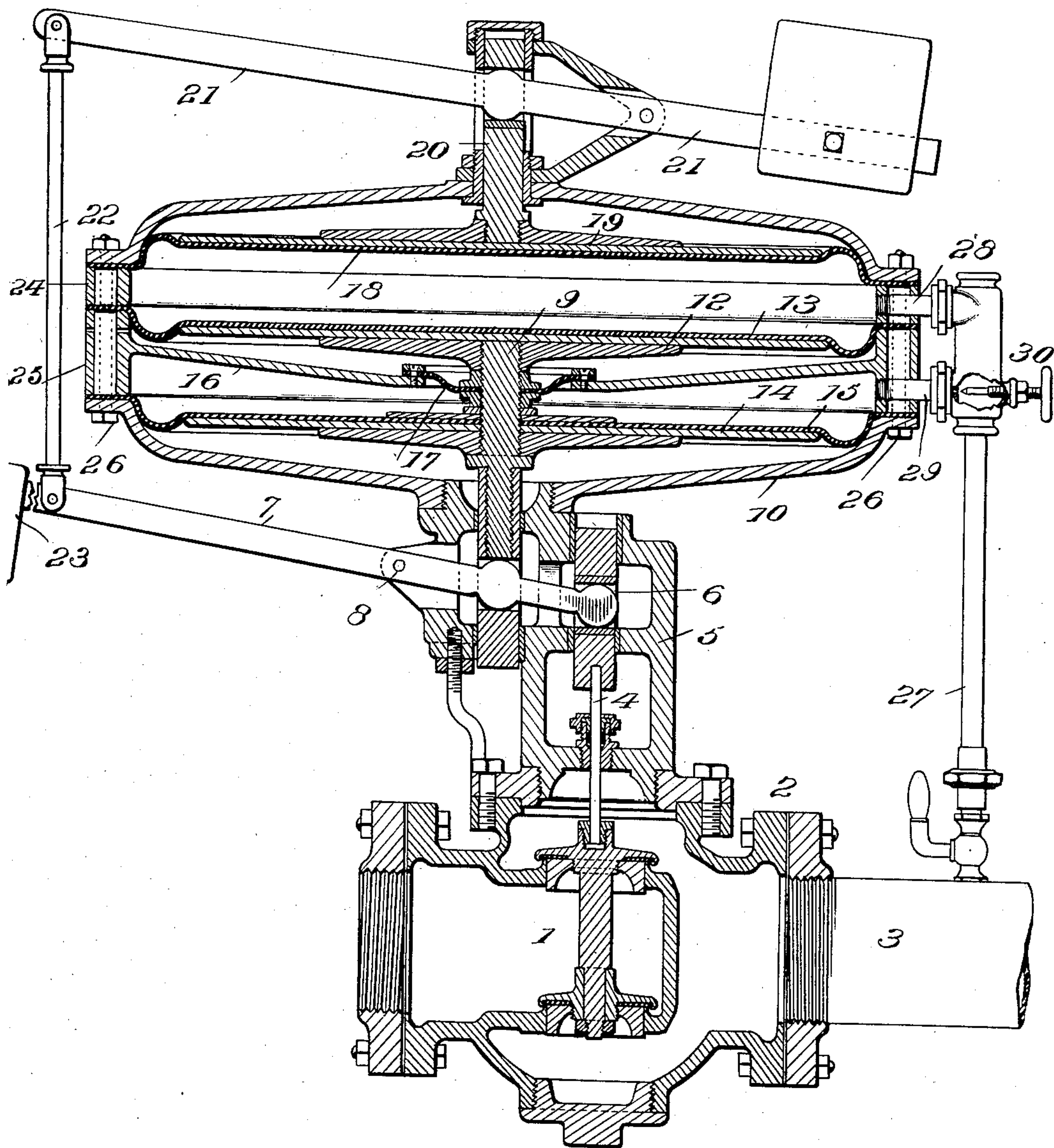


No. 863,528.

PATENTED AUG. 13, 1907.

