(No Model.)

G. WESTINGHOUSE, Jr.

PRESSURE REGULATOR AND CUT-OFF.

No. 312,543. Patented Feb. 17, 1885.

Fig. 1.

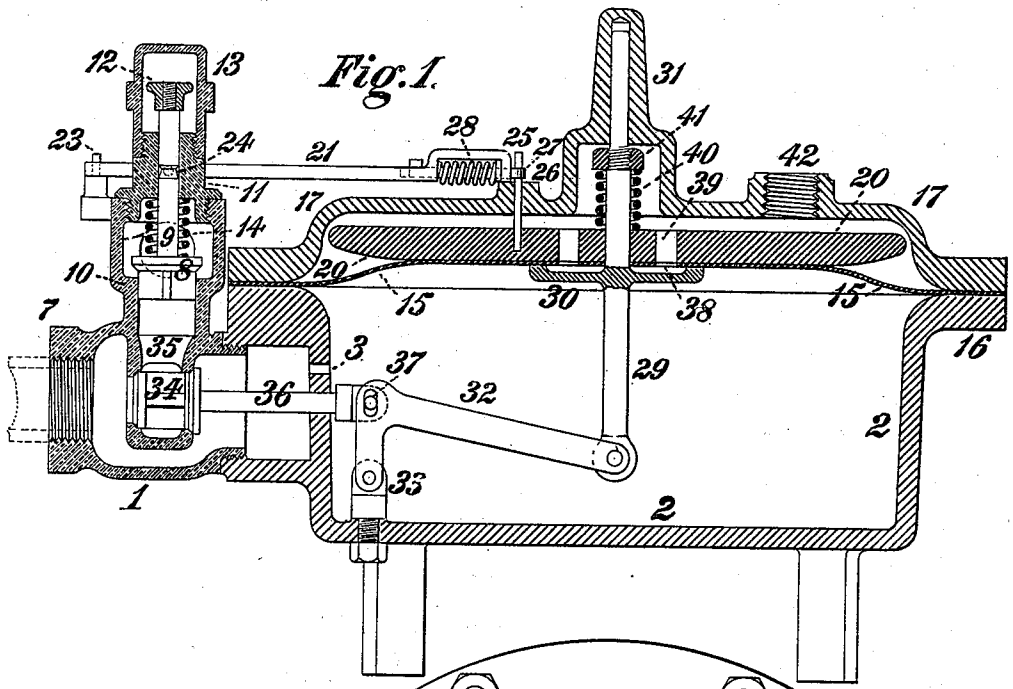
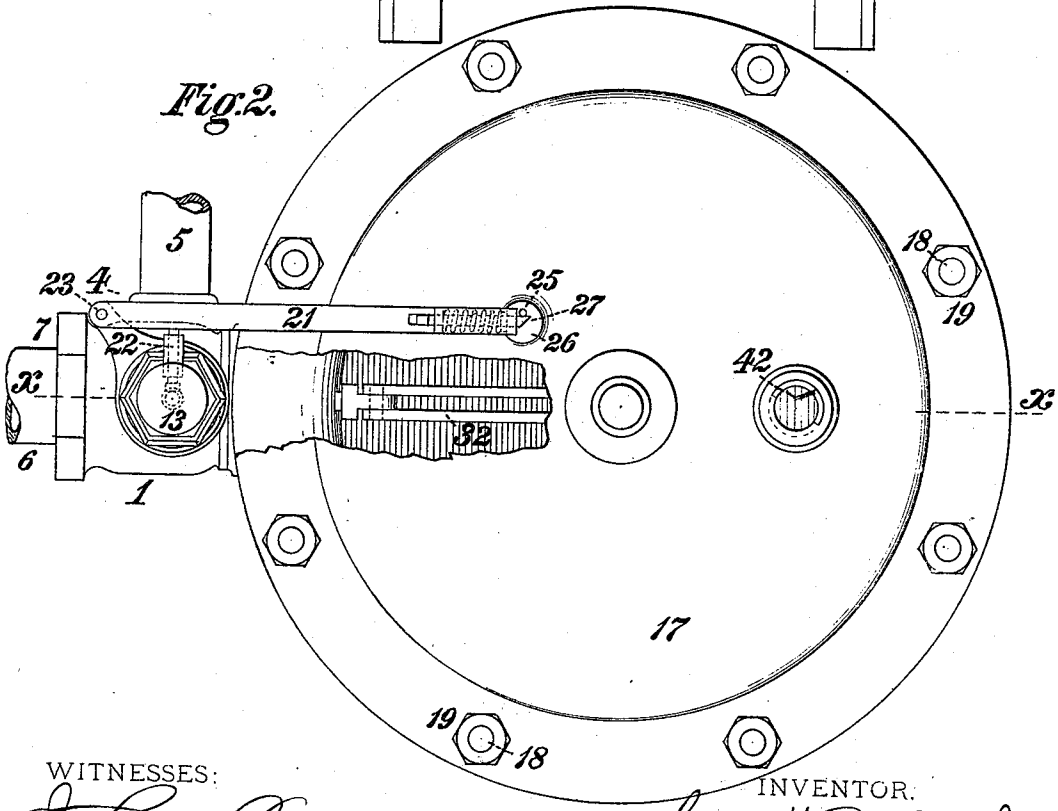


