E. J. DEEGAN.

REGULATOR.

APPLICATION FILED APR. 5, 1918.

1,288,389. Patented Dec. 17, 1918.

Fig. 1.

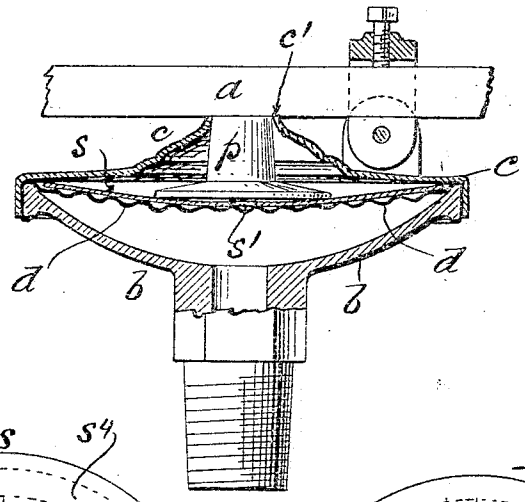



Fig. 3.

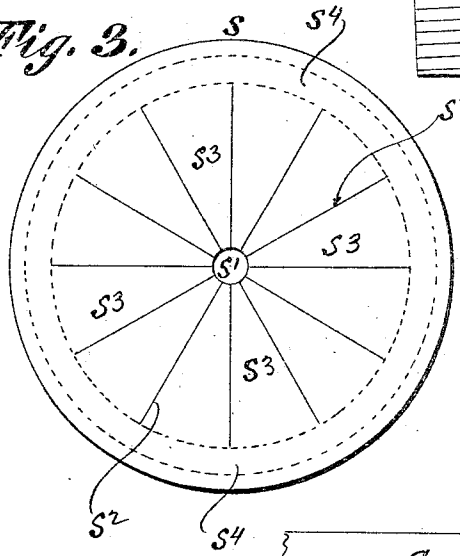
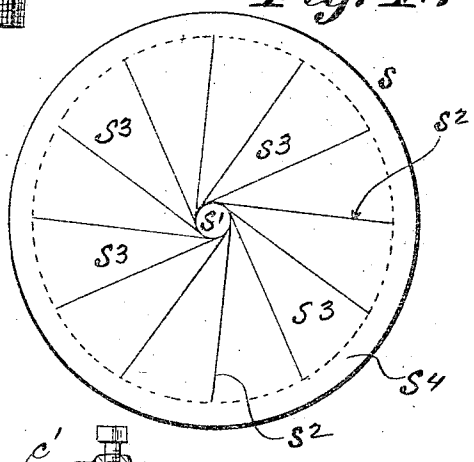



Fig. 4.



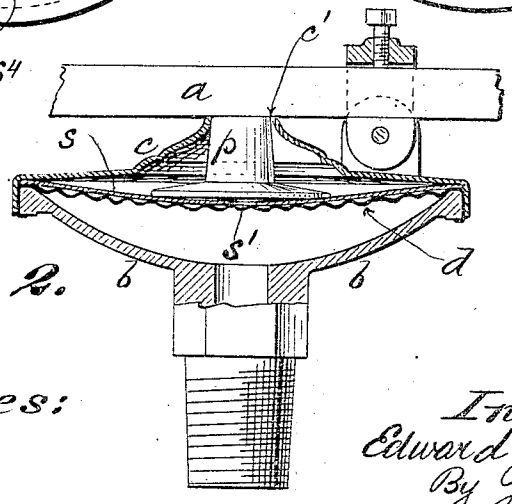




Fig. 2.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

EDWARD J. DEEGAN, OF NEW YORK, N. Y.

## REGULATOR.

1,288,389. Specification of Letters Patent. Patented Dec. 17, 1918.

Application filed April 5, 1918. Serial No. 226,856.

*To all whom it may concern:*

Be it known that I, EDWARD J. DEEGAN, a citizen of the United States, and a resident of the borough of Bronx, county of Bronx, city and State of New York, have invented certain new and useful Improvements in Regulators, of which the following is a specification.

My invention relates to diaphragmatic pressure regulators in which the diaphragm supports the transmitting plunger which actuates the valve or damper operating mechanism, as in Letters Patent No. 1,064,713, issued to me June 17, 1913, and in Letters Patent No. 1,108,146, issued to me August 25, 1914.

