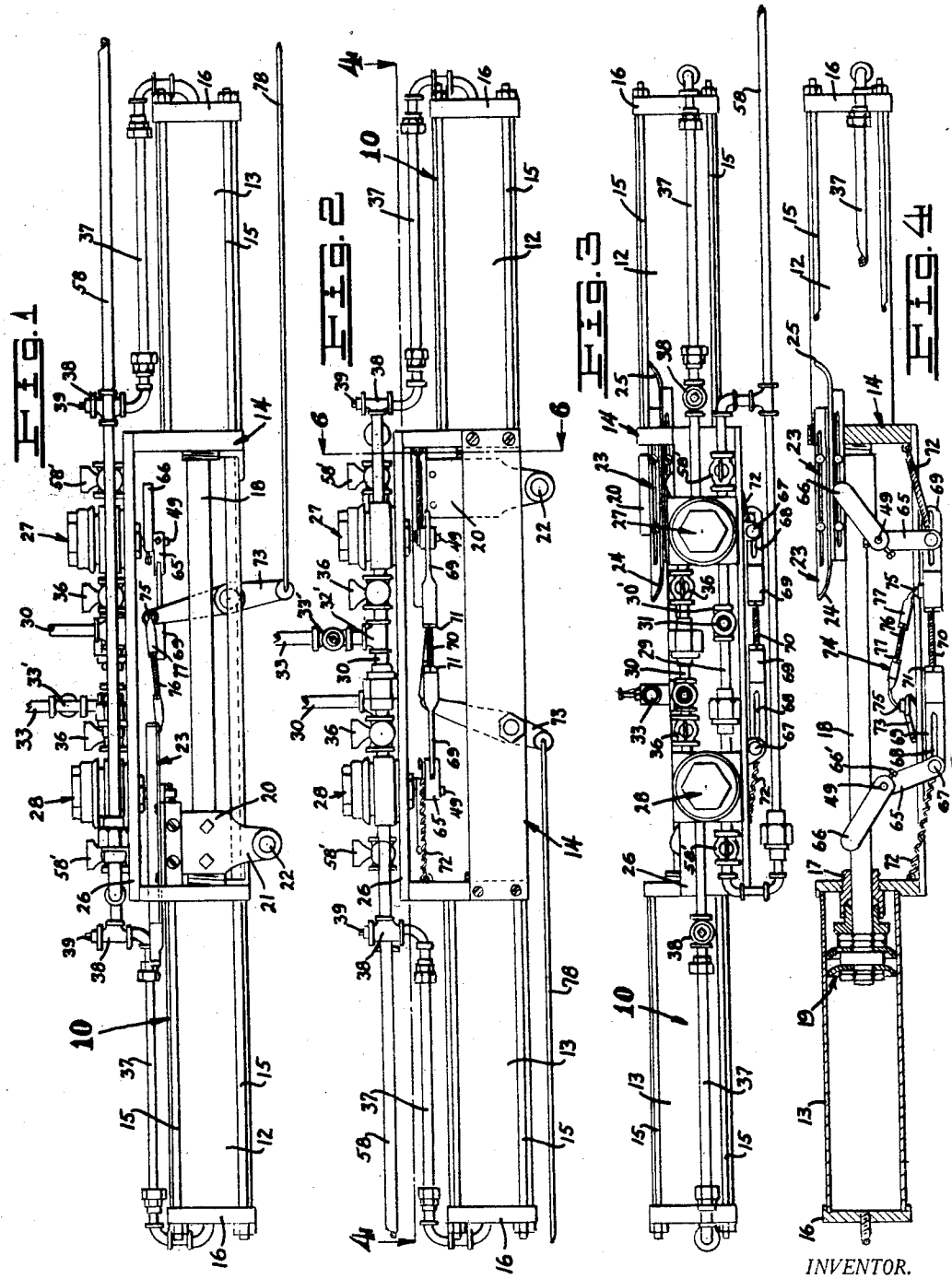
Feb. 14, 1933. S. P. WIEGNER 1,897,350

DOOR CONTROL MECHANISM

Filed Sept. 25, 1929 3 Sheets-Sheet 1



INVENTOR.
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DOOR CONTROL MECHANISM

