No. 648,593. Patented May 1, 1900.

J. P. METZGER.

PRESSURE REGULATOR.

(Application filed Dec. 16, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

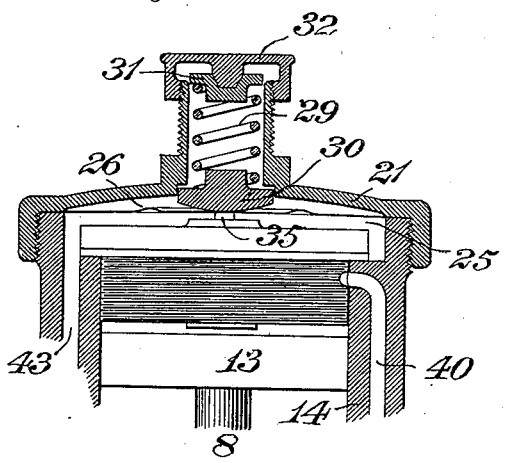


Fig. 2.

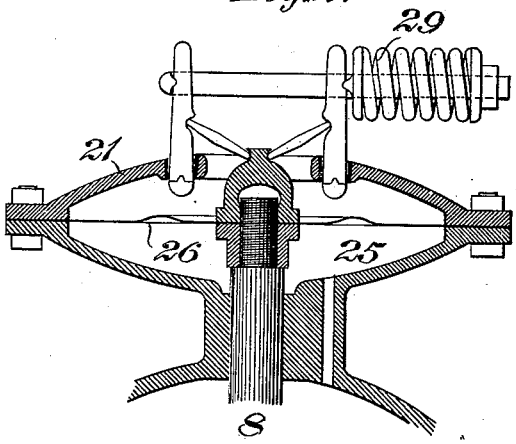


Fig. 4.

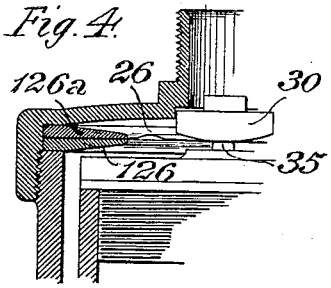


Fig. 3.

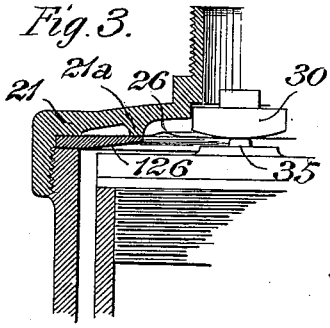


Fig. 7.

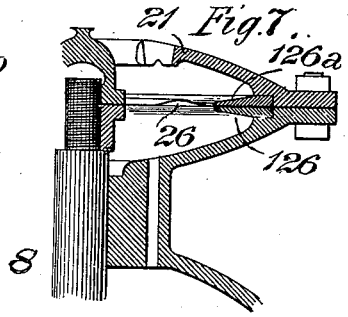


Fig. 5.

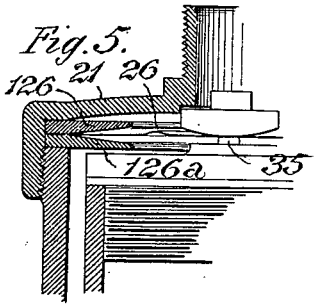
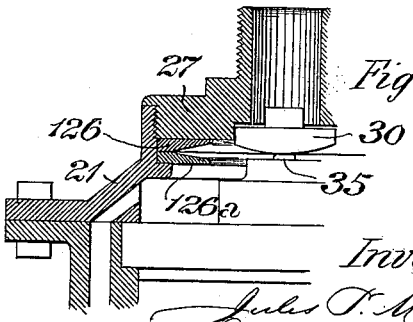


Fig. 6.



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By J. H. Woodcock Dale

Atty.

No. 648,593. Patented May 1, 1900.

J. P. METZGER.

PRESSURE REGULATOR.

(Application filed Dec. 16, 1899.)

(No Model.) 2 Sheets—Sheet 2.

