(No Model.)

W. THOMAS.

Pressure Regulating Valve.

No. 239,573 **Patented March 29, 1881.**

FIG. 1.

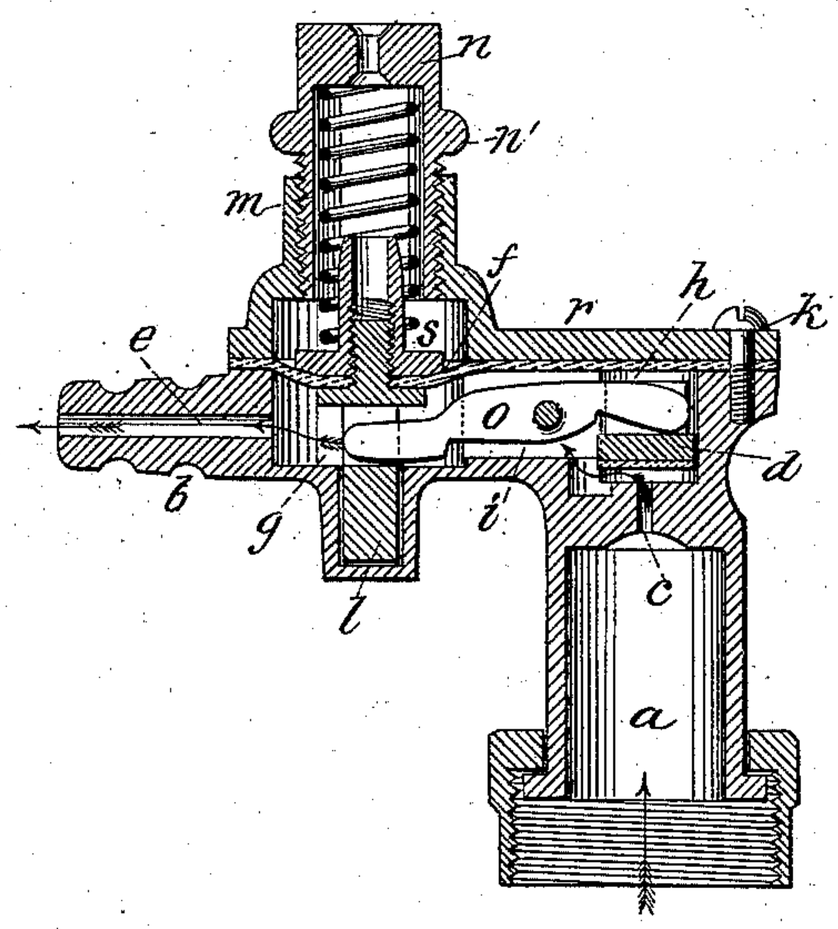
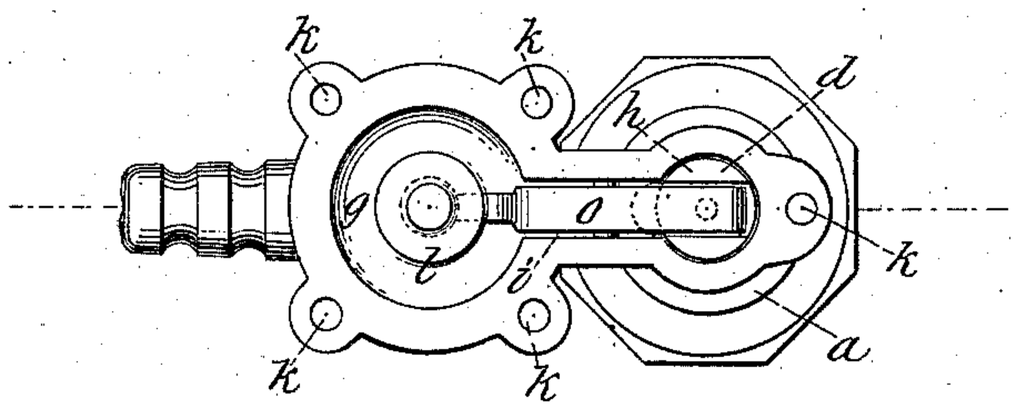


FIG. 2.