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Fig. 4

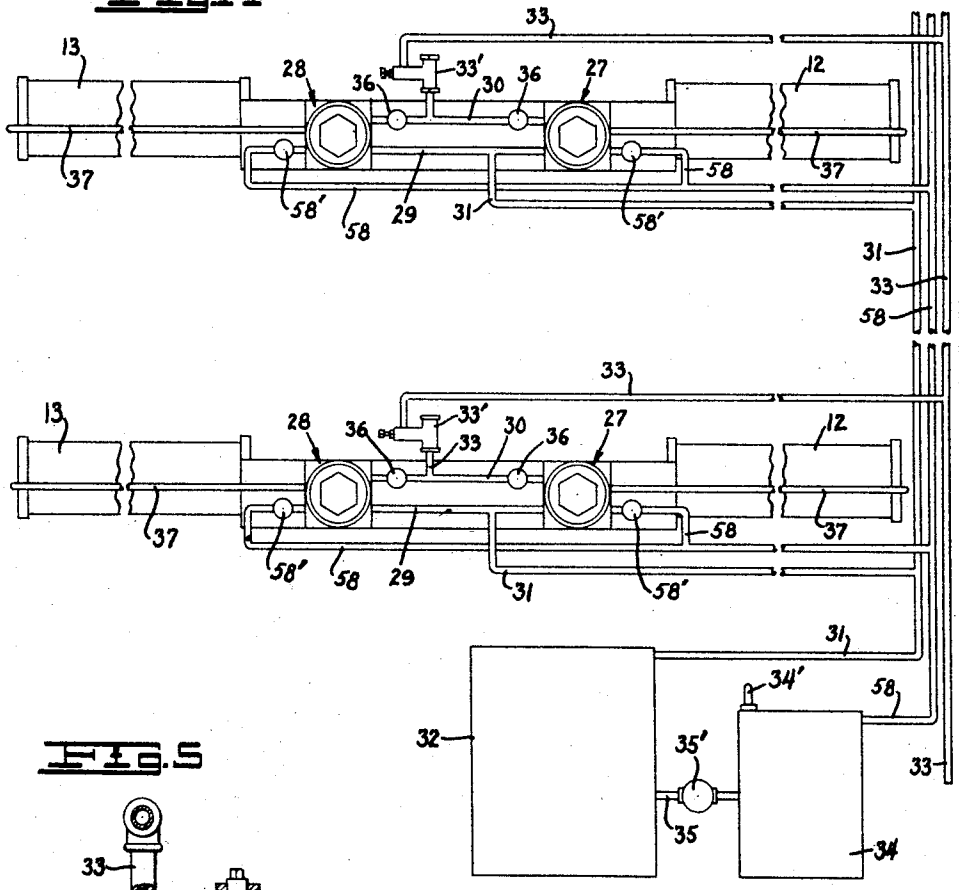
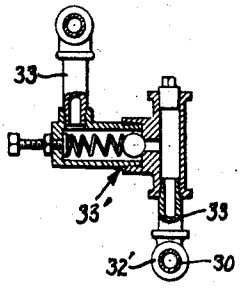