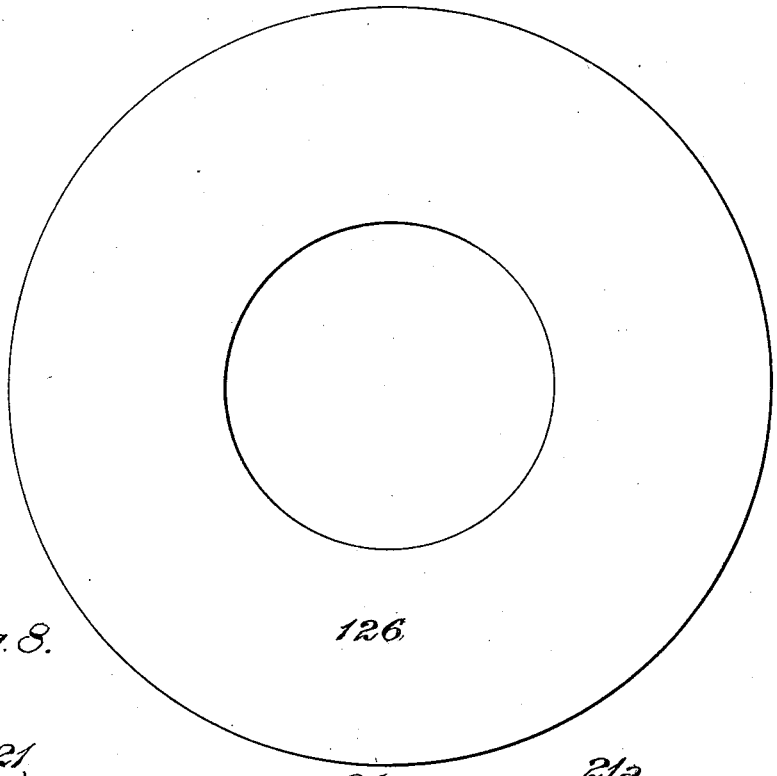

Fig. 8.

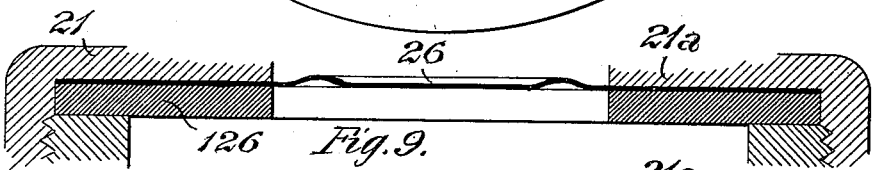

Fig. 9.

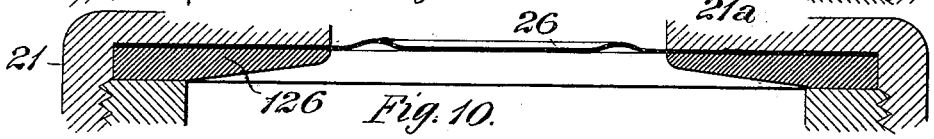

Fig. 10.

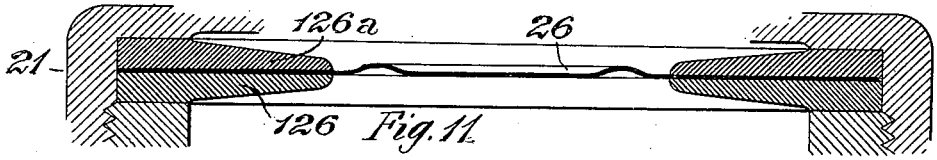

Fig. 11.

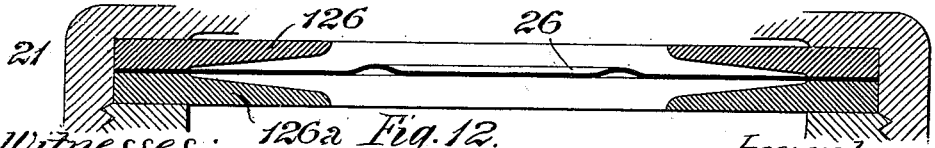

Fig. 12.

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UNITED STATES PATENT OFFICE.

JULES P. METZGER, OF NEW YORK, N. Y., ASSIGNOR TO JOHN S. LESLIE, OF PATERSON, NEW JERSEY.

PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 648,593, dated May 1, 1900.

Application filed December 16, 1899. Serial No. 740,540. (No model.)