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PRESSURE-REGULATING VALVE.

SPECIFICATION forming part of Letters Patent No. 239,573, dated March 29, 1881.

Application filed July 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM THOMAS, of Jersey City, Hudson county, New Jersey, (assignor to WM. A. BABCOCK, of South Coventry, Connecticut,) have invented certain new and useful Improvements in Pressure-Regulating Valves, of which the following is a specification.

My invention relates to those valves which are placed upon the delivery-pipes of reservoirs of compressed air or other fluids, to deliver the same under a constant reduced pressure, and which usually consists of a diaphragm connected to a valve controlling the high-pressure orifice, which diaphragm is exposed on its inner side to the reduced pressure of the air or gas, which constantly tends to close the valve, while a spring acting on the outer side of the diaphragm constantly tends to depress the diaphragm and open the valve, which tendencies, balancing each other, render the delivery uniform under the desired reduced pressure.

My invention aims to provide a valve of this class which, while being sensitive and efficient, shall embody a compact, simple, and inexpensive construction; and to this end my invention consists in the relative arrangement of the diaphragm and the high-pressure valve and the connection between them; also, in the form of the valve-casing, and in other details, as hereinafter fully set forth.

Figure 1 of the accompanying drawings presents a central vertical section of my improved valve; and Fig. 2, a plan view of the same, with the diaphragm and top plate removed.

My improved valve has been more especially designed for those automatic hydraulic air-compressors now used in bars for pumping or expelling malt or carbonated liquors from barrels or casks, such as patented to me July 22, 1879; but it may, of course, be employed for any equivalent purpose where a pressure reducing and regulating valve is required.

In the original drawings the valve is represented full size.

a indicates the attaching-neck of the valve-casing, which is connected by a suitable union or coupling to the air-chamber of the air-compressor, or to other source or reservoir of the compressed air or gas; and *b* indicates the delivery-neck of the valve, which is usually connected by a hose with the air-space of the barrel of ale or other liquor.

c indicates the high-pressure escape-orifice, which is preferably in line with the axis of the neck *a*, and is controlled by the puppet or valve *d*, which may be termed the "high-pressure" valve, and *e* indicates the low-pressure escape-orifice, which is preferably much larger than the high-pressure orifice. The chamber between these two orifices forms the reduced-pressure chamber or diaphragm-chamber, and is closed on the top by the diaphragm *f*. This chamber, as may be observed from Fig. 2, is composed of two circular cells, *g h*, joined by a narrow throat, *i*. The high-pressure valve *d* plays like a piston in the smaller cell *h*, and has a flat rubber face to seat upon the bottom of the cell and close the orifice *c* while the diaphragm plays in or over the larger cell *g*. The diaphragm is preferably made of elastic sheet-rubber, and is cut to correspond with the exterior outline of the reduced-pressure chamber *g h i*, as seen best in Fig. 2, and is held between the flat margin thereof and the top plate, *r*, of the valve-casing. This top plate is flat over the cell *h* and throat *i*, to hold the diaphragm rigid at those points, where it acts merely as packing, and is domed or hollowed over the cell *g*, to permit the free movement of the operative part of the diaphragm, and this plate is screwed to the main casing at the five points *k*. (Seen best in Fig. 2.)

l is the spindle of the diaphragm, which is guided at its lower end in a central bore or cavity in the bottom of the cell *g*, and has formed on its upper end a broad shoulder, which rests against the under side of the diaphragm, and is terminated with a threaded shank, which projects through the diaphragm and receives a nut, *s*, with a broad face, which is screwed tightly against the diaphragm, as shown. This nut has an elongated neck, which enters a spiral spring, *m*, whose lower end rests on the broad end of the nut, while its upper end rests on the end of the bore of a hollow screw, *n*, which incloses said spring. The hollow-screw *n* screws into a threaded

neck formed on the top plate, *r*, in line with the diaphragm-cell, and has a milled rim, *n'*, by which the screw may be turned in or out to compress or relax the spring more or less, and thus put more or less external pressure on the diaphragm, which, as may be observed, constantly tends to depress it in opposition to the air-pressure upon its inner side. As usual, the space above the diaphragm has free communication with the external air, while the space below communicates with the vessel into which the valve discharges, as will be readily understood.