Fig. 5



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DOOR CONTROL MECHANISM

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Fig. 6

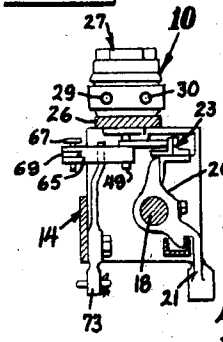


Fig. 7

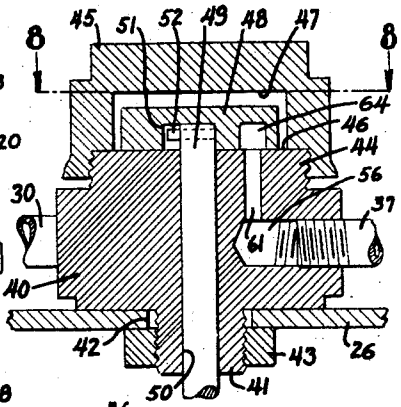


Fig. 8

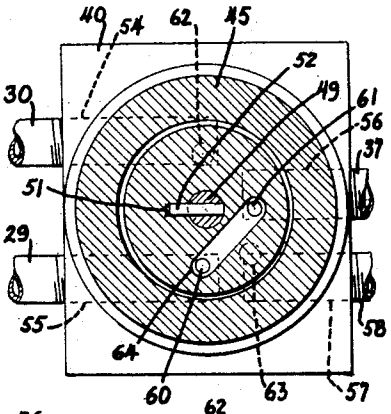


Fig. 10

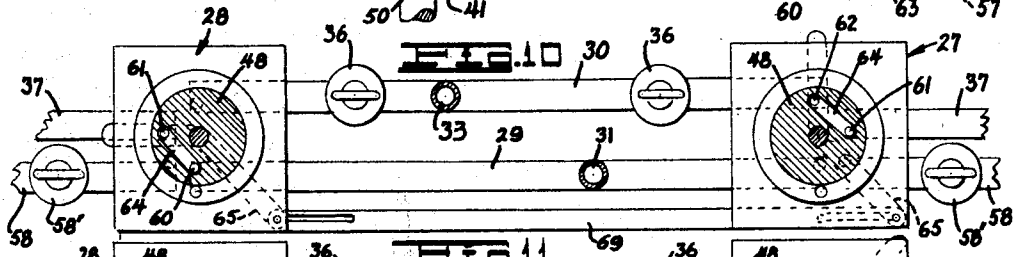


Fig. 11

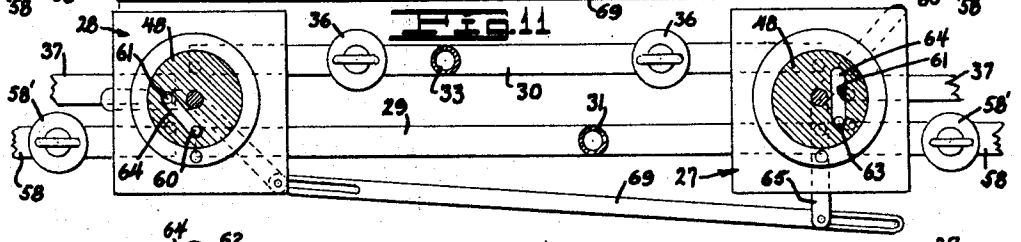


Fig. 12

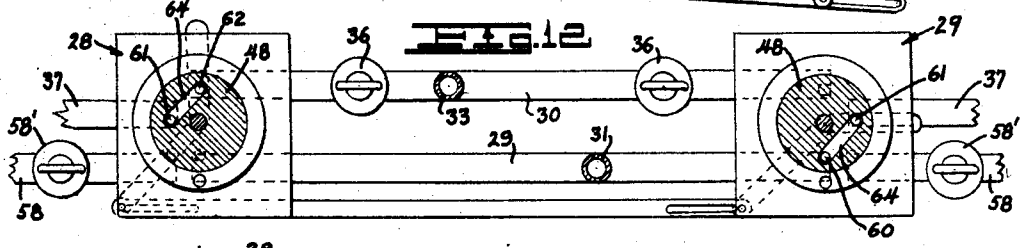


Fig. 13

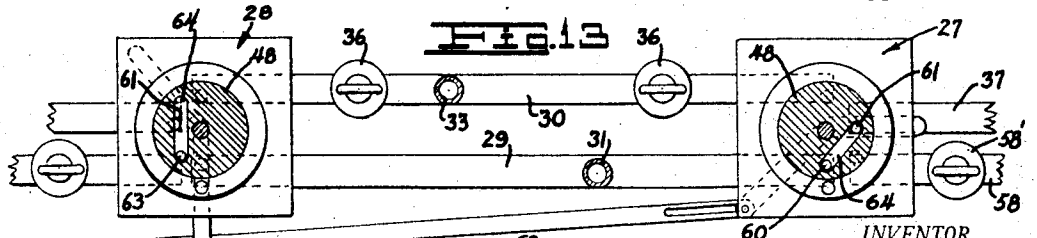
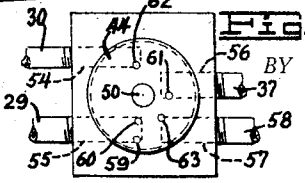


Fig. 9



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Patented Feb. 14, 1933 1,897,350

UNITED STATES PATENT OFFICE

SIMON P. WIEGNER, OF LOS ANGELES, CALIFORNIA

DOOR CONTROL MECHANISM

Application filed September 25, 1929. Serial No. 395,023.

This invention relates to door control mechanisms.

The general object of the invention is to provide an improved door opening and closing device.

A specific object of my invention is to provide an improved fluid pressure mechanism for controlling the movement of a door and wherein a novel type of control is provided.

A further object of my invention is to provide a novel means for arresting the movement of a fluid controlled door.

An additional object of my invention is to provide an improved cushioning means for arresting the movement of a fluid controlled door.

Another object of the invention is to provide an automatic adjustable cushioning means for arresting a moving door.

Other objects and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation of my improved door actuating mechanism.

Fig. 2 is a view similar to Fig. 1 showing the other side of the mechanism.

Fig. 3 is a top plan view of the door actuating mechanism shown in Fig. 2.

Fig. 4 is a section taken on line 4—4 of Fig. 2 with parts broken away to more clearly illustrate the same.

Fig. 5 is an enlarged central vertical section through the relief valve.

Fig. 6 is a section of the device taken on line 6—6 of Fig. 2.

Fig. 7 is an enlarged central vertical section of one of the control valves.

