T. R. BROWN.

PNEUMATIC DOOR OPERATING MECHANISM.

APPLICATION FILED MAR. 15, 1906. RENEWED MAR. 12, 1909.

1,002,029.

Patented Aug. 29, 1911.

2 SHEETS—SHEET 1.

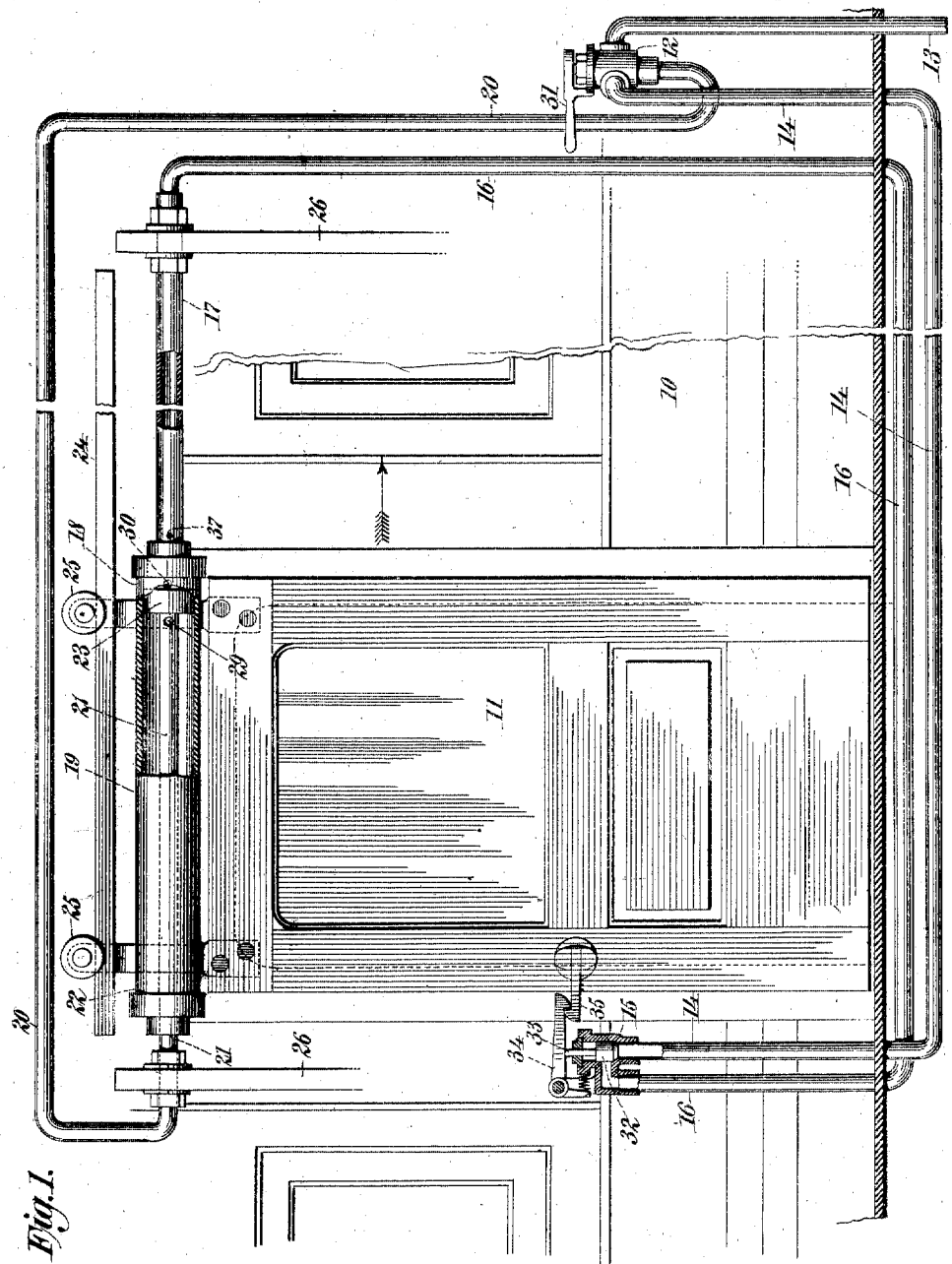

Fig. 1.

