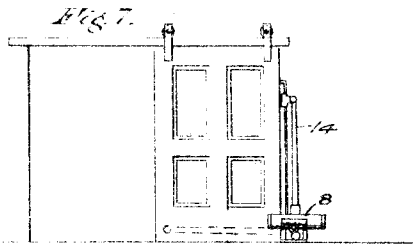
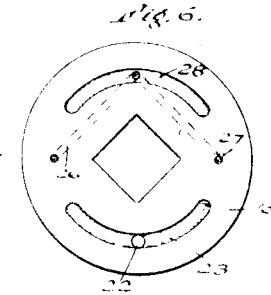
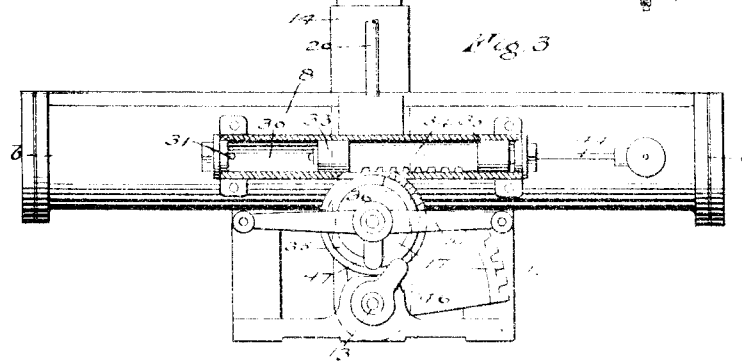
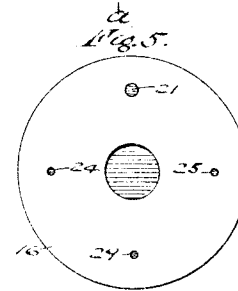
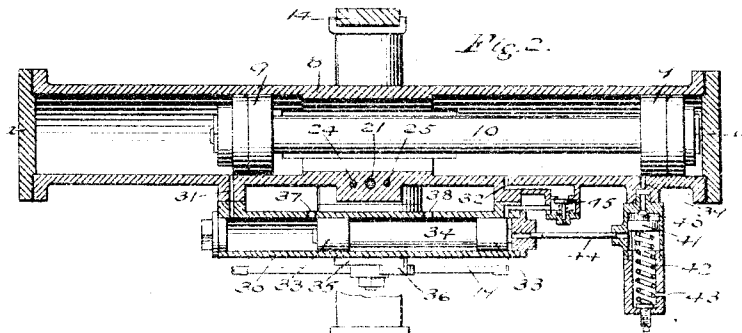
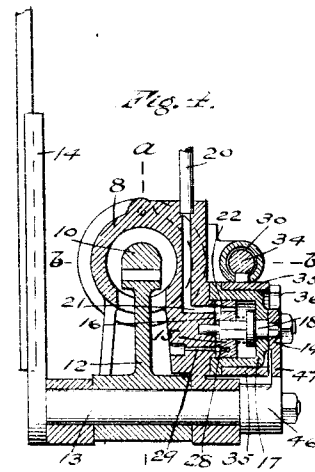
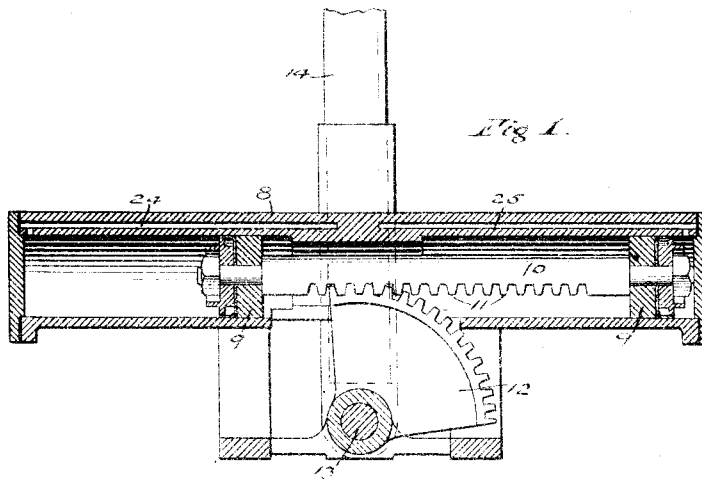


A. GOTTSCHALK.
DOOR OPERATING DEVICE.
APPLICATION FILED SEPT. 24, 1909.

1,065,323.

Patented June 17, 1913.



WITNESSES
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UNITED STATES PATENT OFFICE.