Fig. 8 is a plan section of the control valve taken on line 8—8 of Fig. 7.

Fig. 9 is a top plan view of a control valve with the cap and rotor member removed to more clearly show the passage in the body member.

Fig. 10 is a diagrammatic top plan view corresponding to Fig. 3, showing the relative position of the valve parts when the doors are being moved in one direction, for instance to a closed position.

Fig. 11 is a view similar to Fig. 10 showing the valve parts in their respective positions when the doors are closed.

Fig. 12 is also a view similar to Fig. 10 showing the relative positions of the valve parts when the doors are being moved in an opposite direction, for instance to an open position.

Fig. 13 is another similar view showing the relative positions of the valve parts when the doors are fully opened, and

Fig. 14 is a diagrammatic view showing the fluid pressure connections to a plurality of my improved devices.

Referring to the drawings by reference characters I have indicated my improved device generally at 10. This device is similar in many respects to the device shown in my copending application Serial No. 151,891, filed Dec. 1, 1926.

My improved device 10 comprises spaced cylinders 12 and 13 mounted on a frame 14 and secured thereto by bolts 15 and end plates 16. Each of the cylinders 10 is provided with a piston rod bushing or guide 17 which is secured to the frame 14 (see Fig. 4). A piston rod 18 passes through each bushing or guide 17 and is provided at each of its ends with a piston 19 as clearly shown in Fig. 4. The piston 19 may be of any desired construction, and the details thereof as well as the details of the manner in which the inner ends of the cylinders are bled form no part of my present invention.

Secured to the piston rod 18 I show a block 20 having a downwardly extending arm 21 apertured as at 22 for pivotal engagement with a door actuating lever (not shown) and having on its top surface a valve actuating cam indicated generally at 23 and which consists of two adjustable arms 24 and 25.

