(No Model.) 2 Sheets—Sheet 1.

C. L. BASTIAN.

PRESSURE REGULATING VALVE.

No. 548,172. Patented Oct. 22, 1895.

Fig. 1.

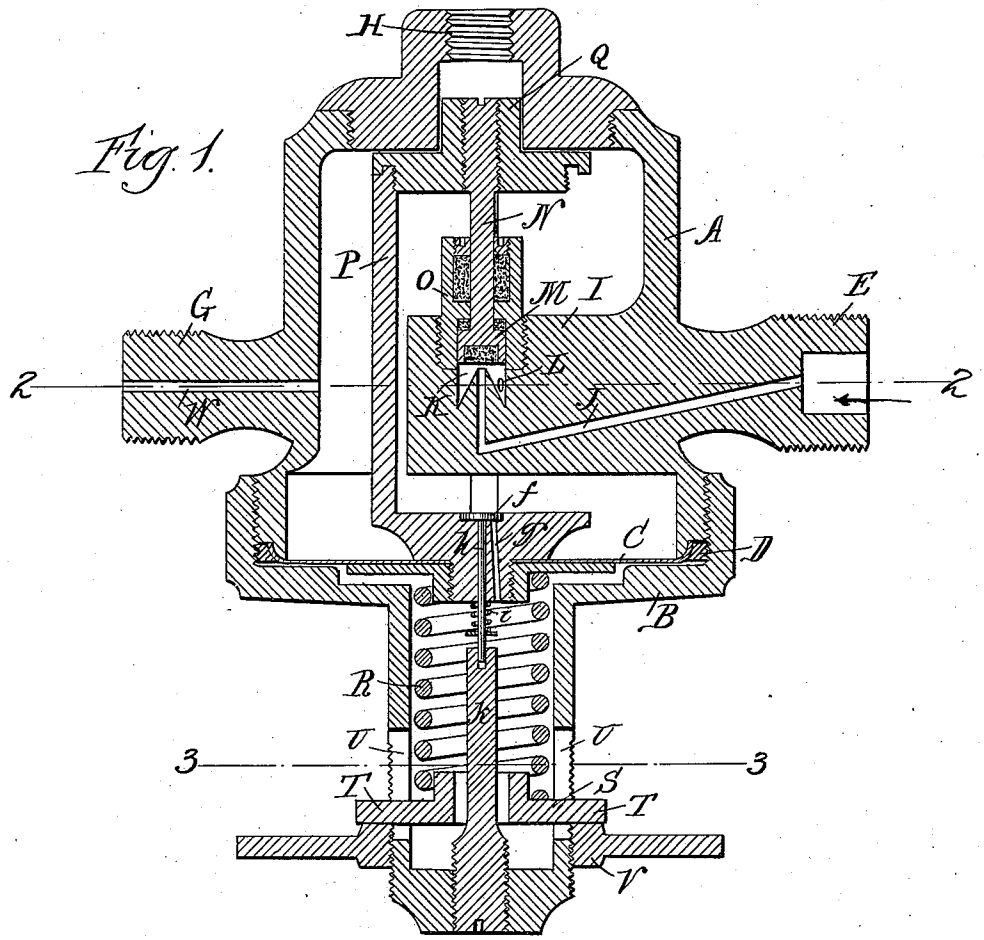
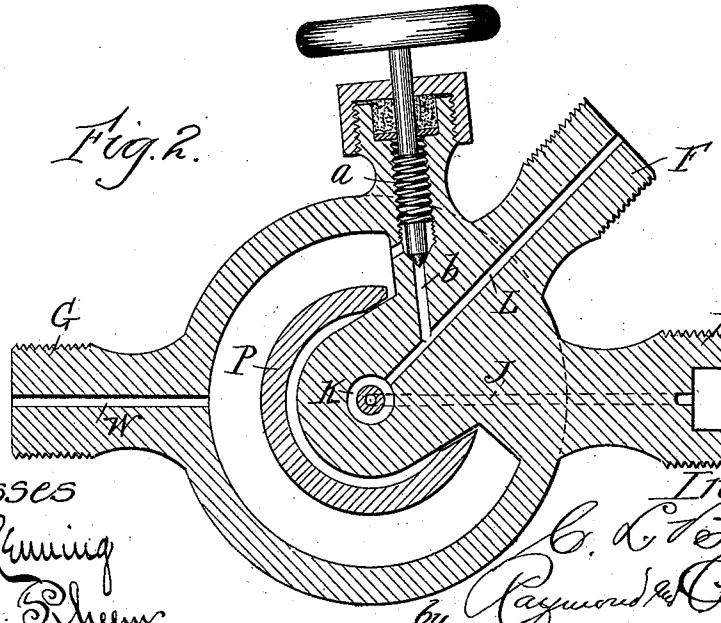