ALBERT GOTTSCHALK, OF NEW YORK, N. Y., ASSIGNEE TO NATIONAL PNEUMATIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

DOOR-OPERATING DEVICE.

1,065,323.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed September 24, 1909. Serial No. 519,432.

To all whom it may concern:

Be it known that I, ALBERT GOTTSCHALK, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Door-Operating Devices, of which the following is a specification.

This invention relates to a fluid pressure device for operating doors, gates, and the like, and particularly car doors such as used in cars of elevated railways, subways, local suburban traffic and electric traction service generally. In this class of service the door or doors may be located at the end or at the middle of the car and may be some distance from the motorman, guard or conductor who is to control the opening and closing of the door, and it is desirable that such an apparatus should have the following advantageous features:—The operator should be able to open and close the door from his usual position but when closed no one except the operator should be able to open the door. When the door is in either open or closed positions the supply of fluid should be automatically cut off from the motor to prevent leakage and waste of fluid. When the door moves to nearly open or closed positions a cushioning action should occur to prevent slamming. When the door is open it should be adapted to be closed manually and such action should automatically supply fluid under pressure to the motor to assist or complete such operation. When the door is arrested in its closing movement as by a person or obstacle in the path of the door, the power or fluid pressure supply to the motor should be automatically cut off to prevent injury to persons or apparatus.

The several objects of my present invention are to provide improved means whereby these desirable results may be accomplished in a fluid pressure door operating device.

In the accompanying drawing which illustrates a preferred form of construction embodying my improvements, Figure 1 is a vertical section taken on the line *a—*a** of Figs. 2 and 4; Fig. 2 a horizontal section taken on the line *b—*b** of Figs. 3 and 4; Fig. 3 a side elevation with the valve actuating motor indicated in vertical section; Fig. 4 a central transverse section; Fig. 5 a face view of the valve seat; Fig. 6 a face view of

the valve; and Fig. 7 an elevation, on a smaller scale, indicating a preferred location of the motor and its connection to the door.

Various forms of fluid pressure motors may be employed for actuating the door but the construction here illustrated is of a type having a long cylinder 8 with a double headed piston, the heads 9 being joined by a rod or bar 10 having rack teeth 11 adapted to engage the geared segment 12 on the rock shaft 13, and operate an arm 14 which may be connected to move the door in any desired manner, for instance, as indicated in Fig. 7.

A valve is employed for controlling the supply of fluid to the respective ends of the cylinder for opening and closing the door, and while any suitable or preferred form of valve may be used in any convenient location, I have illustrated a valve 15 of the rotary type located on a seat 16 formed either separate from or integral with the cylinder casing and frame to which a cap section 17 covering the valve and chamber may be secured. On the valve stem 18 outside the casing is mounted a lever arm 19 to the ends of which may be attached pull rods or any suitable form of mechanical or electrical connections extending within reach of the operator who is to control the operation of the door. A supply pipe 20 leading from a source of fluid pressure such as a reservoir of compressed air communicates through port 21 in valve seat and port 22 in valve 15 with the valve chamber, the port 22 having an extension or cavity 23 in the face of the valve so that the compressed air or other fluid is admitted to the valve chamber in all the positions of the valve. Ports 24 and 25 lead from the valve seat to the opposite ends of actuating cylinder 8 for admitting fluid under pressure to open and close the door. The valve is also provided with ports 26 and 27 communicating with groove 28 in the face of the valve and with the exhaust port 29 in the seat.

When the valve is in its normal or lap position, with the handle or lever 19 horizontal, as indicated in Fig. 3, the supply of fluid to either end of the operating cylinder is cut off, the ports 24 and 25 being closed. The valve lever is oscillated in one direction for connecting supply port 22 and groove 23 with port 24 and admitting fluid under pressure to the left end of cylinder 8 for moving the piston to open the door, and the

lever is turned in the opposite direction from its normal or lap position to connect port 22 and groove 23 with port 25 for admitting fluid to the right end of the cylinder for closing the door. In order
 5 that the valve may normally occupy its lap position with the supply to either end of the cylinder cut off when the door is in either its open or closed position, and thereby prevent leakage, I provide means
 10 controlled by the movement of the motor piston or door to either end of its stroke for automatically shifting the valve to lap position and thereby cut off the supply of fluid
 15 to the cylinder. Various forms of mechanism for this purpose may be devised, that shown herein comprising a valve shifting motor having cylinder 30 communicating by
 20 ports 31 and 32 with the door actuating cylinder, and containing a double piston with opposite heads 33 connected by rack bar 34
 which engages teeth on the oscillating sleeve 35 mounted on the valve casing and provided with a projection 36 adapted to en-
 25 gage the valve lever and shift the same to its horizontal position.

