

No. 845,708.

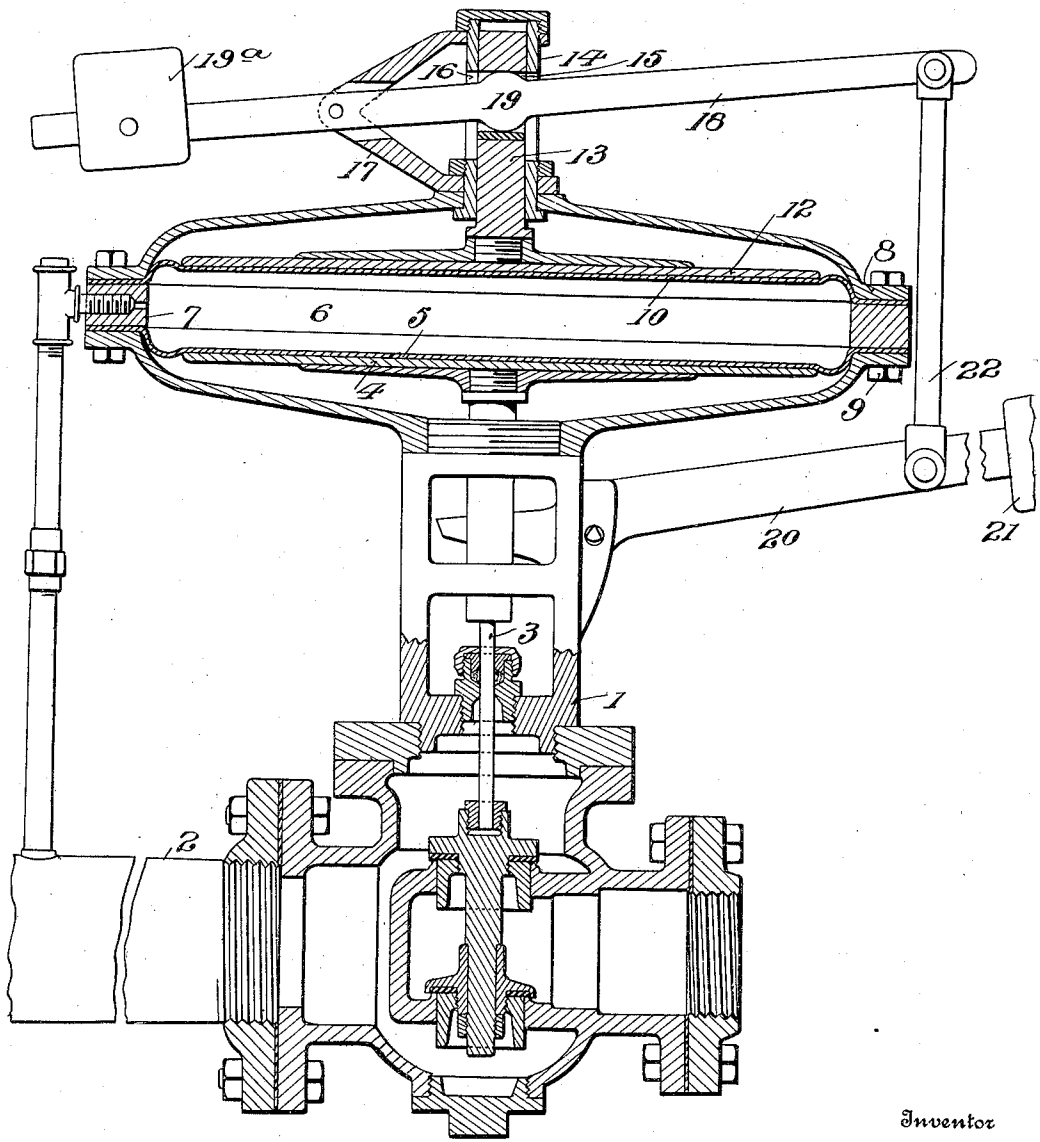
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L. B. FULTON,  
FLUID PRESSURE REGULATOR.

APPLICATION FILED OCT. 18, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



Inventor

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Witnesses

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By

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# UNITED STATES PATENT OFFICE.

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## FLUID-PRESSURE REGULATOR.

No. 845,708.

Specification of Letters Patent.

Patented Feb. 26, 1907.