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

C. L. BASTIAN.

PRESSURE REGULATING VALVE.

No. 548,172. Patented Oct. 22, 1895.

Fig. 3.

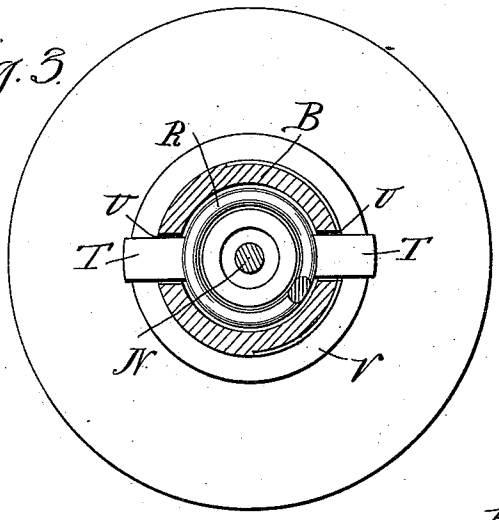
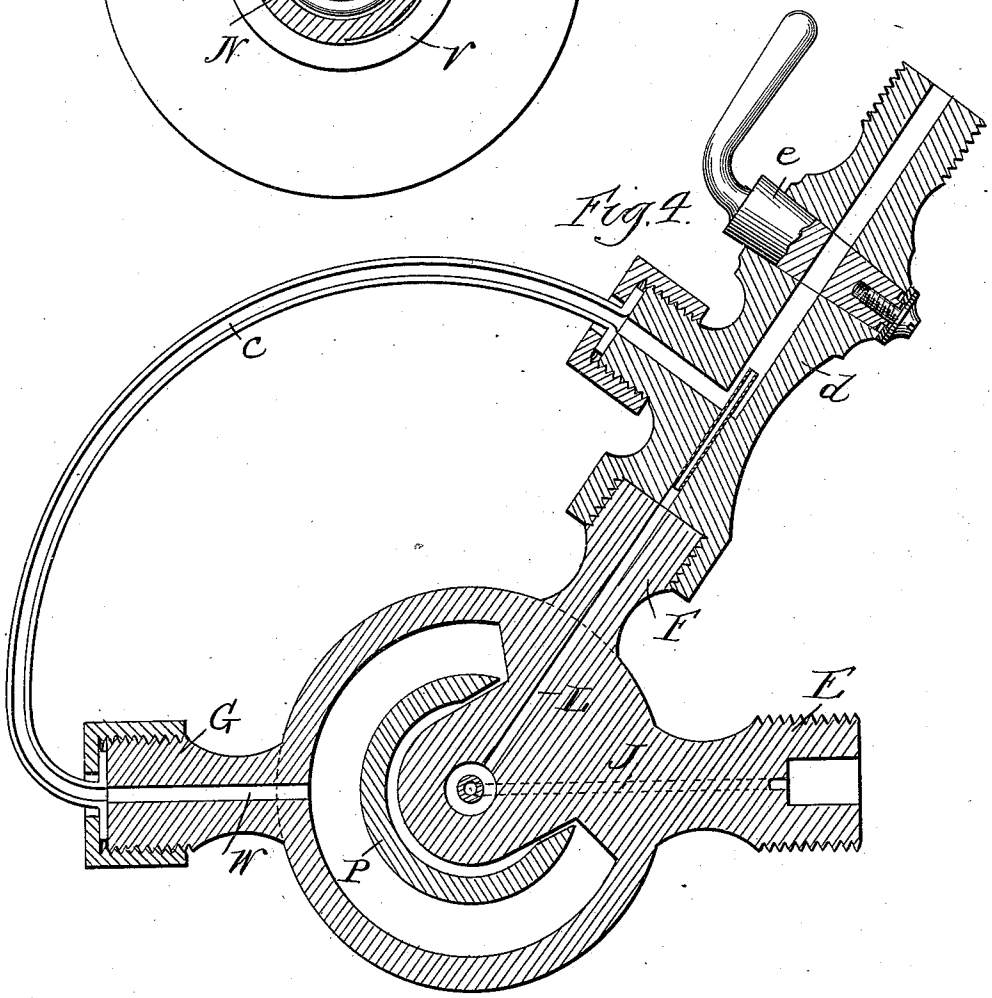


