

No. 714,048.

Patented Nov. 18, 1902.

H. F. SMITH.

HIGH OR LOW PRESSURE METALLIC DIAPHRAGM ATTACHMENT FOR GOVERNORS.

(Application filed June 21, 1902.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

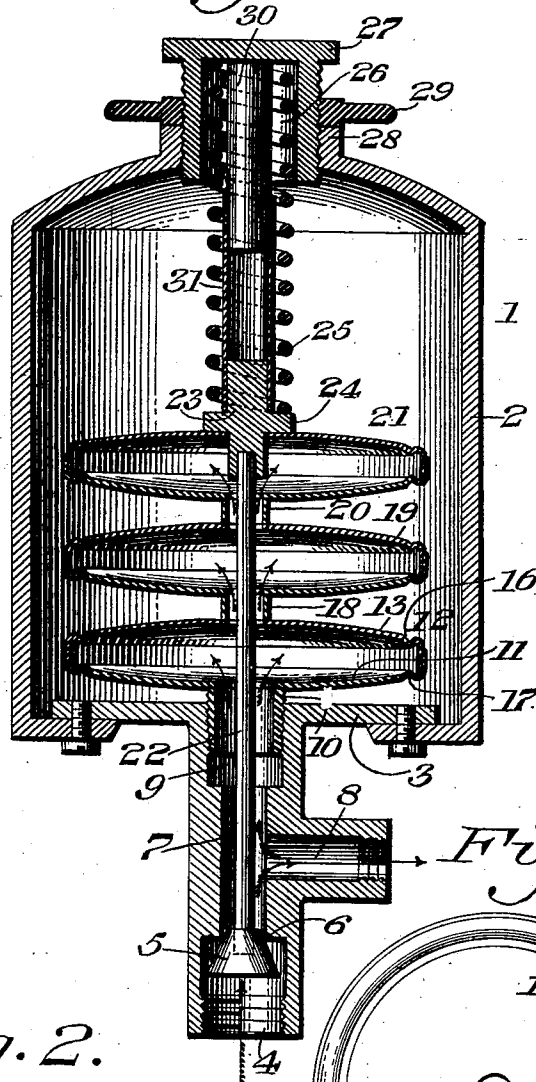


Fig. 2.

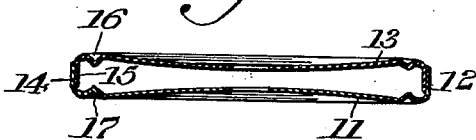
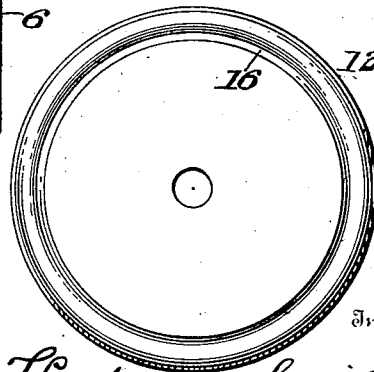


Fig. 3.



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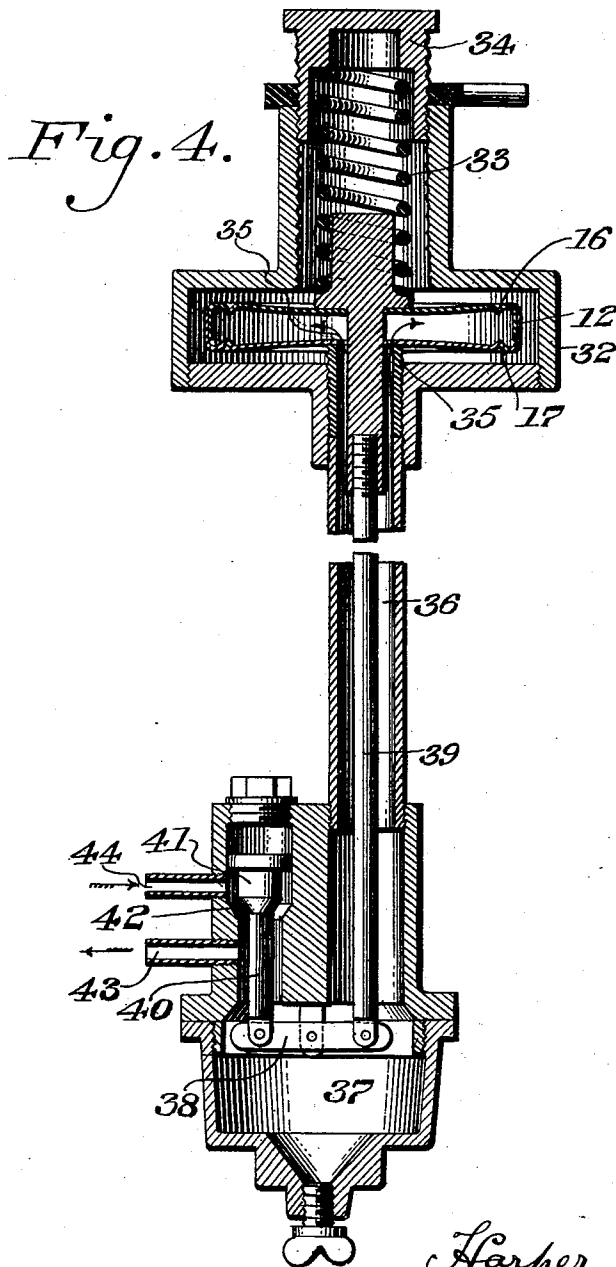
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2 Sheets—Sheet 2.



