W. HODGSON.

REGULATOR.

APPLICATION FILED FEB. 6, 1919.

1,338,081. Patented Apr. 27, 1920.

Fig. 1.

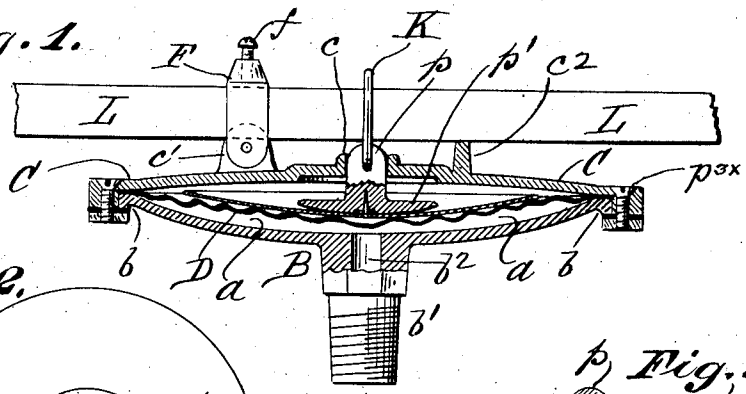


Fig. 2.

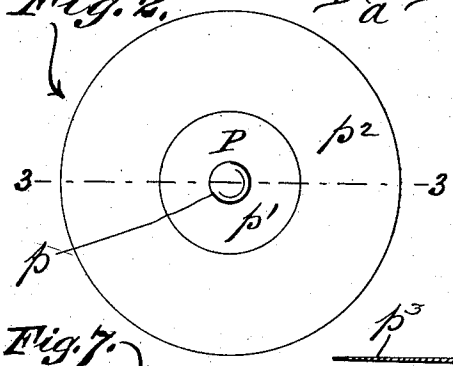


Fig. 3.

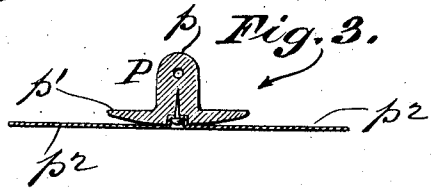


Fig. 4.

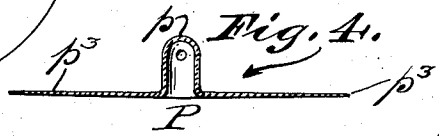


Fig. 6.

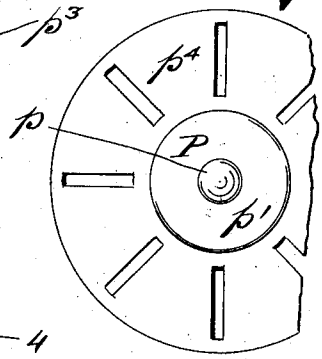


Fig. 7.

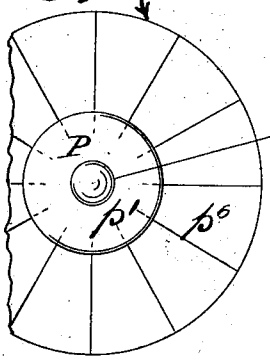


Fig. 5.

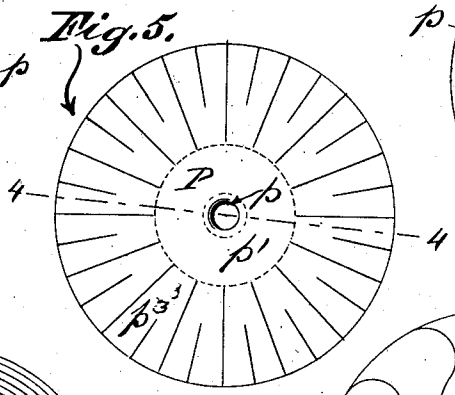


Fig. 8.

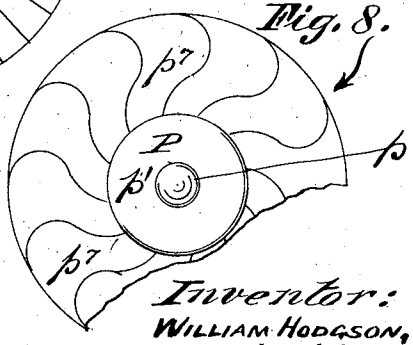
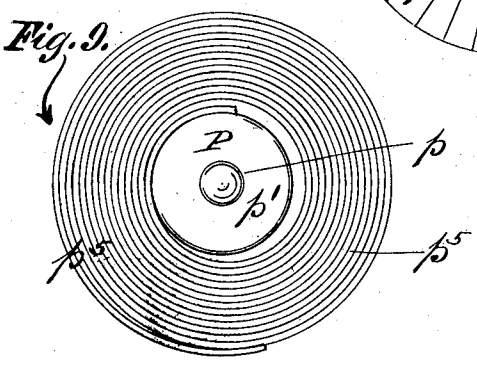


Fig. 9.