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES L. BASTIAN, OF CHICAGO, ILLINOIS.

PRESSURE-REGULATING VALVE.

SPECIFICATION forming part of Letters Patent No. 548,172, dated October 22, 1895.

Application filed November 22, 1894. Serial No. 529,569. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. BASTIAN, a citizen of the United States, residing in the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pressure-Regulating Valves, of which the following is a specification.

This invention relates to improvements in that class of pressure-regulating valves more particularly designed to reduce and regulate the pressure of carbonic-acid gas and other fluids to be delivered under high pressure to a suitable receptacle, such as a soda-water fountain, where the gas is used for charging and expelling the liquids.

Prior to this invention it has been common to have the diaphragm operating the control-valve subjected to the pressure of the gaseous fluid immediately upon its entrance into the valve and before the fountain is charged; and, furthermore, the gaseous fluid upon its entrance into the reducing-valve is permitted to expand therein before reaching the fountain. These features are objectionable, first, because of the danger of rupture or bulging of the diaphragm beyond usefulness; next, because the charging of the fountain is rendered extremely irregular and uncertain by the action of the gaseous fluid which expands in the diaphragm-chamber before entering the fountain, thereby causing fluctuations of the diaphragm which opens and closes the supply-valve, and, finally, because of the liability of the contracted passage, through which the gas enters the valve-chamber, freezing and closing such passage as a result of the sudden expansion of the gas adjacent to the end of the contracted passage.

The object of this invention is to avoid these objections by isolating the diaphragm from the gaseous fluid until after the fountain is charged and by having the expansion of the gas take place in the fountain instead of in the valve. These and such other objects as will hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a central vertical section through a pressure-regulating valve embodying my invention. Fig. 2 represents a horizontal section thereof on the line 2 2 of Fig. 1. Fig. 3 represents a horizontal section on the line 3 3 of Fig. 1; and Fig. 4 represents a modification of my invention.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates the upper and B the lower section of the valve-casing, having a screw-threaded connection therebetween and a diaphragm C firmly held at its edges between said sections, or, if desired, by the intermediation of an externally-threaded ring D, which is held in its place by the lower section B. The inlet-nozzle E is connected with a suitable source of supply. (Not shown.) The charging-nozzle F is connected with a fountain or other receptacle to be charged with the gas, and the return-nozzle G is connected either directly or indirectly, as will hereinafter appear, with the fountain or other receptacle to be charged. A gage connection H is also provided for indicating the pressure of the gas in and on its return from the fountain.

The nozzle E has an internal extension I, through which extends a contracted duct J from the said nozzle, which duct opens in a small valve-chamber K within the extension, and from said valve-chamber leads a correspondingly-contracted duct L to and through the charging-nozzle F. In the small chamber K works a valve M, adapted to close and to open the duct J for the passage of the gas, and thus establish and cut off communication between the ducts J and L. It will be noted that the valve-chamber is so small that practically no expansion of the gas can take place therein.

