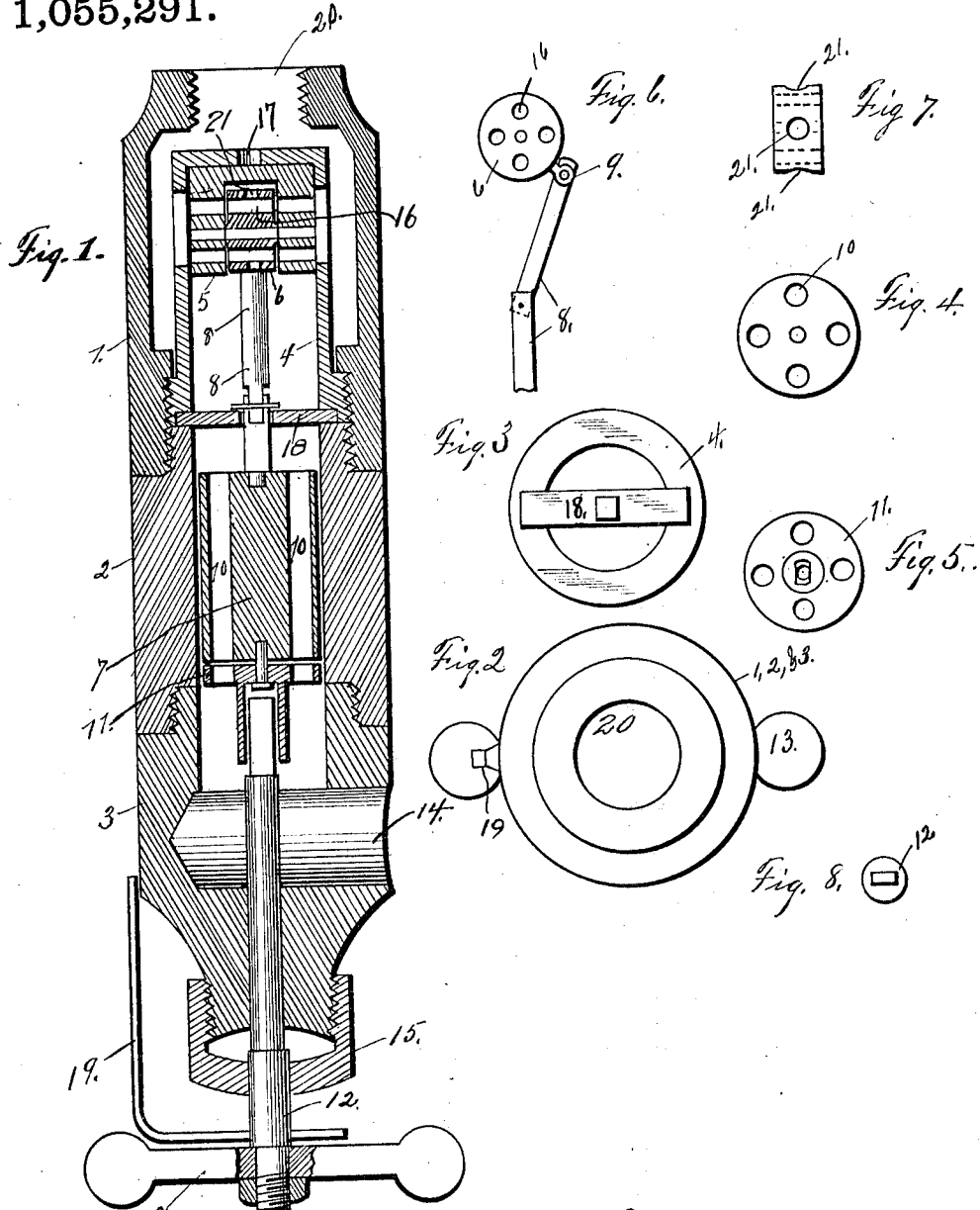


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VOLUMETRIC VALVE.
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Patented Mar. 4, 1913.

1,055,291.



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1,055,291.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM K. RICHARDSON, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented a certain new and useful Volumetric Valve, of which the following is a specification.

