No. 788,240. PATENTED APR. 25, 1905.

E. M. BOURNONVILLE.

PRESSURE REDUCING VALVE.

APPLICATION FILED NOV. 2, 1904.

Fig. 1.

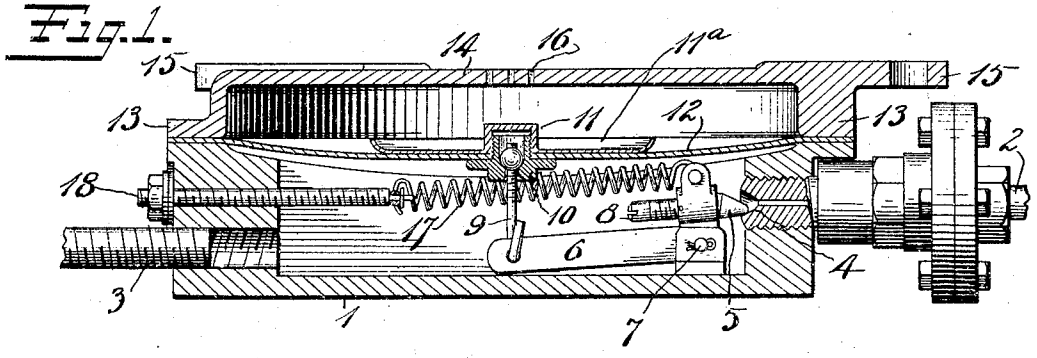



Fig. 2.

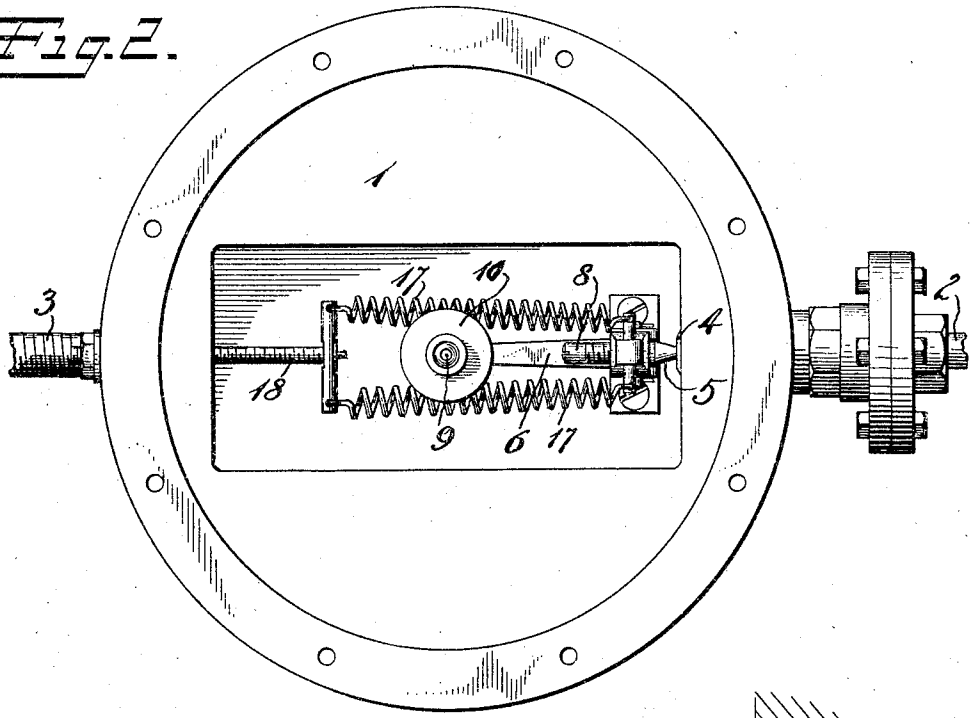
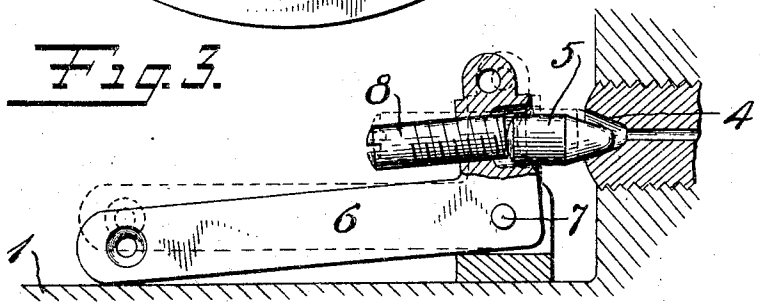



Fig. 3.




