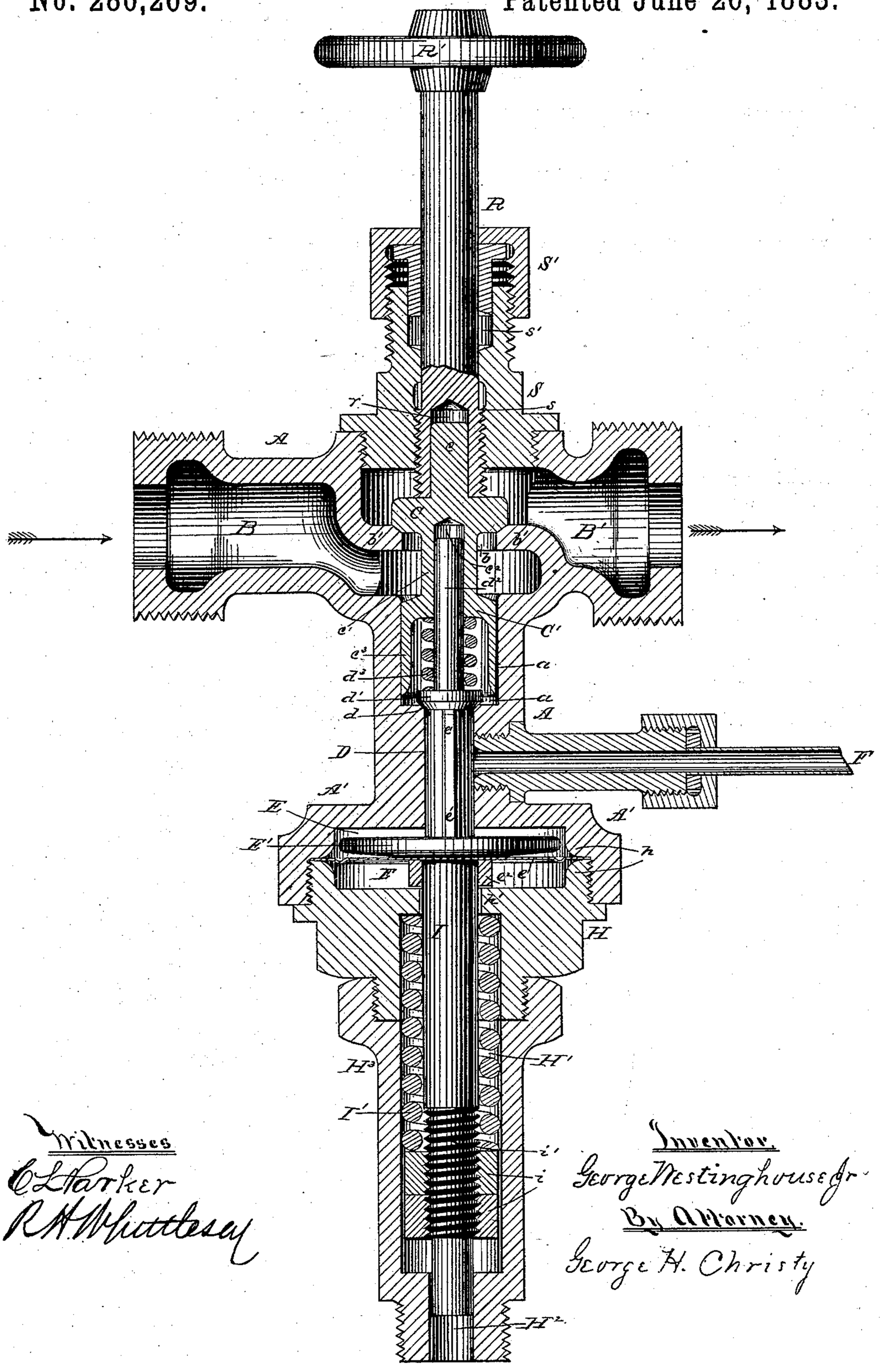
(No Model.)

G. WESTINGHOUSE, JR.

FLUID PRESSURE REGULATOR.

No. 280,269. Patented June 26, 1883.



Witnesses
C. L. Parker
R. H. Whittlesey

Inventor.
George Westinghouse Jr.
By Attorney.
George H. Christy

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 280,269, dated June 26, 1883.

Application filed March 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, county of Allegheny, and State of Pennsylvania, have invented or discovered a new and useful Improvement in Fluid-Pressure Regulators; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, which illustrates my improved regulator by a view in sectional elevation.

