

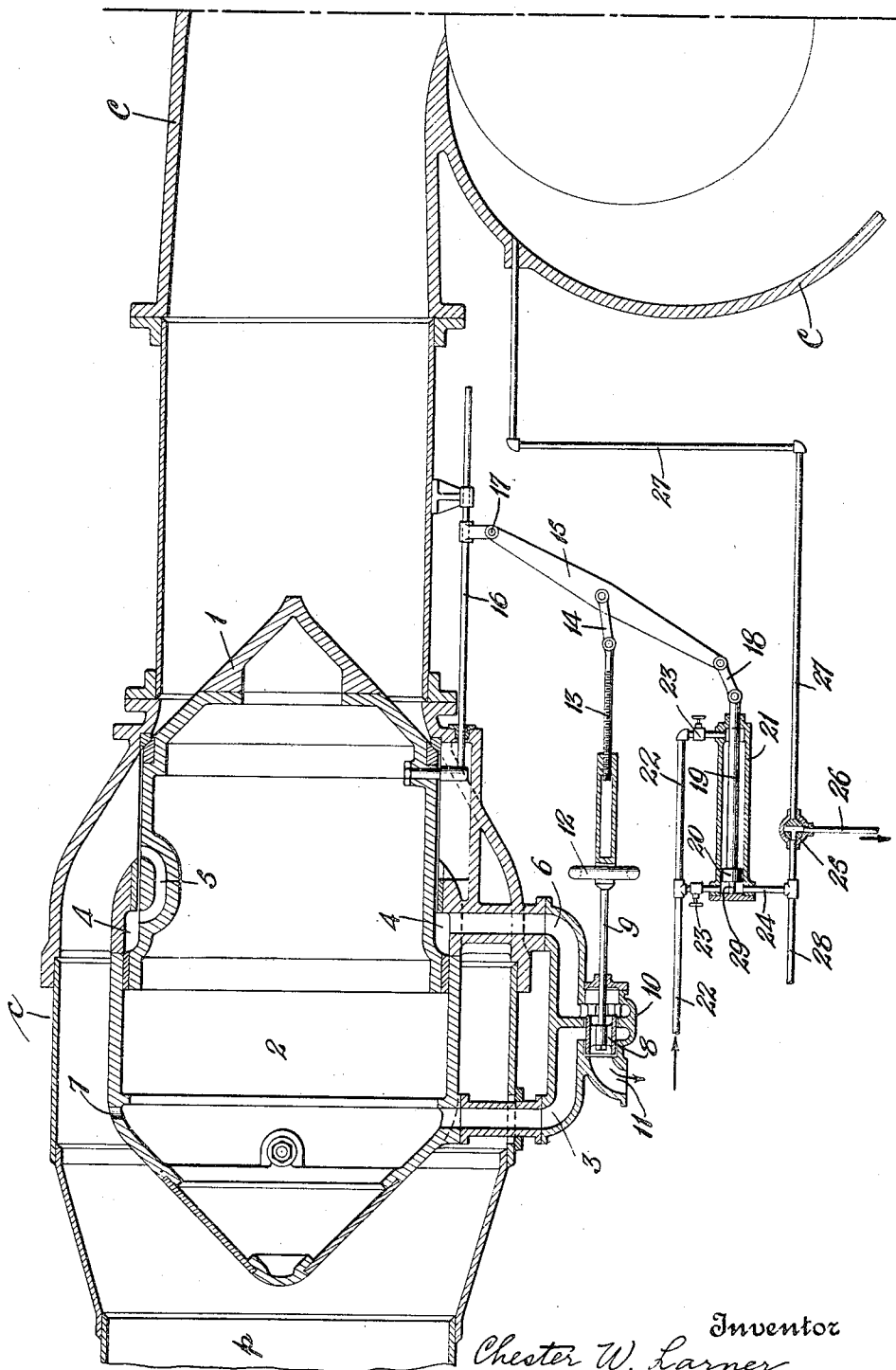
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C. W. LARNER

VALVE

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VALVE.

