W. HODGSON.
REGULATOR.
APPLICATION FILED JAN. 29, 1919.

1,338,080.

Patented Apr. 27, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

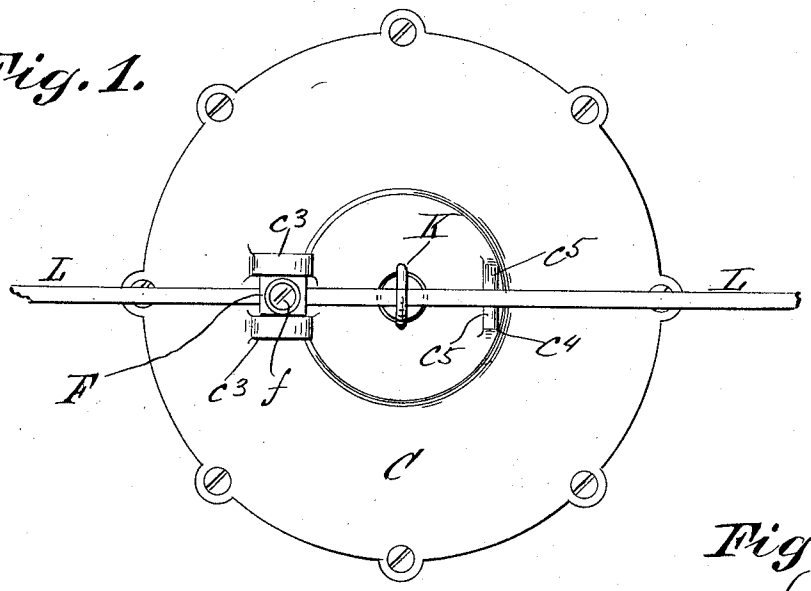


Fig. 4.

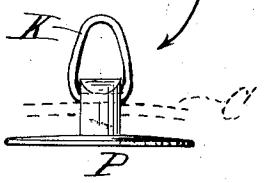


Fig. 2.

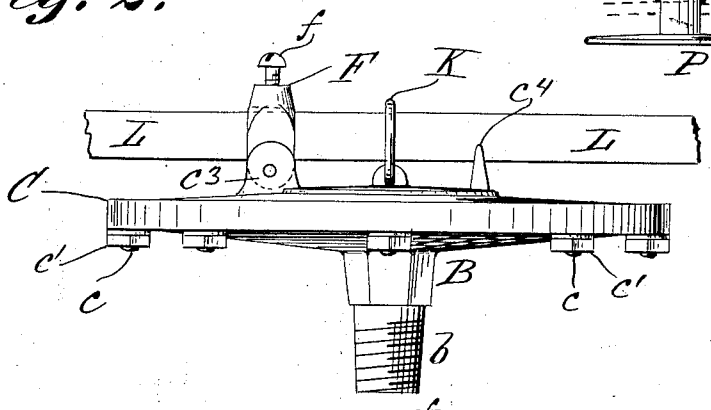
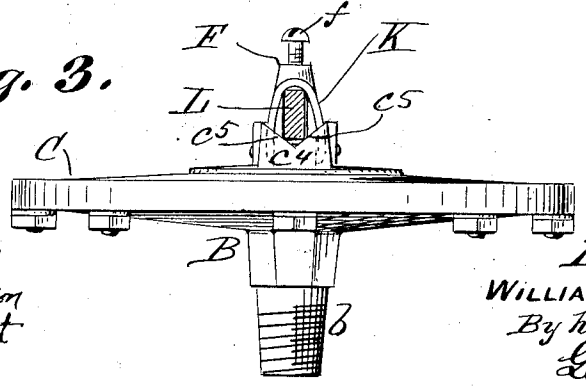


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 5.

