F. SHOEMAKER.

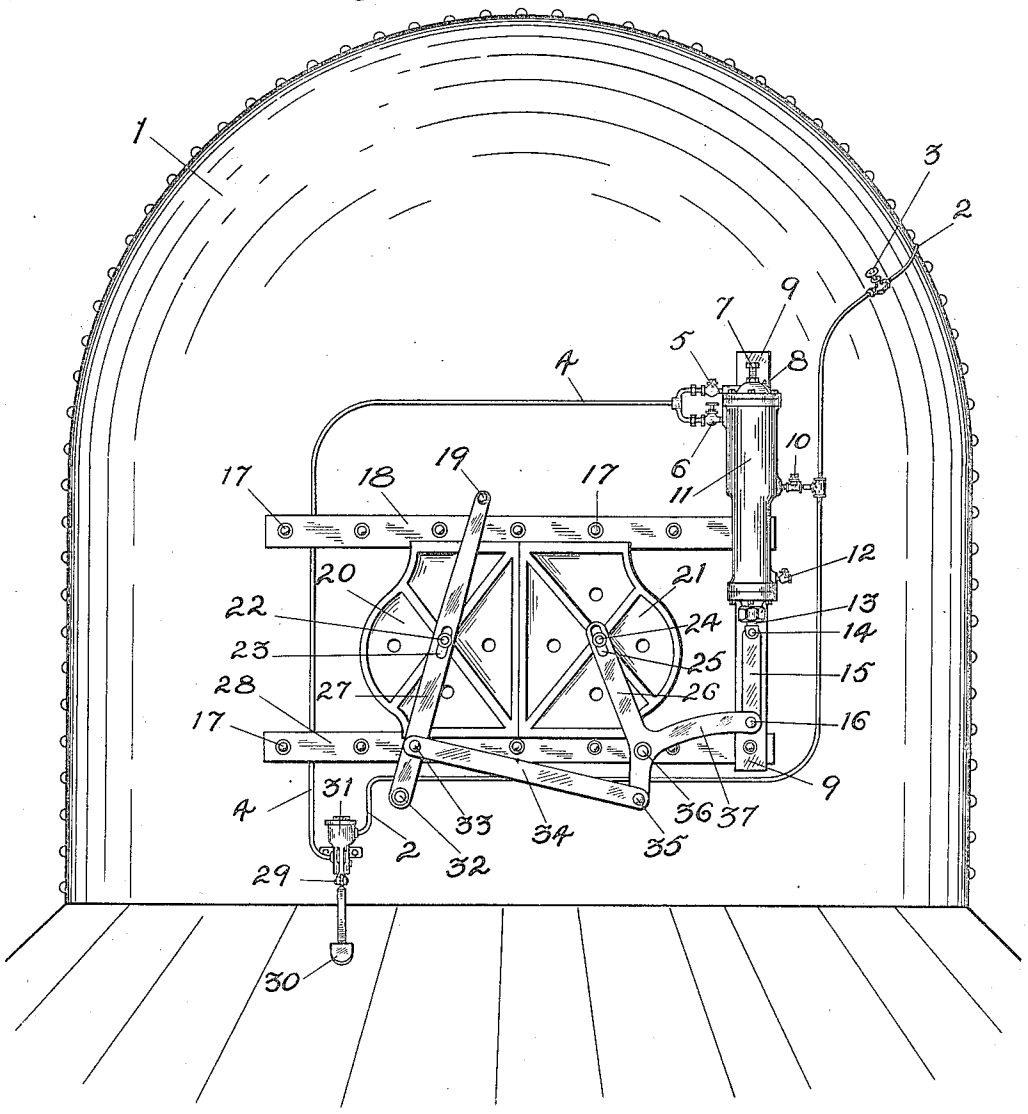
DOOR OPERATING APPLIANCE.

APPLICATION FILED APR. 27, 1908.