Application filed October 18, 1906. Serial No. 339,550.

*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  
5 new and useful Improvements in Fluid-  
Pressure Regulators; and I do hereby declare  
the following to be a full, clear, and exact de-  
scription of the invention, such as will enable  
others skilled in the art to which it apper-  
10 tains to make and use the same.

The primary object of this invention is to  
increase the area of the actuating-surface in  
a pressure-regulator without increasing the  
diameter of the diaphragm-case, so that the  
15 device will be affected by even slight changes  
in the main on the delivery or low-pressure  
side of the regulator.

It is well known in the art that the sensi-  
tiveness of a valve-controlling diaphragm is  
20 proportional to the effective area thereof,  
and yet it is highly expedient that dia-  
phragms of not too great diameter be em-  
ployed, since, aside from the cost, dia-  
phragms of large diameter are cumbersome  
25 to handle, take up unnecessary room, add to  
the weight and cost of shipment, and are  
liable to burst when in use. My present in-  
vention overcomes all these difficulties, and I  
am enabled to obtain all the advantages that  
30 arise from the employment of a diaphragm  
of large diameter and at the same time avoid  
any material increase in the cost of manu-  
facture.

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

In the accompanying drawings, Figure 1 is  
a vertical sectional view. Figs. 2 and 3 are  
similar views of modified forms of my inven-  
40 tion.

Referring to the drawings, 1 designates the  
regulator-valve located in a gas-main 2, said  
valve being shown as of the balanced type,  
although any preferred form of construction  
45 may be employed. The rod or stem 3 of  
this valve carries at its upper end a circular  
plate 4, located beneath a diaphragm 5 with-  
in the diaphragm-casing or chamber 6. This  
casing is shown in Fig. 1 as being made in  
50 two parts, the upper part being separated  
from the lower by a ring 7, fitted between the  
bolt-flanges 8, said parts and ring being held  
by the nutted bolts 9. The edge of the dia-

phragm 5 is secured between the ring and the  
lower part of the casing.

10 designates a second diaphragm located  
55 within the diaphragm-casing and secured at  
its edge between the ring and the upper part  
of the casing. Against this diaphragm  
bears a circular plate 12 on the lower end of a  
60 rod or stem 13, extended through a tubular  
sleeve 14, fitted in a central opening in the  
top of the diaphragm-casing. The rod or  
stem 13 has an opening 15 formed therein co-  
incident with opposite slots 16 in sleeve 14,  
65 and on said sleeve are fitted the ring-like  
ends of a yoke 17. In this yoke is fulcrumed  
a lever 18, having a bulged or rounded por-  
tion 19, which fits snug within the opening  
15. One arm of this lever has a weight 19<sup>a</sup>  
70 thereon to balance the upper diaphragm and  
its cooperative parts, so that such diaphragm  
will float and be sensitive to all changes in  
pressure.

20 designates a lever fulcrumed on the  
75 valve-housing beneath the diaphragm-cas-  
ing, its short arm engaging the valve rod or  
stem 3, while its long arm is extended be-  
yond the edge of the diaphragm-casing and  
equipped with a counterbalancing-weight 21.  
80 Between its counterweight and fulcrum this  
lever is connected by a link 22 to the outer  
end of lever 18. A pipe leading from the  
low-pressure side of the valve opens into the  
diaphragm-casing between the two dia-  
85 phragms, said pipe being fitted in an opening  
in ring 7.

In practice the pressure of the gas in the  
space between the two diaphragms will uni-  
formly act against the two diaphragms, the  
90 tendency being to force them apart. The  
downward movement of the lower diaphragm  
5 tends to seat the regulator-valve as against  
the lifting action of the counterweighted lever  
20, and likewise the upward movement  
95 of the diaphragm 10 tends, through lever 18  
and link 22, to lift the lever 20 to permit the  
regulator-valve to be seated. As the pres-  
sure falls, permitting the two diaphragms to  
move toward each other, the regulator-valve  
100 is opened, allowing an increased supply of  
gas.