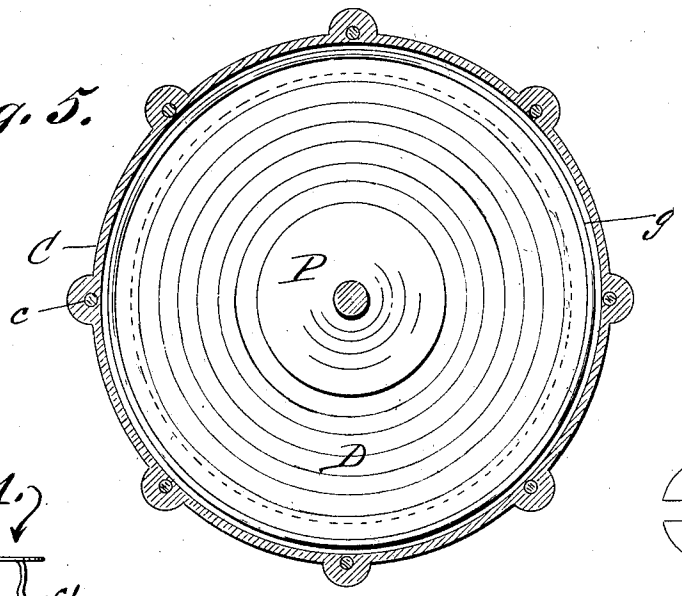


Fig. 10.

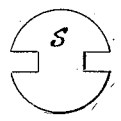


Fig. 11.

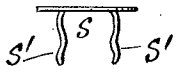


Fig. 6.

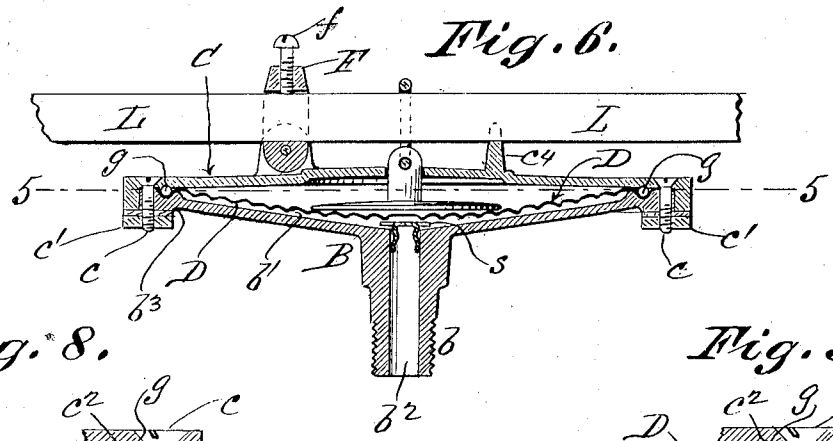


Fig. 8.

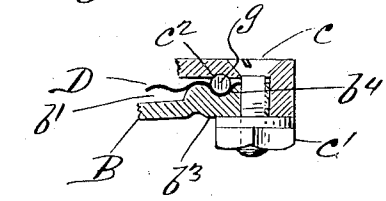


Fig. 9.

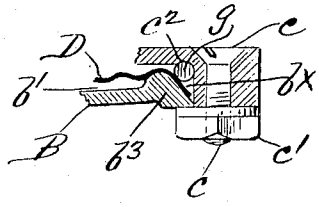




Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM HODGSON, OF NEW YORK, N. Y.

REGULATOR.

1,338,080. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed January 29, 1919. Serial No. 273,905.

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 to the type of diaphragmatic pressure regulator in which the diaphragm contacts directly with the motion-transmitting plunger which actuates valve or damper operating mechanism. For the purpose of attaining a maximum of strength and flexibility and rendering the diaphragm sensitive and readily responsive to fluctuations in pressure it is made of relatively thin elastic resilient material, preferably copper, and is also preferably corrugated for reinforcement. Hence the diaphragm is somewhat fragile and easily distorted or ruptured if subjected to rough treatment, as by uneven or undue pressure, or resistance exerted thereon by the aforesaid plunger, the periphery of which should bear evenly upon the diaphragm when in contact therewith. When properly installed and in operation the required relationship between plunger and diaphragm is maintained automatically because the diaphragm controls the plunger under normal conditions of use, but carelessness in packing or transportation, or in the manipulation of the parts during installation, or even thereafter, may result in injury to the diaphragm,—extraneously exerted and uneven pressure being transmitted thereto through the medium of the plunger. Another source of danger to the relatively thin soft diaphragm arises from the fact that carelessness or curiosity frequently prompts the insertion of a pencil, stick or the like through the opening to the pressure chamber prior to the installation of the regulator, resulting in the puncture or distortion of the diaphragm and rendering it inoperative in an effectual sense.