Secured to a top member 26 on the frame 14 I show pressure or cylinder control valves 27 and 28 having a common inlet pipe 29 and a common exhaust pipe 30. The inlet pipe 29 is provided with a T 30′ for communication with a pipe 31 from a fluid pressure tank 32 (see Fig. 14) and the exhaust pipe 30 is provided with a T 32′ for communication with a pipe 33 having a relief valve 33′ interposed therein as shown in detail in Fig. 5.

As shown in Fig. 14 I also provide a cushioning fluid pressure tank 34 which includes a pressure relief valve 34′ and is connected to the main tank 32 by a pipe 35 having a pressure regulator 35′ interposed therebetween.

The relief valve 34′ is adjusted so that the cushioning fluid is maintained at all times under less pressure than the pressure of the main operating fluid.

On each side of the exhaust T 32′ I provide a shutoff valve 36 for controlling the exhaust from the valves 27 and 28. Communication is afforded between each of the valves 27 and 28, and the outer ends of the cylinders 12 and 13 by means of pipes 37, each of which is provided intermediate its length with a T 38 which may have one of its openings closed by a screw plug 39. This T 38 is for testing and lubricating purposes, since to test the device it is only necessary to remove the plug 39 and replace it with a pressure gauge.

The valves 27 and 28 are similar in construction, and each comprises a body portion 40 (Fig. 7) having on its under surface a screw threaded stem 41 which extends through an aperture 42 in the top plate 26 of the frame 14, and is adapted to be clamped to the plate 26 by a nut 43. The top of the body 40 is provided with a boss 44 having its outer periphery threaded for the reception of a cap member 45. On the top surface 46 of the box 45 and within a recess 47 of the cap 45 I provide a rotor member 48 adapted to be rotated by a shaft 49 which extends through a bore 50 in the body 40 and into a cylindrical recess 51 of the rotor member 48.

For imparting rotation from the shaft 49 to the rotor 48 I provide a pin 52 on the shaft 49 which extends into an aperture 53 of the rotor member 48. The body 40 is provided with a threaded bore 55 (see Figs. 8, 9) for engagement with the inlet pipe 29 and a threaded bore 55 for the reception of the exhaust pipe 30. On the side opposite from the inlet and outlet bores a threaded bore 56 is provided in each body 40 for the reception of the pipes 37 which communicate with each cylinder and another threaded bore 57 is provided for the reception of cushioning fluid pressure pipes 58 which communicate with the cushioning pressure tank 34 as shown in Fig. 14. Adjacent the valves 27 and 28 the pipes 58 are provided with shutoff valves 58′ for controlling the passage of fluid into the valves.

Extending upwardly from the inlet bore 55 I provide two smaller bores 59 and 60 and extending upwardly from the bore 56 I provide another small bore 61. Similarly I provide a small bore 62 extending upwardly from the exhaust bore 54 to the surface 46 and a small bore 63 extending upwardly from the cushioning fluid bore 57 to the surface 46. In the underside of the rotor member 48 I provide a recess 64 of a length sufficient to embrace the bores 61 and 62 or the bores 60 and 61.

In order to rotate the shafts 49 each shaft is provided with an arm 65 adjacent its lower end and each of the shafts 49 has another arm 66 adjustably secured thereto as by a thumb screw 66′. The arm 65 has a pin 67 thereon which fits in a slot 68 in a bar 69 to allow the arm 65 to move independently of the bar 69 at times, also the bar 69 is adjustable as to length by means of a screw threaded stud 70 and lock nuts 71. The arms 65 have coiled springs 72 attached thereto to normally retain the pins 67 against the outer extremities of the slots 68. Upon a movement of the bar 69 one of the arms 65 will be moved thereby to rotate one of the shafts 49 to cause either the valves 27 or 28 to assume an intake position and the other to assume an exhaust position.

For imparting movement to the bar 69 I provide an arm 73 connected to the bar 69 by a link 74. The link engages the arm 73 and the bar 69 by ball and socket connections as at 75 and is adjustable as to length by a threaded stud 76 and lock nuts 77. The arm 73 is shown as adapted to be actuated by a rod 78 which may be operated in any desired manner.

