E. W. MARSHALL.

HYDRAULIC VALVE.

APPLICATION FILED JUNE 23, 1906.

910,079.

Patented Jan. 19, 1909.

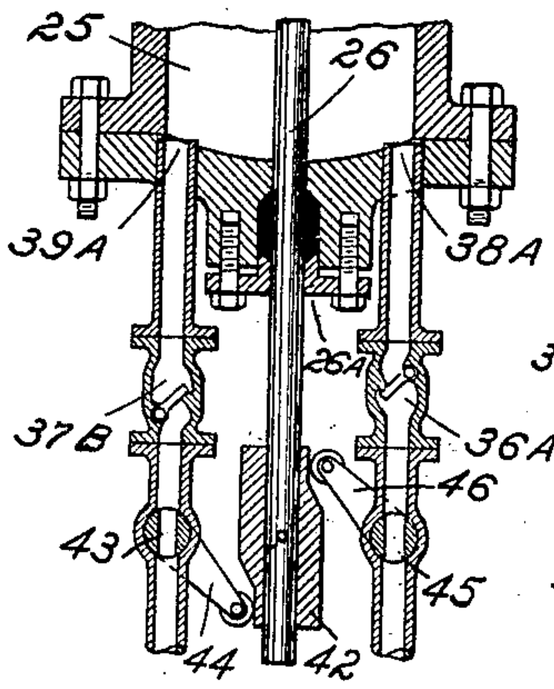

FIG. 4

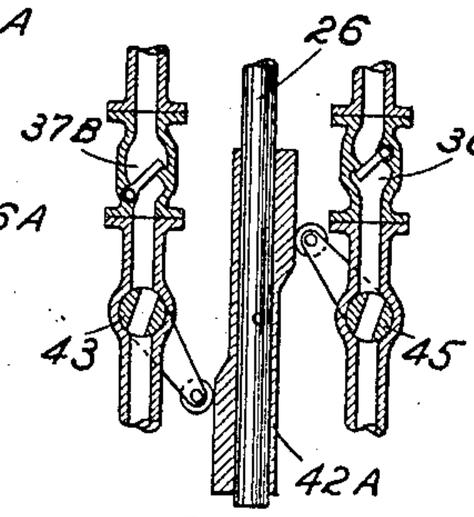

FIG. 5

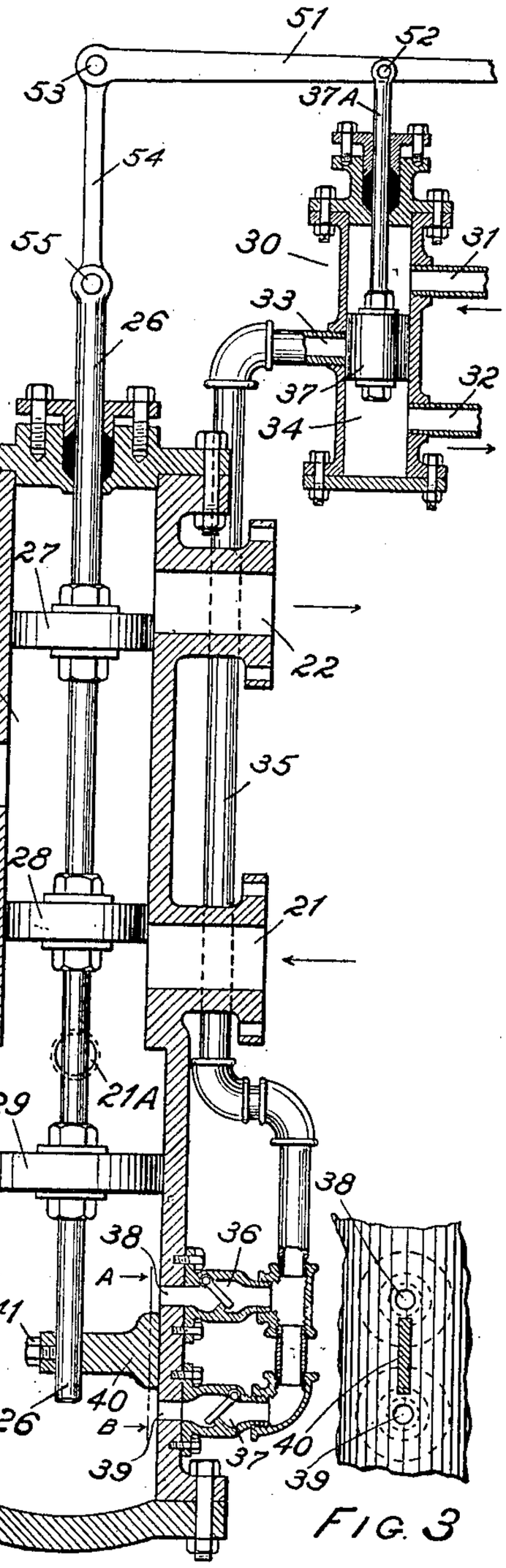

FIG. 3

FIG. 2

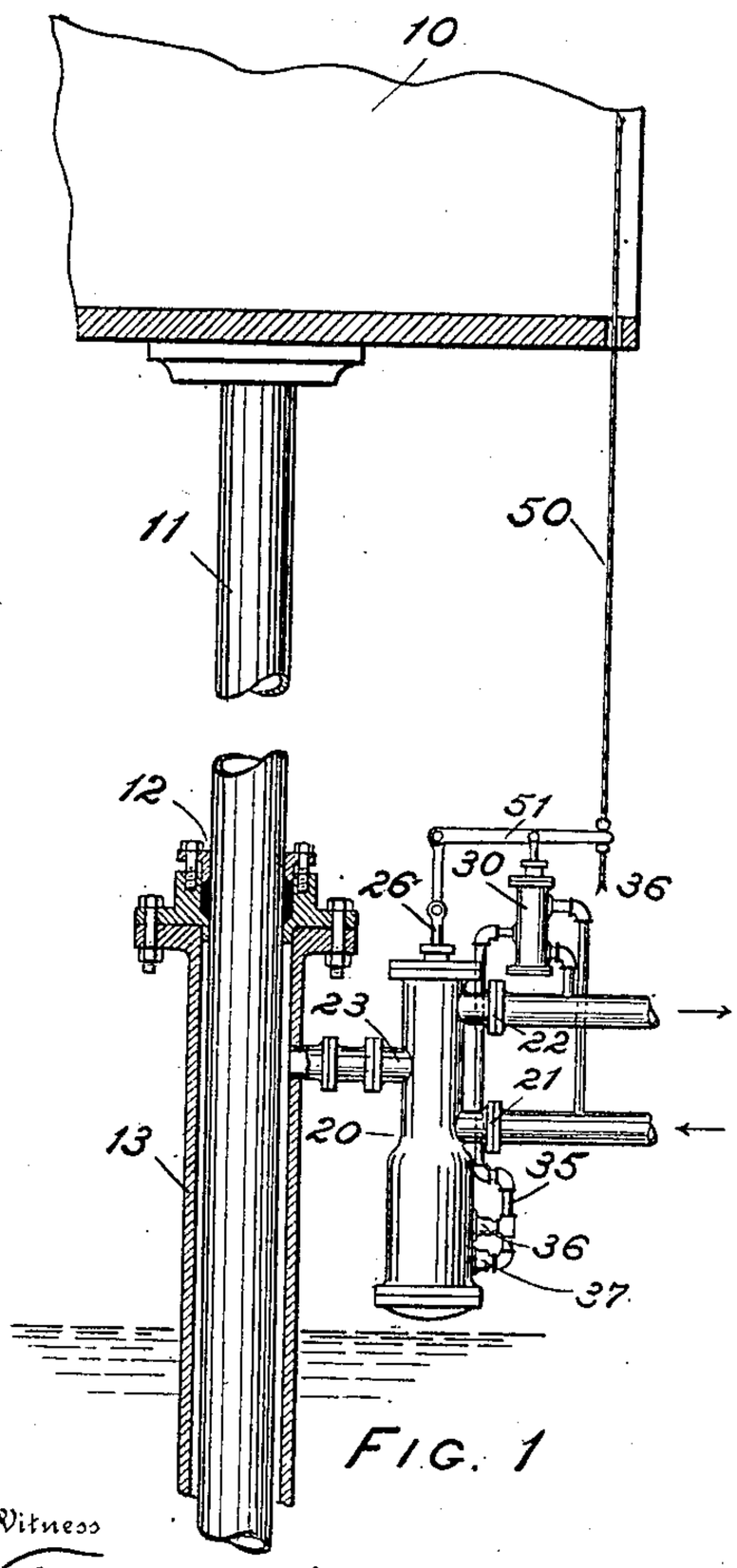

FIG. 1

Witness

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HYDRAULIC VALVE.

No. 910,079. Specification of Letters Patent. Patented Jan. 19, 1909.

Application filed June 23, 1906. Serial No. 322,996.

To all whom it may concern:

Be it known that I, ERNEST W. MARSHALL, a citizen of the United States, and a resident 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 of that type which is operated by means of a pilot valve, and its object is to improve upon structures of this kind.

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

Referring to the drawings, Figure 1 is an elevation, partly in section, 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 section of a portion of the valve shown in Fig. 2, the section being taken through the line A B of Fig. 2 and the view taken in the direction of the arrows. Fig. 4 is a sectional view of a modification of my invention. Fig. 5 is a sectional view of some of the parts shown in Fig. 4 but somewhat differently arranged.

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

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

