

Oct. 4, 1927.

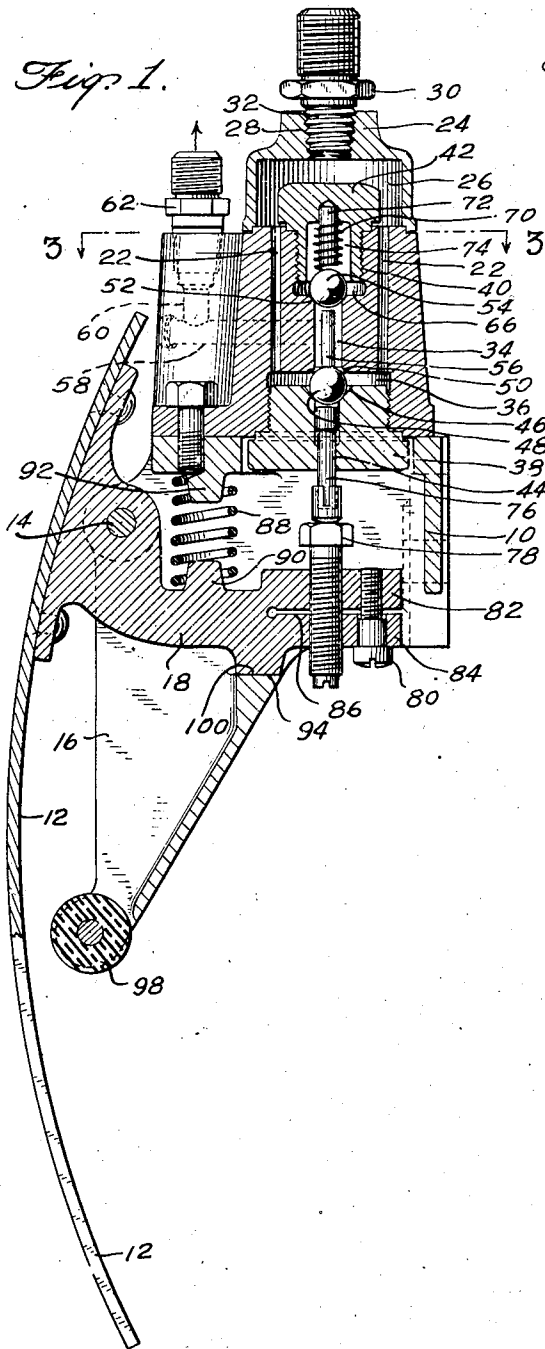
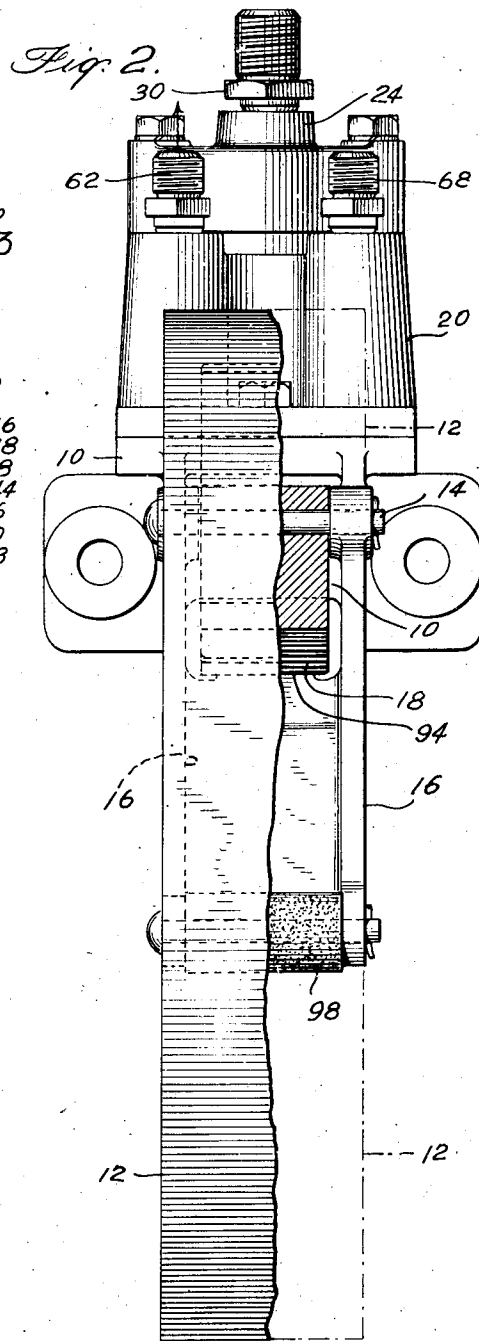
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1,644,093

CONTROL VALVE

Filed June 25, 1925

4 Sheets-Sheet 1



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Fig. 3.