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To all whom it may concern:

Be it known that I, CHESTER W. LARNER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Valves, of which the following is a specification:

This invention relates to plunger valves for large hydraulic mains and the like and particularly to the control means for the operation of such valves. The object of the invention is to provide a valve in which the operating mechanism is combined with a hydraulic operating means which may be actuated from a distance and is adapted to control the movement of the valve at a predetermined rate and close it in an emergency such as the breaking of the conduit.

In the accompanying drawings illustrating the invention the valve installation is shown in diagrammatic plan view.

The flow is received from penstock *p* and passes through the valve and conduit connections *c* to the turbine casing *C*, the flow being controlled by the valve plunger 1 which is opened by exhausting pressure from chamber 2 through port 3, the pressure of the line being admitted meanwhile to chamber 4, at first through by-pass 5 and later by leakage through the clearance space around the plunger. Plunger 1 is closed by exhausting pressure from chamber 4 through port 6, the pipe line pressure being simultaneously admitted to chamber 2 through port 7.

The valve which controls the exhaust of pressure through ports 3 and 6 consists of a cylindrical sleeve 8 connected by ribs to a stem 9 and enclosed in a housing 10 with an outlet 11 leading to a drain or some region of relatively low pressure. In the position shown the sleeve valve 8 closes port 3 and opens port 6 to the exhaust. When sleeve valve 8 is moved to the right it cuts off port 6 and exhausts port 3.

Stem 9 has a hand wheel 12 attached to it and a threaded telescopic extension 13 connected by a link 14 to a floating lever 15. By revolving the hand wheel 12, the connection between the floating lever 15 and the sleeve valve 8 may be lengthened or shortened, thus effecting a movement of sleeve valve 8.

Plunger 1 has a rod 16 attached to it and

projecting through the body of the valve. This rod 16 moves in an axial direction with the plunger 1 and is connected at 17 to floating lever 15. The other end of the floating lever is connected by a link 18 and a piston rod 19 to a piston 20 in a stationary cylinder 21 mounted on the foundation which supports the main valve, or in some other convenient manner.

Each end of cylinder 21 is connected by a pipe 22 to the conduit in which the main valve is located so that pipe 22 supplies full conduit pressure to each end of cylinder 21. The connections are provided with valves 23 which may be used to control the rate at which conduit pressure is supplied.

The left-hand end of cylinder 21 is provided with an outlet 24 connected through a three-way cock 25 to two pipes 26 and 27. Pipe 26 leads to a drain or some region of relatively low pressure and pipe 27 connects to some point in the conduit beyond the main valve such as the turbine casing shown.

The figure shows the plunger 1 in the closed position and cock 25 in the position for closing plunger 1 or for holding it in the closed position. The pressure in the left-hand end of cylinder 21 is exhausted to the atmosphere through pipes 24 and 26, the pressure admitted through pipe 22 being throttled by means of valve 23.

To open plunger 1, cock 25 is set in a neutral position blanking all of the ports. This cuts off the exhaust through pipe 24 and permits pressure to build up through pipe 22 and valve 23. The pressure in both ends of cylinder 21 will be thus equalized but on account of the exposed area of stem 19 the forces applied to piston 20 are unbalanced and it moves to the right. This movement of piston 20 is communicated through floating lever 15 to sleeve valve 8, cutting off port 6 and opening port 3, thus causing plunger 1 to move toward the open position. As plunger 1 moves to the left, however, its motion is communicated through floating lever 15 to sleeve valve 8, producing a movement of the latter in the reverse direction and tending to stop the movement of plunger 1. It is thus seen that plunger 1 will move only as fast as piston 20 moves and the rate of motion of the latter may be controlled by manipulating valves 23.

The closing movement of plunger 1 is ac-

complied by setting cock 25 in the position shown, the pressure being thus exhausted from the left-hand end of cylinder 21, producing a left-hand movement of piston 20 and opening port 6 and closing port 3.

The same effect may be accomplished from a remote point of control by means of a cock similar to 25 placed in an outlet 28.

Piston 20 is provided with an extension 29 to prevent its covering the pipe connections at the left-hand end of cylinder 21 and the latter is reduced in size at the right-hand end to provide a stop for piston 20 to prevent its covering the pipe connection at this end.