The stem N of the control-valve M works through a stuffing-box O of any suitable character, screwed or otherwise tightly fitted in the extension I, the upper end of the stem being adjustably connected with a yoke P, which in turn is rigidly secured at its lower end to the diaphragm C, the upper end of the yoke terminating in a boss Q, fitting loosely and working in a suitable socket in the upper end or cap of the casing A leading to the gage, the boss thereby serving as a guide for the yoke in its vertical reciprocations under the influence of gas-pressure on the diaphragm

in one direction and a spring R in the opposite direction, which spring is confined between the under side of the diaphragm and an adjustable bridge S in the lower section B of the casing. This bridge which supports the spring is simply an annulus or ring, with radial arms T projecting through slots U in the casing B and resting upon the nut V, working on the external threaded lower end of the section B of the casing.

From the foregoing description it will be understood that the gas under pressure enters the valve through the duct J, valve K, and duct L, from whence it is conducted through suitable pipes to the fountain or other receptacle, where it expands, and from whence it passes back to the diaphragm-chamber through the duct W in the return-nozzle G. When pressure in the fountain or other receptacle has reached the desired maximum, the pressure in the diaphragm-chamber, which is the same as that in the fountain, will overcome the tension of the spring R, depress the diaphragm C, and cause the valve M to be seated, and thus cut off all further supply until such time as the pressure in the fountain is reduced below the desired maximum, when the valve M will be automatically unseated by the action of the spring R, and the fountain be thereby recharged; but when the maximum is again reached the supply will again be automatically cut off. This automatic opening and closing of the valve by the described arrangement is very prompt and certain and extremely sensitive, far more so than if the diaphragm were at all times initially exposed to the pressure of the gas, for by this construction the gas cannot come in contact with the diaphragm until after it has fully expanded, and the action of the diaphragm is, therefore, far less violent than, though equally as sensitive and efficient as, in the ordinary constructions. It is also apparent that the difficulty heretofore experienced, resulting from the freezing up of the contracted inlet-passage due to the expansion of a highly-compressed gas in the chamber to which it is delivered by such passage, will be entirely obviated by my construction, as there is practically no expansion of the gas in the valve-chamber and practically all of the expansion takes place in the fountain, where it properly should to produce the best results.

Incidental to the construction is the adjustable connection between the valve-stem N and the yoke through which the upper end of the valve-stem is threaded, which enables a most accurate adjustment of the position of the valve with relation to the diaphragm. Another adjustment, equally important, is that of the spring R, by which the maximum pressure may be regulated and changed at will, this being accomplished, as before mentioned, by the bridge-like support for the lower end of the spring, and the nut V upon which the bridge rests and which has a screw-thread connection with the lower end of section B of the valve-casing. Another desirable adjunct is the hand-valve *a*, (see Fig. 2,) adapted and arranged to close a passage *b*, leading from the duct L into the diaphragm-chamber, so as to afford immediate and direct entrance of the gas into the diaphragm-chamber without it having to pass through the fountain whenever it is desired to adjust or change the pressure at which the diaphragm is to seat the main control-valve. This auxiliary valve and the by-pass controlled thereby are not essential to the operation of my valve, as hereinbefore described, but are very desirable adjuncts thereto, as they enable a quick and accurate adjustment of the action of the control-valve.

In the valve shown in Fig. 4 the construction and operation of all the parts are identical with those previously described, excepting that instead of the return-nozzle G being connected directly with the fountain or other receptacle it is indirectly connected therewith by means of a pipe *c*, which connects with the pipe or cock D, leading from the charging-nozzle F to the fountain, so that there is but one pipe connection between the fountain and my regulating-valve. This short pipe connection *c* affords open communication between the fountain and the diaphragm-chamber, just as did the pipe before described, the only difference being that in this case the charging-pipe is also partially used as a return-pipe. Hence when the pressure in the fountain exceeds the desired maximum the control-valve will be seated in exactly the same manner as before described. By providing the one-way cock *e* in the charging-pipe the charging-passage leading to the fountain may be closed, and the pipe *c* may be used as a by-pass for affording immediate and direct connection with the diaphragm-chamber whenever it is desired to adjust the pressure at which the control-valve shall be opened and closed, thereby doing away with the necessity for the use of the auxiliary valve *a* and the by-pass *b*, controlled thereby.