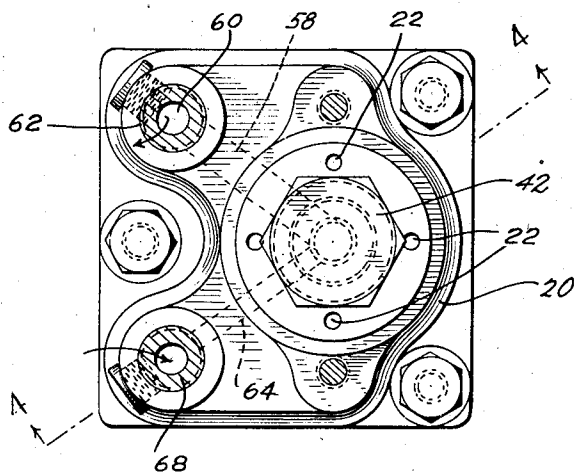
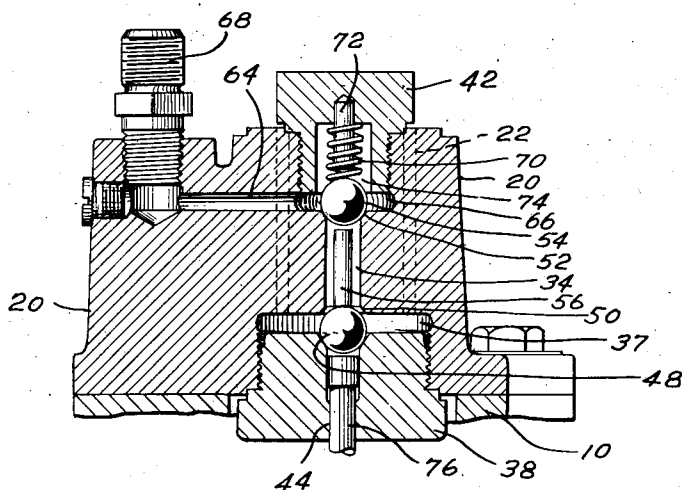


Fig. 4.



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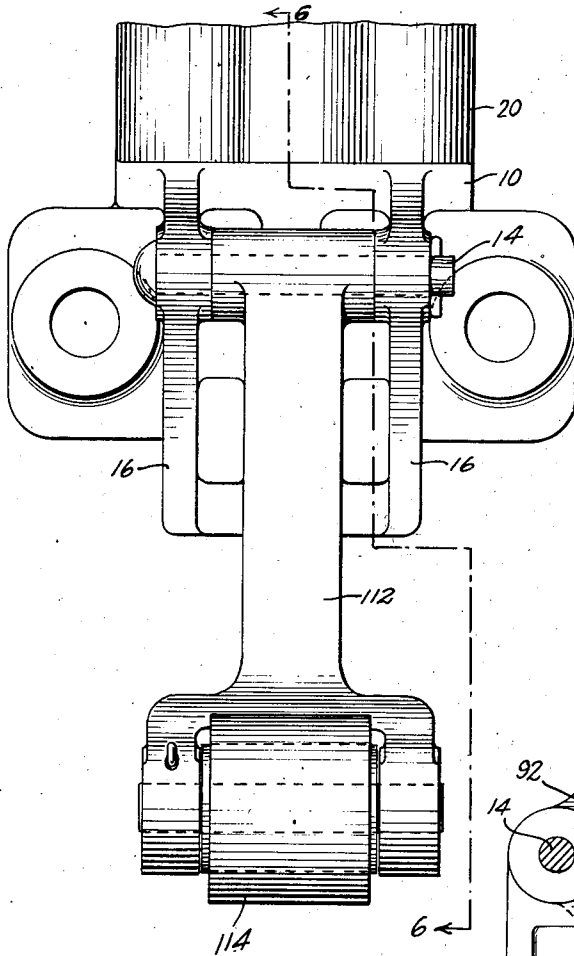


Fig. 5.

