E. W. MARSHALL.

HYDRAULIC VALVE.

APPLICATION FILED JAN. 9, 1909.

940,643.

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Fig. 1.

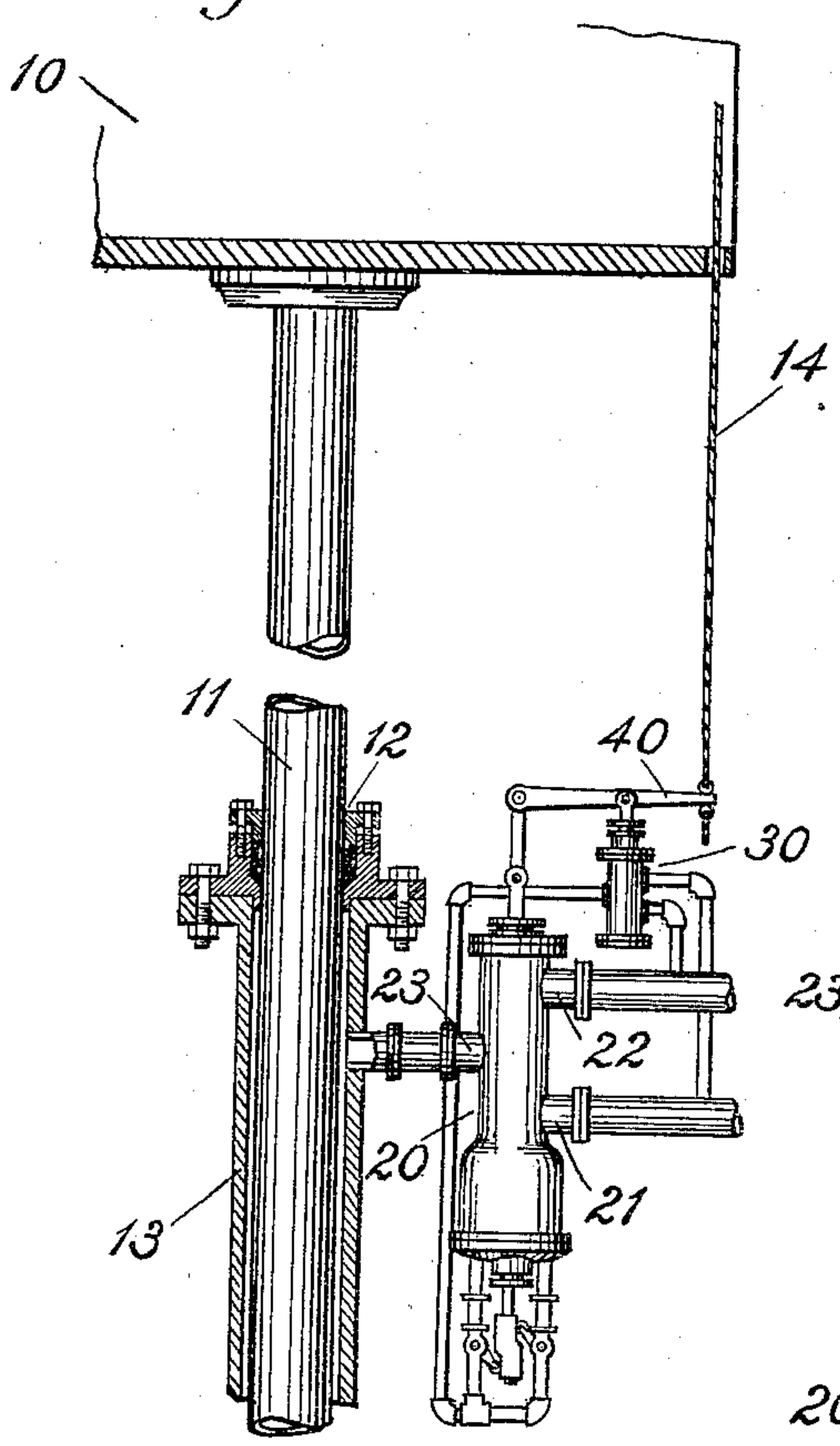


Fig. 2.