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HIGH OR LOW PRESSURE METALLIC DIAPHRAGM ATTACHMENT FOR GOVERNORS.

SPECIFICATION forming part of Letters Patent No. 714,048, dated November 18, 1902.

Application filed June 21, 1902. Serial No. 112,567. (No model.)

To all whom it may concern:

Be it known that I, HARPER F. SMITH, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in High or Low Pressure Metallic Diaphragm Attachments for Governors, of which the following is a specification.

My invention relates to an attachment for governors which can be used in connection with any form of governors now in existence and is equally applicable to be used under the pressure of any hot or cold air, vapor, gas, steam, or hot or cold liquids; and it consists of a series of oval metallic box-diaphragms or diaphragm-chambers capable of acting under the slightest degree of pressure as well as responding to the heaviest and greatest amount of pressure that may be desired.

To the above ends my invention consists of the novel combination of a valve which controls the passage of vapor or fluid in any condition to a series of metallic diaphragms, which are in communication with each other and are adapted to be adjusted by a suitable tension device, which can be manipulated on the exterior of the device.

It also consists of a novel construction of oval metallic diaphragm-chamber which is provided with an annular exterior groove or grooves, which are located near the outer edges of the diaphragm, whereby the strain on the extreme ends of the diaphragm-plates is relieved, thereby minimizing the liability of the same to crack.

It further consists of novel details of construction, all as will be hereinafter fully set forth, and particularly pointed out in the claims.

Figure 1 represents a vertical sectional view of a high and low pressure metallic diaphragm attachment for governors embodying my invention. Fig. 2 represents a sectional view of one of the diaphragms in detached position. Fig. 3 represents a plan view of Fig. 2. Fig. 4 represents a vertical sectional view of another embodiment of my invention.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates my novel attachment for governors, the same consisting of the casing 2, having a base 3

formed on or secured thereto in any suitable manner.

4 designates the inlet for the fluid or vapor, above which is located the valve 5, which is adapted to contact with a seat 6, above which is located the passage 7, from which leads the branch or outlet pipe 8. Above the passage 7 is located the chamber 9, into which is screwed or otherwise secured the depending nipple 10, which opens into the lower portion or bottom 11 of the diaphragm-chamber 12, the construction of which will be readily understood from Figs. 1 and 2, said chamber consisting of the lower portion 11 and the top or upper portion 13, each of the latter being provided with the flanges 14 and 15, respectively, which are brazed or otherwise secured in any suitable manner, whereby a tight or hermetical joint is formed.

16 designates an annular ridge which is located in the outer portion of the top 13 of the diaphragm-chamber, the under side 11 being provided with a similar annular ridge 17, whereby it will be seen that the strain on the extreme ends of the upper and lower diaphragm-plates will be relieved while the device is in use, whereby the diaphragm-chamber will be prevented from cracking and the life of the same prolonged.

18 designates a neck or nipple which forms a communication between the upper portion of the diaphragm-chamber 12 and the lower portion of the diaphragm-chamber 19, to the upper portion of which latter is secured the neck or nipple 20, whereby communication is had with the uppermost diaphragm-chamber 21, it being understood that the diaphragm-chambers 19 and 20 are similar in construction to the diaphragm-chamber 12, and it will also be apparent that the number of the diaphragm-chambers may be increased or diminished according to requirements, although I have shown in the present instance three of such diaphragm-chambers employed.

22 designates a rod or valve-stem which extends upwardly from the valve 5 and is secured to a suitable portion of the tube-guide 23, which is brazed or otherwise secured to the top of the diaphragm-chamber 21, so that a tight or hermetical joint will be established.