In order to render the diaphragm sensitive and readily responsive to pressure it is made of relatively thin elastic resilient material, preferably of copper, and this renders it somewhat fragile, so much so that the contactual edge of the transmitting plunger resting thereon has a tendency to wear and break or crack the diaphragm under exceptional strain or uneven alinement, and especially undue back pressure unduly exerted by improper manipulation of the regulator lever, rendering the regulator inoperative for practical purposes. Furthermore this fact materially limits the pressure capacity of the regulator, since the limit of strength is at or adjacent to the central annular line of contact of the edge of the transmitting plunger with the diaphragm which area has to sustain the maximum of wear and strain. In other words the strength and pressure capacity of the diaphragm has heretofore been that of this restricted area of contactual engagement with the transmitting plunger.

It is the object of my present invention to obviate this difficulty, and to lengthen the life of the diaphragm while augmenting its pressure capacity, utility and efficiency, and this I accomplish by interposing between the diaphragm and the transmitting plunger an elastic resilient auxiliary plate or compensating shield of peculiar construction which receives and distributes the contactual strain of the transmitting plunger over practically the whole diaphragm so as to render such strain innocuous, while at the same time increasing the pressure capacity of the diaphragm and regulator, all as hereinafter more fully set forth and claimed specifically.

In the accompanying drawings,

Figure 1, is a central vertical sectional elevation of a regulator provided with my diaphragmatic auxiliary or protector;

Fig. 2, is a like view showing a slight modification in the arrangement of parts;

Fig. 3, is a top view of my relief plate or shield;

Fig. 4, is a like view illustrating a modification of the same.

While applicable to other forms of pressure regulators I have herein shown my invention as used in conjunction with a pressure regulator of the type set forth in Letters Patent heretofore granted to me as before stated, in which the diaphragm *d* preferably corrugated, is held peripherally by and between the edges of a concavo-conoidal base *b*, and a cover plate *c*, the space below the diaphragm being the pressure chamber and that above the diaphragm being subject to atmospheric pressure through the central opening *c'*, in the cover *c*, through which the stem of the transmitting plunger *p*, protrudes,—said plunger *p*, being formed with a relatively broad, circular base which has heretofore rested directly upon the upper side of the diaphragm *d*.

I have found by experience that the part of the diaphragm subject to greatest strain and wear is that at or adjacent to its contact with the edge of the base of the transmitting plunger *p*, the function of which latter is to transmit the motion and pressure of the diaphragm *d*, to the actuating member *a*, by which the regulating damper or valve is controlled in a manner well known in the art. One serious danger in so far as the diaphragm is concerned has been that of undue back pressure resulting from careless manipulation of the valve or damper actuating mechanism, particularly the member *a*. If improper weight or pressure is applied to the latter it is obvious that it will be transmitted by the plunger *p*, to the diaphragm, and that the edge of the base of the plunger will represent the line of critical strain,—the internal pressure, if any, exerted upon the under side of the diaphragm resisting such undue back pressure, and tending to engender a shearing strain at the basic edge of the plunger *p*.

By my present invention I protect the diaphragm against such deleterious localized strain, and distribute the latter evenly over the diaphragm by means of the elastic resilient relief plate or shield *s*, preferably metallic, which I superpose upon the dia-

phragm $d$, and between it and the base of the transmitting plunger $p$, as shown in Figs. 1 and 2. This shield plate $s$, is preferably of substantially the same size as the operative, flexible area of the diaphragm $d$, upon which it may rest loosely, as in Fig. 1, or the shield may be of sufficient diameter to be clamped peripherially between the edge of the diaphragm and the cover $c$, as indicated in Fig. 2. In either case it is made to conform to the general contour of the upper face of the diaphragm $d$, when the latter is at rest or deflated, so as to contact therewith for practically the full area thereof, as shown in Figs. 1 and 2. Hence, as the base of the plunger $p$, rests directly upon this shield $s$, the weight of said plunger, and any back pressure exerted thereby, will be distributed by the shield and imparted to the diaphragm over substantially the whole area of the latter, obviating excess of strain at any particular part thereof. Furthermore the relief or reinforcing shield $s$, by contacting directly with the base of the plunger $p$, prevents any abrasive action of the latter against the diaphragm, which may consist of a delicate sheet of relatively thin copper, whereas the shield may be made of sheet steel or other relatively hard and tenacious material.