It may now be observed that the reduced-pressure or diaphragm chamber extends laterally from the high-pressure orifice, and that the axis of the diaphragm is placed at a considerable lateral distance from the high-pressure orifice and its valve *d*. The diaphragm is, however, operatively connected with the high-pressure valve by a lever, *o*, which is pivoted in the throat *i*, while its short arm projects into a slot in the top of the high-pressure valve *d* and rests against, but is not fastened to, the valve, and its long arm fits into a slot in about the middle of the diaphragm-spindle. Hence, as soon as the pressure of the air below the diaphragm—or, in other words, the back-pressure from the vessel into which the valve discharges—becomes greater than the pressure of the spring upon the diaphragm, the diaphragm will be raised, the lever tipped, and the high-pressure valve closed, and, on the other hand, when this air-pressure falls below the pressure of the spring the spring will depress the diaphragm, tip the lever, and permit the high-pressure valve to open, so that ordinarily the air-pressure balances the spring-pressure, so as to render the delivery of the air constant at the desired reduced pressure, which may, of course, be increased or decreased at will by adjusting the spring-screw *n*.

A little consideration will now show that the described construction of the valve, with the cavity or reduced-pressure chamber extending laterally and the diaphragm placed at a lateral distance from the high-pressure valve and operatively connected by a lever, presents many advantages. Thus the cavity of the valve-casing, when thus formed, is very easily cast, the casing being cast in one piece, as shown, and the cells for the high-pressure valve and the orifice therefor, as well as the bore for the diaphragm-spindle, may be easily formed or finished by simple drilling or reaming in a straight line. Furthermore, it is always desirable in this kind of valve that the diaphragm shall rise and the high-pressure valve close in opposite directions, the valve closing against and opening with the pressure. Now, the connecting-lever interposed between these parts enables them to act in this opposite manner, and yet the construction is very simple and compact, much more so than where a yoke is used to pass around the part having the valve-orifice.

Again, by the use of the interposed lever a much smaller diaphragm may be used, as the leverage may be made in favor of the diaphragm, so as to obtain the proper ratio between the diaphragm and the high-pressure valve without having to largely extend the area of the former.

It may be also seen that, as the short arm of the lever rests upon but is not fastened to the high-pressure valve, hence when the diaphragm is depressed the valve will not be raised from its seat unless the back-pressure from the ale-barrel or other vessel is less than the pressure from the air compressor or reservoir, so that hence the valve is free to act as a check-valve to prevent the return of air from the ale-barrel or other vessel into which the valve discharges.

It may be further observed that by making the adjusting-screw *n* hollow to inclose the spring a long spring may be used without occupying much space, while being at the same time well supported.

What I claim as my invention is—

1. In a regulating-valve of the described kind, the combination, with a diaphragm arranged at a lateral distance from the high-pressure valve, of a lever operatively connecting the two and resting on, but not fastened to, the said high-pressure valve, substantially as and for the purpose set forth.

2. A pressure-regulating valve of substantially the kind described, having its valve casing or chamber *g h i* extending laterally from its high-pressure orifice or neck *a*, and provided with the valve-cell *h* and diaphragm-cell *g*, formed perpendicularly therein and at a lateral distance from each other, with a communicating passage, *i*, between said cells, and a diaphragm and valve arranged to play in the respective cells, and an operative connection between them arranged in the said passage, substantially as herein shown and described.

3. A pressure-regulating valve such as described, having its valve-casing formed with the diaphragm-cell *g*, valve-cell *h*, and communicating throat *i*, forming one cavity or chamber opening on one side of the casing, with the flexible diaphragm-sheet *f* entirely covering said cavity, and the top plate, *r*, domed over the diaphragm-cell *g*, but flat over the remainder of the cavity, and fixed to the casing to confine said sheet at all points except over the cell *g*, whereby the same sheet serves as a packing over the entire cavity and a diaphragm over the cell *g*, substantially as herein shown and described.

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