

(No Model.)

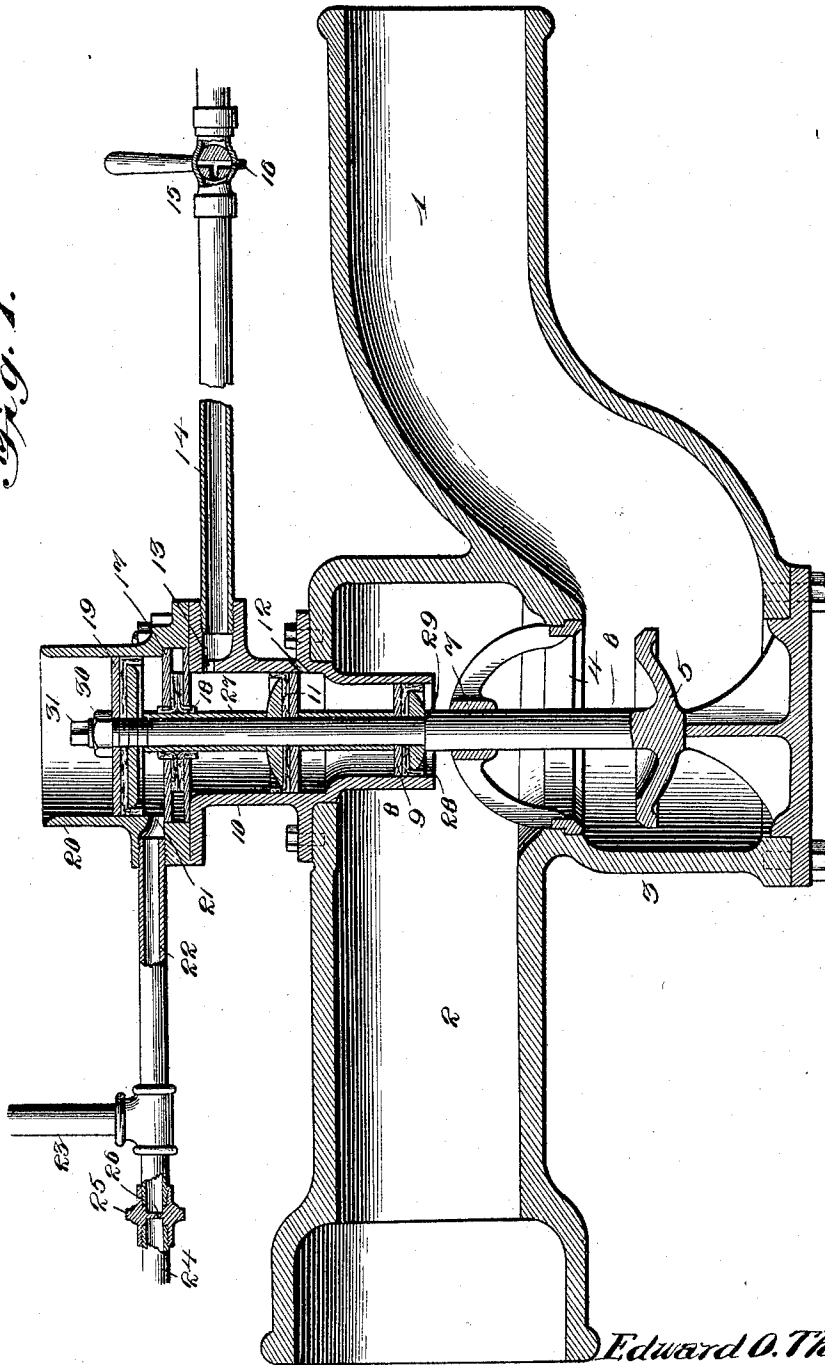
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E. O. THOMPSON.
FLUID PRESSURE REGULATOR.

No. 584,799.

Patented June 22, 1897.

Fig. 1.



Inventor
Edward O. Thompson

Witnesses
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By *his* Attorneys,