According to another feature of my improvements means are provided for cushioning the door at either end of its movement
 30 by compressing the fluid remaining at atmospheric pressure in the opposite end of the main motor cylinder, and this comprises ports through which the compressed air or
 35 other fluid may freely exhaust from the main motor cylinder to the atmosphere, such as ports 31 and 32 and ports 37 and 38 in the valve shifting cylinder, and a restricted
 40 port, such as exhaust port 29, through which the atmospheric air is forced from the cylinder. The device then operates as follows:
 To close the door the operator turns the
 45 valve lever to position for connecting ports 22 and 23 with port 25 to admit fluid under pressure to right end of cylinder 8. The
 piston 9 then moves toward the left turning
 50 segment 12, shaft 13 and arm 14 and thereby moving the door to its closed position. As the piston 9 passes the port 31 the atmospheric
 55 air contained in the cylinder 8 at the left of the piston is forced out through ports 24, 28 and 29 and as this is a restricted passage the air is compressed sufficiently to-
 60 ward the end of the stroke to retard the movement and form a cushion to prevent slamming of the door. As the piston 9
 reaches the end of its stroke and passes the
 65 port 32 the fluid passes into the right end of the valve shifting cylinder 30 forcing
 piston 33 to the left and thereby turning the sleeve 35 so that its projection 36 en-
 gages the inclined lever 19 and shifts the
 same with the valve to normal lap position.
 This cuts off the supply of fluid and opens
 65 both ends of the main motor cylinder to the atmosphere through ports 26, 27 and 29.

This prevents any leakage, if there should be any, from accumulating in the cylinder and causing any undesired movement of the door. As the valve shifting piston reaches
 70 the end of its stroke it opens port 38 per- mitting free exhaust of fluid from the right end of both cylinders. The mechanism then remains in this position until it is de-
 75 sired to open the door, when the operator turns the valve lever to the opposite inclined position in which the ports 22 and 23 com-
 80 municate with port 24 and admit fluid to the left end of cylinder 8. The action above described is then repeated, the air at the
 85 right end being compressed to form a cushion, and the piston 9 passing port 31 at the end of its stroke to admit fluid to valve
 shifting cylinder and actuate piston 33 to shift the valve back to normal lap position thereby cutting off the supply and opening
 90 outlet port 37.

If the door should be arrested in its closing movement, as by a person or object in its path, means are provided for cutting off
 95 the fluid pressure to the motor automatically, and this constitutes another feature of my improvements. As herein shown this
 comprises a pressure operated valve 40 connected by port 39 with the cylinder 8 at a
 100 short distance from its right end and having an adjustable spring 42 and piston 41 for controlling port or pipe 44 leading to
 the right end of valve actuating cylinder 30. As the fluid under pressure is admitted to
 105 the right end of cylinder 8 to close the door the piston moves to the right and clears port 39. If then the door is arrested and the
 piston 9 held at an intermediate position the pressure in the right end of the cylinder
 110 rises to substantially reservoir pressure and forces valve 40 from its seat, the spring 42
 being adjusted to permit the valve to open under a slightly less degree of pressure than
 115 that carried in the supply reservoir. As soon as valve 40 leaves its seat the larger
 area of piston 41 is subjected to the fluid pressure and immediately moves out to
 120 open communication through port 44 to the cylinder 30 where the fluid acting on piston 33 instantly shifts the valve to normal lap
 125 position and cuts off the supply of motive fluid to cylinder 8, thereby relieving the pressure upon the door. A check valve 45
 may be located in the port or passage 32 to prevent the fluid admitted through port
 130 44 from escaping through port 32 into the atmospheric space in cylinder 8 between the piston heads 9. When the fluid under pressure is first admitted to the cylinder 8 for
 the purpose of closing the door the pressure may momentarily rise to nearly reservoir pressure just before the piston 9 starts
 and for this reason the port 39 is preferably located a short distance from the end of the
 135 cylinder so as not to be opened until the pis-

ton is moving freely and the pressure reduced. By this means the pressure valve 40 will be prevented from opening during the normal operation of the apparatus.

5 There is a very small vent 43 from the spring chamber to prevent the accumulation of any pressure leaking past piston 41 but this vent is so small as not to interfere with the proper action of valve shifting piston 33 when fluid
10 under pressure is admitted from cylinder 8 through port 32 and check valve 45 to cylinder 30.