My invention relates to mechanism for regulating the flow and pressure of fluids in order to maintain uniform pressure and supply in a receiving-vessel; and in general terms it consists in certain combinations of a case having a through way or passage with a valve-governed port therein; a piston-chamber in line with the port, the piston being connected with the valve; a valve-governed port and passage leading from the piston-chamber to the escape; a flexible diaphragm and chamber, with connection between the diaphragm and escape-valve for unseating the latter by movement of the diaphragm; a passage leading from the diaphragm-chamber to the vessel containing fluid the pressure of which is to be regulated; and springs co-operating with fluid-pressure on the valves, piston, and flexible diaphragm to effect the desired regulation of pressure, as hereinafter more fully described and claimed.

I have illustrated my present invention in form designed for use in air-brake apparatus, for the purpose of regulating steam-supply to the air-pumps by means of the air-pressure in the main reservoir or in the brake-pipe. It may be employed, however, to regulate the pressure and flow of other fluids, in connection with other apparatus and for other purposes. I do not wish, therefore, to limit my invention to the specific use described, but include therein all uses and purposes to which it may be applied.

In the drawing, A represents a metal case having a steam-passage, B B′, leading through the same, with the usual provision for making pipe-connection to the boiler from inlet B, and to the air-pump or other place of use from outlet B′. Across this passage is formed a diaphragm or partition, *b′*, having a central port, *b*, therein. Beneath the port in the body of the case is formed a cylindrical chamber, *a*, by preference of the same diameter as the port. On the upper or discharge side of the port is seated a valve, C, having an upward-extending guide-stem, *c*, and a downward-extending hollow stem, *c′*, carrying on the lower end of such stem a hollow or cup-shaped piston, C′, which latter is fitted to move freely but practically steam-tight within the chamber *a*. A small groove, *a′*, is made in the wall of the chamber, or, as an equivalent, in the side of the piston-shell c^3, to permit steam in comparatively small quantity to pass to the under side of the piston, and thereby secure steam-pressure below as well as above the piston when escape from below is closed. Provision is made for such escape by port *d* and passage D, leading from the bottom of the chamber to the waste-pipe F. The port *d* is governed by a valve, *d′*, seating thereon from above, and guided in its movement by downward-extending winged stem *e′*, and an upward-extending stem, d^2, entering the tubular chamber c^2 in stem *c′*. A spring, d^3, is seated within the piston-shell c^3, and, bearing upon the piston and the valve, sustains the weight of the piston and valve above and assists in holding the valve below to its seat. The purpose of extending the shell c^3 of the piston into its chamber is to obtain room for the action of spring d^3, and at the same time secure piston-bearing within the chamber through the range of movement of the piston without increased length of case. The passage D is continued past the waste F through the body of the case, and opens into a chamber, E, formed within the enlarged head A′ and the chambered screw-plug H. Between the abutting shoulders *h* of the plug and head is clamped a flexible diaphragm, *e*, which is also secured at its center to the under face of disk or head E′. The winged stem *e′* of valve *d′* rests upon the upper face of this disk, whereby upward movement of the diaphragm is effective in lifting the escape-valve from its seat, while downward movement of the diaphragm permits the valve to take its seat and close the port, being actuated by steam-pressure thereon from above assisted by the spring d^3.

On the under side of disk E′ is formed or

secured a rod, I, the disk being, in effect, a head on the rod or bolt, which rod extends downward through opening *h'* and chamber H' into the passage H², formed in the shell H³. This passage H² may lead by suitable pipe-connections to the brake-pipe of the Westinghouse automatic or to the main reservoir of the non-automatic brake. It thus serves not only to guide the rod I, but also to admit air from the reservoir or brake-pipe through chamber H' to the under side of diaphragm *e*, whereby air-pressure which may exist in the reservoir or brake-pipe is effective in raising the diaphragm. This pressure is counterbalanced to a predetermined degree by coiled spring I', seated against the upper end of chamber H' and against nuts *i i*, run on the threaded portion *i'* of rod I. A ring-stop, *e*², at the upper end of the rod relieves the diaphragm from excessive downward strain by the spring when not sustained by fluid-pressure in the chamber. By screwing the nuts up or down (the lower one being used as a jam-nut) the tension of the spring may be adjusted to any given amount of pressure—say fifty pounds per square inch on the under face of the diaphragm.