20 designates a main valve and 30 designates 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 designates an outlet port and 23 designates 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 extends through these two cylinders 24 and 25 and 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 25. 21^{A} designates a port which may be connected to the inlet port 21 and serves the function of maintaining the constant pressure supply in the space between the pistons 28 and 29.

The pilot valve 30 comprises a cylinder 34 and a piston 37. An inlet port 31 and an outlet port 32 are arranged, as shown, above and below the piston 37, and a third port 33 is arranged intermediate these two ports, which port 33 is connected by a pipe 35 to the motor cylinder 25. The valve-stem 37^{A} of the pilot valve is connected to the piston 37 and extends up through a stuffing-box to a floating-lever 51 to which it is pivoted at 52. This floating-lever 51 is also connected to the stem 26 of the main valve which extends up through a stuffing-box at the top of the valve by a link 54 which is pivoted at 53 to the floating-lever, and at 55 to the valve-stem 26. The floating-lever 51 is connected by some suitable mechanism to be operated from the elevator-car 10; for example, a hand-rope 50 may be connected to one end of the floating-lever and extended up through 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 the car desires the car to move upward he will raise the right hand end of the floating-lever 51 by means of the hand-rope and will thereby open a hydraulic connection between the port 33 and the exhaust port 32. The exhaust port 32, as has been pointed out, is connected to the motor cylinder 25. Any water which is in the motor cylinder 25 may therefore flow out through the pipe 35 and the exhaust port 32. As the piston 29 in the motor cylinder is larger than the piston 28 in the main cylinder, the hydraulic pressure which enters through port 21 and the port 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 cylinder 13. The hydraulic pressure, then, in 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 will cause the pilot-valve piston 37 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 51, 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 51 by the hand-rope in the opposite direction until the inlet port 31 is opened to port 33, and through pipe 35 to the motor cylinder 25. The hydraulic pressure under the piston 29 will then cause the valve-stem 26 and its connected parts to be raised up again until the pilot-valve piston 37 again closes the port 33. A further downward movement of the pilot-valve piston 37 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 cylinder 13 to flow out through the exhaust port 22, and the elevator will then move downward. The operator may again bring the elevator-car to rest by a suitable operation of the floating-lever 51. 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 quickly and close slowly, and it is one of the objects of this invention to supply an efficient and simple arrangement of parts to accomplish this result. For this purpose, then, I divide the connection between the pipe 35 and the motor cylinder 25 into two paths and interpose a check-valve in each of these paths, which check-valves operate in opposite directions.