C. A. Snow & Co.

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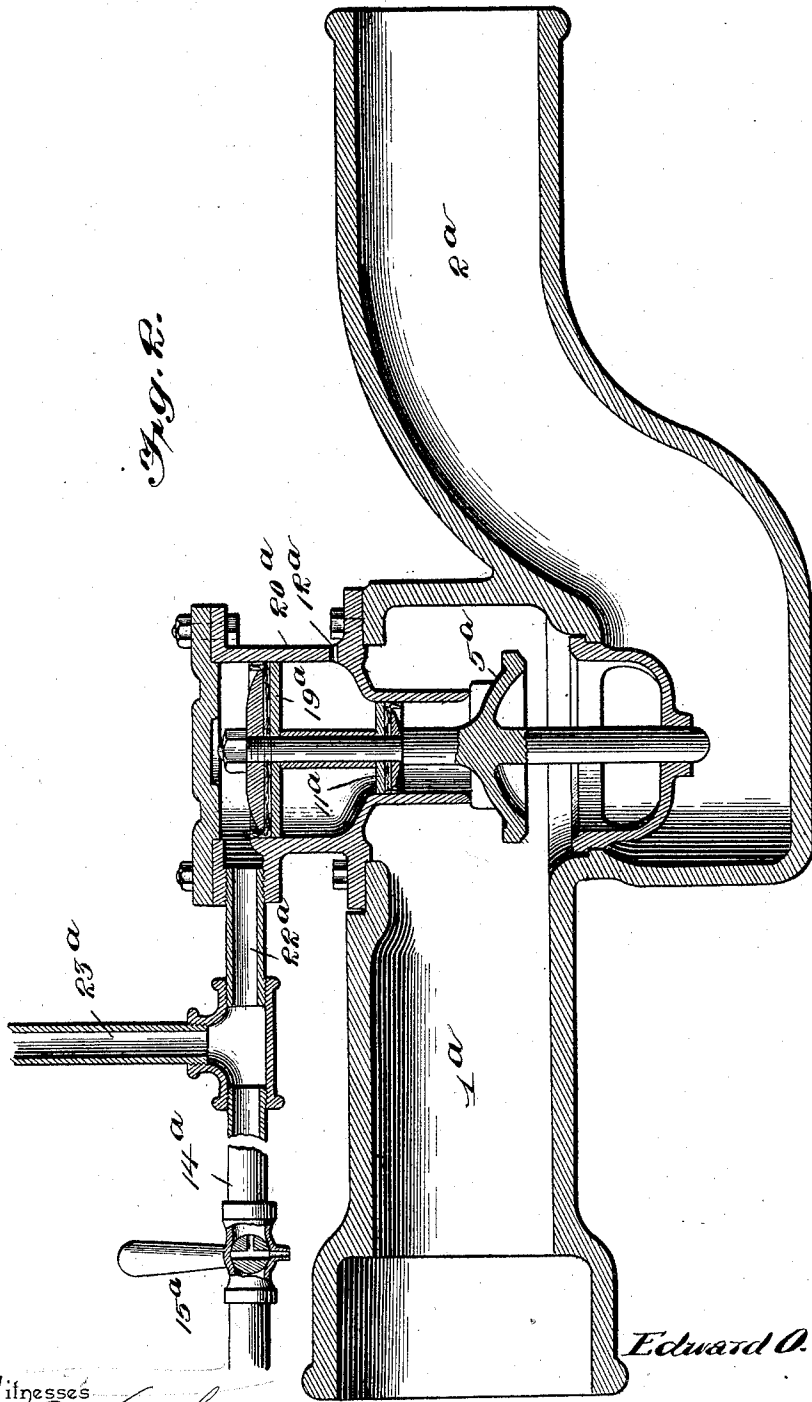


Fig. 2.

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By *his* Attorneys,

C. Snow & Co.

UNITED STATES PATENT OFFICE.

EDWARD O. THOMPSON, OF THOMASVILLE, GEORGIA, ASSIGNOR OF ONE-HALF TO E. M. MALLETTE, OF SAME PLACE.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 584,799, dated June 22, 1897.

Application filed July 23, 1896. Serial No. 600,294. (No model.)

To all whom it may concern:

Be it known that I, EDWARD O. THOMPSON, a citizen of the United States, residing at Thomasville, in the county of Thomas and State of Georgia, have invented a new and useful Hydraulic-Pressure-Regulating Valve, of which the following is a specification.

My invention relates to pressure-regulating devices particularly adapted to control hydraulic pressure, as in city water-service, and has for its object to provide a simple and efficient construction and arrangement of parts whereby the position of a regulating-valve is controlled by variations of pressure applied to a piston or pistons carried by the valve-stem, modified by stand-pipe and supply or street-main pressure, to which a secondary or balancing piston is exposed, and also modified by variable pressure applied by overflow from the stand-pipe or tank.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a sectional view of a regulating-valve constructed in accordance with my invention. Fig. 2 is a similar view showing a modified arrangement of parts whereby the regulating-valve is normally held open by supply-main and stand-pipe pressure.

Similar numerals of reference indicate corresponding parts in both figures of the drawings.

In the construction illustrated in Fig. 1 the supply or street main 1 is in communication with a service-pipe 2, leading to a stand-pipe or tank, (not shown,) said communication between the main and service pipe being through a valve-casing 3, having a valve-seat 4. The downwardly-opening regulating-valve 5 is provided with a stem 6, extending upwardly through the valve-seat and a suitable guide 7, arranged thereabove.

