(No Model.)

# V. H. HIGGINS & W. D. SMITH.

## PRESSURE REGULATOR.

No. 483,516. Patented Sept. 27, 1892.

Fig. 1.

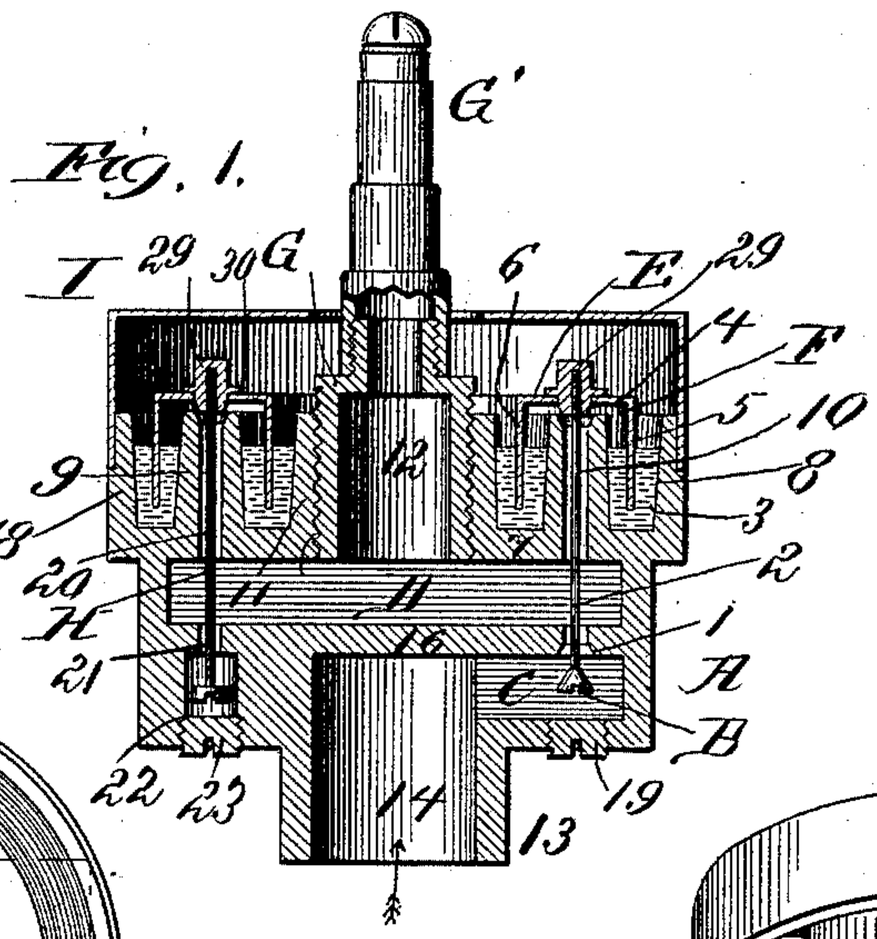



Fig. 2.

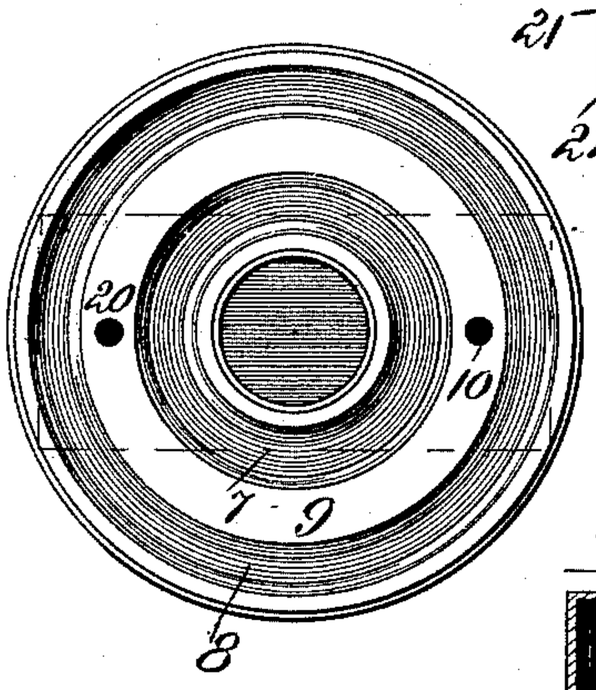



Fig. 3.