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Geo. Wm. Mutt

UNITED STATES PATENT OFFICE.

WILLIAM HODGSON, OF NEW YORK, N. Y.

REGULATOR.

1,338,081. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed February 6, 1919. Serial No. 275,416.

To all whom it may concern:

Be it known that I, WILLIAM HODGSON, 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 improvements relate more particularly to the plungers, so called, used in diaphragmatic pressure regulators of the class set forth in my concurrent application No. 265,950, filed Dec. 9, 1918, resulting in Letters Patent No. 1,305,603, issued to me June 3, 1919, for transmitting the motion of the diaphragm to the means by which damper or valve controlling mechanism is actuated. As therein set forth, the diaphragms, for the purpose of attaining a maximum of strength and flexibility and rendering them sensitive and readily responsive to fluctuations of fluid pressure, are made of relatively thin elastic resilient material, preferably copper, and are also preferably corrugated for reinforcement. Hence such diaphragms are somewhat fragile, so much so that the contactual edge of the transmitting plunger as heretofore made, if resting thereon directly, has had a tendency to unduly wear, and even crack or rupture, the diaphragm under exceptional strain or uneven alinement of parts, and especially under the strain of resistance or back pressure exercised by improper manipulation of the lever or other valve or damper actuating device contacting extraneously with said plunger. This fact has heretofore materially limited the pressure capacity of the regulator since the limit of strength was at or adjacent to the central annular line of contact of the edge of said transmitting plunger with the diaphragm, which area had to sustain the maximum of wear and strain. To remedy this difficulty elastic resilient reinforcing shields have been interposed between the plunger and the diaphragm as set forth in Letters Patent No. 1,288,389, dated Dec. 17, 1918, and in my Letters Patent No. 1,305,603 hereinbefore referred to, with good results. But these shields have been loosely placed between the diaphragm and the plunger, and positioned and confined peripherally only in the casing, so that they have a freedom of movement axially and otherwise which is conducive to wear, and is otherwise objectionable.

Hence, my present invention, which consists essentially in a unitary structure of plunger and shield, or rather in so constructing the plunger that it also performs the function of a shield to the diaphragm by equalizing and distributing the strain of contactual engagement therewith so as to render the same innocuous,—while at the same time increasing the pressure capacity of the diaphragm, and consequently of the regulator as a whole, all as herein fully set forth and claimed specifically.

In the accompanying drawings,

Figure 1, is a central vertical sectional elevation of a regulator of the type designated, provided with a plunger made in accordance with my invention;

Fig. 2, is a plan of the plunger formed with a plain, unslit circumscribing elastic resilient contactual extension;

Fig. 3, is a section taken upon plane of line 3—3, Fig. 2;

Fig. 4, is a central section (on plane of line 4—4, Fig. 5) of a one piece plunger formed with elastic resilient circumscribing contactual extension;

Fig. 5, is a view of the under side of the plunger shown in Fig. 4;

Fig. 6, is a top view, partly broken away, of a plunger formed with a slotted elastic resilient circumscribing contactual extension;

Fig. 7, is a similar view of a plunger formed with a radially and peripherally slitted elastic resilient circumscribing contactual extension;

Fig. 8, is a similar view showing a plunger with still another form of slitted elastic resilient contactual extension;

Fig. 9, is a top view of a plunger formed with a contactual extension consisting of a spiral of elastic resilient wire.

In Fig. 1, I show my improved plunger P, as incorporated in a regulator essentially the same as that shown and described in my aforesaid concurrent application for patent Serial No. 265,950, consisting of the concave base B, corrugated copper diaphragm D, and cover plate C, the diaphragm D, being held peripherally between the rim *b*, of the base B, and said cover plate C. The base plate B, is formed with a threaded

nipple b', for engagement with a pipe communicating with a source of fluid pressure,—said nipple b', being formed with the inlet port b^2, communicating with the space between the diaphragm D, and the base B,—said space constituting the pressure chamber a, of the regulator.

The upper part of the post p, of the plunger P, protrudes through a centralizing sleeve c, in the cover C, for engagement with lever L, by which the valve or damper mechanism is actuated in a manner well known in the art. The fulcrum link F, is pivotally supported in the usual way between fulcrum lugs c', on the top of the cover plate C, and is recessed for the accommodation of said motion-transmitting lever L, and provided with a set screw f, for binding the latter against longitudinal movement, as heretofore, when required.

The cover C, is also formed with a rest c^2, for the lever L, when the diaphragm D, is fully deflated (as in Fig. 1),—the post p, of the plunger P, in the particular arrangement shown, being coupled to the said lever L, by means of the link K. The rest c^2, acts as a protector to the diaphragm D, by guarding against the undue depression of the plunger P, by means of the lever L.

The plunger post p, with its annular base p', is rigid, but the circumscribing marginal extension p^2, is elastic and resilient, and extends sufficiently beyond the base p', to cover the greater portion of the area of the diaphragm D, as illustrated in Fig. 1, without contacting peripherally with the cover plate C.