Arranged concentrically with the valve-stem above the guide 7, and having an open inner end which is in communication with the valve-casing, is a cylinder 8, in which operates a valve-closing piston 9, and in communication with the outer end of the cylinder 8

and also concentric with said valve-stem is a cylinder 10 of larger diameter than the cylinder 8 and inclosing a valve-opening piston 11. A vent 12 is formed in the wall of the cylinder 10 below the plane of the piston 11 to allow the escape of air between the pistons 9 and 11 during the downward movement thereof, and also in communication with said cylinder 10 above the plane of the piston 11 is a port 13, with which communicates a pressure-supply conductor 14, adapted to extend to a pumping-station (not shown) and provided at any suitable point with a waste-cock 15, having a relief or drip opening 16, whereby when the cock is closed to prevent the communication of pressure from the pumping-station to the cylinder 10 the relief perforation is arranged in open communication with said cylinder to allow the contents of the latter to escape slowly, for a purpose hereinafter explained.

The valve-stem 6 extends above the upper end of the cylinder 10 through a partition 17, provided with suitable packing 18, and is fitted at its extremity with a piston 19, which operates in a cylinder 20 of larger diameter than the cylinder 10, and in communication with a port 21 in the side of this cylinder is arranged a waste-pipe 22, having a branch 23, which extends to the overflow of the stand-pipe (not shown) to convey overflow-pressure to the interior of the cylinder 20, and also provided with a second branch 24, fitted with a union 25, in which is formed a drip or relief perforation 26, adapted to allow the gradual exhaust of the contents of the cylinder 20 after the supply through the overflow-pipe 23 has ceased.

The pistons, which are of different areas and are increased successively in size from the inner toward the outer end of the regulating valve-stem, are held in place upon said stem by means of interposed thimbles or sleeves 27, a washer 28, which is interposed between the piston 9 and a contiguous shoulder 29 of the stem, and a nut 30, which is threaded upon the stem above the plane of the piston 19. Thus by loosening the nut 30 the valve-stem may be turned to regrind the valve and seat, without turning the pistons, a suitable tool for turning said stem being

adapted to be applied to the wrench-seat 31, with which the upper extremity of the stem is provided.

From the above description it will be seen that the piston 9 is exposed to supply-main and stand-pipe pressure, which is approximately constant, said piston being of less area than the valve 5 in order to allow said valve to be unseated by stand-pipe pressure when the pressure in the supply-main falls below the pressure in the stand-pipe a number of pounds corresponding with the difference in areas between the valve and said piston. In order to unseat the valve, I apply "valve-opening pressure" to the upper side of the piston 11, and inasmuch as the piston 11 is of greater area than the piston 9 it will be seen that the same or equivalent pressures applied to the two pistons will unseat the valve, but that the reduction of pressure in the cylinder 10 will allow the valve to be re-seated by the "valve-seating pressure" in the supply-main or stand-pipe. In operation this reduction of pressure upon the piston 11 is attained by closing the waste-cock 15, and thereby opening the vent 16, and inasmuch as the vent is of small capacity the exhaust from the cylinder 10 will be slow, and hence the regulating-valve will be closed without "water-hammer."

Valve-closing pressure may also be applied to the piston 19 by overflow from the stand-pipe introduced through the overflow-pipe 22, and inasmuch as the area of the piston 19 is greater than that of the piston 11 it will be seen that even when the latter is exposed to valve-opening pressure the valve may be closed in opposition thereto. When the pressure applied through the overflow-pipe ceases, the contents of the cylinder 20 will escape through the drip or relief-port 26, thus relieving the pressure in the cylinder and allowing the valve to be opened by the pressure in the cylinder 10, provided the waste-cock 15 remains open. Thus the valve is adapted to be closed by street-main and stand-pipe pressure, which is approximately constant, and may be opened in opposition thereto by valve-opening pressure applied to the piston 11, but while the piston 11 is exposed to valve-opening pressure the valve may be closed by overflow-pressure applied to the piston 19, which is of larger area than either of the other pistons. On the other hand, while the valve is normally held closed by street-main and stand-pipe pressure it is adapted to be opened by stand-pipe pressure when the street-main pressure falls a given amount below the stand-pipe pressure owing to the excess of stand-pipe pressure upon the unbalanced portion of the valve, the balancing piston 9 being of smaller area than the valve 5 in order to provide for the opening of the valve by excess of stand-pipe pressure.

In the construction illustrated in Fig. 2 I also employ a plurality of pistons of different areas, the smaller valve 11^a being exposed

to piston-opening pressure supplied by the street-main and stand-pipe, the valve 5^a being upwardly or outwardly opening in contradistinction to the valve 5 of the form illustrated in Fig. 1, which is upwardly or inwardly closing, the term "inwardly" being adopted to designate movement toward the stand-pipe and the term "outwardly" to movement toward the street-main.