In the arrangement shown in Figs. 2 and 3 the hydraulic supply, entering into motor cylinder 25 from the pipe 35, is taken through a port 39 in the motor cylinder after passing through a check-valve 37. The hydraulic supply passing out of motor cylinder 25 into pipe 35 is taken through a port 38 and passes through a check-valve 36. A throttling-blade 40 is attached to the valve-stem 26 and held rigidly in place on the rod by means of a set-screw 41. This throttling-blade 40 is arranged to pass over and to partially close either one of the ports 38 or 39 when the main valve 20 has been opened in one direction or the other. Thus the blade 40 in conjunction with the port 38 constitutes a throttling valve for the passage into pipe 35 through check-valve 36, and in conjunction with the port 39 this blade constitutes a throttling valve for the passage from the pipe 35 through the check-valve 37 into the cylinder 25. If the main valve stem and its connected pistons have been raised by a supply of water passing through pipe 35, check-valve 37 and port 39 into motor cylinder 25, the throttling-blade 40 will have been moved thereby over port 38. This upward movement of the valve-stem and its pistons may be as rapid as desired by having the pilot valve and its connected parts of desired size. Now, when it is desired to bring the valve-stem 26 and its connected piston back again to their central position, the pilot valve may be so manipulated as to allow the water to flow out of the motor cylinder 25. It may be seen that this water can not pass out through the port 39 because the check-valve 37 is arranged to prevent any outward flow of water. Whatever water, then, passes out of the motor cylinder must pass through port 38 which is now partially closed by the throttling-blade 40. The proportional part of the area of this port 38, which is closed by the throttling-blade 40, may be as large or as small as desired, but it may be seen that as the passage for the water through this port is now restricted, the movement of the valve-stem 26 and its connected parts must be comparatively slow. After the valve-stem 26 and its connected parts have reached their central position the throttling-blade 40 will have been moved off from the port 38 so that the latter is again free to move the valve quickly in case it is desired to move it down away from its central position. Similarly, when the operator has moved the valve-stem 26 and its connected parts downward by allowing the water to flow out of the motor cylinder 25 through the port 38 and check-valve 36, the throttling-blade 40 will be moved down over the port 39 so that when it is desired to have the main valve brought back to its central position by allowing the water to flow into motor cylinder 25 it can only do so through the restricted opening which is formed by port 39 which is now partially closed by the throttling-blade 40.

In Fig. 4 I have shown a modification of my invention in which case an ordinary standard elevator-valve may be used with but slight change of construction. In this case the valve-stem 26 is carried down through a stuffing-box 26^A at the bottom of the valve, and a cam member 42 is rigidly attached to it. The two ports 38^A and 39^A may be placed in the bottom of the valve and the check-valves 36^A and 37^B interposed in the pipes leading from these ports in the manner already described. In this case, however, a rotary throttling-valve 43 is interposed in the pipe leading from the port 39^A and this valve is provided with an operating arm 44 which extends into the path of travel of the cam member 42. A similar rotary throttling-valve 45 is interposed in the pipe leading from the port 38^A and is provided with an operating arm 46 which extends into the path of travel of the cam member 42. In this case, if the valve-stem 26 and its connected parts are moved upward by water passing through port 39^A the cam member 42, acting upon operating arm 46, will rotate the valve 45 and cause it to partially close the passage in the pipe lead-