With cock 25 set in the neutral position piston 20 will be held against the stop at the right-hand end of cylinder 21 by the conduit pressure applied over the exposed cross-sectional area of stem 19. Under this condition the end of floating lever 15 which is connected to stem 19 becomes a fixed point and plunger 1 may be operated by screwing stem 9 on stem 13, lengthening or shortening this connection to valve 8 and producing the same results as with the hydraulic control above described. As long as cock 25 is neutralized cylinder 21 is inoperative after piston 20 has seated against the stop at the right-hand end of the cylinder.

Plunger 1 may be set for automatic closing as a result of a break in the system beyond the valve and the resultant drop of pressure, by setting cock 25 to connect pipe 24 with pipe 27. In this case, when the pressure in pipe 24 drops sufficiently to overcome the differential pressure on piston 20 the latter will move toward the left-hand position, thus setting sleeve valve 8 to close plunger 1. Piston 20 will move as rapidly as pressure is admitted through valve 23.

With cock 25 set for automatic closing piston 20 will be locked at the right-hand end of cylinder 21 in the same manner as if cock 25 were neutralized, and the hand control by means of hand wheel 12 will be equally effective.

In the apparatus of this invention the hand control and hydraulic and automatic operation of the auxiliary valve 8 are combined together in simple and effective manner, the restoring lever being used as a connecting part between the various mechanisms. The main valve may be held fixed in open or closed or any intermediate position and the automatic closing means is always in effective cooperation with the operating means except when the main valve is being intentionally closed by the setting of valve 25.

While this invention has been illustrated in connection with a specific embodiment in a particular installation it is not con-

fined thereto but is intended to cover such variations therefrom as fall within the scope of the appended claims.

I claim:—

1. In a system for controlling the flow of a fluid the combination with a conduit, of a main valve for controlling the flow through said conduit, fluid pressure means for operating said valve, and control means for said fluid pressure operating means comprising a control valve, hand operated means for moving said control valve, fluid pressure operated means for moving said control valve, and a restoring mechanism connecting said hand operated means and the fluid pressure moving means to said main valve.

2. In a system for controlling the flow of a fluid the combination with a conduit, of a main valve for controlling the flow through said conduit, fluid pressure means for operating said valve, a control valve for said fluid pressure means, and means for operating said control valve comprising a piston member a source of continuous fluid pressure therefor, means for controlling said fluid pressure to move said piston member and hold it in desired position and restoring mechanism connecting said piston member to said main valve.

3. In a system for controlling the flow of a fluid the combination with a conduit, of a main valve for controlling the flow through said conduit, fluid pressure means for operating said valve, a control valve for said fluid pressure means, and means for operating said control valve comprising a piston member a source of continuous fluid pressure therefor, means for controlling said fluid pressure to move said piston member and hold it in desired position including means for limiting the rate of movement of said control valve and restoring mechanism connecting said piston member to said main valve.

4. In a system for controlling the flow of a fluid the combination with a conduit, of a main valve for controlling the flow through said conduit, fluid pressure means for operating said valve, and control means for said fluid pressure operating means comprising a control valve, hand operated means for moving said control valve, fluid pressure operated means for moving said control valve, restoring mechanism, and means for automatically actuating said fluid pressure operated moving means to close the main valve upon the occurrence of abnormal conditions.

5. In a system for controlling the flow of a fluid the combination with a conduit, of a main valve for controlling the flow through said conduit, fluid pressure means for operating said valve by the conduit pressure, a control valve, for said fluid pres-

sure means, means for operating said control valve comprising fluid pressure means to move said control valve and hold it in desired position and separate normally in-
5 operative means for automatically actuating said last named means to close the main valve upon occurrence of abnormal conditions.

10 6. In a system for controlling the flow of fluid through a conduit the combination with a main valve, of control means therefor comprising restoring mechanism and a control valve and fluid pressure operating means for said control valve said fluid pressure operating means being connected to

said conduit to automatically actuate the main valve upon occurrence of abnormal conditions.

7. In a valve for a conduit a differential restoring mechanism connected to the main 20 valve, an auxiliary valve for controlling the main valve connected to said restoring mechanism, fluid pressure operated means adapted to cooperate with said auxiliary valve through the medium of said restoring 25 mechanism, and means for automatically actuating said fluid pressure operating means upon the occurrence of abnormal conditions in said conduit.

CHESTER W. LARNER.