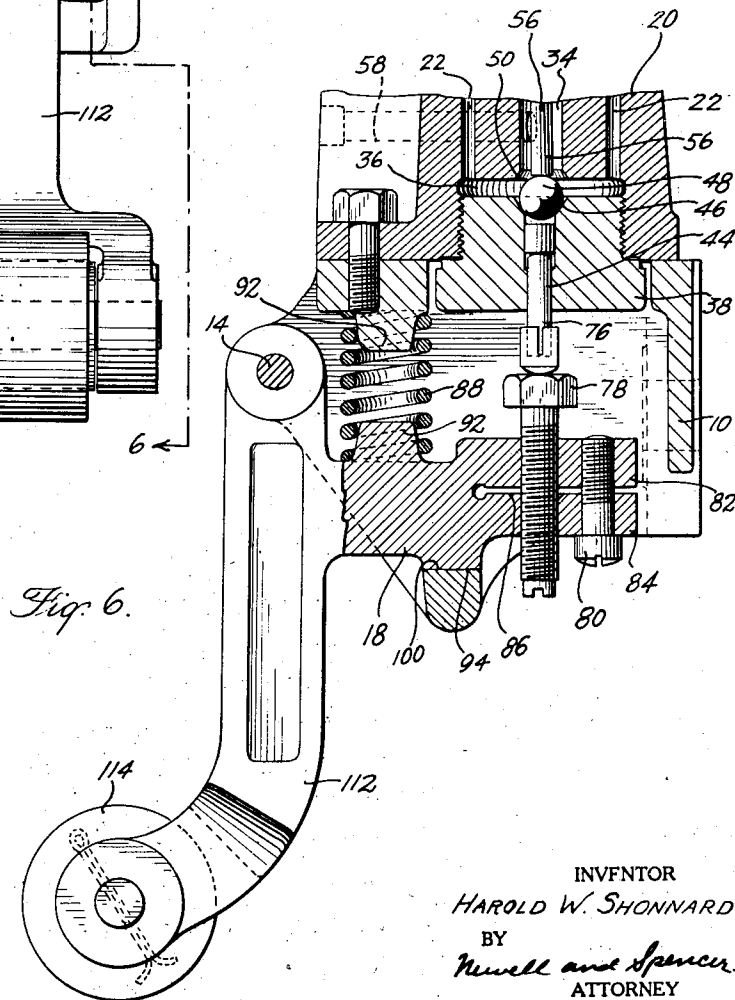


Fig. 6.

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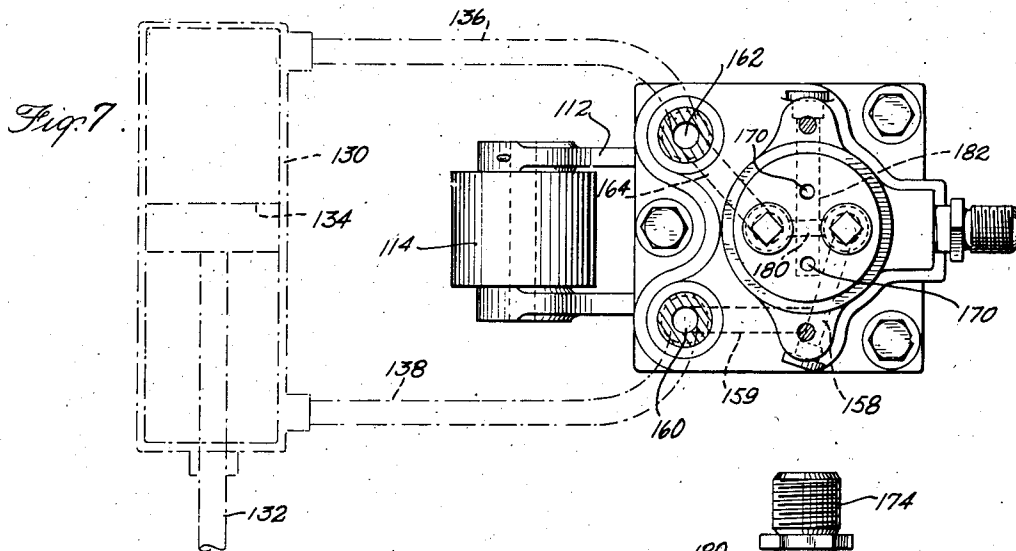
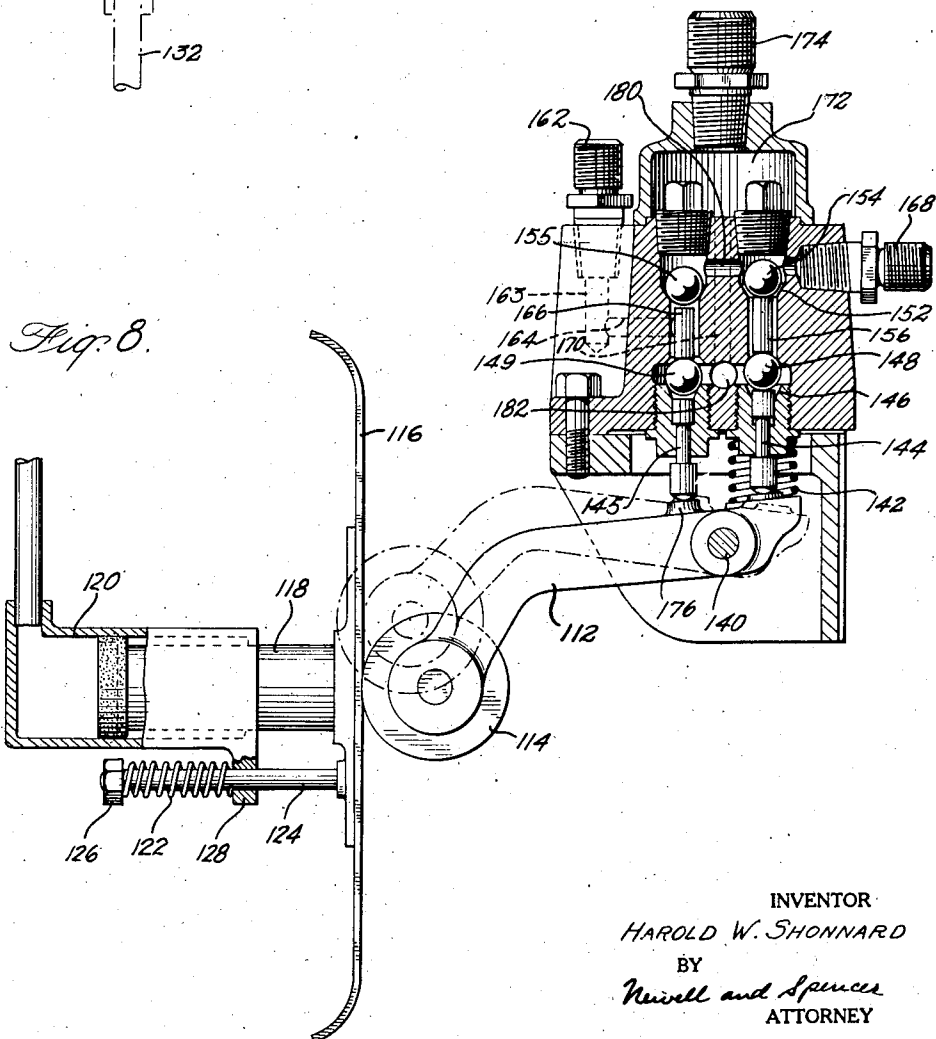
1,644,093