In order to render my diaphragm shield $s$, sufficiently sensitive and responsive to the flexible fluctuations of the diaphragm $d$, I prefer to form it with a central opening $s'$, of less diameter and area than the base of the plunger $p$, and also to form it with a plurality of slits divergent from this central opening. These slits $s^2$, $s^2$, may be arranged radially as shown in Fig. 3, or tangentially as shown in Fig. 4, or in fact in any desired manner or direction provided they afford a series of inwardly convergent tongues $s^3$, extending from the peripheral margin $s^4$, to the center, or to the central opening $s'$, before mentioned. This diaphragm shield $s$, is preferably formed by means of stamping dies which not only cut the centrally convergent slits $s^2$, and form the central opening $s'$, but also impart to the shield disk $s$, a dish shaped or conoidal form essentially the same as that of the concavo-conoidal depression of the diaphragm $d$, when deflated and at rest.

By the use of my reinforcing shield $s$, I not only protect the diaphragm against excessive and localized strain and wear in so far as the transmitter plunger $p$, is concerned, but I also greatly increase the effective capacity of the relatively thin and otherwise frail diaphragm, so that, thus reinforced, it is enabled to withstand an operative pressure, and variations or fluctuations thereof, many times greater than the capacity of the same diaphragm not thus reinforced or protected. As a result I attain greater scope of usefulness and efficiency for the regulator without increase of size of parts or thickness of diaphragm, and this at a minimum of additional cost because my diaphragm shield is simple and inexpensive. At the same time my shield while reinforcing the diaphragm so that it will safely withstand what would, without it, be excessive and dangerous pressure, detracts little if any from the sensitiveness of the diaphragm to respond to slight variations in pressure, because the shield, thus constructed, is itself easily flexed, its thickness being such as to afford a maximum of elasticity combined only with sufficient resiliency to enable it to conform to and follow contactually the flexures of the diaphragm.

As a matter of fact I have demonstrated by practical test and investigation that by the use of my reinforcing shield I can augment the pressure capacity of the diaphragm four fold with practically no loss of sensitiveness and responsiveness to relatively low degrees of pressure.

The number of centrally convergent slits $s^2$, formed in the reinforcing disk, may be varied to suit requirements, and they are clear cut so that their adjoining edges contact closely, and hence the bearing against the diaphragm is continuous and uniform throughout, thereby preventing injury to the opposed face of the diaphragm and insuring equable distribution of pressure.

What I claim as my invention and desire to secure by Letters Patent is,

1. In a regulator of the character designated, the combination with the diaphragm of an elastic resilient reinforcing shield independent of and interposed between it and the plunger by which the motion of the diaphragm is transmitted by the actuating mechanism, said diaphragm and shield being unconfined throughout their area except at the periphery, for the purpose described.

2. In a regulator of the character designated, the combination with the diaphragm of an elastic resilient reinforcing shield, independent of and interposed between it and the plunger by which the motion of the diaphragm is transmitted to the actuating mechanism, said reinforcing shield being formed with a plurality of slits extending from a peripheral margin inward convergently toward the center, said diaphragm and shield being unconfined throughout their area except at the periphery, for the purpose described.

3. In a regulator of the character designated, the combination with the diaphragm of an elastic resilient reinforcing shield entirely disconnected from and interposed between it and the plunger by which the motion of the diaphragm is transmitted to the actuating mechanism, said reinforcing shield being formed with a central opening and with a plurality of slits extending from a

peripheral margin to said central opening, for the purpose described.

4. In a regulator of the character designated, a diaphragm, and an elastic resilient reinforcing shield independent of, unattached to, and superimposed upon the diaphragm to receive the impact of the plunger of the device.

5. In a regulator of the character designated, a diaphragm, and an elastic resilient reinforcing shield independent of, unattached to, and superimposed upon the diaphragm to receive the impact of the plunger of the device, said shield having a plurality of slits extending from a peripheral margin toward the center with the inner ends of the portions between the slits free and unattached.

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Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."