It is obvious that the elastic resilient marginal portion p^2, (or extension of or beyond the plunger base p') for engagement with the diaphragm D, may be formed in various ways without departing from the spirit and intent of my invention in this respect,—the essential feature of such marginal extension p^2, being a flexibility sufficient to enable it to yield and adapt itself to the fluctuations of the diaphragm, combined with sufficient resilience to enable it to maintain contactual engagement with the diaphragm whether the latter be fully inflated or deflated, thereby distributing the strain of such contactual engagement over practically the whole area of the diaphragm and thus shielding the latter against undue strain in any part.

Thus the elastic resilient marginal portion p^2, of the plunger P, may consist, as in Figs. 2 and 3, of the peripheral extension beyond the base p', of a plain thin disk of sheet steel or other suitable material adapted to conform to the curvature of the diaphragm D, as heretofore set forth,—it being understood in this connection that the weight of the transmitting lever L, tends constantly to hold and press the plunger P, considered as a whole, against the upper surface of said diaphragm, so that even when the latter is deflated as in Fig. 1, the under surface of the plunger P, will be in contactual engagement with the diaphragm; and conversely, as the diaphragm is inflated and raised, the resilience of the marginal portion p^2, of the plunger P, will cause it to adapt itself to the change in curvature of the diaphragm and thus still maintain continuous contactual engagement therewith over the whole area of opposed surfaces.

To this end, when the plunger post p, and its base p', are provided with a peripheral extension in the form of an attached disk or plate, as in all but Figs. 4 and 5, of the drawings, the under side of the base p', is preferably curved convexly as shown in Figs. 1 and 3, to allow the contactual plate to conform fully to the curvature of the diaphragm as above set forth,—the contactual plate being attached to the base centrally by means of a countersunk rivet $p^{3\times}$, or equivalent means, as may be found most expedient.

The plunger P, and all its parts, including the elastic resilient marginal portion p^2, may however be made in one piece of suitable metal stamped and drawn out into shape substantially as indicated in Figs. 4 and 5,—the post p^0, in this case being hollow and rigid and the base and marginal portions p^3, being reduced in thickness as compared with said post p^0, so as to afford the requisite degree of flexiblity and resilience.

Various means may be resorted to in adapting the degree of elasticity of the resilient marginal extension to the varying requirements of use, the size and purpose of the regulator, etc., some of which are illustrated in the accompanying drawings. Thus, as in Fig. 6, the marginal portion p^4, may be slotted radially or otherwise, to increase flexibility, while in Figs. 5, 7 and 8, different forms of radial slotting are resorted to for a like purpose, the resilient marginal portion in Figs. 7 and 8 being designated as p^6 and p^7 respectively. Again, in Fig. 9, the marginal extension p^5, consists of a spiral coil of suitable elastic resilient wire, or the like; so that it will be seen that my invention is not to be restricted to any particular means whereby the resilient marginal area p^2, is to be rendered also flexible to a suitable degree.

The unitary structure of plunger and shield, and of strain distribution and equalization of pressure, thus attained as between plunger and diaphragm, tends to lengthen the life and utility of the latter, as well as to increase its capacity for pressure, and hence the capacity and utility of the regulator as a whole. Furthermore, this unitary

structure of the plunger and contactual shield is of advantage in the assembling of the parts, and in centralizing and maintaining the plunger and shield in proper alinement with and relation to the diaphragm.

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 a plunger for transmitting the motion of said diaphragm to the actuating mechanism, said plunger being rigid with a rigid central portion and with a circumscribing elastic resilient extension thereof for contactual engagement with said diaphragm, for the purpose described.

2. In a regulator of the character designated, the combination, with the diaphragm, of a plunger for transmitting the motion of said diaphragm to the actuating mechanism, said plunger being rigid with a rigid central portion and with a circumscribing elastic resilient extension thereof for contactual engagement with said diaphragm, said marginal extension being slitted, for the purpose described.

3. In a regulator of the character designated, the combination, with the diaphragm, of a plunger for transmitting the motion of said diaphragm to the actuating mechanism, said plunger being rigid with a rigid central portion and with a circumscribing elastic resilient extension thereof for contactual engagement with said diaphragm, said marginal extension having a plurality of slits extending to and through its periphery, for the purpose described.

4. In a regulator of the character designated, the combination, with the diaphragm, of a plunger for transmitting the motion of said diaphragm to the actuating mechanism, said plunger being formed in one piece with a rigid central portion, and with a circumscribing elastic resilient extension thereof for contactual engagement with the diaphragm, for the purpose described.

5. In a regulator of the character designated, the combination, with the diaphragm, of a plunger for transmitting the motion of said diaphragm to the actuating mechanism, said plunger being formed in one piece with a rigid central portion and with a circumscribing elastic resilient extension thereof for contactual engagement with the diaphragm, said marginal extension having a plurality of slits extending to and through its periphery, for the purpose described.

WILLIAM HODGSON.

Witnesses:
DOROTHY MIATT,
GEO. WM. MIATT.