This invention relates to a valve, designed to regulate the volume of a liquid or fluid, flowing to, or from a conduit or pipe, by utilizing the energy of flow and gravitation to operate the mechanism of the valve.

The object of this invention is the production of a valve, that will pass a desired uniform volume, irrespective of the pressure under which the fluid may be when admitted to the valve, or the discharge pressure tailing from the valve.

Another object of this invention is to provide a valve of this character, that is susceptible of adjustment for the control of different volumes.

A further object is the production of a controlling valve that will indicate the quantity of the water passing through the valve in an increment of time.

With this object in view, this invention consists in certain novel features of construction, and the utilization of the force of natural agencies for their operation as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawings, in which:

Figure 1, is a vertical cross-section of the apparatus. Fig. 2, is a plan view looking down. Fig. 3, is a plan view of the lower end of the controlling valve cylinder. Said figure also shows the guide block in position. Fig. 4, is end view of the plunger. Fig. 5, is bottom end view of set valve. Fig. 6, is end view of that part of the controlling valve indicated by the numeral 6 in Fig. 1, also showing shackle-rod attached. Fig. 7, is another view of Fig. 6, showing entry ports 21 to passages 16. Fig. 8, is a plan view of the upper end of stem 12.

Referring now to the drawing in which like reference characters indicate corresponding parts throughout the several views, 1, 2, and 3, indicate the three distinct parts constituting the outer casing of the apparatus. Within member 1, is screwed the cylinder 4, said member 4, containing the valve seat 5, and valve 6. Within member 2, operates the plunger 7, and centrally

connected thereto at its upper end is shackle-rod 8, said rod having a flexible joint and attached at its opposite end to the valve 6, by means of eye bolt and pin 9, as shown in Fig. 6. The plunger 7, is of less diameter than the bore of member 2, for the purpose of forming an annular chamber around the plunger. The plunger 7 is provided with longitudinal passages 10, as indicated in Figs. 1, and 4. To the lower end of the plunger is pivotally attached the set valve 11, having openings in the disk end that will register with passages 10, or the valve may be made to close said passages when desired, by movement of the stem 12, said stem being provided at its lower end with hand wheel 13. The upper end of the stem is shaped and shouldered to enter the guide socket of the set valve 11. Member 3 is bored centrally from the upper side, and intersects with the horizontal admission passage 14. The stem 12, is provided with the usual type of packing gland and nut 15, to prevent leakage.

The valve seat 5, is constructed as follows: A solid bar is turned to a driving fit for the cylinder 4, cut off the required length, and split in a milling machine to a depth and width required to receive the valve 6. The journal hole is then drilled. The valve 6, with its journal hole drilled is placed in the valve seat, journaled and locked. The passages 16 are then made in both valve and seat by boring entirely through the seat, insuring these passages registering. The ports 21, are bored from the periphery of the cylindrical shaped valve 6, to intersect with passages 16, as shown in Fig. 7. The construction of valve 6 when placed within the bifurcated valve seat 5, constitutes a balanced valve, for the hydrostatic pressure of the liquid, or the velocity flow has no tendency to force the valve in either direction upon the seat 5, and it is therefore left free to move upon its journal supports without undue friction. Hole 17, in the upper end of the cylinder 4, is for the purpose of entering a punch to back out the valve seat when required to be removed. The bridge block 18, is for the purpose of holding the plunger centrally of member 2, acting as a guide and also as means for screwing the cylinder 4, to a seating on the shoulder, and consists of a bar or strap having a central perforation through which may pass the shackle-rod 8, a mortise being cast or cut in

the lower end of the cylinder as shown in Fig. 3, to receive the ends of the bar.

19, is an index pointer, rigidly attached to stem 12, and moves over the dial stamped on member 3, whenever the hand wheel 13 is turned to increase or diminish the volume of flow.

Having thus described the several parts of this apparatus, I will now describe their operation.