Assuming the pressure by which the device 10 is operated and referring to Fig. 10 of the drawings which is a diagrammatic view, it will be seen that the bar 69 has been moved to cause the arm 65 to turn the shafts 49 and the rotor members 48 so that the valve 27 is in an exhaust position and the valve 28 is in an intake position. When the valves are in these positions the rotor members 48 are turned so that in the valve 27 the recess 64 forms a communicating passage from the bore 61 to the bore 62, and in the valve 28 the recess 64 forms a communicating passage between the bores 60 and 61.

When the valve 28 is in this position the air pressure will pass from the supply pipe 29 into the bore 55 through the bore 60 and into the recess 64 of the members 48 and thence through bore 61 into the bore 56 to the pipe 37 and to the cylinder 12, to thereby cause the piston rod 18 to move. At the same time the compressed air is coming through the bore 60 it also comes through the bore 59 and at all times into the recess 47 of the cap 45. As the area of the top surface of the rotor member 48 is greater than the area of the recess 64 there will be more pressure on the top of the member 48 than there is on the under side of the same and thus the rotor member will be kept seated on the top surface 48 of the boss 44.

When the valve 27 is in the position shown in Fig. 10, the exhaust air from the cylinder 13 will pass through the pipe 37 into the bore 56 through bore 61 and into the recess

64 of the rotor 48, thence through the bores 61 and 62 into the bore 54 and through the pipes 30 and 33 to the atmosphere.

When the valves 27 and 28 are in the positions as just described and as shown in Fig. 10, the piston rod 18 starts its travel from the cylinder 13 towards the cylinder 12 and carries with it the block 20 and the cam tracks 23, and as the cam track 25 approaches the cylinder 12 it forces the arm 66 of the valve 27 inwardly thereby rotating the shaft 49 which causes the rotor member 48 to assume the position shown in Fig. 11. When in this position the recess 64 forms a communicating passage from the bore 61 to the bore 63. Heretofore the exhaust has been free so that the piston rapidly moves, but in this new position the auxiliary pressure from the tank 34 is admitted to the cylinder 13 which immediately builds up a pressure and damps the movement of the piston thereby preventing slamming of the elevator doors. The amount of auxiliary air admitted to the cylinders in a given length of time may be adjusted by the shutoff valves 58′. The cushioning fluid admitted to the cylinder does not stop the movement of the piston but merely damps the movement thereof. The actual stopping of the piston is caused by the elevator door or doors coming to rest against a stop.

When the cushioning air enters the cylinder and the piston continues to travel it builds up the auxiliary air pressure in the cylinder until the pressure therein is greater than that of the incoming auxiliary air whereupon the flow of the auxiliary air is reversed causing it to flow back into the low pressure line and the tank 34 and as the relief valve 34′ is set to maintain a predetermined pressure therein some of the auxiliary air will be forced out through the relief valve.

By providing the relief valve 33′ in the exhaust line it acts as a governor to maintain a certain pressure in the cylinders at all times to prevent the pistons from exceeding their normal speed when the device is reversed before the pistons have reached the limit of their stroke which they would do if the exhaust was unrestricted. Thus the pistons cannot enter the cushioning area faster than normal thereby the cushioning air pressure is not overcome too rapidly and the pistons slow down at a predetermined point. Without controlling the exhaust with a device such as the relief valve 33′ the pistons, when the device is quickly reversed before reaching the limit of their stroke, would travel much too fast and overcome the auxiliary air pressure too rapidly and allow the door to close with a slam or jar.

In Fig. 12 I have diagrammatically illustrated the valve mechanism as in a reverse position from that shown in Fig. 10, that is, the bar 69 has been moved to cause the valve 27 to assume an intake position and the valve 28 to assume an exhaust position. In Fig. 13 the valve 27 is still in an intake position while the valve 28 has been moved by the cam track 24 to assume an intermediate position when the auxiliary air produces the damping and cushioning effect.