922,530. Patented May 25, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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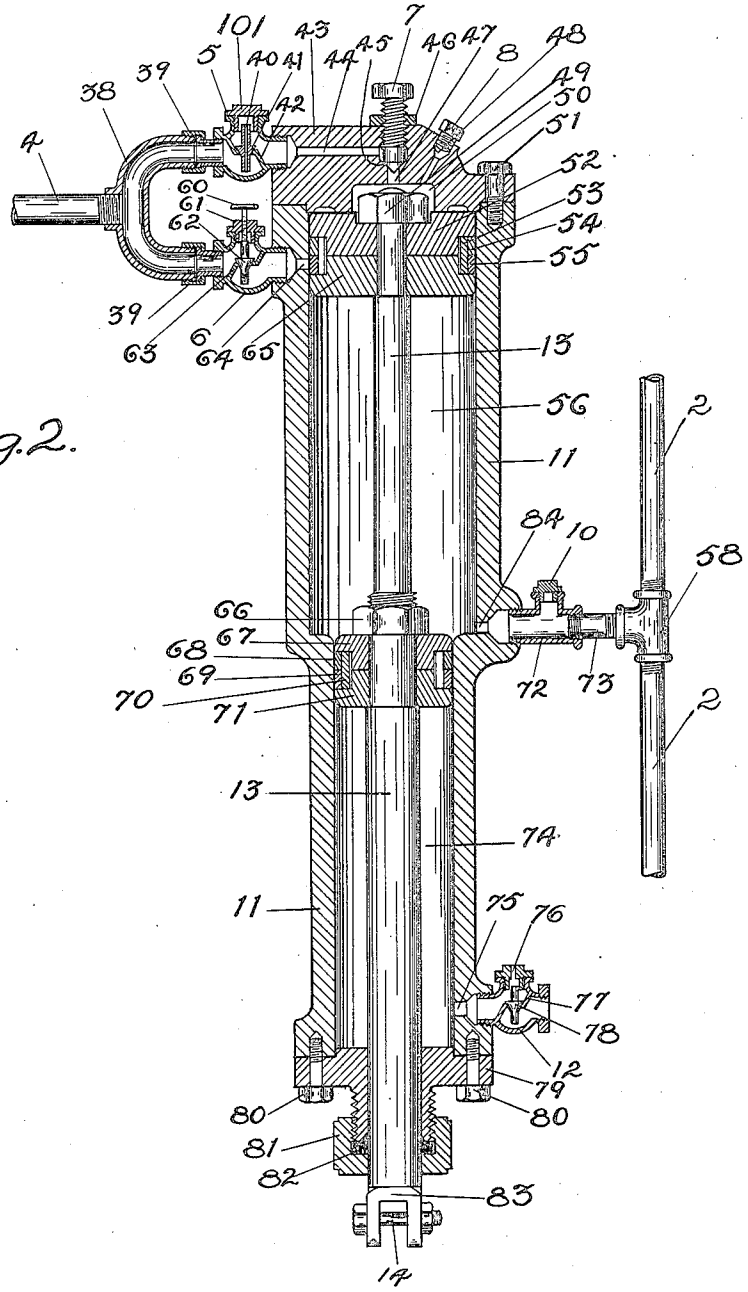


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

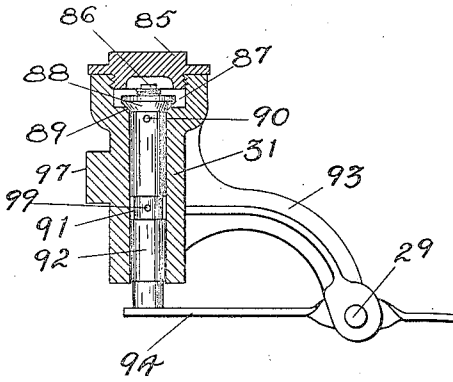
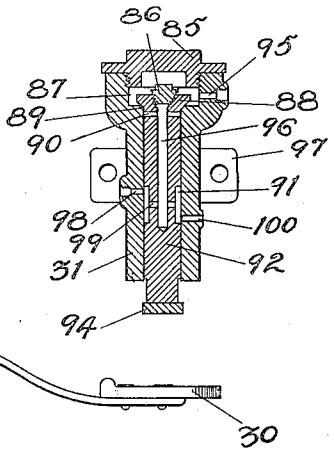


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK SHOEMAKER, OF WATERLOO, IOWA.

DOOR-OPERATING APPLIANCE.

No. 922,530. Specification of Letters Patent. Patented May 25, 1909.

Application filed April 27, 1908. Serial No. 429,370.

To all whom it may concern:

Be it known that I, FRANK SHOEMAKER, a citizen of the United States of America, and a resident of Waterloo, Blackhawk county, Iowa, have invented certain new and useful Improvements in Door-Operating Appliances, of which the following is a specification.