The invention is capable of several modi-  
fications. The two diaphragms need not be  
located in the same casing, nor need they both  
105 be arranged above the valve. In Fig. 2 I

have shown the second diaphragm 10<sup>a</sup> as mounted in a separate casing 6<sup>a</sup>, superposed on casing 6, the branch pipe 23<sup>a</sup> opening into both casings above their diaphragms. The valve rod or stem 3<sup>a</sup> is elongated and passes through coincident openings in the two casings, carrying a second circular plate 12<sup>a</sup> for the upper diaphragm. A small diaphragm 24 surrounds this stem to prevent leakage from the lower casing.

In Fig. 3 I have shown the second diaphragm 10<sup>b</sup> located in a casing 6<sup>b</sup>, bolted to the under side of the valve-casing, the upper face of such diaphragm being subjected to the pressure on the low-pressure side of such valve.

By employing two diaphragms for acting on the counterweighted lever I insure the operation of the regulator-valve under all varying degrees of pressure, such diaphragms when of ordinary diameter being as sensitive to changes as a single diaphragm of an area equal to that of the two diaphragms. Thus I am enabled with great economy in material and space to provide in a low-pressure regulator means for insuring the operation of the valve under all changes.

This application is filed in lieu of application Serial No. 303,532, filed February 28, 1906.

I claim as my invention—

1. A pressure-regulator comprising a valve having a rod or stem, a superposed diaphragm secured directly to such rod or stem, means normally tending to unseat such valve, and a second diaphragm in coöperative relation to the first-mentioned diaphragm, said diaphragms being movable by pressure from the low-pressure side of the valve, the movement of each diaphragm being communicated to the valve independently of the other diaphragm.

2. A pressure-regulator comprising a valve having a rod or stem, a diaphragm secured to such rod or stem, a second diaphragm, said diaphragms being movable in unison in opposite directions under pressure from the low-pressure side of the valve, levers actuated by the movements of said diaphragms, and a connection between said levers.

3. A pressure-regulator comprising a valve, a diaphragm connected thereto, means normally tending to unseat such valve, a second diaphragm, means operated thereby connected to the first-mentioned means, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

4. A pressure-regulator comprising a valve having a rod or stem, a diaphragm secured to such rod or stem, a second diaphragm also having a rod or stem, said diaphragms being movable in unison in opposite directions, levers engaging said rods or stems and actuated by the movements of said diaphragms, a

connection between said levers, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

5. A pressure-regulator comprising a valve having a rod or stem, a diaphragm secured to such rod or stem, a second diaphragm also having a rod or stem, said diaphragms being movable in unison in opposite directions, levers engaging said rods or stems, one lever having a counterbalancing-weight normally tending to unseat such valve, a connection between said levers, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

6. A pressure-regulator comprising a valve having a rod or stem, a diaphragm secured to such rod or stem, a second diaphragm also having a rod or stem, said diaphragms being movable in unison in opposite directions, a weighted lever engaging said valve rod or stem for normally tending to unseat such valve, a second lever engaging the rod or stem of said second diaphragm, a connection between said levers, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

7. A pressure-regulator comprising a valve having a rod or stem, a two-part casing, a diaphragm secured to said rod or stem and fitted between the parts of the casing, a weighted lever normally tending to unseat such valve, a second diaphragm also secured between said parts of the casing, and having a rod or stem, a second lever engaging said latter rod or stem, means connecting said levers, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

8. A pressure-regulator comprising a valve having a rod or stem, a two-part casing having bolt-flanges, a ring held between said flanges, a diaphragm secured to said rod or stem and fitted between said ring and the lower casing part, a weighted lever tending to normally unseat such valve, a second diaphragm secured between said ring and said upper casing part, a second lever engaging said rod or stem, means connecting said levers, and a branch pipe leading from the low-pressure side of the valve to the space between said diaphragms.

9. A fluid-pressure regulator comprising a valve, having a rod or stem, a diaphragm secured to such rod or stem, a second diaphragm, means for balancing such second diaphragm, said diaphragms being movable in unison in opposite directions under pressure from one side of the valve, and means actuated by the movements of said diaphragms for effecting the seating of said valve when said diaphragms move in opposite directions.

10. A fluid-pressure regulator comprising a valve having a rod or stem, a diaphragm secured to such rod or stem, a second dia-

phragm also having a rod or stem, said diaphragms being movable in unison in opposite directions, a weighted lever engaging the rod or stem of said second diaphragm, a second weighted lever engaging the valve-rod, a connection between said levers, and a branch pipe leading from one side of said valve to the space between said diaphragms.

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.