L. B. FULTON.  
FLUID PRESSURE REGULATOR.  
APPLICATION FILED NOV. 22, 1906.



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# UNITED STATES PATENT OFFICE.

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## FLUID-PRESSURE REGULATOR.

No. 863,528.

Specification of Letters Patent.

Patented Aug. 13, 1907.

Application filed November 22, 1906. Serial No. 344,642.

*To all whom it may concern:*

Be it known that I, LOUIS B. FULTON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Fluid-Pressure Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In an application for patent filed by me October 18, 1906, Serial No. 339,550, I disclosed a pressure-regulator having a greatly increased area of actuating surface but without any increase in the diameter of the diaphragm case, provision being made for insuring the operation of a valve by even slight changes in the main on the delivery or low pressure side of the regulator.

The primary object of the present improvement is to still further increase the area of the actuating surface in a pressure-regulator, without increasing the diameter of the diaphragm case, so as to thereby add to the sensitivity of the apparatus; and a further object is to insure quick and complete movements of the valve in response to even slight movements of the diaphragms, thereby enabling the regulator to respond promptly to changes in pressure.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawing, the figure is a vertical longitudinal sectional view illustrating my present improvements.

Referring to the drawing, 1 designates the regulator valve of the balanced type, whose casing 2 is located in a gas main 3. The rod or stem 4 of this valve is extended outwardly and guided by a skeleton-frame 5. It is formed with an opening 6 to accommodate the ball-end of a lever 7 fulcrumed at 8 to a lateral extension of frame 5. The lever 7, at a point intermediate its fulcrum and the said ball-end, engages a rod 9 depending through an opening in the bottom of a diaphragm casing 10 superposed on frame 5. Preferably lever 7 is formed with a spherical enlargement at its point of engagement with rod 9, which latter is movable on lines parallel with, but in opposite directions to, the valve stem 4. The rod 9 carries at its upper end a circular plate 12 located beneath a diaphragm 13, and at a point about midway between its upper end and the bottom of diaphragm casing it carries a second plate 14 which bears against a second diaphragm 15. These two diaphragms are in separate chambers divided by a partition 16 having a central opening to permit of the passage of rod 9, such opening being tightly closed by a flexible disk 17 secured to the partition 16 and to the rod.

A third diaphragm 18 is located opposite to and above the diaphragm 13, and against it bears the circular plate 19 of a rod 20. This diaphragm is caused to float by the engagement with its rod of a weighted lever 21,

as pointed out in my before noted application for patent, said lever being connected by a link 22 to the long arm of lever 7, between the fulcrum of the latter and its counterbalancing weight 23. This latter lever is intended to unseat the valve as against the closing action of the gas pressure on the diaphragms.

The diaphragm casing is shown as being composed of upper and lower sections separated by an upper ring 24 and a lower ring 25, the several diaphragms and rings being retained by the nutted bolts 26. The partition 16 is preferably formed integral with the lower ring 25. A pipe 27 leading from the low pressure side of the valve opens into the diaphragm casing through branch 28 between oppositely disposed diaphragms 13 and 18, and through a second branch 29 into the space between partition 16 and diaphragm 15. Communication with this latter chamber may be cut off by a valve 30.

In practice, the pressure of the gas in the space between the opposed diaphragms 13 and 18 will uniformly act against both, the tendency being to force them apart and through the described lever connections hold valve 1 to its seat. The pressure against the diaphragm 15 supplements the pressure on the diaphragm 13. By the introduction of the additional diaphragm 15, the available power is multiplied the full area of such diaphragm, less the area of the flexible disk 17. The slightest movement of the diaphragms produces a multiple movement of the valve, that is to say, the latter travels twice the distance of the diaphragms. By this arrangement, I am enabled to secure a quick and extensive movement of the valve under a relatively slight movement of the diaphragms, thus causing the regulator to respond quickly to any demand for gas, and to instantly cut off the supply when the demand ceases.

I claim as my invention:—

1. A pressure regulator comprising a valve, a plurality of diaphragms movable by pressure from the low pressure side of the valve, and means in coöperative relation to said diaphragms for causing the valve to move at an increased ratio relative to the plurality of diaphragms.