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CONTROL VALVE

Filed June 25, 1925

4 Sheets-Sheet 4



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Patented Oct. 4, 1927.

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UNITED STATES PATENT OFFICE.

HAROLD W. SHONNARD, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO ELEVATOR SUPPLIES COMPANY, INC., A CORPORATION OF NEW JERSEY.

CONTROL VALVE.

Application filed June 25, 1925. Serial No. 39,580.

The present invention relates to a valve mechanism and more particularly to a control valve which is especially adapted for use in connection with elevator door operation to control the passage of pressure fluid to and from the motor mechanisms operatively connected to the elevator shaft doors.

It is the primary object of the present invention to simplify the construction of control valves and to provide a form of control valve which is particularly adapted for use in connection with the operation of elevator doors, and which shall be easy to manufacture.

Another object of the invention is to provide a new and improved form of control valve in which parts of the mechanism may be readily adjusted in position or replaced by new parts when the parts thereof have become worn.

Another object of the invention is to provide a new and improved form of control valve in which the use of leather washers or pistons and similar non-metallic parts is avoided, and in which the operating parts of the mechanism are made entirely of metal, and do not therefore, readily become worn.

With these and other objects in view the invention comprises the various features hereinafter more fully described and particularly defined in the claims.

The various features of the invention are illustrated in connection with the accompanying drawings, showing the preferred form of the invention, in which:

Figure 1 is a cross sectional view in elevation of a valve embodying my invention;

Figure 2 is a view in front elevation of the device shown in Figure 1;

Figure 3 is a plan view of the top portion of the valve, in which the various passageways in the valve are indicated in dash lines;

Figure 4 is a detail view in section showing the supply pipe connection to the valve, and the supply passage in the valve;

Figure 5 is a front view in elevation of a special form of actuating means for the valve;

Figure 6 is a view in elevation partly in section taken on the line 6-6 of Figure 5;

Figure 7 is a plan view of a modified construction of the control valve shown with the top cover removed, and

Figure 8 is a sectional view in elevation

of the modified form of control valve shown in Figure 7, together with the preferred form of operating means for the valve.

Referring more particularly to the drawings the numeral 10 designates a control valve embodying my invention, which may be mounted in any desired manner in the elevator shaft or in connection with the elevator car. For the operation of elevator shaft doors, I preferably mount the control valve upon a counterweight rail or on one of the guide rails in the shaft, and connect to the control valve a trip lever 12, whereby the valve may be operated through the contact of any suitable operating means connected with the elevator car. The trip lever 12 may be mounted on or pivotally connected to the valve in any desired manner, as by means of a pin 14 connected to the casing or attached to a bracket 16 connected to the valve. Integral with the tripping lever 12, or suitably connected thereto, is an arm or lever 18 adapted to swing or pivot on the pin 14 with movements of the lever 12, whereby the operation of the valve is controlled, as will be hereinafter explained.