Assuming the set valve 11, to be adjusted so that the ports will register with the passages 10, in the plunger 7, the water under pressure flowing through passage 14, with a certain velocity, in passing through and around plunger 7, its velocity is increased directly as the area of cross-section of these entry passages are reduced, compared to the area of cross-section of port 14. Therefore there must be a diminished static pressure upon the upper end of plunger 7, for the velocity of flow is evidence of unbalanced pressure. This unbalanced pressure upon the plunger causes the plunger to move against the action of gravity, and this motion is communicated through the shackle-rod 8, to the valve 6, causing a partial closing of the passages 16, to the valve seat 5. This closing motion will be just sufficient to establish an equilibrium between the difference in the static pressure on the two ends of the plunger, and friction of flow, tending to elevate the plunger, and the action of gravity tending to move it in an opposite direction. A reduction of pressure in the discharge pipe will cause closing motion of the valve 6, and a raise of pressure an opening motion. For this reason when the plunger is in equilibrium between the velocity of flow in one direction and the action of gravity upon the plunger in an opposite direction, any change in velocity of flow will move the plunger, and impart motion to valve 6, as above stated. Should it be desired to pass a less quantity of water through the valve, by turning hand wheel 13, the stem 12, upon which it is fixed, turns the set valve 11, and this reduces the quantity of water flowing through the plunger, therefore, reduces the velocity of flow, which diminishes the difference of the static pressure between the two ends of the plunger per unit of area of cross-section, but as the area of cross-section of the lower end of the plunger is increased, by closing or restricting the passages to the plunger no change in the poise of the plunger takes place, after it has moved upward to impart closing motion to valve 6, sufficient for the passage of this desired reduced volume of water. The index pointer assists one in determining how far the hand wheel should be turned in either direction to adjust the set valve 11, to any desired volume within the capacity of the valve.

From the foregoing it is apparent I have produced a reliable and efficient volumetric valve, embodying features of advantage enumerated in the statement of the object of the invention, and I desire it to be understood that the invention is susceptible of modification in various particulars without departing from the essential spirit and scope of the appended claims.

What I claim as new and desire to secure by Letters-Patent, is:

1. The herein described valve, which consists of an outer casing provided with an entry and a discharge port, and adapted to receive a controlling valve at one end of said casing, and at the other end thereof a plunger provided with a valve, said plunger being of less diameter than the bore of the casing that a chamber may be formed around the plunger for the free passage of a fluid, and means for connecting the plunger and the controlling valve that movement of the plunger may impart motion to the controlling valve to effect opening or closing of said valve.

2. The herein described valve, which consists of an outer casing provided with an entry and discharge port, and adapted to receive a controlling valve at one end of said casing, and at the other end thereof a plunger provided with a valve, a valve stem for manually operating said valve exterior of the casing, said plunger being of less diameter than the bore of the casing that a chamber may be formed for the free passage of a fluid around the plunger, and means for connecting the plunger and the controlling valve that movement of the plunger may impart motion to the controlling valve to effect opening or closing of said valve.

3. The herein described valve, which consists of an outer casing provided with an entry and a discharge port, and adapted to receive a controlling valve at one end of said casing and at the other end thereof a plunger, said plunger provided with a valve, a stem for manually controlling said valve exterior of the casing an index pointer attached to said stem to indicate adjustment of the valve, and means for connecting the plunger and the controlling valve that movement of the plunger may impart motion to the controlling valve to effect opening or closing of said valve substantially as described.

4. In a water mechanism for regulating the flow of fluid, the combination with a casing provided with an entry and a discharge port and a conduit connecting them, of a valve for controlling the flow through said casing, and a plunger located in said conduit and constructed to permit a flow of fluid past it and of less external diameter than the internal diameter of the conduit within the range of its movement, and oper-

ating connections between said plunger and valve, and means for varying the total area in cross section of the passage from one side of said plunger to the other.

- 5 5. In a water mechanism for regulating the flow of fluid, the combination with a casing provided with an entry and a discharge port and a conduit connecting them, of a plunger located in said conduit whereby it
10 will receive the impact of velocity flow, and constructed to permit a flow of fluid past it

in a manner that it may respond to a varying pressure due to velocity flow of fluid past it, means for increasing or decreasing the lifting surface of said plunger, a valve controlling the flow through said casing, and
15 operating connections between said plunger and valve.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."