2. A pressure regulator comprising a valve having an outwardly extended stem, a rod parallel with, and designed to move in opposite directions to, said stem, a plurality of diaphragms movable by pressure from the low pressure side of the valve, and means actuated by said rod for unseating such valve as against the combined actions of the several diaphragms.

3. A pressure regulator comprising a valve, diaphragm mechanism movable by pressure from the low pressure side of the valve, a rod movable by the movements of said diaphragm mechanism, and a counterbalancing lever for unseating such valve, said lever being engaged by said rod at a point intermediate its fulcrum and its connection with the valve.

4. A pressure regulator comprising a valve, a plurality of diaphragms movable by pressure from the low pressure side of the valve, a rod movable by the movements of said diaphragms, and a counterbalancing lever for unseating



such valve, said lever being engaged by said rod at a point intermediate its fulcrum and its engagement with the valve.

- 5 5. A pressure regulator comprising a valve having an outwardly extended stem, a weighted lever engaging said stem for unseating said valve; diaphragms, a rod movable by such diaphragms, and a casing for said diaphragms in communication with the low pressure side of the valve, said rod engaging said lever at a point intermediate its fulcrum and its engagement with the valve stem.
- 10 6. A pressure regulator comprising a valve having an outwardly extended stem, a weighted lever engaging said stem for unseating said valve, two diaphragms, a rod to which such diaphragms are secured, and a casing for said diaphragms having separate chambers in communication with the low pressure side of the valve, said rod engaging said lever at a point intermediate its fulcrum and its engagement with the valve stem.
- 15 7. A pressure regulator comprising a valve having an outwardly extended stem, a rod parallel with, and designed to move in opposite directions to, said stem, two diaphragms mounted on said rod, a casing having separate chambers for said diaphragms in communication with the low pressure side of the valve, and an additional diaphragm in cooperative relation to the first mentioned diaphragms, located in one of said chambers, a weighted lever engaging said valve stem for unseating such valve, said lever engaging said diaphragm rod, and means for communicating the movements of said additional diaphragm to said weighted lever.
- 20 8. A pressure regulator comprising a valve having an outwardly extended stem, a rod parallel with and designed to move in opposite directions to said stem, a weighted lever engaging said stem for unseating said valve, a rod engaging said lever intermediate its fulcrum and its engagement with said valve stem, two diaphragms mounted on said rod, a casing for said diaphragms having separate chambers for the latter in communication with the low pressure side of the valve, a balanced diaphragm located within one of said chambers and movable in opposite directions to said first mentioned diaphragms, and means operated by said balanced diaphragm for communicating the movements thereof to said weighted lever.
- 25 9. A pressure regulator comprising a valve having an outwardly extended stem, a rod parallel with and designed to move in opposite directions to said stem, a weighted lever engaging said stem for unseating said valve, a rod engaging said lever intermediate its fulcrum and its engagement with said valve stem, two diaphragms mounted on said rod, a casing for said diaphragms having separate chambers for the latter in communication with the low pressure side of the valve, a balanced diaphragm located within one of said chambers and movable in opposite directions to said first mentioned diaphragms, and means operated by said balanced diaphragm for communicating the movements thereof to said weighted lever.

phragms, located in one of said chambers, a weighted lever engaging said valve stem for unseating such valve, said lever engaging said diaphragm rod, and means for communicating the movements of said additional diaphragm to said weighted lever.

8. A pressure regulator comprising a valve having an outwardly extended stem, a rod parallel with and designed to move in opposite directions to said stem, a weighted lever engaging said stem for unseating said valve, a rod engaging said lever intermediate its fulcrum and its engagement with said valve stem, two diaphragms mounted on said rod, a casing for said diaphragms having separate chambers for the latter in communication with the low pressure side of the valve, a balanced diaphragm located within one of said chambers and movable in opposite directions to said first mentioned diaphragms, and means operated by said balanced diaphragm for communicating the movements thereof to said weighted lever.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

LOUIS B. FULTON.

Witnesses:

CHARLES W. TOWNSEND,  
WM. C. CHAPLIN.