Witnesses
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No. 788,240. Patented April 25, 1905.

# UNITED STATES PATENT OFFICE.

EUGENE M. BOURNONVILLE, OF JERSEY CITY, NEW JERSEY.

## PRESSURE-REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 788,240, dated April 25, 1905.

Application filed November 2, 1904. Serial No. 231,058.

*To all whom it may concern:*

Be it known that I, EUGENE M. BOURNONVILLE, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Pressure-Reducing Valves, of which the following is a full, clear, and exact description.

My invention relates to certain new and useful improvements in pressure-reducing valves for gas or air.

Among the main objects of my invention are simplicity of construction, durability, and effectiveness, which objects I attain by the use of the improvements referred to in the following specification and illustrated in the accompanying drawings.

In the drawings, Figure 1 is a sectional view showing the interior construction. Fig. 2 is a plan view, the cover, diaphragm, and diaphragm-reinforce being removed. Fig. 3 is a relatively enlarged detail view partly in section.

1 is a case in which the operating mechanism is located and through which the gas or air passes from the inlet or supply pipe 2 to the outlet or service pipe 3.

4 is a valve-seat adjacent to the inner end of the inlet-pipe 2.

5 is a valve adapted to the seat 4 and arranged to open or close the passage therethrough.

6 is a bell-crank lever pivotally mounted at 7 and provided to operate the valve.

In the short arm of the lever 6 is a suitable socket arranged to support the valve 5. This valve partakes of a free lateral movement, as will be seen by reference to Fig. 3, so that it is self-centering in the seat 4. The substantial advantages of this self-centering valve will be apparent from the fact that were the valve immovably connected to the operating-lever it would fail in the course of time to operate properly by reason of wear at the pivotal support 7. In the particular form shown the valve has a cone-shaped forward end, and the valve-seat is suitably tapered to receive said end. The bearing-surfaces are usually ground in to effect a secure closure. Obviously the particular form of the valve is immaterial to the broad scope of the invention, although the cone or needle form is preferred for reasons hereinafter stated.

8 is an adjusting-screw, which may be carried by the valve support or lever 6. This adjusting-screw receives the thrust of the valve at its rear end and forces it properly up to its work as the lever 6 is operated. To the long arm of the lever is connected a link 9, which in its preferred form has a universal bearing in a nut 10 at or near its upper end. The nut 10 receives the cap 11. Clamped between the cap 11 and the nut 10 is a diaphragm 12, the same being impervious to the gas or air which is to be passed through the apparatus underneath said diaphragm. The diaphragm 12 is preferably held in position by means of the annular flange 13 of the cover 14.

15 15 are brackets which may be provided on any part of the apparatus—for example, on the cover 14—and by means of which the apparatus may be secured in place wherever desired.

16 16 are vent-holes in the cover 14, whereby atmospheric pressure may be maintained in the space between the diaphragm 12 and cover 14.

$11^a$ is a diaphragm-reinforce and protecting-plate. This plate $11^a$ is preferably of disk-like form, is carried upon the cap 11, and covers as much as desired of the central portion of the diaphragm, leaving an unreinforced border between its edge and the holding-flange 13 of sufficient area to insure freedom of action and yet quick response to variations in pressure in case 1.

17 is a spring connected to the short arm of the bell-crank lever 6—for example, just above the valve-support. This spring is connected at its other end to a stem 18, which may be adjusted to and fro in any suitable manner, whereby the spring pull upon the lever may be modified at will to satisfy the demands. The tendency of the spring 17 is to swing the valve-operating lever 6 in a direction to open the valve. Any number of springs 17 may be employed. In the drawings two are shown.