My invention relates to improvements in appliances for operating doors, and the object of my invention is, generally, to provide means for opening and closing the doors of a furnace, such as the fire-doors of a locomotive fire-box, and specifically, to improve the construction of the actuating means so as to render the latter very efficient, easy to assemble and repair. These objects I have accomplished by the mechanism which is hereinafter fully described and claimed, and which is illustrated in the accompanying drawings, in which:

Figure 1 represents a furnace, with my improved operating-appliance connected to its sliding-doors. Fig. 2 is an enlarged central vertical section of the cylinder of said appliance and its ports and valves. Fig. 3 is an enlarged central vertical section of the valve-chamber. Fig. 4 is an enlarged central vertical section of both said valve-chamber and its valve.

Similar symbols of reference refer to similar parts throughout the several views.

I am aware that heretofore several devices have been invented designed to open and close the fire-doors of furnaces of locomotives, with the view to keep such doors open only long enough to permit the introduction of fuel, and thus prevent cooling down of the fire and also injury to the boiler-flues. I do not therefore claim such an appliance generally, but do show and claim certain vital improvements, designed to simplify the construction, do away with the use of springs or resilient bodies which quickly become brittle and break, and otherwise improve the actuating parts to render them more efficient in practice, as hereinafter set forth.

The numeral 1 designates the fire-box of a locomotive, supplied with fire-doors 20 and 21, horizontally-grooved on their upper and lower edges to slide along the projecting edges of the parallel horizontal bars, which are secured to the back-plate of the fire-box by rivets or bolts 17. When it is desired to operate said doors by hand, when the engine is cold, the hand-lever 27, having a projecting handle 19, is used, said lever having its lower end pivoted on a stud 32, while at an intermediate point it is provided with a slot 23 whereby a stud 22 may project therethrough from the door 20. A bell-crank lever 26 has its lower member connected with the lower part of the hand-lever 27 by means of a link 34 with pivotal connections 35 and 33. The bell-crank lever 26 has two other members, one of which extending vertically from the pivot 36 has at its upper end a slot 25 inclosing a stud 24 projected from the door 21, while the other member 37 is directed to the right, and pivotally connected at 16 with the pitman 15, the latter having a pivotal connection 14 with the end of the piston-rod 13. By the said means the doors may be shifted in the usual manual manner, when so desired.

The means which I have adopted for operating the doors automatically, are actuated either by steam or compressed air. The pipe 2, which has a stop-cock 3, is in communication with any suitable reservoir of compressed air, such as the cylinder of an air-brake apparatus, and said pipe is in communication with a valve-chamber 97 through an inlet-port 95, shown in Fig. 4. The valve-stem 92 of the conical valve 88 is of comparatively large diameter, and is movable within the cylindrical central part of said chamber, with its lower end projecting downward therefrom and adapted to be contacted on its under side by the shorter arm of a lever 94, the latter pivoted at 29 to a bracket 93, and being provided with a treadle 30. The valve 88 has its sloping surface ordinarily seated on the valve-seat 89 in said chamber, the valve being adapted to move upward from said seat into an annular space 87. The valve-chamber is closed by a removable cap 85. The valve 88 and its stem 92 have, opening from above, a cylindrical axial bore 96 which extends about two-thirds of the length of said stem downwardly, and whose upper end is closed by a screw-plug 86. The stem 92 is transversely perforated from side to side through its axis horizontally in two places 90 and 99, said orifices being placed respectively near the base of the valve 88 and at a middle point of the stem. The orifice 90 when the valve is seated is closed at its ends by the inner wall of the

valve-chamber, but when the valve is lifted, the orifice is placed in communication with the space 87. The lower transverse orifice 99 opens into an annular groove 91, and the latter, when the valve is seated, is in communication with the exhaust-port 100, but is cut off from said port when the valve is elevated. The supply-pipe 2 is in communication with the space 87 by means of the inlet-port 95. A port 98 affords communication between the groove 91 and the pipe 4, the latter leading to the two-way coupling 38 which affords access to the cylinder 11.

