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DOOR OPERATING MECHANISM

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2 Sheets-Sheet 1

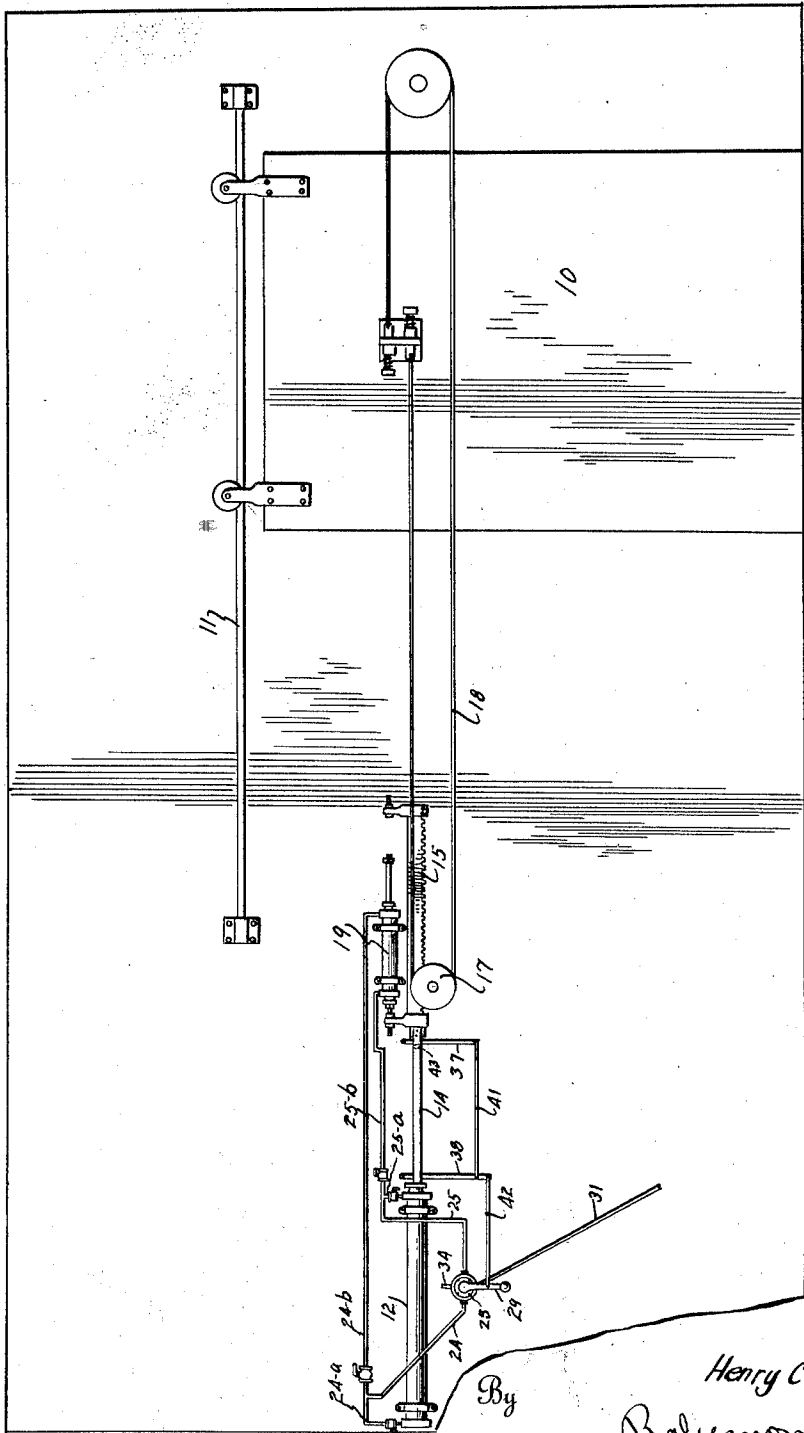


Fig. 1

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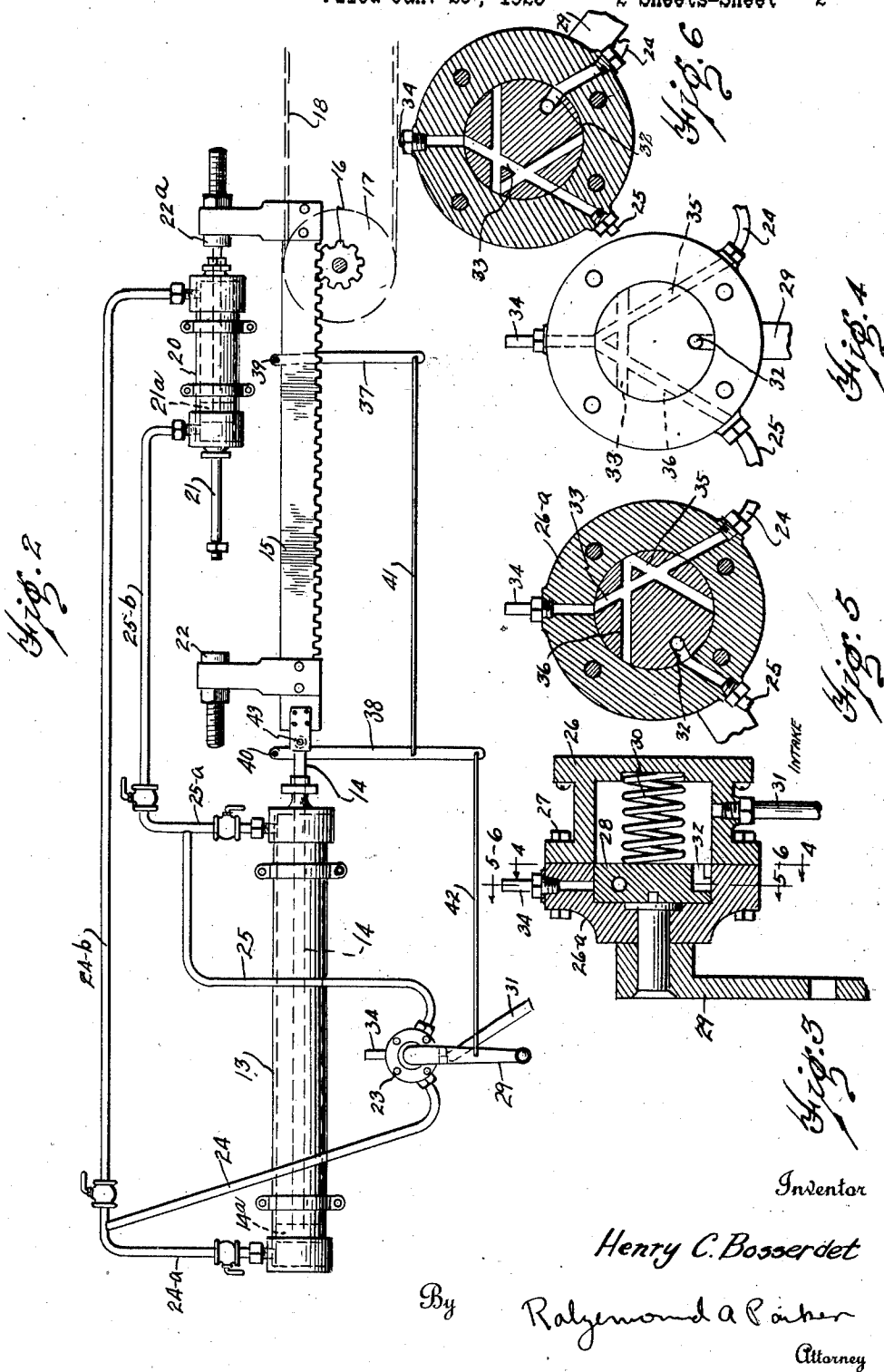
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

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DOOR-OPERATING MECHANISM.

Application filed January 29, 1923. Serial No. 615,526.

My invention relates to improved door operating mechanism. The object is to provide improved door operating mechanism comprising a power operating device and a
5 retarding device co-operating to effectively control the door at all times during its operation so that the door may be quickly opened or closed without jar or slam.

A further object is to provide door operating mechanism consisting of a power operating device and a power check device both under a single control and supplied with a power operating medium from a common
10 source of supply.

A further object is to provide in connection with a movable door operating mechanism consisting of a power device to move the door and a power device to check the door, said power devices being preferably of
15 the pneumatic or fluid motor type, and so arranged and constructed as to co-operate in such a manner that by a single control valve it is possible to completely regulate the movement of the door.

A further object is to provide in door control mechanism of the fluid motor type means automatically operable to prevent building up of fluid pressure in the control devices,
20 adapted, preferably through the employment of means automatically operable by the movement of the door, to exhaust the control devices after each movement of the door, thereby insuring constant uniformity of operation of the door when under control of
25 such devices, irrespective of whether such operation is constant or interrupted.