It is the object of my invention to obviate these difficulties and dangers which I accomplish through the medium of the special construction and arrangement herein described and claimed,—distinctive features being the means afforded for preserving the correct alinement of the plunger and preventing its pressing unduly on the diaphragm, and the protecting of the under or inner side of the diaphragm by means of a shield interposed between it and the inlet to the pressure chamber, all as hereinafter fully set forth.

In the accompanying drawings,

Figure 1, is a top view of my improved regulator;

Fig. 2, is a side elevation thereof;

Fig. 3, is a side elevation thereof taken at right angles to Fig. 2, and showing the motion transmitting lever in section;

Fig. 4, is a detail view of the plunger and its coupling link;

Fig. 5, is a sectional elevation taken upon plane of line 5—5, Fig. 6;

Fig. 6, is a central vertical sectional elevation of my improved regulator;

Fig. 7, is a representation of a portion of an annular gripping member;

Fig. 8, is an enlarged sectional detail of the jointure shown in Fig. 6;

Fig. 9, is a similar view showing a modification;

Fig. 10, is a top view of the diaphragm shield; and

Fig. 11, is a side elevation thereof.

As heretofore in this type of regulator, the diaphragm D, is clamped peripherally against the rim of the pressure chamber base plate B, by means of a cap plate C,—screw bolts c, and nuts c', in the present case being used as the securing means. The pressure chamber plate B, is formed with the usual threaded nipple b, for engagement with a pipe or other connection with a source of fluid pressure, which latter enters the pressure chamber b', through the inlet passage b^2, in said nipple b, as will be seen more particularly by reference to Fig. 6, of the drawings.

The diaphragm D, is preferably made of a disk of relatively thin elastic resilient copper, corrugated in a manner now well known in the art to afford a maximum of strength with a minimum of weight and thickness.

The edge of the diaphragm D, is held against the rim b^3, of the pressure chamber base plate B, by an annular gripping member g, preferably although not necessarily circular in cross section. This annular gripping member g, may consist either of relatively hard metallic wire calculated to embed itself to some extent in the softer metal of the diaphragm, or it may consist of a wire of relatively soft alloy or metal, as for instance lead,—in either case the pres-

sure exerted in clamping the gripping member g, in position being relied upon to effect a slight flow or displacement of metal sufficient to insure a tight joint between the parts. Thus interposing the gripping member g, between the diaphragm D, and the clamping member (*i. e.*, the cover C, in construction shown herein), enables me to attain an effective joint of such simplicity that skilled labor may be dispensed with in the formation thereof, it being simply necessary to assemble the parts (the base B, diaphragm D, gripping ring g, and cover C) loosely, and then apply the bolts c, and nuts c', which operations do not call for the services of an expert.

In order to further insure the effectiveness of this joint between the parts named I form the inner face of the rim b^3, of the pressure chamber base plate B, with an annular seating groove b^4, coincident with the position of the gripping member g, so that the latter compresses the edge of the diaphragm into said groove b^4, which seating groove is purposely made of less depth than the cross section of the ring g, so as to insure a tight fit of the edge of the diaphragm and the lower portion of said ring g, within said groove b^4. In fact the sides of the seating groove b^4, are practically inclined planes against which the edge of the diaphragm D, is driven by the gripping member g; and this function is further exemplified in the modification shown in Fig. 9, in which the groove $b^\times$, is formed by and between the edge of the rim b^3, and the opposed flange surface of the cover C. In either case the result is the same in that the edge of the diaphragm in pinched between the gripping member g, and a coincidental inclined surface or surfaces on the rim b^3, of the pressure chamber base plate B.

For a like reason I also prefer to form the inner surface of the cover or cap plate C, with an annular groove c^2, to fit over the upper part of the annular gripping member g, and assist in centralizing it and holding it to its proper function of wedging and pinching the edge of the diaphragm against the convergent sides of the seating groove b^4, in the rim b^3, of the pressure chamber base plate B, as shown in Fig. 8, or against the convergent sides of the groove $b^\times$, Fig. 9, formed as before stated between the edge of the rim b^3, and the inner side of the cap flange.

The fulcrum link F, is pivotally supported in the usual way between fulcrum lugs c^3, c^3, on the top of the cover plate C, and is recessed for the accommodation of the motion-transmitting lever L, and provided with a set screw f, for binding the latter against longitudinal movement as heretofore when required.