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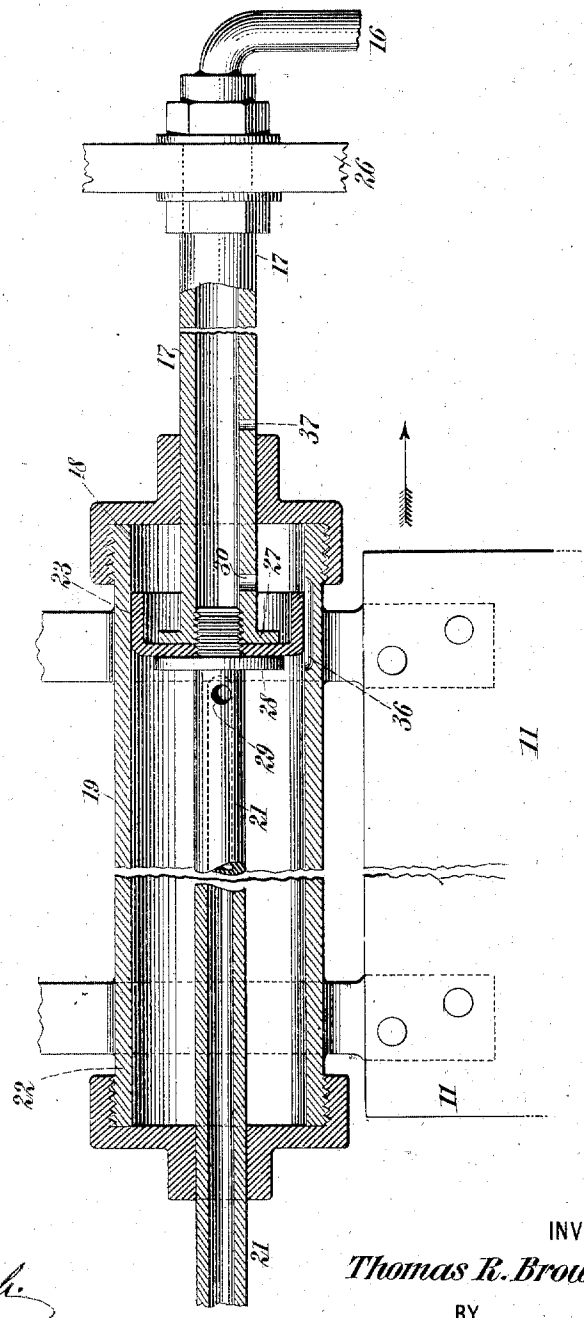
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS R. BROWN, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO NATIONAL PNEUMATIC COMPANY, A CORPORATION OF WEST VIRGINIA.

PNEUMATIC DOOR-OPERATING MECHANISM.

1,002,029. Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed March 15, 1906, Serial No. 306,130. Renewed March 12, 1909. Serial No. 483,061.

To all whom it may concern:

Be it known that I, THOMAS R. BROWN, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Pneumatic Door-Operating Mechanisms, of which the following is a specification.

The invention relates to improvements in pneumatic door-operating mechanisms, and it consists in the novel features, arrangements and combinations of parts hereinafter described, and particularly pointed out in the claims.

I present my invention herein as applied to a car for opening and closing the door thereof, and in its preferred embodiment my invention comprises means whereby upon the movement of a control-handle to one position, compressed air will be caused to effect the unlatching and opening of the door and upon the movement of said handle to another position, the same air, then acting against a surface of larger area, will be caused to effect the closing of the door, the latter becoming latched upon reaching its closed position. I thus utilize the air by which the door is opened for closing the same and avoid the waste of air which would result if one supply of air from the reservoir were employed in opening the door and another supply thereof used for closing the door.

The mechanical devices for carrying my invention into effect may vary in many respects with the will of the manufacturer and the nature of the car or other body to be equipped with the same, but a very satisfactory embodiment of my invention will comprise a manually operable control-valve to whose casing a pipe from a reservoir for compressed air will lead, a door-latching device to which a pipe from said casing will extend and pass thence to one end of a fixed pipe which enters one end of a cylinder secured to the door, and a second pipe leading from said valve casing to another fixed pipe which enters the other end of said cylinder, the adjoining ends of said fixed pipes within said cylinder being coupled together and holding a piston and also being provided with air ports. Upon the movement of the control valve to one position the compressed air will pass through its casing to the pipe leading to the door-latching device and after freeing the latch from engagement with the door, travel thence to the opening-end, as it may for convenience be termed, of the cylinder, wherein it will act to move said cylinder on said fixed pipes and thereby effect the opening of the door. Thereafter upon the movement of the control valve to another position the air supply pipe from the reservoir will be cut off and the pipe leading from the valve-casing to the fixed pipe entering the other or closing-end of said cylinder, will be placed in communication with the pipe leading to the opening-end of said cylinder, with the result that the air in the pipe system at one side of the piston will expand into the pipe system leading to the cylinder at the other side of said piston and enter the same, wherein, acting against a surface of larger area than that in the opening-end of the cylinder, it will reverse the movement of said cylinder on said fixed pipes and effect the closing of the door; the air in the then connected system of pipes and cylinder exhausting through a suitable vent upon the door's reaching its closed position and the latch then automatically passing into locking engagement with the closed door.