Another important feature is to provide a movably supported door with control apparatus consisting of a power device to operate the door and a power device to check the
30 movement of the door, each of said devices being supplied with operating medium from a suitable source of power and which check device is adapted to be reversely operated in
35 opposition to the operating medium supplied thereto by the door to slow up the movement of the door.

The above and other objects, together with details of construction and operation, will
40 more fully appear from the following description, appended claims and accompanying drawings, in which:

Figure 1 is an elevation showing my improved door operating mechanism connected
45 with a movable door.

Fig. 2 is an enlarged elevation of the door operating mechanism.

Fig. 3 is a vertical section taken through a control valve.

Fig. 4 is a cross-sectional view taken on
50 the line 4—4 of Fig. 3.

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 3.

Fig. 6 is a cross-sectional view taken on the
55 line 6—6 of Fig. 3.

In the drawings, let 10 indicate a movably supported door. As my device is particularly intended for use with heavy doors such as are used in public garages, it is here shown in connection with a door mounted for
60 slidable movement upon a track 11. To operate the door I provide a power device 12 here shown as a pneumatic motor having a cylinder 13 in which is disposed a piston 14^a connected by a piston rod 14 with rack 15 which
65 drives the pinion 16 to rotate a sheave 17 over which runs a cable 18 to operate the door. The connection with the door is a common one and more particularly described in my
70 pending application No. 431,835 filed Dec. 20, 1920, and obviously the construction might be of any form desired as it constitutes no part of the present invention.

To check the movement of the door I provide a second power device 19 which is so
75 constructed and disposed as to be operated coincident with each movement of the door so as to be in position to arrest such movement before the door arrives at its limit of
80 movement. This check on the movement of the door is the result of the second power device being reversely operated by the door in opposition to the impulse of its supplied
85 power medium, thereby slowly arresting the movement of the door.

I prefer to use in this connection a pneumatic motor of reduced power as compared with the pneumatic motor used to actuate the door but regulated by the same control valve, and furnished with power from the same
90 source as the door operating motor, and comprising a cylinder 20 within which is mounted a reciprocating piston 21^a. This piston has a piston rod 21 that extends through and
95 beyond each end of the cylinder to be engaged for operation to check the movement of the door in either direction. The construction here shown is such that the piston
100 rod 21 is engaged by provided parts of the door operating mechanism before the door
105
110

arrives at its limit of movement so as to slowly arrest the travel of the door. Obviously it might be engaged by the door itself or by parts carried by the door or might even be carried by the door and engage stationary stops for though the details of construction would vary the broad principle of operation would be the same.

The construction here shown is similar to that described in my patent application Serial No. 599,163 filed Nov. 4, 1922, in which there is provided a pair of opposed stops 22 and 22^a carried by the door operating mechanism adapted to engage the piston 21 to drive the same through the cylinder against the built up pressure therein as the door completes its movement in either direction, thereby retarding the movement of the door and bringing it slowly to a stop. These stops, as shown, are adjustable relative their supports.

Each cylinder is provided with an opening at each end so that fluid under pressure may be admitted and exhausted from each end of each cylinder to reciprocate the piston therein. Each of these openings is connected by a suitable communicating passageway with a source of fluid pressure, the supply reservoir which is not shown in the drawing, and the admission and exhaust of fluid is controlled by means of a manually operable valve indicated in assembly as 23. By means of this valve it is possible to admit fluid under pressure through pipe 24 and 24^a to one end of the power cylinder 13, and at the same time through a branch 24^b to the check cylinder 20 to drive the piston 14^a to operate the door and at the same time move the piston 21^a to a position to check the door or if piston 21^a is in such position to build up a pressure to resist its movement through the cylinder, as shown in Fig. 2, in which position the piston is shown as being so disposed as to be engaged by the stop 22 and forced through the cylinder 20 in opposition to the built-up pressure therein. Leading from the valve is a second conduit 25 which communicates by means of a branch 25^a with the opposite end of the cylinder 13 and by way of the branch 25^b with the opposite end of the check cylinder 20.

My valve comprises a valve casing formed in two portions 26 and 26^a secured together by bolts 27, within the interior of which is disposed a rotatable valve member 28 controlled by a manually operable handle 29, said valve member being held securely to one end of the casing by spring 30. The valve is here shown as secured to the wall, as is the door operating mechanism.