In order to insure the accurate alinement of the motion-transmitting lever when at rest with the plunger P, in its lowest position, which is to say when the diaphragm D, is deflated as in Fig. 6, I form the cover plate C, with a lever rest c^4, having convergent upper edges c^5, c^5, the point of intersection of which is in alinement with the correct longitudinal alinement of said lever L, as related to its fulcrum and to the center of the diaphragm D. The plunger P, being coupled to the lever L, by means of the link K, it follows that when the lever L, is so contacting with the rest c^4, the plunger P, will be centralized as related to the diaphragm D.

The coupling link K, which is a new and important feature of my invention, not only acts as stirrup or suspender for the plunger P, when the diaphragm is deflated, but it also performs the function of limiting the inward thrust of said plunger by contacting with the top of the cover C, as shown in Figs. 2 and 6, and indicated more particularly by dotted lines in Fig. 4, of the drawings. Thus extraneous pressure applied to the lever L, cannot be transmitted through the medium of the plunger P, to the diaphragm and the latter is thereby protected from danger from above. The shape of the stirrup link K, is such as to straddle snugly the upper edge of the motion transmitting lever L, as shown more particularly in Fig. 3; and the lower portions of its side members also fit the stem of the plunger P, snugly so that there is no play or lost motion and hence the plunger P, is suspended true and does not wabble.

In order to protect the inner or lower side of the diaphragm, before the installation of the regulator, from injury by the insertion of objects of any kind through the inlet b^2, I, during the assembling of the parts, position a shield s, between said diaphragm D, and the inner end of said inlet passage, as shown in Fig. 6. This shield may be of any desired configuration provided it covers the cross area of the said port b^2, so as to intervene between the diaphragm and anything that might be surreptitiously or maliciously introduced into the nipple b, of the pressure chamber base plate B. As shown in the drawings the shield s, consists of a disk of sheet metal formed with lateral tongues s', s', adapted to fit into the port passage b^2, and thereby centralize and hold the shield in position as related to the diaphragm D. This shield in no wise interferes with the transmission of fluid pressure through the inlet passage b^2, to the pressure chamber b'.

It will thus be seen that by the various improvements set forth herein I not only simplify the construction and assembling of the several parts, but also render the device practically "fool proof," and better adapted

to the exigencies and dangers of packing, transportation, careless manipulation, and so forth,—the relatively delicate diaphragm being isolated and protected against extraneous pressure of all kinds without impairing its sensitiveness to fluid pressure.

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

1. In combination with a regulator of the character designated, a corrugated diaphragm, an unattached plunger resting loosely thereon and formed with a central post protuberant through the cover plate of the regulator, a motion-transmitting lever adjustable longitudinally through and upon a pivotally supported fulcrum link on the cover plate, said fulcrum link formed with binding means for contacting with said motion-transmitting lever, and a stirrup link loosely straddling the said lever and articularly connected with the protuberant end of the plunger post, for the purpose described.

2. In combination with a regulator of the character designated, a corrugated diaphragm, an unattached plunger resting loosely thereon and formed with a central post protuberant through the cover plate of the regulator, a motion-transmitting lever adjustable longitudinally through and upon a pivotally supported fulcrum link on the cover plate, said fulcrum link formed with binding means for contacting with said motion-transmitting lever, a rest on the cover plate formed with concavo-convergent guide surfaces for the centralization of the motion-transmitting lever, and a stirrup link loosely straddling the said lever and articularly connected with the protuberant end of the plunger, for the purpose described.

3. In a regulator of the character designated, the combination, with the diaphragm and pressure chamber base plate formed with a peripheral inclined surface, of an annular gripping member contacting with the margin of the diaphragm in opposition to the peripherally inclined surface of the base plate, a cap plate formed with an annular groove coincident with said annular gripping member and the inclined peripheral surface of said pressure chamber base plate, and clamping means for securing the parts together in such manner that the annular gripping member functions as a wedge to bind the periphery of the diaphragm.

4. In combination with a regulator of the character designated, a shield interposed between the diaphragm and the inlet port passage into the fluid pressure chamber in the base, said shield covering the cross area of said port passage, and being formed with tongues adapted to fit within said inlet port passage, for the purpose described.

5. In combination with a regulator of the character designated, a shield interposed between the diaphragm and the inlet port passage into the pressure chamber, said shield being formed with centralizing tongues extending into said port passage, said shield permitting free transmission of fluid pressure through the inlet passage for the purpose described.

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DOROTHY MIATT.