To prevent rupture or undue bending or bulging of the diaphragm in case of a sudden or excessive charging of the diaphragm-chamber, I provide a valve *f*, seated in the lower end of the yoke and closing a passage *g* through the yoke, affording communication between the diaphragm-chamber and the external atmosphere. The stem *h* of this valve works through the lower end of the yoke and has sleeved thereon a coiled spring *i*, confined between the lower end of the yoke and a collar or shoulder upon said stem, the tension of which spring normally tends to seat the valve *f*, in which action it is assisted by the pressure on the diaphragm-chamber.

The lower end of the valve-stem *h* is adapted and arranged, upon an excessive movement of the diaphragm to impinge against a stationary abutment and thereby unseat the valve *f* and instantly relieve the pressure in the diaphragm-chamber by permitting a portion thereof to escape to the open air. The

stationary abutment *k* for the valve-stem has a screw-threaded connection with the lower end of the section B, so that it may be readily adjusted with a screwdriver, wrench, or other tool to cause the unseating of the valve *f* at any part of the movement of the diaphragm, and hence the relief of pressure in the diaphragm-chamber may be accurately adjusted, so as to guard against any possible damage or injury to the diaphragm as a result of excessive pressure under any conditions.

What I claim is—

1. In a pressure regulating valve, the combination with a casing having an outlet duct, a small valve-chamber wholly within the casing and into which the duct leads, a charging duct leading from the said small valve-chamber, a diaphragm-chamber surrounding the valve-chamber and independent thereof and having a duct or passage leading thereinto, of a diaphragm located in said chamber, an adjustable control valve located within the said small valve-chamber, a yoke connection between the said diaphragm and the valve, a spring for supporting said diaphragm and yoke, a bridge upon which the spring rests, and a movable nut resting against the under side of the bridge, substantially as and for the purpose described.

2. In a pressure regulating valve, the combination with a casing having an outlet duct, a small valve chamber into which the duct leads, a charging duct leading from the said valve chamber, a diaphragm chamber surrounding the valve chamber and independent thereof, of a valve located within its chamber, and a diaphragm arranged in its chamber, an adjustable yoke connection between the valve and diaphragm, a valve supporting the diaphragm and yoke, a bridge upon which the spring rests, an adjustable nut, an escape passage extending through the yoke into the open air, a spring-actuated valve for closing said passage, a rigid stem upon which the stem of said valve abuts upon excessive movement of the diaphragm, and a by-pass leading from the charging duct to the diaphragm chamber, substantially as shown and described.

3. In a pressure regulating valve, the combination with a casing having inlet and charging ducts and a valve chamber between said ducts, and also a diaphragm chamber having open communication with the receptacle to be charged but isolated from said ducts and valve chamber, a diaphragm, a valve working in said valve chamber and actuated by the diaphragm, a port leading from the diaphragm chamber to the external air, and a valve adapted to automatically open said port upon excessive movement of the diaphragm under pressure of the fluid in the diaphragm chamber, substantially as described.

4. In a pressure regulating valve, the combination with a casing having inlet and charging ducts, and a valve chamber between said ducts, and also a diaphragm chamber having open communication with the receptacle to be charged but isolated from said ducts and valve chamber, of a diaphragm, a valve working in said valve chamber and actuated by the diaphragm, a port leading from the diaphragm chamber to the external air, a spring-actuated valve adapted to close said port, and an adjustable abutment for the stem of said valve, against which said stem impinges upon excessive movement of the diaphragm, substantially as described.

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Witnesses:
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CHAS. B. BOWEN.