movements of the doors.

4. The combination with oppositely moving doors, of a door opener comprising a cylinder and its piston for each of the doors, the piston being in connection with the door, a valve for controlling the passage of fluid pressure to and from the opposite ends of both cylinders, means for moving the valve out of a normal closed position to a position for causing the pistons to open or close the doors, a pair of stops on said means, and an arm carried by one of the doors for engaging the stops to return the valve to its normal closed position near the end of the movements of the door.

5. The combination with oppositely moving doors, of a door opener comprising a cylinder and its piston for each of the doors, the piston being in connection with the door, a valve for controlling the passage of fluid pressure to and from the opposite ends of both cylinders, there being a normal position for the valve wherein it closes the passages of the cylinder, a spring pressed treadle, a

connecting rod between the treadle and the valve whereby the treadle may move the valve from its normal position to make connections for opening or closing the doors, stops on the connecting rod, and an arm carried by one of the doors and adapted to engage the stops for returning the valve to its normal closed position before the end of the movements of the doors.

6. The combination with oppositely moving doors, of a door opener comprising a cylinder and its piston for each door, the piston being in connection with the door, a valve for controlling the passage of fluid pressure to and from the opposite ends of both cylinders, there being a normal position for the valve wherein it closes the passages of the cylinders, means for adjustably throttling the exhaust passageways of the valve, a spring pressed treadle, a connecting rod between the treadle and the valve whereby the treadle may move the valve from its normal position to make connections for opening or closing the doors, adjustable stops on the connecting rod, and an arm carried by one of the doors and adapted to engage the stops for returning the valve to its normal closed position before the end of the movements of the doors, the throttling of the exhaust serving to adjust the speed of movement of the doors and the adjustment of the stops serving to time the closing of the valve for cushioning the end of the movements of the doors.

7. The combination with oppositely moving doors, of a door opener comprising a cylinder and its piston for each door, the piston being in connection with the door, a valve casing having passageways leading thereto from both ends of both cylinders and exhaust ports leading therefrom and a supply port leading thereto, a tubular bushing fitting within the valve case and having grooves therein to connect the passageways leading to the opposite ends of the two cylinders, there being ports within the tubular bushing communicating with said grooves and with the exhaust ports and the supply port, a tapering valve fitting within the tubular bushing and having an opening therethrough and grooves at its sides, said valve adapted in its normal position to close the ports leading to the passageways but in another position to connect the supply port with one of the passageway ports while one of the grooves connects the other passageway port with one of the exhaust ports and in another position adapted to reverse these connections, a cap threaded on the end of the casing for holding the bushing in place, a stem on the valve passing through the cap, a spring surrounding the stem and bearing on the valve and on the cap, set screws threaded in the exhaust ports for adjustably throttling the passage thereof, a

crank on the valve stem, a spring actuated treadle, a connecting rod between the treadle and the valve stem, an arm carried by one of the doors and slidably mounted on the
5 connecting rod, and adjustable stops on the connecting rod to be engaged by the arm for restoring the valve to its normal position near the end of the opening or closing move-

ment of the doors as caused by the operation of the treadle.

In testimony whereof, I affix my signature, in presence of two witnesses.

WILLIAM J. ROHAN.

Witnesses:

WALTER C. PALMER,
- MATTIE E. PALMER.