The control valve 10 comprises a central member or casing 20 in which there are one or more openings or passageways 22 which extend through the casing as is shown in Figures 1 and 3. To the top of the section or casing 20 is connected a cover portion or casing 24, serving to provide an exhaust chamber 26 at the top of the valve. In the top of the casing 24 is an opening 28 which is preferably screw threaded so as to permit an exhaust pipe to be connected thereto through a connecting member 30, having a corresponding screw threaded portion 32.

In the central portion of the member 20 is a passageway 34 extending from the top to the bottom of the casing 20 and having an enlarged opening 36 at the bottom or lower end thereof, into which a member 38, serving as a valve holding means, may be screwed. The upper portion of the opening 34 is similarly enlarged to provide an opening 40 into which a corresponding valve holding member 42 may be screwed or otherwise inserted in place. In the valve holding member 38 is a central opening or passageway 44 which passes through the member, the upper portion of the passageway being enlarged or extended to provide a seat 46 for a ball valve 48, which is retained in

place between the smaller or central portion of the opening 34 and the valve seat 46.

At the lower portion of the casing 20, at which the central opening 34 is enlarged to provide the chamber or opening 36, the passageway 34 is preferably rounded or beveled so as to provide a seat 50 for the ball 48, whereby when the ball 48 is moved upwardly it closes the central or smaller portion of the passageway 34, as will be hereinafter more fully described. By the movement of the ball 48 to its seat 50, communication between the central opening 34 and the openings 22 through the chamber 36 will be cut off, thereby cutting off communication of the passageway or opening 34 with the exhaust chamber 26.

At the portion of the central opening 34, at which it is enlarged to provide the chamber or opening 40, I provide a valve seat 52 on which a ball valve 54 is adapted to seat. In the chamber or opening 34 between the ball valves 54 and 48 I provide a suitable connecting or operating means between the valves, adapted to lift the ball valve 54 from its seat when the ball valve 48 is raised. For this purpose I preferably employ a pin 56, of a length slightly greater than the distance between the surfaces of the ball valves 54 and 48 when seated upon their seats 52 and 50 respectively, so that when the ball 48 is seated upon its seat 46 in the member 38, the ball 54 will not contact with the pin 56 but will be permitted to seat upon its seat 52, whereas when the ball 48 is seated upon its upper seat 46, the pin 56 will hold the ball 54 away from the seat 52. The pin 56 is preferably cylindrical in shape and is of sufficient diameter with respect to the opening between the seat 50 and the ball 48, when seated on its lower seat 46, that the pin will not be able to pass between them.

In the casing 20 connected to the central portion of the passageway or chamber 34 is a passageway 58, which passes preferably through the casing at right angles to the passageway or opening 34, and is connected to a pipe, leading to the mechanism to be operated, through a passageway 60 in the valve casing. The passageway 60 may be connected to the pipe leading to the motor mechanism for operating the elevator doors, by any suitable form of connection 62. A passageway 64 in the casing similar to the passageway 58, passes into the chamber 66 at the portion of the enlarged opening 40, formed between the valve casing and the closure member 42. The passageway 64 is connected to a supply pipe through a connection 68 similar to the connection 62, whereby pressure fluid from a suitable source may be conducted to the control valve.

The ball 54 is preferably held in place in proximity to its seat 52 by means of a spring 70, which may be held in place in a central

opening 74 in the closure member 42 by means of a pin 72. The spring 20 may be omitted in constructions in which the valve is to be employed in upright position since the force of gravity will carry the ball member 54 to its seat 52 after the ball valve has been operated, but it is to be understood that in constructions in which the valve is to be employed in other than upright position the spring member 70 must be employed to properly seat the ball 54. In order to operate the ball valve 48 and parts connected therewith, by means of which the operation of the valve 10 is controlled, I provide a pin 76, which is slidably mounted in the closure member 38 in the opening 44 therein, which is adapted to raise the ball valve 48 when actuated or raised through the movement of a set screw or other suitable lifting member 78, which is adjustably held in position in the arm member 18.

In order to lock the member 78 in position in the arm 18, I may employ a locking means, such as a set screw 80 positioned in the outer portion of the arm 18, between the branches or side members 82, 84 thereof, which are formed by a groove or opening 86 through a portion of the arm, as shown in Figure 1.