Fluid, preferably air under pressure, is supplied to the interior of this valve from a suitable source of air through conduit 31. The rotatable member 28 is provided with an angular air passageway 32, one end of which opens into the interior of the casing to receive compressed air and the opposite end of which

terminates in the periphery of the member 28 and is adapted to be brought into registration with port holes in the casing which serve as terminals of the pipes 24 and 25 thereby forming a communicating connection between the intake 31 and either pipe 24 or 25 to furnish air to the door operating mechanism from the source of supply.

As shown in Fig. 4, the rotatable member is in the neutral or inoperative position, the passage 32 being out of communication with either port hole, at which position no fluid is supplied to the door operating mechanism. Both power devices are open to exhaust as hereinafter described.

In Fig. 5 the rotatable member has been moved to bring the peripheral outlet of passageway 32 into registration with the port in the casing which communicates with conduit 25 to supply air under pressure through the pipe 25^a to the cylinder 13 and through the branch extension 25^b to the cylinder 20.

In Fig. 6 the rotatable member has been moved to bring the peripheral outlet of the angular passageway 32 into communication with the port hole through the casing which forms the inlet to conduit 24 to supply air through the branches 24^a and 24^b to the opposite ends of each cylinder from that supplied by conduit 25.

The rotatable member is also provided with a passageway 33 which is adapted, when the angular passageway 32 is brought into registration with the inlet to either pipe 24 or 25, to supply air from the source of supply thereto, to connect up the valve inlet to the other pipe with the exhaust 34 which leads from the valve. In Fig. 5, in which view the valve mechanism is so disposed as to permit air to enter the door control devices through the conduit 25, the passageway 33 brings the conduit 24 into communication with the exhaust 34 so that the opposite end of the air cylinders is opened to exhaust. In Fig. 6, in which view the angular passageway forms a communicating link between the inlet 31 and the conduit 24, the passageway 33 connects up the conduit 25 with the exhaust 34 so that the opposite ends of the cylinders are opened to exhaust.

Two additional passageways indicated as 35 and 36 are provided through this rotatable member. These passageways have a common end opening adapted to register with the exhaust 34 from the valve when the valve is in the neutral position, the opposite end of passageway 35 then being in registration with the conduit 24 and the opposite end of passageway 36 being in registration with conduit 25. It will be seen, therefore, that when the valve is in "neutral" the supply conduits 24 and 25 which lead to the cylinders place both ends of each cylinder in a position to exhaust so that air under pressure will not be stored in the cylinders from one movement of operation to another but whenever the

valve is brought into the neutral position the cylinders will exhaust. It will also appear that when air is admitted to either end of the cylinders, the opposite ends of the cylinders are opened automatically to exhaust.

I have provided mechanism operable by the door to automatically throw the valve into the neutral position with each complete movement of the door. This prevents the building up of fluid pressure in the control devices from one movement of operation to another and insures uniformity of action of the control devices when air is admitted thereto. This connection may consist, as here shown, of mechanical linkage comprising a pair of levers 37 and 38 suitably pivoted to the wall at points 39 and 40 respectively. These lever arms are connected by means of a tie rod 41 so as to swing together and a link 42 is extended from the free end of lever 38 to the valve operating handle 29. To operate these levers I provide a stop 43 carried by the connection between the piston 14 and the rack 15 so arranged that just before the door arrives at its limit of movement in one direction the stop 43 engages lever 38 moving it to a vertical position so as to shift the handle 29 of the valve into the neutral position. When the rack is moving in the opposite direction the stop 43 will engage lever 37 and swing the handle from the position to which it has been moved to admit air to the control mechanism, to the vertical position which places the valve in "neutral". It will be seen that, of course, as the handle 29 is shifted in either one direction or the other to admit air first to one end and then the other end of the air cylinders, that the lever arms 37 and 38 will be swung about their pivot points away from the vertical position and into which they must be moved with the placing of the valve mechanism in the neutral position.

In the operation of this device if the valve handle 29 is shifted so as to admit air from the inlet 31 through the valve casing and passageway 32 to the conduit 24, air will enter through the branch 24^a the cylinder 13 and drive the piston outwardly to operate the door. At the same time a portion of the air will pass through conduit 24^b to the check cylinder 20 to drive the piston therein into the position in which it is shown in Fig. 2 or if piston 21 is in such position to build up a pressure to resist its movement through the cylinder. As the door approaches its limit of movement stop 22 carried by the door operating mechanism will engage the end of the piston rod 21 and drive the same through the cylinder 20 against the pressure built up therein, forcing the air out of the cylinder 20 back through the conduits 24^b and 24 and through the valve into the source of supply, thereby cushioning the shock of the door as it comes to a stop. The difference in power