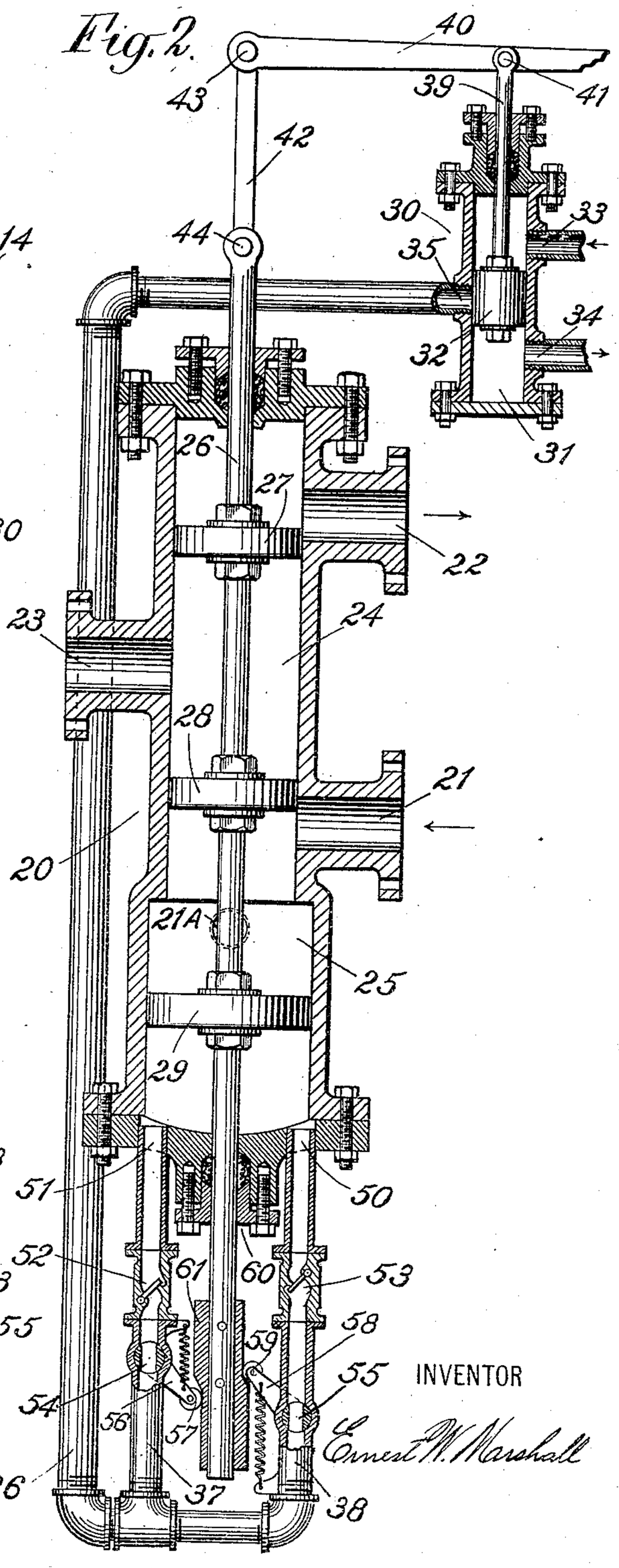
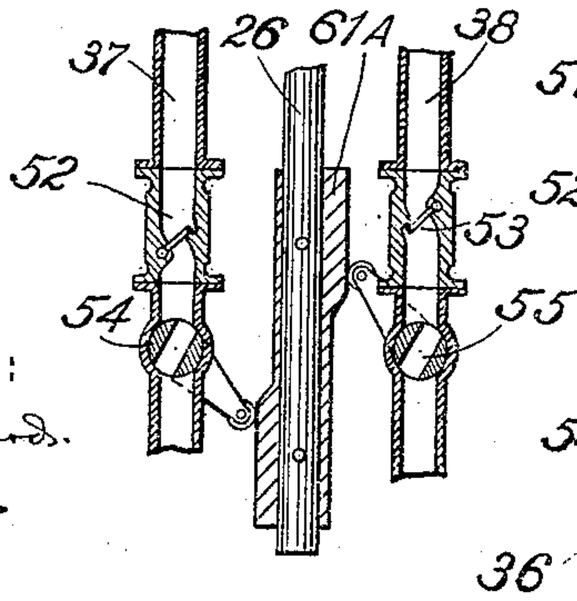


Fig. 3.



WITNESSES:

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HYDRAULIC VALVE.

940,643. Specification of Letters Patent. **Patented Nov. 16, 1909.**

Original application filed June 23, 1906, Serial No. 322,996. Divided and this application filed January 9, 1909. Serial No. 471,413.

To all whom it may concern:

Be it known that I, ERNEST W. MARSHALL, a citizen of the United States, and a resident of the city of Yonkers, in the county of Westchester and State of New York, United States of America, have invented certain new and useful Improvements in Hydraulic Valves, of which the following is a specification.