To all whom it may concern:

Be it known that I, JULES P. METZGER, of the borough of Manhattan, in the city and State of New York, have invented a certain new and useful Improvement in Pressure-Regulators, of which improvement the following is a specification.

My invention relates to pressure-regulating appliances of the general class which is exemplified in an application for Letters Patent of the United States filed by me November 24, 1899, Serial No. 738,125, (Case A.)

The object of my invention is to provide simple and inexpensive means, which can be readily applied by an ordinary mechanic, whereby undue strain upon and liability to buckling or breakage of the diaphragms of appliances of the character above referred to may be prevented and said diaphragms be adapted to operation under higher or lower pressure, as desired, without changes in the adjusting-springs in connection with which they operate or increase of strain upon them by overpressure.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figures 1 and 2 are vertical central sections through portions of pressure-regulators, illustrating applications of diaphragms thereto as practiced prior to my invention; Figs. 3, 4, and 5, similar sections illustrating embodiments of my invention in pressure-regulators of the class indicated in Fig. 1; Fig. 6, a similar section illustrating an embodiment of my invention in a pressure-regulator of the same class, but of improved type; Fig. 7, a similar section illustrating an embodiment of my invention in a pressure-regulator of the class indicated in Fig. 2; Fig. 8, a plan or top view, on an enlarged scale, of a removable covering member; and Figs. 9 to 12, inclusive, transverse sections, on the same scale, through diaphragms and their accessories and connections, illustrating different detailed forms of application of my invention.

As is well known to those skilled in the construction and operation of pressure-regulating appliances, the failure of these appliances frequently occurs by reason of strain or buckling of the diaphragm, resulting, in large valves, from an undue exposure of their surface to fluid-pressure, or, either in large or small valves, from an increase of pressure above that under which the diaphragm was originally designed to operate. It is also a well-known fact that in pressure-regulators of the ordinary constructions the surface of the diaphragm which is exposed to fluid-pressure is increased proportionately with the increase in diameter of the chamber in which it operates, so that in large regulators the pressure upon the diaphragm becomes so great that it either splits and is destroyed or buckles so as to be useless as a regulating medium.

My present invention is particularly designed for application in pressure-regulators of existing constructions in which the objections above stated obtain, so as to increase their range of capability of operation by adapting them to use under greater variations of initial and reduced pressures and preserving the diaphragms from deterioration or destruction.

My invention enables a low-pressure regulator to be adapted for use as a high-pressure regulator, and vice versa.

Referring first to Figs. 1 and 3 to 5, inclusive, my invention is shown in the latter figures as applied in a pressure-regulator of the class known prior to my invention, which is indicated in Fig. 1—that is to say, one in which a regulating-valve controlling communication between a fluid-pressure inlet-passage and a fluid-pressure outlet-passage is connected to and actuated by a stem 8, fixed to a piston 13, working in a cylinder 14. Fluid-pressure is admitted to the upper side of the piston 13 through a port 40, governed by a controlling-valve (not shown) which is fixed upon a stem 35. The controlling-valve stem 35 abuts against the lower side of a flexible diaphragm 26, which is secured peripherally between the top of the piston-chamber and a cover or cap 21 and is subject on its lower side to fluid-pressure from the outlet-passage of the appliance, which enters through a port or passage 43. The upper side of the diaphragm is subject to the pressure of an adjusting-spring 29, which fits between upper and lower spring-seats 31 30, the latter of which abuts against the upper side of the dia-

phragm and is adjusted and held in position by a threaded cap 32. Under this or any other construction in which the diaphragm is similarly connected to the casing and cover it must of course be of corresponding diameter and be increased proportionately to the increase in size of the apparatus, being thus exposed to very great pressure in regulators of large size and correspondingly liable to deterioration or destruction.