I have illustrated, in this application, the cylinder within which the air acts to both open and close the door, as arranged at the upper edge of the latter, but said cylinder may be disposed at the lower edge of the door if so desired.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a side elevation, partly broken away and partly in section, of a car equipped with door operating mechanism constructed in accordance with and embodying the invention, and Fig. 2 is a central vertical longitudinal section, partly broken away, of the operating cylinder and connected parts, the piston within the cylinder being shown in the position it occupies when the door is in closed position.

In the drawings, 10 designates a portion of a usual car, 11 the door thereof, 12 the control-valve casing, 13 the supply pipe for compressed air leading thereto from a suitable reservoir, not shown, 14 the pipe lead-

ing from said casing to the casing 15 for the door latching devices and extending thence by a branch pipe 16 to the outer end of a fixed pipe 17 leading into the opening-end 18 of the cylinder 19, 20 a pipe leading from the control-valve casing 12 to the outer end of a second fixed pipe 21 which leads into the opposite or closing-end 22 of said cylinder, and 23 a stationary piston within the said cylinder supported and secured by the meeting ends of the fixed pipes 17, 21. The cylinder 19 is secured to the door 11, and said cylinder and door are suspended from a rail 24 by means of usual rollers 25 which may travel upon said rail during the opening and closing of the door. The fixed pipes 17, 21 are, at their outer ends, secured in portions of the framing 26 of the car, and said pipes are in line with each other and extend toward each other through the respective heads of the cylinder 19, the pipe 17 being of larger diameter than the pipe 21 and the latter at its inner end being threaded, as shown in Fig. 2, to engage a thread formed within the inner end of the pipe 17. The pipes 17, 21 at their inner ends are respectively provided with flanges 27, 28 between which is clamped the cup-piston 23. The inner threaded end of the pipe 21 is closed and said pipe during the closing of the door only communicates with the left-hand or closing end 22 of the cylinder 19, and this communication is by means of a port 29 formed in said pipe adjacent to the piston 23. The pipe 17 only communicates with the opening-end 18 of the cylinder 19 during the opening of the door, and this communication is through a port 30 formed in said pipe adjacent to the piston 23. The cylinder 19 being rigid with the door, will, during the operation of the latter, travel longitudinally upon the fixed pipes 17, 21, the piston 23 remaining stationary. The pipe 17 is of greater diameter than the pipe 21 and hence the resisting surface areas in the respective ends of the cylinder 19 against which the compressed air may act vary, the surface area in the closing-end of the cylinder being greater than that in the opening-end thereof, due to the decreased diameter of the pipe 21.

The control-valve within the casing 12 is operable by means of a handle 31 and is a two-way valve of any suitable character adapted when the handle 31 is turned to one position to place the supply pipe 13 in communication with the pipe 14 and when turned to another or its closing position to cut off the pipe 13 and place the pipes 14, 20 in communication with each other so that the air in the pipe 14 may expand into the pipe 20. I do not limit my invention to any special form of two-way valve within the casing 12 but one example of such valve is illustrated in detail in my application Serial No. 483,058 of even date herewith for Letters Patent for improvements in door operating mechanisms.

Within the casing 15 for the door latching device is provided a vertical plunger valve 32 from which projects a vertical stem 33 directly below the pivoted latch 34 adapted to engage a catch arm 35 secured to the door 11. When the valve 32 is in its lower position the stem 33 permits the latch 34 to remain in engagement with the catch arm 35, and said valve 32 when in its lower position cuts off communication from the pipe 14 to the branch pipe 16. When air is admitted to the pipe 14 for opening the door it will elevate the valve 32 and disengage the latch 34 from the catch arm 35 and also open the port to the pipe 16, into which the air will pass on its way to the fixed pipe 17 and opening-end 18 of the cylinder 19. The latch 34 will remain in its elevated position so long as the air pressure remains in the pipe 14 but after the door 11 has been opened and then closed the air in the pipe system is permitted to exhaust and at such time the valve 32 will descend and the latch 34 automatically reëngage the catch arm 35.