My invention relates to a hydraulic valve which is arranged to be moved in one direction to allow water or other fluid to flow into a pipe, and to be moved in the opposite direction to allow the fluid to flow out of the pipe. Its object is to provide means for regulating the rates of speed of the relative movement of the valve.

This invention was first disclosed in a copending application for patent, Serial Number 322,996, which was filed by me on the 23d day of June, 1906, and the subject-matter of the present application for patent is divided out of the above-mentioned application.

I will describe my invention in the following specification and point out the novel features thereof in the appended claims.

Referring to the drawings, Figure 1 is an elevation, partly in section, of a portion of a hydraulic elevator, with my improved valve connected thereto. Fig. 2 is an enlarged sectional elevation of my improved valve and its connected parts. Fig. 3 is a sectional view of a modification of my invention.

Like characters of reference designate corresponding parts in all of the figures.

10 designates a portion of an elevator-car, which is affixed to the top of a plunger 11. This plunger passes through a stuffing-box 12 and into a cylinder 13.

20 designates a main valve, and 30 a pilot valve. The main valve 20 comprises an inlet port 21 which is connected to a suitable source of hydraulic supply under pressure.

22 is an outlet port, and 23 a port which may be connected to the cylinder 13 as shown in Fig. 1.

The valve 20 also comprises a main valve cylinder 24, and a motor cylinder 25 of larger diameter. A valve rod or stem 26 which extends through these two cylinders has attached to it pistons 27 and 28 which are arranged to be moved in the main valve cylinder 24, and a piston 29 which is arranged to be moved in the motor cylinder 26.

21[A] designates a port which may be connected with the inlet port 21 and serves the purpose of maintaining a constant pressure supply of fluid in the space between pistons 28 and 29.

The pilot valve 30 comprises a cylinder 31 and a piston 32. An inlet port 33 and an outlet port 34 are arranged as shown above and below the piston 32 and may be connected, respectively, with the pipes leading to the ports 21 and 22 as is shown in Fig. 1. A third port 35 is arranged intermediate the ports 33 and 34 and is connected by pipe 36 and branch-pipes 37 and 38 with the motor cylinder 25.

The valve stem 39 of the pilot valve is connected to the piston 32 and extends up through a stuffing-box to a floating lever 40 to which it is pivotally connected at 41. This floating lever 40 is also connected with the stem 26 of the main valve which extends up through a stuffing-box at the top of the valve, by means of a link 42 which is pivoted at 43 to the floating lever, and at 44 to the upper end of the valve stem 26. The floating lever 40 is connected by some suitable mechanism which may be operated from the elevator-car 10, such, for example, as a hand-rope 14, which may be connected to the outer end of the floating lever and extended up to the elevator-car within reach of an operator in the car.

The parts above described are well-known in the art, and before proceeding with the description of my invention, I will point out their operation.

If an operator in a car desires the car to move upward, he will raise the outer end of the floating lever 40 by means of a hand-rope, and will thereby open a hydraulic connection between the port 35 and the exhaust port 34. The exhaust port 34 will then be connected with the motor cylinder 25 through a port 50, the branch-pipe 38 and pipe 36. The water which is in the motor cylinder 25 may therefore flow out through these pipes and the exhaust port 34. As the piston 29 in the motor cylinder has a

greater area than has the piston 28 in the main cylinder, the hydraulic pressure which enters through the ports 21 and 21[A] will cause the valve stem 26 and its connected parts to move downward. This will connect the hydraulic supply through port 21, valve cylinder 24, and port 23 to the elevator cylinder 13. The hydraulic pressure, then, in the cylinder 13, will cause the plunger 11 and the car to move upward, and this upward movement will continue as long as the pressure supply remains connected to the elevator cylinder.

The mechanical connections between the main valve and the pilot valve, which I have above pointed out, will cause the pilot valve piston 32 to be moved down again to its central position when the valve stem 26 has been moved an amount proportional to the movement which the operator has given to the lever 40 so that the pilot valve will become automatically closed after it has performed its function of causing the pistons of the main valve to be moved.

When the operator desires to stop the upward movement of the elevator he will move the floating lever 40 by means of the hand-rope in the opposite direction, until the inlet port 33 is opened to port 35 and fluid is admitted through these ports and through pipe 36, and branch-pipe 37 to the motor cylinder 25 through a port 51. The hydraulic pressure under the piston 29 will balance the pressure on the upper side of this piston and the pressure on the under side of piston 28 will cause the valve stem and its connected parts to be raised up again until the pilot-valve piston 32 again closes the port 35. A further downward movement of the pilot valve piston 32 will cause the hydraulic pressure to continue the upward movement of the valve stem 26 and its connected parts until the port 23 is connected to the exhaust port 22. This will allow the water in the elevator cylinder 13 to flow out through the exhaust port 22 and the elevator-car will then move downward. The operator may again bring the elevator-car to rest by a suitable operation of the floating lever 40.