In order to retain the lever 12 normally in its extended position a spring 88 is preferably provided between the arm 18 and the casing member 20, the spring being preferably held in position by means of a lug 90 on the arm 18, and a corresponding lug 92 on the casing 20. In order to limit the outward movement of the lever 12, a seat or shoulder 94 may be provided on the downwardly projecting bracket or member 16, with which a portion of the arm 18 is adapted to contact, thereby preventing the lever 12, connected therewith from moving beyond the corresponding position in rotating on the pivot or pin 14. In order to limit the inward movement of the lever 12, on the other hand, so as to prevent the lever from being bent when the valves 54 and 48 have been raised, a roller 98 of hard rubber or other resilient material may be provided which is preferably positioned at the lower end of the bracket 16. The roller is preferably adjusted in position so that when the ball valve 48 is on its seat 50, being held thereon by means of the pin 76 and the supporting screw 78, the arm of the lever 12 will be nearly, but not quite, touching the roller. Should the lever 12 be bent further, as by a sudden blow, for example, the lever will contact with the roller 98, which will prevent the arm from being broken or bent out of shape.

The operation of the form of valve illustrated in Figures 1 and 4 is as follows:

Assuming that the control valve 10 is positioned on a counterweight rail in an

elevator shaft, for example, and is connected through the connection 62 to a pipe leading to a motor mechanism, connected to the shaft doors to be operated. Assuming also that the connection 68 leading to the passageway 64, is connected through a pipe to an air compressor or other source of pressure fluid supply. When the elevator car in the shaft has been stopped at a suitable distance from the desired landing so that the tripping mechanism, connected therewith, may actuate the lever 12, the mechanism is operated and the lever 12 is thereby moved to the right or in a counter clockwise direction, with reference to Figure 1. By this movement the arm 18 is raised against the force of the spring 88, lifting the set screw or lifting member 78 attached to the arm and the stem 76, which is thereby brought into contact with the ball valve 48, which is raised from its seat 46, thereby lifting the pin 56, in chamber 34, into contact with the ball 54, which is in turn lifted from its seat 52, against the force of the spring 70. By this movement the ball 48 is brought against its upper seat 50, thereby closing off communication between chamber 34 and exhaust chamber 26, through openings 22. When the valve 54 is raised from its seat 52 the chamber 34 is brought into communication with the pressure fluid supply pipe through the passageway 64 which communicates with the chamber 66, whereby the pressure fluid passes through the connection 68 through the passageway 64 into chamber 66 and into chamber 34, which is directly connected to the passageway 58, through which the pressure fluid flows into the passageway 60 and through the connection 62 to the engine or motor mechanism which is connected to the elevator doors. Through the passage of the pressure fluid to the motor mechanism, the latter is operated, whereby the elevator doors are caused to open.

When it is desired to close the elevator doors, the mechanism or means in the elevator car is operated to release the tripping lever 12 which, with reference to Figure 1, is moved by the spring 88 to the left, whereby the arm 18 is brought downwardly until the projection 100 on the arm comes into contact with the seat 94. The stem 76 is thereby released by the lifting member 78, and returns to its original position, whereby the ball valve 48 moves away from the seat 50 and drops to its seat 46 in the member 38, whereby communication between the chamber 34 and the exhaust chamber 26 is again established. The pressure fluid then passes from the motor mechanism connected to the elevator doors through the pipe connected therewith to the connection 62, and through this connection it passes to passageway 60 and through passageway 58 to the chamber or opening 34, and from thence into the

chamber 36, from which it passes through passageways 22 into the exhaust chamber 26 at the top of the control valve, and from the exhaust chamber it passes through the opening 28 and connection 30 into an exhaust pipe.

Should it be desired to reset the valves or to make adjustments in the control valve the set screw 80 is turned to unlock the set screw or supporting member 78 which may then be raised or lowered by suitably turning the set screw. After the adjustment has been made the locking screw 80 is again turned into locked position, whereby the set screw 78 is rigidly held in position and prevented from turning.

In the application of the control valve to the operation of elevators I preferably employ a special actuating means for the valve comprising a lever 112 having a roller 114 thereon which is adapted to contact with a suitable form of cam attached to the elevator in any desired manner. By this means the one cam on the elevator will serve to operate the various control valves at the various landings, and should any damage occur to the cam, or should it be desired to change the form of operating cam, it will obviously be necessary only to change one cam for the whole shaft instead of a large number of cams, as would be required if one cam were used for each control valve in the shaft.

The preferred form of operating cam which may be connected under the elevator car is shown in Figure 8, being indicated by the numeral 116. The cam is preferably mounted on a shaft or piston 118 operating in a cylinder 120 by means of pressure fluid. When it is desired, to operate a control valve at a particular landing pressure fluid is passed into the cylinder 120 through the operation of a suitable valve or by other means, whereby the cam 116 will be moved outwardly so as to contact with the roller 114, thereby operating the control valve in the same manner as has been above set forth. The cam 116 remains in extended position until it is desired to close the elevator door through the operation of the control valve which is accomplished by turning the valve or other controlling means, so that pressure fluid will be exhausted from the cylinder 120, whereby the spring member 122 mounted on the rod 124 between the nut 126 and the bracket 128 will return the cam 116 to its inoperative position.