Fig. 2.



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PRESSURE-REGULATOR AND CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 312,543, dated February 17, 1885.

Application filed October 18, 1884. (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, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Pressure-Regulators and Cut-Offs, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a vertical central section, at the line *x x* of Fig. 2, through a pressure-regulator and cut-off embodying my invention, a portion of the section being taken through a boss exterior to said center line; and Fig. 2, a plan or top view of the apparatus.

The object of my invention is to afford convenient and effective means for regulating the delivery of gas or other fluid at determined lower pressure from a source of higher pressure supply, as well as to cut off communication between the supply and delivery passages upon the cessation of the supply.

To these ends my invention, generally stated, consists in the combination of a supply-valve located in the line between a supply-main and a delivery-pipe, a stop device adapted to maintain said valve in open position, and a movable abutment acting to release the valve from the stop on the cessation of supply-pressure; also, in the combination of a supply-valve, a regulating-valve, and a movable abutment connected to the regulating-valve, and actuated in opposite directions, respectively, by the pressure of fluid delivered by the supply-valve and by a spring or weight.

The improvements claimed are hereinafter fully set forth.

In the practice of my invention I provide a valve-casing, 1, which is connected to a pressure-chamber, 2, and communicates therewith by one or more openings, 3, in the wall of the chamber, the combined cross-section of the openings 3 being of limited area relatively to the supply-valve opening, for a purpose hereinafter described. A flange or nozzle, 4, is formed upon the casing 1 adjacent to its top, for the attachment of a pipe, 5, leading from a main or other source of higher pressure supply of gas or other fluid; and a delivery-pipe, 6, for the passage of fluid to the point or points of utilization, is connected to a flange or nozzle, 7, on the casing, said pipe opening into a space within the casing, which communicates with the opening 3 and pressure-chamber 2. A supply-valve, 8, fixed upon a stem, 9, is fitted to seat over an opening in a partition, 10, extending across the casing 1, below the supply-opening thereof, the valve-stem 9 passing with sufficient closeness to prevent the escape of fluid through the head 11 of the casing, and having a hand-piece, 12, by which it may be raised and lowered, on its outer end.

As an additional preventive against the escape of fluid from the casing, the projecting portion of the valve-stem is inclosed by a removable cap, 13, secured to the head 11 of the valve-casing. A helical spring, 14, encircling the valve-stem, bears at its opposite ends against the inside of the head 11 and the back of the supply-valve 8, respectively, its tendency being to effect and maintain the seating of the valve, except when the latter is, as presently to be described, held in open position.