In the operation of my invention, the door being in closed position, the control handle 31 will be moved to place the supply pipe 13 in communication with the door opening pipe 14, and thereupon the compressed air will flow through the pipe 14 to the casing 15, unlatching the door, and then through the branch pipe 16 to the fixed pipe 17 through which it will pass and escape, through the port 30, into the opening end 18 of the cylinder 19, wherein the air acting against the cylinder head will force the cylinder and door to the open position of the latter. The door will be held open so long as the air pressure is permitted to exert its force within the opening-end of the cylinder. When it is desired to close the door 11 the control handle 31 will be moved to its other or closed position and thereby cut off the supply pipe 13 and place the pipes 14, 20 in communication with each other, and thereupon the air in the pipes 14, 16, 17 and in the cylinder at the opening side of the piston, will expand into the pipes 20 and 21 and escape through the port 29 into the closing-end 22 of the cylinder 19, wherein said air acting against the left hand cylinder head will drive said cylinder to its initial position and effect the closing of the door. Upon the door reaching its closed position, a by-pass groove 36 (Fig. 2) in the wall of the cylinder, at the opening end thereof, becomes partly uncovered and permits the air within the cylinder and connected pipes to exhaust around the piston and through the port 30 into the pipe 17 and thence through the vent 37 formed in said pipe in a position to be uncovered by

the adjacent cylinder head when the door is in its closed position, whereupon the air pressure being relieved the valve 32 will descend to its initial position and permit the latch 34 to pass into reëngagement with the catch arm 35, locking the door in its closed position. The areas of by-pass groove 36 and of vent opening 37 should be so restricted and limited in proportion to the size of the port openings 30 and 29 that when pressure medium is initially supplied through pipe 27 to the opening end of the cylinder a movement of the cylinder will be effected so as to close the vent opening 27 and by-pass groove 36 before any appreciable or material exhaust of the pressure medium takes place therethrough. The surface area at the right hand end of the cylinder against which the air acts to effect the opening of the door is less than that against which the air acts in the opposite end of the cylinder in forcing the door to its closed position, and thus I am enabled to utilize the same air which effected the opening of the door, for closing the same.

The fixed pipes 17, 21 aid in supporting and guiding the cylinder 19 and door 11 and afford a very durable and simple construction and arrangement, said pipes also at their outer ends conveniently receiving the ends of the pipes 16, 20.

What I claim as my invention and desire to secure by Letters-Patent, is:—

1. In combination, in a mechanism for moving doors or other devices, an element to be moved, a cylinder connected to move with said element for actuating the same and presenting at its ends opposing faces of unequal areas to be acted upon respectively by compressed air, a stationary piston within said cylinder, fixed pipes extending through the respective ends of said cylinder and connected with said piston and upon which pipes said cylinder may move back and forth, said pipes having outlet ports adjacent to said piston, a manually operable control valve connected with a source of supply for the air, and pipes leading therefrom to said fixed pipes, said valve being adapted when moved to one position to admit the air to one of said pipes and its communicating fixed pipe for moving the movable element in one direction and when moved to another position to cut off the air supply and place said pipes leading to said fixed pipes in communication with each other, whereby the air previously admitted to one set of said pipes is permitted to expand into the other set of said pipes for moving the movable element in the other direction; substantially as set forth.

2. In combination, in a mechanism for moving doors or other devices, an element to be moved, a cylinder connected to move with said element, and having at its ends opposing faces of unequal areas, a stationary piston in the cylinder, and valve mechanism for controlling the supply of pressure medium to one end of said cylinder, said valve mechanism operating, when actuated, to place both ends of said cylinder in communication with each other.

3. In combination, in a mechanism for moving doors or other devices, an element to be moved, a cylinder connected to move with said element, said cylinder having opposing end faces of unequal area, a stationary piston arranged in said cylinder, a valve casing, a supply pipe connection to the said casing, delivery pipes intermediate said casing and the respective ends of said cylinder, and means for placing said delivery connections from the valve casing to the respective ends of the cylinder into communication with each other.

Signed at New York city, in the county of New York and State of New York this 13th day of March A. D. 1906.

THOMAS R. BROWN.

Witnesses:

ARTHUR MARION,

CHAS. C. GILL.