of the two air motors is such that the small motor 19 will yield to the larger motor 12. As heretofore described, the air will be exhausted from cylinder 13 ahead of the moving piston through the conduit 25 and through the valve to the atmosphere, and at the same time the air ahead of the moving piston 21^a in the check cylinder while such piston is under control of the air entering through the branch 24^b will be exhausted through the conduit 25^b in the same manner into the atmosphere. In operating the door in the reverse direction the method of valve operation will be the same except that air under pressure will be entering through the conduit 25 and leaving through the conduit 24. It is possible to reverse the movement of the door at any point in its travel, and the check device automatically assumes a position to check the movement of the door in the new direction of travel. Further, when the valve is in the neutral position the door may be operated independently of the power operating mechanism.

What I claim is:

1. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders.

2. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted when disposed to admit operating medium to either end of said cylinders to open the other end thereof to exhaust.

3. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, a single control to regulate the ad-

mission of operating medium to one end of each of said cylinders and at the same time open the other end to exhaust.

4. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, a single control to regulate the admission of operating medium to one end of each of said cylinders and at the same time open the other end to exhaust and having a position at which both ends of each cylinder are opened to exhaust.
5. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted to admit operating medium to the power cylinder to operate the door and to the check cylinder to build up a pressure therein tending to hold the piston in position to be driven reversely through the cylinder, overcoming said built up pressure by the movement of the door.
6. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted to admit operating medium to the power cylinder to operate the door and at the same time to the check cylinder to build up a pressure therein, said piston adapted to be driven by the movement of the door reversely through the check cylinder in opposition to the built up pressure therein to check the door.
7. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to check the movement of the door before it arrives at its

limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit and exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted to admit operating medium to the power cylinder to operate the door and at the same time to the check cylinder to build up a pressure therein, said piston in the check cylinder adapted to be reversely operated by the door against the built up pressure in the check cylinder to check the movement of the door, and means operable by the door to exhaust both cylinders.

8. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to operate the same, a check cylinder, a piston therein to be actuated by the door to check the movement of the door before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit and exhaust operating medium therefrom, control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted to admit operating medium to the power cylinder to operate the door and at the same time to the check cylinder to build up a pressure therein to restrain the door actuated movement of the piston therethrough and means operable by the door to exhaust the operating medium from each of said cylinders as the door arrives at its limit of movement in a given direction.

9. In apparatus of the class described, the combination with a movably supported door, of a power cylinder, a piston therein having connection with the door to open and to close the same, a check cylinder, a piston therein to be actuated by the door to check the movement of the door in either direction before it arrives at its limit of movement, a source of power, a communicating connection from said source of power to each end of each cylinder to admit or exhaust operating medium therefrom, single control means to regulate the admission and exhaust of operating medium to and from each end of each of said cylinders adapted to admit operating medium to the power cylinder to operate the door and at the same time to the check cylinder to build up a pressure therein to check the door actuated movement of the piston therethrough in either direction, and means automatically operable to exhaust the operating medium from said power cylinder with the completion of each movement of the door.

10. In door operating mechanism, a movably supported door, a fluid motor having a piston to operate the door, a fluid pressure control device having a piston adapted to be

actuated in the same direction by the movement of the door to check such movement, a source of fluid pressure, control means adapted to admit fluid under pressure from said source to either end of the door operating motor to drive its piston in a given direction to operate the door, said control means adapted at the same time to admit fluid under pressure to either end of the control device to build up a pressure therein to restrain the movement of its piston in the same direction.

11. In door operating mechanism, a door, a single fluid motor provided with a piston connected with the door to open and close the same, a single fluid pressure check cylinder provided with a piston adapted to be actuated by the door in the opening and in the closing thereof to check the door, a source of fluid pressure, a single control valve operable to admit fluid under pressure from said source to either end of said fluid motor to operate the door and to either end of said check cylinder to determine the position of the piston therein and to build up a pressure therein to resist the door actuated movement of the piston therethrough.

12. The invention as characterized in claim 11 wherein the control valve is adapted to be actuated to simultaneously exhaust both the fluid motor and the check cylinder.

13. The invention as characterized in claim 11 wherein mechanism is provided adapted to be actuated by the door coincident with the closing thereof to exhaust the fluid motor and at substantially the same time to exhaust the check cylinder.

In testimony whereof, I sign this specification.

HENRY C. BOSSERDET.