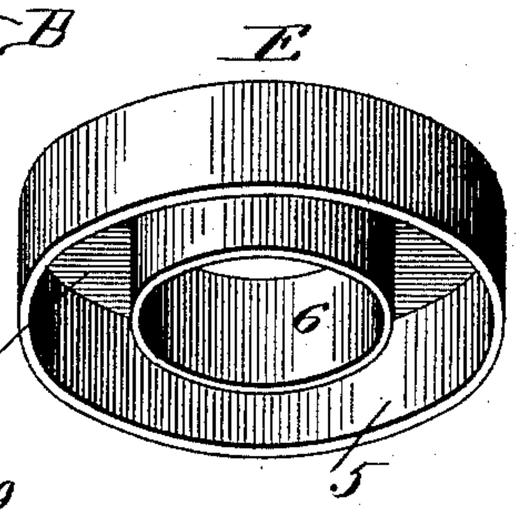



Fig. 4.

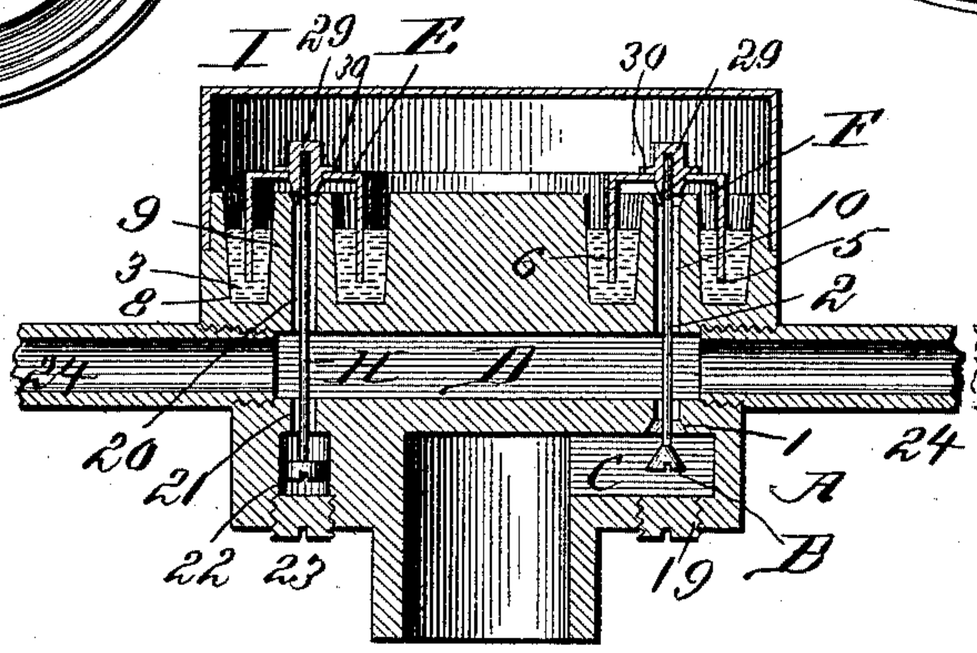
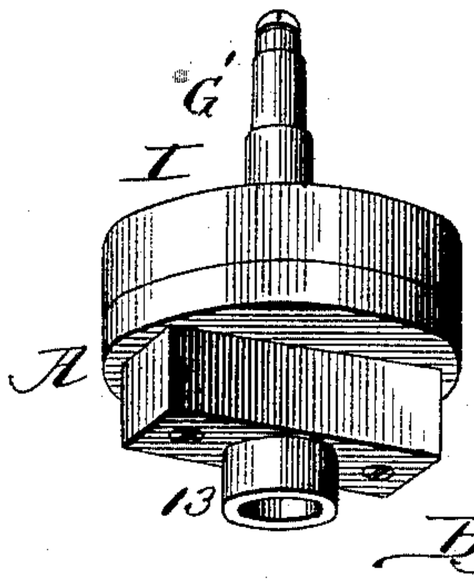



Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 483,516, dated September 27, 1892.