24 designates a flange or shoulder on the tube-guide, upon which rests the lower ex-

tremity of the spring 25, the upper extremity of said spring being contained within the chamber 26 of the adjusting-cap 27, which is in threaded engagement with the top 28 of the casing 2 and which is adapted to be readily manipulated from the exterior of the casing, whereby the tension of the spring is regulated according to requirements.

29 designates a lock-nut or jam-nut which is adapted to lock the adjusting-cap in the desired position.

30 designates a guide-pin which may depend from or be attached to the adjusting-cap in any suitable manner and whose lower end enters or telescopes within the tube 31, which latter serves as a guide for the spring 25 and holds the latter in its proper position during the operation of the governor.

It will thus be seen from the foregoing that when the spring 25 or its equivalent tension device is set to the required pressure the pressure entering the inlet 4 is brought to bear internally against the upper and lower sides of each diaphragm or series of diaphragms, thereby expanding and contracting the internal space within the diaphragm-chambers according to the pressure exerted, on which the tension-spring would be set. For example, if the tension device 25 should be set at one pound any excess of pressure would expand the diaphragms until the valve 5 was closed or seated, and any decrease below that pressure at which said spring was set would immediately release or unseat said valve.

It will be apparent from the foregoing that the diaphragm or series of diaphragms can be worked either singly or in series, as it may be desirable to increase the movement of the valve-rod, which movement can be adjusted to any desired length, according to the number of diaphragm-chambers used. It will also be understood that the upper diaphragm-chamber is closed at its top and that the other diaphragm-chambers are connected at the center by a series of tubes, nipples, or necks, which are either brazed or otherwise tightly and suitably joined, so as to prevent the escapement of the air, liquid, vapor, or whatever fluid-pressure medium may be employed. It will also be seen that the lower diaphragm-chamber on its lower side is connected to the body of the governor by any suitable device, so that it remains stationary and acts as a retention device when the tendency of the diaphragm chamber or chambers is to expand.

In Fig. 1 I have shown the valve 5 closed and the diaphragm-chambers all in an expanded state, therein showing the action of the diaphragm and the position the valve assumes upon the very slightest excess of pressure beyond the amount set, it being seen that when the pressure is released under which the spring is set the diaphragms contract and the valve reopens.

It will of course be understood by those skilled in this art that when my invention is

used in connection with liquid-pressure said liquid enters beneath the valve 5, passes through the passage 7 and chamber 9 to the interior of the diaphragm-chambers, whereby the pressure is exerted on the top and bottom of said diaphragm-chambers, thereby expanding them to the pressure set, said pressure being delivered through the outlet 8 at any given pressure that may be desired.

In Fig. 4 I have shown but a single diaphragm-chamber as attached to the governing device patented to me in United States Letters Patent No. 693,170, dated February 11, 1902, showing the application of my invention to an air or vapor pressure, the diaphragm-chamber being shown therein in its normal or collapsed condition, the valve being opened.

It will be apparent that while I have described and prefer in practice that my diaphragm-chambers should be composed of metal I do not desire to be limited thereto, as it is obvious that the same may be composed of other material without departing from the spirit of my invention. It will also be evident that the shape or the contour of the diaphragm-chambers may be changed from the forms shown without departing from the spirit of my invention.

In the construction seen in Fig. 4 I have shown another embodiment of my invention wherein but a single diaphragm-chamber 12 is employed, the same being contained within a casing 32, in the upper portion of which is contained a spring 33, the tension of which can be varied by the adjustment of the cap 34, the above parts having substantially the same function as already described in Fig. 1. In the lower portion of the diaphragm-chamber seen in Fig. 4 are located the ports 35, whereby a communication is had with the interior of said diaphragm-chamber and the tube or passage 36, which leads into the chamber 37, within which is pivotally mounted the lever 38, one end of said lever being pivotally attached to the rod 39, whose upper extremity is suitably secured to said diaphragm-chamber or its adjuncts, so that said rod and diaphragm-chamber move in unison.

40 designates a valve-stem which depends from the valve 41, the lower end of said valve-stem being pivotally connected with an extremity of the lever 38, said valve being provided with the seat 42, above which is located the inlet-pipe 44, the outlet-pipe 43 being in the present instance located below said valve-seat.

The device seen in Fig. 4 is especially adapted for use in regulating vapor, air, or similar fluid pressure, it being apparent that the fluid enters through the pipe 44 and that there is an accumulation thereof within the chamber 37 and that, furthermore, the pipe or passage 36 is filled with a body of air which is interposed between the top of the fluid in the chamber 37 and the interior of the diaphragm-chamber 12.

By adjusting the tension device 33, as has been explained in detail with reference to Fig. 1, it will be apparent that said tension device can be adjusted to any desired pressure.

It will be apparent that the construction seen in Fig. 4 is equally well adapted for use with steam, gases, or other liquid or fluid pressure.