The cylinder 11 is secured to and supported by a vertical bar 9 fastened to the ends of the horizontal bars 18 and 28. The main part of the cylinder-casing 11 containing the chamber 56, has a diminished lower portion containing the diminished chamber 74. A piston-rod 13, whose lower end is furnished with a bifurcation 83 and bolt 14 for pivotal connection with the pitman 15, is movable through both said chambers, and is constructed in two sections medially secured together by a nut 66. The upper cylinder-head 43 is secured to the cylinder 11 by screws 51, and the lower head 79 is secured in place by screws 80. The lower head has a stuffing-box 81 and packing-ring 82. The piston is formed of two disks 52 and 65, secured together and to a shoulder on the piston-rod 13 by a nut 49. An annular recessed seat in the adjoining edges of said disks is provided for packing-rings 54 and 55, which have thereunder the split-ring 53, the latter being resilient enough to keep such packing-rings in close contact with the cylinder. An orifice 48 in the cylinder-head is provided for purposes of a conduit for lubrication, and is closed by a screw-plug 8. A recessed chamber 50 is provided in the cylinder-head to receive the projecting nut 49, and channels 47 and 44 afford a communication between said chamber and the upper inlet-chamber 5. A set-screw 7, having a lock-nut 46, is seated in an interiorly threaded orifice in the head 43, and its end is coned to fit against a similarly-formed seat 45 between the two channels 47 and 44, whereby, when said screw is turned it may be adjusted up or down to vary the extent of communication between said channels.

The inlet-valve casing 5 is put in communication with the upper branch of the two-way coupling 38 by means of a screw-clamp 39, in the same way that the lower branch of said coupling is secured to the exhaust-valve casing 6 by another screw-clamp 39. The chamber 5 has a screw-cap 101, while the chamber 6 has a screw-cap 61, the latter orificed vertically to receive the threaded stem of an adjusting-screw 60 adapted to adjust the play of the valve 62. This latter valve is coned to fit a coned seat 63 in said chamber 6. The valve 41 and its seat 42 in the inlet-chamber 5 are of similar form to the other valve and seat just described, except that the valve 41 has a small vertical axial perforation 40, affording limited communication at all times between the coupling 38 and the channel 44.

The numeral 84 designates a supply-port for the chamber 56, which delivers from the supply-pipe 2 through the union 72, (which latter has an oil-plug 10,) the pipe 73 and the T-coupling 58. The exhaust-port 64 affords communication between the chamber 50 above the piston-head 52—65 and the lower branch of the two-way coupling 38.

The lower portion of the cylinder 11 is diminished in diameter and has an interior chamber 74 of less diameter than the chamber 56 above it. This chamber 74 has a vent-port 75 supplied with an exterior valve-chamber 12, and the latter with a valve 78 movable vertically from its seat 77 to admit air at atmospheric pressure when the auxiliary piston moves upward. When said piston, which is formed of disks 67 and 71 placed in contact, and secured by a nut 66, is moved downward in the chamber 74, the air in said chamber is compressed to form a cushion, but a portion thereof escapes through the port 75 and a narrow orifice 76 in the valve-chamber 12. This arrangement provides an elastic cushioning of the lower piston, and obviates any necessity for a spring contained in the chamber 74 to induce return of the piston. The piston-disks 67 and 71 are provided at their adjoining edges with an annular groove or seat for the packing-rings 68 and 69, which are kept in contact with the inner wall of said chamber by means of a resilient split-ring 70 placed thereunder. When the upper piston moves upward, the air above it is exhausted through the port 64 until the piston has moved far enough to cut off the port. The air remaining in the chamber 50 becomes compressed, but since part of this air is permitted to escape through the narrow orifice 40 in the valve 41, the contained air acts as an elastic cushion above said piston, and in the arrangement as described, both ends of the cylinder are cushioned by the compressed air therein.

In operation, when the treadle 30 is depressed the short lever arm 94 pushes up the valve-stem 92 to raise the valve 88 from its seat 89. Compressed air then enters the chamber 87 through the port 95, then moves through the orifice 90, the axial bore 96, the orifice 99, the annular channel 91, and port 98, whence it passes by way of the pipe 4, the upper branch of the two-way coupling 38, and lifting the valve 41, moves into the chamber 50 and pushes the piston downward, and the latter by means of its connections above described, slides the doors 20 and 21 apart. When a shovelful of fuel has

been thrown into the fire-box, the operator's foot being removed from the treadle, the valve 88 descends by gravity and by the air-pressure above it, and resumes its seat, cutting off the air passage therebetween. In this position, as shown in Fig. 4, the ports 98 and 100 come into communication, whereby a vent is provided for exhausting air from the pipe 4 and the lower branch of the two-way coupling 38, as well as the small modicum of air escaping through the narrow bore 40 of the valve 41. By reason of this opening of an exhaust-vent to the chamber 50, the upper piston is forced up by compressed air entering below it from the port 84. When the uppermost piston has moved past and cut off the exhaust-port 64, the remainder of air in the chamber 50 forms a cushion as already described, to remove shock at the end of the stroke by its elasticity. As the lowermost piston ascends the vacuum produced in the chamber 74 brings an inrush of air at atmospheric pressure through the valve-chamber 12, which remains to form a cushion when said piston descends, a portion only escaping by way of the contracted vent 76.