Application filed June 29, 1891. Serial No. 397,774. (No model.)

*To all whom it may concern:*

Be it known that we, VAN H. HIGGINS and WILLIAM D. SMITH, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Mercurial Gas-Governors, of which the following is a specification.

Our invention relates to pressure-regulators or mercurial gas-governors of that class in which the flow of gas is regulated by a float arranged to dip into a body of mercury and a valve connected with and operated by the float, and while in some respects generally applicable for automatically controlling the flow of gas from a source of supply to the point or points of consumption; it is more particularly designed for service in direct connection with any ordinary or desired construction of gas-fixture, such as a bracket, chandelier, and the like.

The objects of our invention are to establish a uniform supply of gas to a burner or burners and to automatically check the supply of gas in excess of such predetermined rate, so as to prevent waste; to provide a simple, compact, and efficient construction of pressure-regulator which can be incorporated in a gas-fixture without rendering the latter either unsightly or otherwise objectionable; to render the valve by which the supply is governed readily responsive to an excess of pressure, and to provide certain novel and improved details, all serving to increase the general efficiency and utility of pressure-regulators.

In a mercurial gas-governor involving our invention the gas-conducting passage is arranged to connect with a source of supply and can be used for supplying one or more burners, as may be desired. The gas-conducting passage is at a point within the regulator expanded to form a pressure-distributing chamber from which the gas is delivered to the burner or burners. The flow of gas into the pressure-distributing chamber is established through a valved supply-port, which is desirably formed through the bottom of said chamber. The valve for the supply-port is automatically operated by a float which is adapted to form an open-bottom pressure-chamber, partially submerged in and sealed by a body of fluid, such as mercury. This pressure-chamber is practically formed by such space within the float as is not occupied by the mercury, and hence the area of the pressure-chamber is variable, since it is dependent on the extent to which the float sinks into the mercury. The pressure-chamber is in open communication with the gas-conducting passage at the delivery side of the valved supply-port, and as a means for establishing such communication a passage is arranged to extend from the pressure-distributing chamber to what may be termed the "floating pressure-chamber." The valve and float are so connected that when an increment of pressure within the pressure-chamber serves to cause the float to rise the movement of the float will cause the valve to close the supply-port to an extent to limit the supply, and thereby prevent waste at the burner or burners. The float can be weighted proportionally to the number and size of the burners and also in accordance with the altitude at which the device is used, and the pressure-chamber is made annular and arranged to surround either a burner or a passage leading to or from the apparatus.

The matters of construction and arrangement involved in a mercurial gas-governor of such description and constituting our improvement therein are hereinafter described in connection with the drawings, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical central section through an automatic gas-governor or pressure-regulator embodying our invention. Fig. 2 is a top plan of the body with its cap I removed. Fig. 3 illustrates the float which serves to form a pressure-chamber. Fig. 4 is a vertical central section corresponding generally with Fig. 1, but involving certain different features of construction hereinafter set forth. Fig. 5 represents in perspective and on a smaller scale the device of Fig. 1.

In the drawings we have represented two constructions of pressure-regulators embodying our invention, but severally involving certain distinctive features.

Where like parts occur in the figures we have employed corresponding letters and figures as a means for designating them.

The several constructions involve in common with one another a gas-conducting passage formed through a shell or body A, and a valve B, arranged for automatically regulating the flow of gas through said passage. The gas-conducting passage is expanded at the supply side of the valve, so as to form a receiving-chamber C, and also expanded at the delivery side of the valve to form what we may term a "pressure-distributing chamber" D. The port 1 for the valve is formed through a partition between the receiving-chamber and the pressure-distributing chamber, and the valve is desirably arranged to open at the supply side of the port. The stem 2 of the valve is connected with an inverted open-bottom float E, which is partially submerged in a body 3 of mercury contained within a chamber in the upper portion of the shell or body A.