The modified form of control valve which is shown in Figures 7 and 8 is adapted for the operation of two cylinders or operating mechanisms and is especially adapted in connection with elevator operation for the operation of a Burdett-Rowntree mechanism, in which a piston in the cylinder is operated by pressure fluid on both sides of the piston to open and close the elevator

door or doors. In Figure 7 a cylinder of this form is diagrammatically indicated in order to clearly illustrate the operation of the modified form of control valve in this connection.

The control valve comprises a double set of valves which are adapted to operate in opposed positions or, in other words, the operation of one set is exactly the reverse of the operation of the other set in the two positions of the actuating lever, as indicated in full and dash lines in Figure 8. The construction of the device may be made clear in connection with the description of the operation of the modified form of control valve.

Assuming that the cylinder 130 indicated in dash lines in Figure 7 is mounted in connection with the elevator shaft doors at a landing through the piston rod 132 attached to the piston 134 in the cylinder. A pipe 136 is connected from the head end of the cylinder to a port of the control valve to be hereinafter more fully described and a pipe 138 is connected from the crank end of the cylinder 130 to a corresponding port in the control valve. When it is desired to operate the control valve at any particular landing, the car having been stopped within a suitable distance of the desired landing, the cam 116 is extended by means of the mechanism connected thereto through the operation of a suitable lever or control valve and contacts with the roller 114 on the lever or arm 112. The arm 112 is thereby turned in a counter-clockwise direction about the pivot 140 against the action of the spring 142, whereby a pin 144 similar to the pin 44 of Figure 1, lifts the ball 148 from its seat 146 which in turn lifts the pin 156 which contacts with the ball valve 154, thereby lifting the latter from its seat 152. By this means pressure fluid passes from the pipe connected to the connection 168, passes around the ball 154 and into the chamber around the pin 156 and through the passageway 158 and from thence through passageway 159 to the passage or port 160 connected to the pipe 138, whereby the air or other fluid pressure passes into the crank end of the cylinder 130, forcing the piston 134 toward the head end of the cylinder.

Simultaneously with the passage of pressure fluid into the crank end of cylinder 130, pressure fluid is exhausted from the head end of the cylinder and passes through the connection 162 to a passageway 163 and from thence through the passageway 164 in the control valve to the chamber around the pin 166 in the valve and from thence around the ball valve 149 into the central passageway 182, which communicates through one or more passageways 170 with an exhaust chamber 172 similar to the exhaust chamber 26 of Figure 1. The pressure fluid is then

exhausted through the connection 174 to a suitable exhaust pipe.

When it is desired to close the elevator doors the reverse action takes place. The cam 116 is retracted, whereby the roller 114 and the lever 112 connected therewith, move into the position indicated in dash lines in Figure 8, whereby the pin 144 moves downwardly, permitting the ball 148 to seat on the lower seat 146 and the pin 156 moves downwardly to permit seating of the ball valve 154, thereby closing communication between the pipe attached to the connection 168 and the central chamber around the pin 156. Simultaneously the pin 145 is moved upwardly by a projection on the arm 112 indicated by the numeral 176 in Figure 8, whereby the ball 149 is lifted from its seat and moves the pin 166 upwardly against the ball valve 155, which is raised from its seat, whereby pressure fluid from the pipe attached to the connection 168 passes through the inner passageway 180 into the chamber around the ball 155 and downwardly around the ball into the chamber around the pin 166, which is connected to the passageway 164, whereby the pressure fluid passes therethrough into the passageway 163 and from thence through the pipe 136 to the head end of the cylinder 130. By this means the piston 134 is moved toward the crank end of the cylinder and pressure fluid is exhausted therefrom through the pipe 138 into the passageway 160, through passageway 159 to the passageway 158 and from thence to the chamber around the pin 156 and passes downwardly to the chamber around the ball 148 which connects with the passageway 182 and from thence the fluid pressure passes upwardly through the one or more passageways 170 to the exhaust chamber 172 at the upper part of the valve, from whence it exhausts through the connection 174 to the exhaust pipe connected therewith.

It is to be understood that while the forms of control valve constituting my invention have been described as applied in connection with elevator door operation, the valve is also adapted for other uses such as signalling devices, or for other purposes where a control valve is desired, as will be apparent to those skilled in the art. I do not desire therefore to limit the application of my device to the particular use in connection with which the forms of the valve have been described. It is to be understood also that various changes or modifications may be made in the device without departing from the spirit or scope of the invention as defined in the claims.