As the parts above described and their operation are well-known in the art, a more extended description of them is not thought necessary.

In many cases it is desirable to have a valve open at a different rate than it closes. It is the purpose of this invention to provide a simple and efficient device for accomplishing this purpose and to disclose a manner in which existing valves may be arranged to perform this function. It is for this purpose that I divide the connection between the pipe 36 and the motor cylinder 35 into two paths and interpose certain devices in each of these paths.

52 designates a check-valve in the branch-pipe 37 which is so arranged that it will allow water to pass freely from the pipe 36 through branch-pipe 37 into the motor cylinder 25, but will prevent any water passing out of the cylinder through this branch-pipe 37. 53 is a similar check-valve in the branch-pipe 38 but set in the opposite direction so that it will allow water to pass freely out of the motor cylinder 25 through branch-pipe 38, but will effectively prevent any fluid entering the motor cylinder through this branch-pipe 38.

54 and 55 are rotary throttle-valves in the branch-pipes 37 and 38, respectively. An operating arm 56 projects from the valve 54 into the path of movement of a cam 61 which I will presently describe more fully.

57 in an antifriction roller which may be carried on the end of the arm 56. 58 is a similar arm projecting from the valve 55, and 59 is its antifriction roller.

The valve stem 26 is carried down through a stuffing-box 60 on the lower end of the main valve 20, and the cam 61 is affixed to it. This cam is provided with cam surfaces upon which the projecting operating arms 56 and 58 of their antifriction rollers bear. Springs may be provided as shown to hold these rollers against the surfaces of the cam.

The above parts are so arranged that when water is allowed to flow from motor cylinder 25 through branch-pipe 38 to cause the valve stem to be moved downward in the manner already described, the cam 61 will have no effect upon the rotary valve 55 which is in its open position, but the opposite surface of the cam, acting upon the roller on the end of the arm 56, will cause the valve 54 to be rotated a desired amount, dependent upon the dimensions of the cam surface, to thereby partly close the inlet passage through branch-pipe 37. The result of this will be that the valve pistons 27 and 28 may be moved quickly downward from their central position to open a passage between the supply port 21 and the port 23 so that water pressure may be quickly applied to the elevator cylinder. But when it is desired to admit water to the motor cylinder 25 to return the valve stem and its connected parts to their central positions, this can only be done through a restricted passage on account of the position which the rotary valve 54 has assumed. The pistons 27 and 28 will therefore be returned to their central position slowly. When, however, they have reached their central position, the valve 54 will again open the passage through the pipe 37 because its antifriction roller will run off of the high part of the cam 61. In a similar manner the valve stem 26 and its connected parts may be moved upward quickly from its central position, in which case the rotary valve 55 will partly close

the passage through the branch-pipe 38 so that the return of the main valve pistons must be made more slowly.

I have shown this valve connected with a hydraulic elevator of the plunger type as its use in this connection is decidedly advantageous. In such elevators, it is desirable to open the valve quickly, either for the upward or downward movement of the elevator-car, because there is a large amount of weight, the inertia of which must be overcome quickly in order to get the car into motion promptly. It is also desirable to make it impossible for an operator to close such a valve quickly because the momentum of the heavy moving parts is so great that a sudden stop of the flow of water in either direction causes the car to come to rest with a disagreeable vibrating movement. It is clear that this invention is not limited to use in conjunction with hydraulic elevators, but that it may be used in connection with any other arrangement where it is desired to have the valve move at different rates of speed from its central position than it does back to its central position.

The valve may be arranged to move away from its central position slowly and to move back to its central position quickly by a very simple change in the arrangement of parts. Such an arrangement is shown in Fig. 3, in which the cam member 61[A] is arranged to hold the two throttling valves 54 and 55 in a partially closed position when the valve stem 26 is in its central position. Whenever water is allowed to pass through throttling valve 54 and check-valve 52 into the motor cylinder 25 it is clear that the passage is restricted by the position of the throttling valve 54, and this valve will remain in this position during the upward movement of the valve stem 26 and its connected parts. But in this case, when the valve stem is raised above its central position it allows the throttle valve 55 to be opened so that when the water is discharged from the motor cylinder 25 it may flow out rapidly and allow the main valve to return to its central position quickly. In a similar manner the valve stem 26 may move downward from its central position slowly and return to its central position quickly.