I have shown the preferred form of my invention; but it is obvious that it may partake of various modifications in design and ar-

rangement without departure from the spirit and scope thereof. While of course the link 9 may be rigidly connected with the nut 10, the universal connection is preferred, since it prevents any cramping or binding between the parts and insures a free straight-line draft of the link upon the lever 6.

In operation gas or air at high pressure may flow into the space within the case 1 and be delivered at low pressure through the outlet-pipe 3. The pull of the spring 17 determines the pressure required to elevate the diaphragm 12. As soon as this pressure is attained within the case 1 and below the diaphragm the latter is elevated, thereby closing the valve 5. When the pressure below the diaphragm is reduced by the use of gas or air at the service end of the apparatus, the diaphragm lowers, allowing the valve 5 to open, whereupon the designed pressure is reëstablished and the valve closed. The operation of the valve-controlling apparatus is so delicately responsive that variation of pressure within the case 1 is practically imperceptible.

One advantage of the preferred form of the construction of the valve 5 is that both ends are loosely yet effectively supported whether said valve be in the open or closed position. As shown in the drawings, the rear end of the valve is supported in a socket of the lever 6, and the forward end is supported in the tapered seat 4 at all times. This construction also admits of the ready removal or substitution of the valves. The material employed in the construction of the several parts is of course immaterial so long as they are properly adapted to the intended purpose.

In speaking of the valve as a "laterally-movable" valve I mean that the valve or the operative end of the same is laterally movable relatively to its path of movement toward and from the seat.

What I claim is—

1. In a pressure-reducing apparatus, a case, a diaphragm forming one of the walls of said case, an inlet and an outlet, a valve-seat at said inlet, a valve coöperating with said seat, a valve-support said valve being laterally movable in said support, a connection between said diaphragm and said valve-support whereby the latter may be moved in a direction to close the valve.

2. In a pressure-reducing apparatus, a case, a diaphragm forming one of the walls of said case, an inlet and an outlet, a valve-seat at said inlet, a valve coöperating with said seat, a valve-support said valve being laterally movable in said support, a connection between said diaphragm and said valve-support whereby the latter may be moved in a direction to close the valve, and a spring for reversing said movement.

3. In a pressure-reducing apparatus, a case, a diaphragm forming one of the walls of said case, an inlet and an outlet, a valve-seat at said inlet, a valve coöperating with said seat, a valve-support said valve being laterally movable in said support, a connection between said diaphragm and said valve-support whereby the latter may be moved in a direction to close the valve, and a spring for reversing said movement, said spring being connected to said support and arranged to move the same and said diaphragm simultaneously with opening said valve.

4. In a pressure-reducing apparatus, a case, a diaphragm forming one of the walls of said case, an inlet and an outlet, a valve-seat at said inlet, a valve coöperating with said seat, a valve-support said valve being laterally movable in said support, a connection between said diaphragm and said valve-support whereby the latter may be moved in a direction to close the valve, a spring for opening said valve, and means for varying the pull of said spring.

5. In a pressure-regulator, a case, a gas inlet and outlet, an enlarged tapered valve-seat for said inlet said seat being rounded at its inner end, a tapered valve having a rounded end the forward part of said valve being loosely supported by said seat when open, an enlarged socket loosely supporting the rear end of said valve, and a diaphragm connected to said socket whereby the valve may be positively seated when said diaphragm moves in one direction.

6. In a pressure-regulator, a case, a gas inlet and outlet, an enlarged tapered valve-seat at the end of said inlet, the end of said seat being rounded, a tapered valve having a rounded end, the forward part of said valve be-being supported in said seat, and a socket loosely supporting the rear end of said valve, a diaphragm and connecting means between said diaphragm and said socket whereby the latter may be positively moved to seat said valve.

Signed at New York city, New York, this 1st day of November, 1904.

EUGENE M. BOURNONVILLE.

Witnesses:

H. M. SKINNER,

L. VREELAND.