The pressure-chamber 2 is fitted with a movable abutment adapted to be actuated in one direction by the pressure of fluid entering the chamber through the opening 3, and in the other by a spring or weight. In this instance the abutment is composed of a flexible diaphragm, 15, and a gravitating pressure-plate, 20. The diaphragm 15 is secured at and adjacent to its periphery between a flange, 16, projecting around the top of the pressure-chamber 2, and a cap or cover, 17, secured by bolts 18 and nuts 19 to the flange 16. Pressure of fluid entering the chamber 2 through the opening 3 will tend to elevate the diaphragm and plate 20, acting against the downward tendency of the gravity of the plate, and maintaining the abutment in position horizontally or effecting its elevation, respectively, according as it may be sufficient in degree to balance or to overcome the action of gravity.

A spring may be employed in lieu of the weight of the plate, if desired, to effect the depression of the plate and diaphragm.

A latching-lever, 21, pivoted by a pin, 23,

to the exterior of the valve-casing 1, carries a stop-pin, 22, which passes freely through the cap 11 of the casing, and engages at its inner end a V-shaped groove, 24, formed on the supply-valve stem 9, when the stem is raised sufficiently far by the operator to enable the valve to fully open the passage in the partition 10, over which it seats, and the valve will thereby be retained in such open position, while the stop-pin 22 remains engaged with the groove 24. The engagement of the stop-pin and groove is maintained during such period as fluid-pressure from the supply-pipe 5 is exerted upon the diaphragm 15 and pressure-plate 20 by means of a cut-off pin, 25, secured to the plate 20, and passing freely through a guide-socket, 26, in the cap 17, said pin forming a stop or bearing, against which abuts a latch, 27, which is fitted to slide longitudinally on the free end of the lever 21, and is pressed outwardly thereon by a spring, 28.

Upon the cessation of the supply of fluid through the pipe 5 and opening 3 the diaphragm 15 and pressure-plate 20 are depressed by the gravity of the latter, and when the cut-off pin 25 moves below the level of the latch 27, thereby clearing the same and permitting outward movement of the lever 21, the downward pressure of the spring 14 forces the stop-pin 22 out of the inclined face of the groove 24 of the valve-stem 9 and seats the supply-valve 8, thereby preventing access of fluid to the delivery-pipe 6, upon the resumption of supply, until the parts have been restored to their original position by the operator, and preventing waste and liability to accident, which would be liable to ensue in the event of a renewal of supply without preparation therefor at the point or points of utilization of the fluid.

The regulation of fluid-pressure in the delivery-pipe 6 is effected by a regulating-valve actuated by the movements of the diaphragm and pressure-plate in the following manner: A stem, 29, upon which is fixed a plate, 30, adapted to bear against the lower side of the diaphragm 15, passes freely through the diaphragm and pressure-plate, and fits at its upper end within a guide-socket, 31, on the cap 17. The lower end of the stem 29 is coupled to the long arm of a bell-crank lever, 32, the short arm of which is pivoted to a bearing, 33, on the inside of the pressure-chamber 2, adjacent to the point at which the valve-casing 1 is connected thereto. A double-beat regulating-valve, 34, the faces of which are of substantially equal diameters, so as to be in equilibrium of pressure, is fitted to seat in openings in a chamber, 35, within the valve-casing 1, the space within said chamber communicating with the supply-valve opening and that on its exterior with the pressure-chamber and delivery-pipe. The stem 36 of the regulating-valve passes freely through the wall of the pressure-chamber 2, and is coupled to the bell-crank lever 32 by a pin, 37, fitting slotted holes formed in the lever at the junction of its arms.

It will be seen that opening and closure of the regulating-valve will be effected by downward and upward movements, respectively, of the diaphragm and pressure-plate, in accordance with and proportionately to variations of pressure in the fluid entering the chamber 2 through the opening 3.

In pressure-regulating devices of the usual constructions heretofore employed variations of supply or consumption induce objectionable vibratory movements of the regulating-valve and the piston or diaphragm by which it is actuated. This objection is overcome under my invention by the provision of a communication of relatively-limited area between the regulating-valve case and the pressure-chamber, so that an appreciable time is required to effect the movement of the parts under variations of pressure of supply or demands of delivery.