When the device 10 is at rest in either position the pistons 19 at all times have air pressure thereon, at one time the operating air pressure and at other times the cushioning air pressure, thereby retaining the piston packing firmly sealed against the cylinder walls at all times.

From the foregoing description it will be apparent that I have provided an improved door control mechanism which can be economically manufactured and which is highly efficient in use.

Having thus described my invention, I claim:

1. In a device of the class described, a support, a pair of cylinders secured to said support, piston means in said cylinders, a common piston rod for both of said pistons, an operating fluid under high pressure, an auxiliary fluid under less pressure than said operating fluid, a separate valve for each of said cylinders for controlling the intake and exhaust to the respective cylinders, said valves being mounted on said support, said valves each having a common intake pipe and a common exhaust pipe, said valves being arranged to assume full high pressure inlet, full exhaust and full auxiliary fluid inlet positions, shutoff valves on said exhaust pipe independently controlling the exhaust from each of said cylinder valves, means for actuating the said cylinder valves, said means including a pair of arms secured to the valve stem of each valve, a bar, one of said arms of each valve stem being slidably connected to said bar, an arm pivoted to said bar, an arm on said support said last mentioned arm being movable to control the said valves, means on said piston rod for intermittently engaging each of said other arms on said valve stem for causing said cylinder pistons to move from full exhaust position to auxiliary fluid position.

2. In a device of the class described, a frame, a pair of cylinders secured to said frame, piston means in said cylinders, a common piston rod for both of said pistons, a receptacle for operating fluid under pressure, a receptacle for auxiliary fluid under less pressure than said operating fluid, means connecting said receptacles to said cylinders, a separate valve for each of said cylinders for controlling the intake and exhaust to the respective cylinders, said valves being mounted on said frame, said valves each having a common intake pipe and a common exhaust pipe, said valves being arranged to assume

full inlet, full exhaust and auxiliary fluid positions, shutoff valves on said exhaust pipe independently controlling the exhaust from each of said cylinder valves, means for actuating the said cylinder valves, said means including a pair of arms secured to the valve stem of each valve, a bar, an arm pivoted to said bar, an arm on said frame, said last mentioned arm being movable to control the said valves, means on said piston rod for intermittently engaging each of said other arms on said valve stem for causing said cylinder pistons to move from full exhaust position to the auxiliary fluid position, said means consisting of two cam rails, means to adjust each of said cam rails independent of the other, and means for adjusting the area of said auxiliary fluid inlet.

3. In a device of the class described, a frame, a pair of cylinders secured to said frame, piston means in said cylinders, a common piston rod for both of said pistons, means to supply high pressure fluid to each cylinder, means to supply low pressure fluid to each cylinder, a separate valve for each of said cylinders for controlling the intake and exhaust to the respective cylinders, said valves being mounted on said frame, said valves being arranged to assume full inlet from the high pressure fluid to admit fluid to the working side of said piston means, full exhaust to exhaust fluid from the non-working side of said piston and full inlet from the low pressure fluid to the exhausted side of said piston after the exhaust valve has been closed, and means for actuating the said cylinder valves.

4. In a device of the class described, a support, a pair of cylinders secured to said support, piston means in said cylinders, a common piston rod for both of said pistons, means to supply operating fluid under pressure to said cylinders, means to supply cushioning fluid under less pressure than said operating fluid, a separate valve for each of said cylinders for controlling the intake and exhaust to the respective cylinders, said valves being mounted on said support, said valves each having an intake pipe and an exhaust pipe, said valves being arranged to assume full operating fluid inlet position, full exhaust position, and cushioning fluid inlet position, the cushioning fluid inlet valve being opened when the exhaust valve is closed to admit cushioning fluid to the non-working side of the piston and a relief valve on said cushioning fluid supply means.