What is claimed as new is—

1. In a control valve, a casing, a chamber in said casing, means for connecting said chamber to a source of pressure fluid sup-

ply, a second chamber in said casing, a passageway between said chambers, means for connecting said passageway with a pressure fluid operated mechanism, a valve in the first
 5 named chamber for opening and closing communication with said passageway, a valve in said second chamber for opening and closing communication with said passageway, an exhaust chamber, means for exhausting pressure
 10 fluid from said second chamber to said exhaust chamber, means for operating the valve in the second chamber externally to said casing, and means in said passageway for operating the valve in the first named
 15 chamber during a portion only of the movement of the valve in the second chamber.

2. In a control valve, a casing, a chamber in said casing, means for connecting said chamber to a source of pressure fluid supply, a second chamber in said casing, a passageway between said chambers, means for
 20 connecting said passageway with a pressure fluid operated mechanism, a valve in the first named chamber for opening and closing communication thereof with said passageway, a valve in the said second chamber for opening and closing communication thereof with
 25 said passageway, means for dependently operating said valves in opposed positions, an exhaust chamber in said casing, and a passageway between said exhaust chamber and said second chamber, whereby when the valve
 30 in said second chamber is opened pressure fluid will be passed to said exhaust chamber.

3. In a control valve, a casing, a chamber in said casing, means for connecting said chamber to a source of pressure fluid, a second chamber in said casing, a connecting passageway between said chambers, means
 40 for connecting said passageway with a pressure fluid operated mechanism, a valve in the first named chamber for opening and closing communication between said first named chamber and said passageway, means for normally holding said valve in closed position,
 45 a valve in said second chamber for opening and closing communication between said second chamber and said passageway, a seat for the last named valve adapted for holding said last named valve when in open position, an exhaust chamber in said casing, a
 50 passageway connecting said exhaust chamber with said second chamber, a lever connected to said casing, means operatively connected to said lever for lifting the said last named valve from said seat to close communication of said second chamber with said
 55 passageway, whereby communication between said passageway and said exhaust chamber is cut off, and means in said passageway for lifting the first named valve to open communication of said passageway with the first named chamber when the said last
 60 named valve is closed.

4. A control valve comprising a casing, a

chamber in said casing, a passageway in said casing communicating with said chamber and adapted to be connected to a source of pressure fluid, a second chamber in said casing, a connecting passageway between the
 70 the said chambers, a passageway connecting the said connecting passageway with a conduit leading to a pressure fluid operated mechanism, a ball valve in the first named chamber adapted to seat in said connecting
 75 passageway thereby to close communication between said first named chamber and said connecting passageway, a ball valve in the said second chamber adapted to seat in said connecting passageway and thereby to close
 80 communication between said second chamber and said connecting passageway, a seat in the said second chamber for normally holding the last named valve in proximity to said connecting passageway in open position,
 85 an exhaust chamber in said casing, a passageway connecting said exhaust chamber with said second chamber, a lever pivotally connected to said casing, an arm connected to said lever, stop means for limiting outward movement of said lever, spring
 90 means for normally retaining said lever in its outward position, means connected to said arm for lifting the said last named valve from the said seat and to close the valve when said lever is operated, and means in
 95 said connecting passageway for lifting the first named valve, thereby opening the valve, when the said last named valve is lifted through the operation of said lever.

5. A control valve adapted for simultaneously controlling inlet and exhaust from two chambers which comprises a casing, an intake chamber in said casing, an exhaust chamber in said casing, two sets of valves in
 105 said casing, each set of valves being adapted to maintain non-communication of said intake chamber with said exhaust chamber, means in said casing for interdependently operating the valves in each set of valves,
 110 and means external to the said casing for interdependently operating the valve sets to reverse the action thereof, so as to attain opposed or reversed action of the two sets of valves, whereby exhaust from one of the
 115 said chambers will take place simultaneously with intake to the other of said chambers and vice versa.

6. A control valve comprising a casing, a chamber in said casing, a passageway in said casing communicating with said chamber and adapted to be connected to a source of pressure fluid, a second chamber in said casing, a plurality of connecting passageways between the said chambers, a passageway connecting each of said connecting passageways with conduits leading to pressure fluid operated mechanisms, ball valves in the first named chamber adapted to seat in each
 120 of said connecting passageways thereby to

control communication between said first
named chamber and said connecting passage-
ways, ball valves in the said second cham-
ber adapted to seat in said connecting pas-
5 sageways and thereby to close communica-
tion between said second chamber and said
connecting passageways, seats in the said
second chamber for normally holding the
last named valves in proximity to said con-
10 necting passageways when said valves are

in open position, an exhaust chamber in said
casing, a passageway connecting said exhaust
chamber with said second chamber and
means external to the said casing operatively
connected to the said valves for controlling 15
the operation thereof.

Signed at New York city, N. Y. this 24th
day of June 1925.

HAROLD W. SHONNARD.