To enable excess of pressure in the chamber 2 to be relieved if unduly high, a series of openings, 38, is formed in the diaphragm 15, adjacent to its center, said openings registering with corresponding passages, 39, in the pressure-plate, and being normally closed to the fluid in the chamber 2 by the plate 30. Upon the existence of an excess of pressure in the chamber 2, which may arise by leakage past the valve 34 when there is no utilization of fluid in the pipe 6, the upward movement of the diaphragm 15 will first close the regulating-valve, the stem 29 being caused to follow the diaphragm by the resistance of a spring, 40, interposed between the plate 20 and a stop-nut, 41, fixed on the stem 29, above said plate. Upon the closure of the regulating-valve farther upward movement of the stem 29 and plate 30 is prevented by the bearing of the valve against its seats, and the continued movement of the diaphragm and plate 20 withdrawing the openings 38 from the plate 30, fluid escapes through said openings and the passages 39 into the space between the diaphragm and cap 17, from which it may be led, through a pipe connected to an opening, 42, in the cap, to any suitable point of discharge.

I claim herein as my invention—

1. The combination of a supply-valve governing communication between a supply and a delivery pipe, a stop device adapted to maintain said valve in open position, and a movable abutment subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-valve and to the action of a weight or spring, and adapted to release the stop from the supply-valve by movement of the abutment effected by cessation of the fluid-supply, substantially as set forth.

2. The combination of a supply-valve governing communication between a supply and a delivery pipe, a stop device adapted to maintain said valve in open position, a movable

abutment subject to the pressure of fluid delivered by the supply-valve and to the action of a weight or spring, and provided with a bearing which holds the stop in engagement with the supply-valve during the continuance of fluid-supply, a regulating-valve governing communication between the supply-valve and delivery-pipe, and a stem actuated by the movable abutment and coupled to said regulating-valve, substantially as set forth.

3. The combination of a valve-casing having supply and delivery openings, a supply-valve governing communication between said openings, a stem fixed to said valve and passing through the casing, a latch-lever pivoted to the casing and carrying a stop-pin engaging a groove in the valve-stem, a movable weighted abutment working in a chamber communicating with the delivery-passage of the supply-valve, and a cut-off pin fixed to said abutment and bearing against the latch-lever, substantially as set forth.

4. The combination of a valve-casing having supply and delivery openings, a supply-valve governing communication between said openings, a regulating-valve seated in a chamber interposed between the supply-valve and delivery-openings, a pressure-chamber communicating with the space between the regulating-valve and delivery-chamber, a movable weighted abutment working in said chamber, a stop device adapted to maintain the supply-valve in open position and to be released therefrom by the movement of said abutment, and a stem connected to said abutment and coupled to the regulating-valve, substantially as set forth.

5. The combination of a valve-casing having supply and delivery openings, a pressure-chamber communicating with said casing, a flexible diaphragm fitted in said chamber and having one or more openings adjacent to its center, a pressure-plate resting upon the diaphragm and having passages corresponding with the openings thereof, a stem passing freely through the diaphragm and pressure-plate and carrying a disk adapted to cover the openings thereof, a spring interposed between the pressure-plate and a stop on the stem, and a lever pivoted to a support on the pressure-chamber and coupled to the stem and to the regulating-valve, substantially as set forth.

6. The combination of a valve-casing having supply and delivery openings, a supply-valve governing communication between said openings, a pivoted latch-lever carrying a stop-pin engaging a groove in the stem of the supply-valve, and a latch fitted to slide upon said lever and to bear against a cut-off pin fixed upon an abutment which is movable perpendicularly to the lever, substantially as set forth.

7. The combination of a valve-casing, a supply-valve, and a regulating-valve fitting seats therein, a pressure-chamber communicating with the valve-casing, a movable weighted abutment perforated adjacent to its center and working in said chamber, a lever pivoted to the casing and carrying a stop-pin engaging a groove in the supply-valve stem, a cut-off pin fixed to the movable abutment and bearing against the free end of the lever, a stem connected to the abutment with the capacity of a limited degree of movement of the abutment independently of the stem, a plate fixed on said stem and adapted to cover the perforations of the abutment, and a double-armed lever coupled to said stem and to the regulating-valve, and pivoted to a fixed support, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:
J. SNOWDEN BELL,
R. H. WHITTLESEY.