In lieu of the springs 25 to regulate and govern the diaphragm-chamber I may employ a weight which may be superimposed upon the diaphragm, the operation being similar in each case.

It will be apparent that while I have shown the preferred structure of devices in carrying out my invention I do not desire to be limited thereto in every instance, as slight changes may be made by those skilled in the art which will come within the scope of my invention.

It is deemed important that the diaphragm be oval in cross-section—that is, that the sides thereof be rounded or extended beyond parallel lines connecting the outer edges of the diaphragm at the junction of said edges and the ridges 16—as I have found from experience that such construction is essential in order that the diaphragms may respond properly and promptly to the pressure, and where I refer in the following claims to the diaphragms as being “oval” I wish to be understood as referring to such form as just described in contradistinction to that form in which the opposite sides of the diaphragm are parallel with each other.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a diaphragm attachment for governors, a diaphragm-chamber composed of top and bottom portions having overlapping peripheral flanges, suitably joined together, said top and bottom portions being normally curved outwardly and having an annular depression or groove at or near the outer portion thereof.

2. In a diaphragm attachment for governors, a casing, a passage leading to the lower portion of said casing, a valve in said passage, the latter having a seat therefor, a valve-rod for said valve, oval metallic diaphragm-chambers in communication with said passage, means connected with said rod and acting against the upper surface of the upper diaphragm-chamber, and a tension device acting on said means for regulating the pressure to be exercised upon said chambers.

3. In an attachment for governors, a casing, a passage leading to the lower portion of said casing, a valve in said passage, the latter having a seat therefor, an outlet-passage above said valve-seat, a valve-rod for said valve, an oval metallic diaphragm-chamber in communication with said outlet-passage, means supported on the upper surface of the upper wall of said diaphragm-chamber and connected with the valve-rod, a spring contained within

said casing above said diaphragm-chamber and engaging said means, and means for regulating the tension of said spring.

4. In an attachment for governors, a plurality of oval metallic diaphragm-chambers, the interior of each of said chambers being in communication with each other, a support for said chambers, a valve-rod passed through the communicating passages and connected within the upper chamber with means bearing on the upper surface of the upper portion of the latter, means for permitting the inlet of fluid-pressure and an outlet for said fluid-pressure whereby said chambers are caused to expand or contract according to requirements.

5. In an attachment for governors, a plurality of oval diaphragm-chambers, the interior of each of said chambers being in communication with each other, a support for said chambers, means for permitting the inlet of fluid-pressure and an outlet for said fluid-pressure whereby said chambers are caused to expand or contract according to requirements, in combination with a valve-rod passed through the communicating passages, means holding the upper end of said rod and bearing upon the uppermost diaphragm-chamber, a spring bearing on the said holding means and acting on the upper surface of the uppermost chamber, a suitable tension device located in proximity to one of said diaphragm-chambers and bearing on said means, and means for regulating said tension device.

6. In an attachment for governors, oval diaphragm-chambers constructed and adapted to act in harmony to expand and contract in accord with a predetermined pressure, a valve controlling the supply to said chambers, a stem connected with said valve and passed through the passages connecting said chambers, means acting on the upper surface of the uppermost chamber, and a tension device connected with said stem and acting upon said connecting means.

7. In an attachment for governors, a series of oval diaphragm-chambers, tubular necks connecting the same at their centers whereby they all expand in unison, a valve-stem depending from the top of the uppermost chamber, pressure-regulating means acting on the upper surface of the uppermost chamber, and a valve carried by the lower end of said stem, said stem being passed through said chambers and necks.

8. In an attachment for governors, the combination with a casing, of a series of diaphragm-chambers therein, a tubular neck connecting the lowermost chamber with the base of the casing, necks connecting the chambers with each other, a tube-guide attached to the upper portion of the uppermost chamber, a valve-stem depending therefrom and extended through said necks and chambers, a valve carried by the lower end of said stem, a tube carried by said tube-guide, a spring around said tube, an adjusting-cap and a

guide-pin carried thereby and disposed within said spring.

9. In an attachment for governors, the combination with a casing, of a series of diaphragm-chambers therein, a tubular neck connecting the lowermost chamber with the base of the casing, necks connecting the chambers with each other, a tube-guide attached to the upper portion of the uppermost chamber, a valve-stem depending therefrom and extended through said necks and chambers, a valve carried by the lower end of said stem,

a tube carried by said tube-guide, a spring around said tube, an adjusting-cap, a guide-pin carried thereby and disposed within said spring, said cap having a chamber forming a guide for the upper end of said spring, and a lock-nut for locking said cap in its adjusted position. 15

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