In case it is desired to leave the doors open, the valve 3 may be closed, and when the valve 88 is then lifted, the air-pressure in the chamber 56 is just enough to force down the lower piston through the chamber 74, to open the doors. This action is due to the fact, that when the valve 88 is lifted, a communication is established between the spaces at each end of the upper piston 65, causing an equal air-pressure on both sides thereof, and since the pressure on the upper end of the piston 67 exceeds the air-pressure on its lower end, the latter piston is pushed down to its limit, causing the intermediate connections from its piston-rod to the doors to open said doors. The energy of the fluid being then exhausted, the doors remain in their opened position, until the valve 3 is re-opened, when the apparatus is caused by the restored pressure to close the doors, the valve 88 being seated.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a door-operating appliance, in combination, a door, a cylinder provided with heads and one half of whose length is of lesser diameter than the other half, pistons each adapted to fit and move only within the narrower and wider parts of said cylinder respectively, a piston-rod connecting said pistons and protruding through one head of said cylinder, connections between said piston-rod and said door, means for controlling the admission and exhaust of a fluid under pressure above the wider piston, means for admitting a fluid under pressure under said piston, and means for permitting the admission into or exhaustion from said cylinder under the smaller piston of a fluid not under pressure.

2. In a device for operating doors, a door, a cylinder of two diameters provided with heads, a reciprocatory piston-rod in said cylinder and movable through one of its heads and carrying separated pistons of unequal area, said cylinder having in each end a space beyond the limit of stroke of the adjacent piston adapted to secure therein a cushion of fluid under compression, valves located to admit and exhaust a fluid under pressure on one side of one piston, an admission-port being provided in said cylinder on the other side of said piston, said cylinder having admission and exhaust ports between the other piston and its adjacent cylinder-head in communication with the atmosphere, and connections between said piston-rod and said door.

3. In a device for operating doors, a door, a cylinder divided into two parts of differing diameters and provided with heads, a reciprocatory piston-rod in said cylinder, connections between said piston-rod and said door, a power-piston on said rod working only within the wider part of said cylinder, a smaller piston on said rod working only within the narrower part of said cylinder, means for controlling the admission and exhaust of a fluid under pressure above said power-piston, an admission-port being located in the wider part of said cylinder beneath said power-piston, said cylinder having in each end a space beyond the limit of stroke of the adjacent piston adapted to secure therein a cushion of fluid under compression, means for permitting a gradual escape of the compressed fluid from each of said spaces, and means located between said smaller piston and its adjacent cylinder-head adapted to control the admission and exhaust therebetween of a fluid of atmospheric pressure.

4. In a door-operating appliance, the combination with a door, of a piston for actuating the same and a headed cylinder inclosing said piston, means for controlling the admission and exhaust of a fluid under pressure on either side of said piston, connections between said door and piston, a headed pressure-supply controlling-valve formed with a depending stem having an annular groove, a casing inclosing said valve and stem having a seat for the valve-head and formed with a chamber above said seat, means for establishing communication between said cylinder and said valve-casing in line with the annular groove in said valve, a port being formed in said valve-casing and leading from said groove to the atmosphere only when said valve-head is on its seat, a transverse orifice being formed through said valve at the lower limit of its head and being in communication with the chamber above said

head only when said head is lifted from its seat, a central hollow being formed in said valve-stem and affording communication between said transverse orifice and said annular groove, pressure-supply means in communication with the chamber in said valve-casing above said valve-head, and means adapted to lift said valve-head from its seat, said valve being adapted to be returned to its seat by its own gravity.

Signed at Waterloo, Iowa, this 9th day of April, 1908.

FRANK SHOEMAKER.

Witnesses:
O. D. YOUNG,
G. C. KENNEDY.