According to another feature of my improvements the apparatus is so designed
15 that the door may manually be closed by any person and the fluid pressure mechanism automatically assists and completes the said closing movement. For this purpose the valve lever 19 may be provided with a projection 47 which is adapted to be engaged
20 by a cam 46 located upon the door operating shaft 13 in such a manner that if the door should be manually moved from open position toward closed position when the valve lever 19 is in its normal horizontal position,
25 the cam 46 will engage projection 47 and shift the valve lever to the proper inclined position to admit fluid to the right end of actuating cylinder 8 and thereby effect the complete closing of the door by the power
30 mechanism and the automatic lapping movement of the valve in the usual manner. The power operating device may preferably be located substantially in position indicated
35 in Fig. 7, in which the operating arm 14 may be nearly horizontal, as indicated in dotted lines, when the door is in its closed position, and it will then be practicably impossible for a person to manually open the
40 door from its closed position, but as the operating arm is nearly vertical in the open position the door may be readily moved by hand toward its closed position.

While I have described in detail a preferred construction for obtaining the desired
45 advantages, it is apparent that my invention is not limited to any specific means since various forms of mechanism for performing these functions may readily be devised, all
50 within the spirit and scope of my improvements.

It will be understood that the term "door" as employed herein includes a gate, switch, or other similar device adapted to
55 be thrown to open and closed positions.

The features of my invention comprising the means for automatically cutting off the supply of fluid from the motor to prevent leakage and waste of fluid when the
60 door stands in either open or closed position, and the means for cushioning the movement of the same to prevent slamming, are not claimed herein as they form the subject matter of my divisional application, Serial No. 712,849, filed August 2, 1912.
65

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

1. In a door operating apparatus, the combination, with a fluid pressure motor for operating the door, of means governed by the fluid pressure for automatically cutting off the supply of fluid to the motor when the door is stopped during its closing movement.
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2. In a door operating apparatus, the combination with a door, a fluid pressure motor and connecting mechanism for operating the door, of means operated by a predetermined degree of pressure upon the admission side of the motor to open an exhaust therefrom.
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3. In a door operating apparatus, the combination, with a fluid pressure motor for operating the door, of means governed by the fluid pressure for automatically releasing the pressure from the closing side of the motor when the door is stopped in its movement.
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4. In a door operating apparatus, the combination, with a fluid pressure motor for operating the door, of means governed by the fluid pressure for automatically cutting off the supply of fluid to the motor and releasing the pressure therefrom when the door is stopped during its closing movement.
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5. In a door operating apparatus, the combination with a door, a fluid pressure motor and connecting mechanism for operating the door, of a valve for controlling the supply of fluid to said motor to close the door, and means governed by the fluid pressure for automatically closing said valve when the door is stopped during its closing movement.
100 105

6. In a door operating apparatus, the combination with a door, a fluid pressure motor and connecting mechanism for operating the door, of a valve for controlling the supply of fluid to said motor to close the door, and a valve shifting motor governed by the degree of pressure acting upon the main motor.
110

7. In a door operating apparatus, the combination with a door, a fluid pressure motor and connecting mechanism for operating the door, of a valve for controlling the supply of fluid to said motor to close the door, a valve shifting motor, and a valve governed by the pressure in the main motor for supplying fluid to the valve motor.
115 120

8. In a door operating apparatus, the combination with a door, a fluid pressure motor and connecting mechanism for actuating the door, of means operated by the manual movement of the door in closing for automatically admitting fluid pressure to said motor.
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9. In a door operating apparatus, the
130

combination with a door, a fluid pressure motor, intermediate connecting mechanism, and a valve for controlling the admission of fluid thereto for closing the door, of means
 5 operating upon the manual movement of the door from its open position to automatically open said valve.

10. In a door operating apparatus, the combination with a door, a fluid pressure
 10 motor, intermediate connecting mechanism, and a valve for controlling the admission of fluid thereto for closing the door, of means operated by the manual movement of the door from its open position for shifting
 15 said valve to supply fluid to assist in the closing movement.

1. In a door operating apparatus, the combination with a door, a fluid pressure
 20 motor, intermediate connecting mechanism, and a valve for controlling the admission

of fluid thereto for closing the door, of a cam device operated by the manual movement of the door for automatically shifting said valve.

12. In a door operating apparatus, the combination with a door, a fluid pressure
 25 motor, intermediate connecting mechanism, and a valve for controlling the admission of fluid thereto for closing the door, of mechanism operated by the manual movement of the door from its open position for
 30 opening said valve, and means for automatically closing said valve at the end of the stroke.

In testimony whereof I have hereunto set
 my hand.

ALBERT GOTTSCHALK.

Witnesses:

JOHN LANSBERRY,
 FRANK BIRD.