Under my present invention I enable any desired variation to be made in the area of the diaphragm 26, which is exposed to fluid-pressure, by the provision of a removable covering member 126, which is preferably in the form of a flat ring whose internal diameter is less than that of the opening into the valve-casing which is closed by the diaphragm. This covering member fits closely against the lower side of the diaphragm at and adjoining its periphery, said covering member being of greater or less width diametrally, accordingly as less or greater pressure is to be applied to the diaphragm. The covering member 126 is held closely to the diaphragm by being clamped therewith peripherally between the casing of the pressure-chamber 25 and the cover or cap 21, its inner edge being held against the diaphragm either by an annular bearing-face 21^a on the cover 21, as in Figs. 3, 9, and 10, or by a removable ring 126^a, as in Figs. 4, 5, 6, 7, 11, and 12. The covering member 126 may be either flat on both sides and abut against the diaphragm throughout its entire width, as in Fig. 9, or be beveled or inclined on one of its sides, so as to afford access of fluid-pressure to the diaphragm at and adjoining its inner edge when set, as shown in Figs. 5, 6, and 12, and the ring 126^a may be either of rectangular section or be correspondingly formed. By reversing the relative positions of the covering member 126 and the ring 126^a, as shown in Figs. 5, 6, and 12, the entire lower surface of the diaphragm may be exposed to pressure, as in Fig. 1, and the appliance may thus be changed from a high-pressure to a low-pressure regulator, and vice versa, the transposition of these members only being required for the purpose.

Fig. 6 illustrates the application of my invention in connection with a diaphragm 26, which is held in position between the cover 21 and a diaphragm-holder 27 of smaller diameter connected thereto, this combination of the diaphragm with the cover and holder being set forth in my application, Serial No. 738,125, aforesaid, and not being in and of itself claimed as of my present invention.

Fig. 7 illustrates the application of my invention in a pressure-regulator of the prior construction shown in Fig. 2—that is to say, one in which the diaphragm 26 is connected directly with the stem 8 of the regulating-valve, no controlling-valve being employed, and the adjusting-spring 29 acts upon the diaphragm through the intermediation of a system of levers. The covering member 126 is clamped and held to the diaphragm as in the instances before described.

I contemplate in practice to provide a number of covering members of different widths, each adapted to afford a pressure area on the diaphragm suited to a determined pressure, which will be marked upon it. These can be kept in stock and used as desired instead of substituting a different diaphragm and spring for adapting the regulator to operate under a pressure different from that for which it was originally designed or discarding the entire appliance and substituting a new one, as is usually the case.

The protection against buckling or breakage of diaphragms which is afforded by my invention correspondingly improves the reliability and increases the period of service of the pressure-regulating appliance in which it is employed as a whole, and the capability which it affords of readily and inexpensively adapting the appliance to operation under different desired pressures effects a substantial saving to the user.

I claim as my invention and desire to secure by Letters Patent—

1. In a pressure-regulating appliance, the combination of a chamber for the reception of fluid under pressure, a flexible diaphragm secured therein, and means for varying the area of the diaphragm which is exposed to fluid-pressure.

2. In a pressure-regulating appliance, the combination of a chamber for the reception of fluid under pressure, a cap for covering said chamber, a flexible diaphragm secured peripherally between said chamber and cap, and an annular covering member on the pressure side of said diaphragm acting to diminish the area of the diaphragm exposed to pressure.

3. In a pressure-regulating appliance, the combination of a pressure-chamber, a cap therefor, a flexible diaphragm held peripherally between said cap and chamber, and a ring whose internal diameter is less than that of the diaphragm, said ring being also peripherally held between the cap and chamber.

4. In a pressure-regulating appliance, the combination of a chamber for the reception of fluid under pressure having an opening therein closed by a flexible diaphragm, a removable annular covering member of less internal diameter than said opening in the pressure-chamber and which is beveled or inclined on one of its sides and abuts against one side of the diaphragm, and a correspondingly-formed removable ring abutting against the opposite side of the diaphragm.

5. In a pressure-regulating appliance, the combination of a chamber for the reception of fluid under pressure, a cap or cover for said chamber, a flexible diaphragm secured peripherally between the chamber and cap, and means for varying the area of the diaphragm which is exposed to fluid-pressure by

covering a greater or less portion of its surface adjoining its connection with the chamber and cap.

6. In a pressure-regulating appliance, the combination of a chamber for the reception of fluid under pressure, a flexible diaphragm therein, an annular covering member which is beveled or inclined on one of its sides, a correspondingly-formed ring, and a cap or cover connected to the chamber and securing the covering member and ring removably and reversibly to the chamber, on opposite sides of the flexible diaphragm.

JULES P. METZGER.

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PAUL CARPENTER.