ing from port 38A. Consequently, when it is desired to allow the water to run out of the motor cylinder 25 through port 38A and its connected pipes the water can escape but slowly, because the passage is restricted by the throttling-valve 45. The upward movement of the valve-stem 26 and its connected parts may then be a rapid one and its downward movement considerably slower. This holds good only until the valve-stem 26 has reached its central position and its connected pistons have closed the main valve. When the valve-stem 26 is in its central position both of the throttling-valves 43 and 45 are open so that the valve may be moved quickly in either direction. After it has been moved in either direction, however, its return to the central position will be comparatively slow. I have shown this valve connected to 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 quickly. It is also desirable to make it impossible for an operator to close such a valve too quickly because the momentum of the 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 a different rate 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. 5 in which the cam member 42A is arranged to hold the two throttling-valves 43 and 45 in their partially closed position when the valve-stem 26 is in its central position. Whenever water is allowed to pass through throttling-valve 43 and check-valve 37B into the motor cylinder 25 it is clear that the passage is restricted by the position of the throttling-valve 43, and it will remain in this restricted position during the upward movement of the valve-stem 26 and its connected parts; but in this case, when the valve-stem 26 is raised above its central position it allows the throttling-valve 45 to be opened so that when the water is discharged from the motor cylinder 25 it will flow out rapidly and allow the main valve to return to its central position quickly. In a similar manner the valve-stem 26 may be moved downward from its central position slowly and returned to its central position quickly.

I have illustrated two modifications of my invention to show that it is not confined to any particular construction, but that it may be made in various forms.

What I claim is:—

1. A motor comprising a cylinder and a piston, two ports in said cylinder, and means for partially closing one of said ports directly by a movement of the motor piston in one direction and for closing the other of said ports directly by a 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 the flow of fluid through said port from the cylinder, a second port leading from the cylinder, a check-valve associated with said second port and arranged to prevent the flow of fluid through said port to the cylinder, said motor piston being actuated by a flow of fluid through said ports; and means for partially closing 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 and arranged to prevent the flow of fluid through said port from the cylinder, a second port leading from the cylinder, a check-valve associated with said second port and arranged to prevent the flow of fluid through said port to the cylinder, said motor piston being actuated by the flow of fluid through said ports, and a throttling-blade connected to the movable piston and arranged to partially close either of said ports when said 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, and means for partially closing one of said ports directly by a movement of the piston from its central position in one direction, and for partially closing the other of said ports directly by a movement of the piston in the other direction.

5. A main valve, a motor comprising a cylinder associated therewith, a piston-rod, a piston on said rod within said cylinder, two ports in the motor cylinder, and a throttling-blade attached to the piston-rod, said blade being arranged to partially close one of said ports by a movement of the piston-rod in one direction and to partially close the other of the ports by a movement of the piston-rod in the other direction.

6. A main valve, a motor comprising a cylinder and a piston associated therewith, a pilot valve, two ports in the motor cylin-

der, said ports being connected with the pilot-valve, and means in the motor for partially closing one of said ports directly by a movement of the motor piston from its central position in one direction, and for partially closing the other of said ports directly by a movement of the motor piston in the opposite direction.

7. A main valve, a motor comprising a cylinder and adapted to move the main valve, a movable piston in said motor, 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, and a throttling-blade connected with said movable piston, said blade being arranged to partially close 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 other of said ports when the movable piston is moved from its central position in the opposite direction.

8. A main valve cylinder, a motor cylinder in alinement therewith, a piston-rod, pistons in said cylinders, said pistons being attached to the piston-rod, 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 cylinder, a hydraulic connection between said ports and the pilot valve, and a throttling-blade attached to the piston-rod, said blade being arranged to partially close one of said ports by a movement of the piston-rod from its central position in one direction, and to partially close the other of the ports by a movement of the piston-rod from its central position in the other direction.

9. A valve, a motor therefor, two passages to said motor, and means directly attached to the valve and actuated by the movement of the same for changing but not closing the size of the passages.

10. A valve comprising a piston, a motor therefor, two passages to said motor and means directly attached to the piston and actuated by a movement of the same for changing but not closing the size of one of the passages by a movement of the piston from its central position in one direction, and for changing but not closing the size of the other of the passages by a movement of the piston from its central position in the opposite direction.

11. 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, said motor piston being actuated by a flow of fluid through said ports, a throttling-blade operated by the motor piston and arranged to partially close that port through which fluid must flow to cause the motor piston to close the main valve whenever the main valve has been moved away from its central position.

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

ERNEST W. MARSHALL.

Witnesses:
FRANCIS B. WOOD,
ELLA TUCH.