I have shown the stem of regulating-valve C entering a socket, *r*, in the rod R, which screws into the threaded opening *s* in nut S. The stem of this rod passes upward through the packing-box *s'* and cap S', and carries a hand-wheel, R', by which the rod may be turned, thereby forcing valve C to its seat or releasing it, as may be desired. The purpose of this feature of construction is to provide for using valve C both as an automatic regulator and as an ordinary stop or throttle valve. In many cases, however, there may be no occasion for such provision, and then the rod R may be omitted, the stem *c* being guided in any suitable manner—say by a socket formed in the under face of the nut S.

In operation steam admitted through inlet B fills the space below partition *b'*, passing downward through *a'* into and filling chamber *a* below the piston C'. The rod R being screwed out, steam-pressure below will raise the valve C, assisted somewhat by the spring *d*³, and steam will pass the valve through B' to operate the pump. By the action of the pump, air is accumulated in the reservoir and brake-pipe until its pressure effective below diaphragm *e* is sufficient in amount to overbalance the sum of downward pressures upon valve *d'*, and upon the diaphragm exerted by springs *d*³ and I', and the steam-pressure upon the valve. This sum or degree of pressure may be varied by adjustment of nuts *i*, as before described—say to fifty pounds per square inch. Excess of pressure above this predetermined amount will raise diaphragm *e* and valve *d'*, thereby affording steam-escape from below piston C'. Such escape will cause preponderance of steam-pressure upon the upper side of the piston, thereby moving it downward, and carrying the valve C to or toward its seat, and arresting or diminishing the flow of steam to the pump. This condition is continued until air-pressure below the diaphragm has fallen below the predetermined standard, when the diaphragm will descend and the valve *d'* will close, thereby shutting off escape and permitting accumulation of steam-pressure beneath the piston. By such accumulation the valve C may be again raised and steam-supply to the pump be renewed or increased.

An important feature of construction adapting the valve to the performance of these functions is its position on the outlet side of port *b*, the controlling-piston being on the inlet side and exposed to the pressure of the inflowing steam, whereby diminution of steam-pressure below the piston causes the pressure above it to be effective in moving the valve toward its seat.

The same or substantially the same principles of construction may be employed in adapting the apparatus for use in reducing the pressure of fluids, water, vapor, or gas in pipes; and in this or similar cases the chamber E, below the diaphragm, may communicate by suitable pipe-connections directly with passage B'. In such use and application the operation will be substantially the same as above described. Whether the connection between the diaphragm-chamber and the outlet B' be direct or indirect, the pressure of fluid in the outlet virtually controls the escape through the port *d;* and in referring to the control of the escape-valve by pressure of fluid on the discharge side of the regulating-valve, I include both the direct and indirect connection as equivalents in the construction of the apparatus.

I claim herein as my invention—

1. In a fluid-pressure regulator, a case having a through-passage and a partition with port therein across such passage, in combination with a regulating-valve seating on the discharge side of the port, a piston connected with the valve and movable within a piston-chamber on the supply side of the port, a valve-governed escape-passage leading from the piston-chamber beneath the piston, and mechanism for unseating the escape-valve, controlled by fluid-pressure on the discharge side of the regulating-valve, substantially as set forth.

2. The case A, having through-passage B B', port *b*, and piston-chamber *a* therein, in combination with regulating-valve C, seating on the discharge side of the port, piston C', connected with the valve and exposed to fluid-pressure on the supply side of the port, a fluid-escape from the lower side of the piston, controlled by pressure of fluid on the discharge side of valve C, and a stem, R, for forcing valve C to its seat to shut off fluid-passage, substantially as set forth.

3. The case A, having therein through-passage B B', port *b*, piston-chamber *a*, and escape D, in combination with valve C, piston

C′, connected to the valve, the two being on opposite sides of the port, escape-valve *d′*, and spring d^3, seated between the escape-valve and piston, substantially as and for the purposes set forth.

4. The combination of regulating-valve C, piston C′, having extended cylindrical shell c^3 thereon, the piston being connected to the valve by a hollow stem, valve *d′*, having guide-stem d^2, and spring d^3, seated at one end within the piston-shell and at the other end upon valve *d′*, substantially as set forth.

5. The case A, having therein through-passage B B′, port *b*, chamber *a*, passage D, chamber E, and passage H′, in combination with regulating-valve C, piston C′, the two being connected on opposite sides of the port, escape-valve *d′*, spring d^3, diaphragm *e*, rod I, adjustable spring I′, and nuts *i*, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEORGE WESTINGHOUSE, JR.

Witnesses:

C. L. PARKER,

R. H. WHITTLESEY.