In the construction illustrated in Fig. 2 the valve-opening or balancing piston 11^a is of less area than the valve 5^a, and attached to the valve-stem is a valve-closing piston 19^a of larger area than the piston 11^a and operating in a cylinder 20^a, said cylinder being provided between the planes of the pistons with a vent 12^a to allow the escape of the air therebetween during the downward movement of the pistons.

Arranged in communication with the cylinder 20^a above the plane of the piston 19^a is a pipe or conveyer 22^a, provided with a branch 23^a, forming a stand-pipe overflow-pipe, and also provided with a branch 14^a in communication with a pumping-station and provided with a waste-cock 15^a, constructed and adapted to operate substantially as described in connection with Fig. 1.

The piston 11^a is constantly exposed to valve-opening pressure, but when overflow or pumping-station pressure is applied to the piston 19^a the valve is closed in opposition to this opening-pressure, and is so held until relieved of valve-closing pressure unless the street-main pressure, which is applied to the pipe 1^a, falls below the stand-pipe pressure applied to the pipe 2^a, when the valve will be opened by stand-pipe pressure applied to the inner or lower surface of the valve in opposition to valve-closing pressure applied to the piston 19^a. The vent of the waste-cock 15^a forms a relief for the pressure in the cylinder 20^a when the pumping-station or overflow pressure ceases, and thus provides for the reopening of the valve by street-main and stand-pipe pressure.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. A regulating-valve exposed at opposite sides to street-main and stand-pipe pressures and carrying a balancing-piston arranged in a cylinder exposed to one of said pressures and adapted to balance a portion of the pressure applied to one side of the valve, whereby the valve is yieldingly held in its normal position by the excess of pressure applied to the unbalanced side of the valve, and means for moving the valve in opposition to the unbalanced pressure, substantially as specified.

2. A regulating-valve exposed at opposite sides to stand-pipe and street-main pressures and carrying a balancing-piston arranged in

a cylinder exposed to one of said pressures, said piston being of less area than the valve and adapted to balance a portion of the pressure applied to one side of the latter, whereby the valve is normally held open by the excess of pressure applied to the unbalanced side of the valve and adapted, when seated, to be unseated by the reduction of pressure upon that side of the valve toward which it moves to open, substantially as specified.

3. A regulating-valve exposed at opposite sides to street-main and stand-pipe pressures and mounted to open in opposition to street-main pressure, and a piston carried by the valve-stem and exposed to one of said pressures to balance a portion of the pressure applied to the contiguous side of the valve and cause the seating of the valve by the excess of pressure applied to the unbalanced side thereof, whereby the valve is unseated by the reduction of street-main pressure, substantially as specified.

4. A regulating-valve exposed at opposite sides to stand-pipe and street-main pressures, a plurality of pistons of different areas carried by the valve-stem and operating in unconnected cylinders, the piston of least area being exposed to stand-pipe pressure and being of less area than the valve, means for applying valve-opening pressure to a second piston of greater area, and for regulating the rapidity of discharge from the cylinder in which said piston of greater area operates, and means for applying overflow-pressure to a third piston of greater area than the second piston, said means including a vent or drip of less capacity than the supply, whereby the pressure is relieved when the supply ceases, substantially as specified.

5. A regulating-valve mounted for inward closing and exposed at opposite sides to stand-pipe and street-main pressures, a plurality of pistons of different areas carried by the valve-stem and arranged in independent coaxial

cylinders, the piston of least area being exposed to stand-pipe pressure to balance a portion of the stand-pipe pressure applied to the contiguous side of the valve, the second piston of intermediate area being adapted to be exposed to valve-opening, or pumping-station, pressure, means being provided for gradually reducing the valve-opening pressure to avoid water-hammer, and the piston of greatest diameter being exposed to overflow-pressure, and permanently-open means for relieving said pressure upon the cessation of overflow, substantially as specified.

6. A regulating-valve exposed at opposite sides to street-main and stand-pipe pressures, coaxial cylinders of different cross-sectional areas through which the stem of said valve extends, the first piston of least area being exposed at its lower side to stand-pipe pressure, the second piston of intermediate area being exposed at its upper side to valve-opening or pumping-station pressure, means being provided for relieving said pressure, and the third piston of greatest area being exposed at its lower side to overflow-pressure, means being provided for relieving said pressure when the overflow ceases, the cylinders of the second and third named pistons being separated by an interposed partition, and the pistons being fitted loosely upon the valve-stem, held at the proper intervals by interposed spacing sleeves or thimbles and secured in place by a single nut engaging the extremity of the stem, whereby the pistons may be loosened to allow independent rotation of the valve, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

EDWARD O. THOMPSON.

Witnesses:

E. DREYER,

W. H. ROCKWELL.