5. In a door control mechanism, a pair of cylinders, said cylinders being of approximately the same area in cross section, a piston in each of said cylinders, means to connect said pistons for synchronized movement, means to admit high pressure fluid to each of said cylinders to cause movement of said pistons, means to exhaust each of said cylinders, means to close the exhaust and means to supply low pressure fluid to said cylinders after they have exhausted and the exhausts have closed and before said pistons complete their stroke.

6. In a door control mechanism, a pair of cylinders, a piston in each of said cylinders, means to connect said pistons, a source of high pressure fluid, valves means to conduct high pressure fluid from said source to each of said cylinders to cause movement of said pistons, a low pressure fluid source, valved means to exhaust each of said cylinders valved means to supply low pressure fluid from said low pressure source to the exhausting ends of the cylinders and means to actuate said last two valved means to control the exhaust and to control the admission of low pressure fluid to the cylinder which is opposite to the working cylinder after the exhaust has been cut off and before the pistons complete their stroke.

7. In a door control mechanism, a pair of cylinders, a piston in each of said cylinders, means to connect said pistons, a source of high pressure fluid, a source of low pressure fluid, valved means to admit high pressure fluid from said high pressure source to each of said cylinders in order, valved means to simultaneously exhaust the cylinders in order, valved means to admit low pressure fluid from said low pressure source to the end of the exhausting cylinder which is opposite to the working cylinder and means to actuate said last two valved means to control the exhaust and to control the admission of low pressure fluid to the exhausting cylinder after the exhaust has been cut off and before the piston has completed its movement.

8. In a device of the class described, a pair of spaced cylinders, a piston in each of said cylinders, a piston rod connecting said pistons, a source of fluid, valved means to admit fluid from said source first to one of said cylinders and then to the other cylinder, valved means to exhaust the cylinders, a source of fluid of less pressure than said first source and valved means to admit fluid from said second source first to the exhausting end of one of the cylinders and then to the exhausting end of the other cylinder and means to move said last mentioned valve means to admit the fluid of less pressure to the cylinder which is opposite to the working cylinder before the piston completes its stroke and after the cylinder is cut off from the exhaust.

9. In a door control device, a pair of cylinders, a piston in each of said cylinders, a piston rod connecting said pistons, a source of operating fluid, valved means to allow fluid from the operating fluid source to pass to each of said cylinders to move said pistons, valved means to exhaust said cylinders, a source of cushioning fluid and valved means to allow fluid from the cushioning fluid source to pass to the end of each cylinder, after the other

cylinder has been exhausted and the exhaust closed and before it completes its stroke, and means to control the operation of each of said valved means.

10. In a device of the class described, a pair of cylinders, a piston in each of said cylinders, a piston rod connecting said pistons, a source of operating fluid, valved means to supply operating fluid under pressure to each cylinder to cause movement of said pistons, valved means to exhaust each cylinder, a source of cushioning fluid, valved means connecting said source of cushioning fluid and the cylinders and means to operate said last two valved means to close the exhaust after the pistons have moved through a portion of their strokes to admit fluid from said source of cushioning fluid to the end of the exhausting cylinder to damp the action of the pistons.

11. In a door operating mechanism, a cylinder, a piston therein, a source of fluid supply, means to admit fluid from said source to each end of said cylinder to move said piston in each direction, means to exhaust each end of said cylinder, a second source of fluid supply maintained at a lower pressure than the first source, means to admit fluid from said second source to the end of the cylinder which is opposite to the working end and means to actuate said last mentioned means near the end of the stroke and after the exhaust means has been closed.

12. In a door operating mechanism, a cylinder, a piston in said cylinder, a source of high pressure fluid supply, a source of low pressure fluid supply, means to exhaust said cylinder on each side of said piston, means to admit high pressure fluid to said cylinder on each side of said piston and means to admit low pressure fluid to said cylinder on each side of said piston, and means operable when said piston approaches the end of its stroke to cut off said exhaust and to admit low pressure fluid to the previously exhausted portion of said cylinder.

In testimony whereof, I hereunto affix my signature.

SIMON P. WIEGNER.