What I claim is:—

1. A motor comprising a cylinder and a piston, two ports in said cylinder, a separate valve for each port arranged to partially close either of said ports independently, and means for actuating one of said valves directly by a movement of the motor piston in one direction and the other of said valves directly by the movement of the motor piston in the opposite direction.

2. A motor comprising a cylinder and a piston, a port leading to the cylinder, a check-valve associated with said port and arranged to prevent a flow of fluid through said port from the cylinder, and a valve arranged to control the flow of fluid through said port; a second port leading from the cylinder, a check-valve associated with said second port arranged to prevent the flow of fluid through said port to the cylinder, and a valve arranged to control the flow of fluid through said second port, said motor piston being actuated by a flow of fluid through said ports; and means for actuating the valve which controls the flow of fluid through one of said ports when the motor piston is actuated by the flow of fluid through the other of said ports.

3. A motor comprising a cylinder, a movable piston therein, a port leading to the cylinder, a check-valve associated with said port arranged to prevent the flow of fluid through said port from the cylinder, and a valve arranged to control the flow of fluid through said port; a second port leading from the cylinder, a check-valve associated with said second port arranged to prevent the flow of fluid through said port to the cylinder, and a valve arranged to control the flow of fluid through said second port, said motor piston being actuated by a flow of fluid through said ports, and means actuated by the movement of the movable piston to partially close the valve which controls the flow of fluid through one of said ports when the piston is actuated by the flow of fluid through the other of said ports.

4. A main valve, a motor comprising a cylinder and a piston associated therewith, two ports in the motor cylinder, a valve arranged to partially close one of said ports directly by a movement of the piston from its central position in one direction, and another valve arranged to partially close the other of said ports directly by the movement of the piston in the other direction.

5. A main valve, a motor, comprising a cylinder associated therewith, a piston-rod, a piston affixed to said rod within the cylinder, two ports in the motor cylinder, independent valves arranged to control said ports, and a cam-member affixed to the piston-rod, said cam member being arranged to partially close one of said controlling valves by the movement of the piston-rod in one direction, and to partially close the other of the controlling valves by a movement of the piston-rod in the other direction.

6. A main valve, a motor comprising a cylinder and adapted to move the main valve, a movable piston in said motor cylinder, a pilot valve for controlling the movement of the main valve and the motor, two ports in the motor cylinder through which the motor is connected with the pilot valve, an independent controlling valve for each of said ports, and mechanism connected with said movable piston arranged to partially

close the valve controlling one of the ports in the motor cylinder when the movable piston is moved from its central position in one direction, and to partially close the valve controlling the other of said ports when the movable piston is moved from its central position in the opposite direction.

7. A main valve cylinder, a motor valve cylinder in alinement therewith, a piston-rod, pistons affixed to said piston-rod within said cylinders, a pilot valve for controlling the movement of the pistons of the main valve and the motor, mechanical connections between the piston-rod and the pilot valve, two ports in the motor valve cylinder, hydraulic connections between said ports and the pilot valve, an independent controlling valve for each of said ports, and a cam member affixed to the piston-rod, said cam member being arranged to partially close by a movement of the piston-rod from its central position in one direction the valve which controls one of said ports, and to close by a movement of the piston-rod from its central position in the other direction the valve which controls the other of said ports.

8. A main valve, a piston therefor, means for moving said piston in either direction, two throttling valves, means for actuating one of the throttling valves directly by the movement of the main valve piston from its central position in one direction, and for actuating the other throttling valve directly by a movement of the main valve piston from its central position in the other direction.

9. A main valve, a motor comprising a cylinder and a piston associated therewith, a pilot valve, two ports in the motor cylinder, hydraulic connections between the pilot valve and said ports, an independent controlling valve for each of said ports, said motor piston being actuated by a flow of fluid through said ports, a cam member operated by the motor piston and arranged to partially close the valve controlling that port through which fluid must flow to cause the motor piston to close the main valve whenever the main valve piston has been moved away from its central position.

10. A main valve, a cylinder, a motor cylinder of larger diameter in alinement therewith, a piston-rod, pistons within said cylinders affixed to the piston-rod, a pilot valve for controlling the movements of said pistons, mechanical connections between the piston-rod and the pilot valve, two ports in the motor cylinder, hydraulic connections between said ports and the pilot valve, the movement of said pistons being controlled by the flow of fluid through said connections, a check-valve in each of said connections, a rotary throttling-valve in each of said connections; a cam member affixed to the piston-rod outside of said cylinders, arranged to actuate the throttling-valve in one of said connections by a movement of the piston-rod from its central position caused by a flow of fluid through the other of said connections.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST W. MARSHALL.

Witnesses:
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SIMON ABORT.