The float E consists of an annular cap or inverted annular cup formed with an annular top 4, having two marginal concentric sides or flanges 5 and 6, which depend from said top. By such construction the parts 4, 5, and 6 of the float form the top and side walls of an annular open-bottom pressure-chamber F, which is sealed at its open bottom by the mercury into which it dips.

The top portion of the body A is recessed, so as to provide a chamber for the mercury, into which the float will sink to an extent proportional to the weight of the float and the degree of pressure within said chamber. As a simple and economical arrangement we cast the body A with a couple of concentric annular recesses 7 and 8 and form through the annular wall or rib 9 which is left between such recesses a vertical passage 10, which serves both to place what may be termed the "floating pressure-chamber" in communication with the pressure-distributing chamber D and also to provide a passage for the stem 2 of the valve B.

With reference to the construction shown in Fig. 1 the body A is formed with a centrally-arranged bore, which extends from the top of said body to and into the pressure-distributing chamber D, and the annular chamber or recess 7 is formed so as to leave a neck 11 about said bore. The wall of this bore is threaded and the base G of a burner-tip G′ is screwed into the same, in which way the burner-tip is in open communication with the pressure-distributing chamber. The pressure-distributing chamber is arranged within the middle portion of the body A and is preferably of a circular shallow form. The passage 12 in the burner is positioned centrally with relation to the pressure-distributing chamber, while the supply-port 1 is at one side of the center of said chamber. The body A is at its base provided with a neck 13, which can be coupled to the supply-pipe in a gas-burner bracket or fixture in any suitable way, and the passage 14 through said neck is arranged to extend a short distance up within the body A of the device. The passage 14 connects at its upper end with the laterally-arranged receiving-chamber C, which latter communicates with the pressure-distributing chamber through the port 1 and affords room for the downwardly-opening valve.

By the foregoing-described construction an exceedingly-compact arrangement is attained. Thus the supply-passage 14 is below and in alignment with the delivery or burner passage 12, which latter leads up from a centrally-located shallow pressure-distributing chamber which is separated from the supply-passage 14 and chamber C by a partition 16, wherein the port 1 is formed. The valve-stem extends up through the distributing-chamber, and since the rib or wall 9, which forms a division in the recess or chamber for the mercury, need be no higher than the outer wall 18 of such recess, the provision of said rib or wall does not add to the height or bulk of the device. To permit access to be had to the valve, we tap the bottom wall of chamber C at a point under the valve and provide for the opening thus formed a plug 19.

In Figs. 1 and 4 we provide a guide or steady pin H and arrange the same to work through an upper guide-opening 20 in the annular rib or wall 9, and a lower bearing 21, which is formed in the lower portion of the body of the case. The bearing 21 is arranged between the distributing-chamber E and a small chamber or recess 22, which is formed in the body of the case and closed by a plug 23. The recess 22 serves to receive a head on the lower end of the pin, which is at its upper end secured to the top wall of the floating pressure-chamber. The valve-stem is at its upper end suitably secured to the top wall of the floating pressure-chamber, a convenient way being to provide said wall with bearings into which the steady-pin and valve-stem are screwed.

With further reference to Fig. 1 the floating pressure-chamber is weighted so as to leave the valve normally open, it being understood that when the burner is not in use the supply can be cut off by closing a cock in such gas-bracket arm or pipe as may be connected with the passage 14. When the cock last mentioned is opened, the flow of gas will be upwardly through the regulator, as indicated by the arrows. Thus the gas will flow into the receiving-chamber C, thence through port 1 into the pressure-distributing chamber, and thence to the burner. Where the supply-pressure is in excess of the demand at the burner-tip there will be a proportional extent of back-pressure within the distributing pressure-chamber, and this will cause within the chamber of the float a corresponding pressure, whereby the floating pressure-chamber will rise in the mercury and close the valve to an extent proportional to the excess of pressure. Hence the pressure in excess of practical requirements serves to automatically decrease the supply and prevent waste, it being understood that the pressure-chamber is in open

communication with the burner at the delivery side of the valve, that it is responsive to back pressure caused by any and all resistance to the delivery of gas under pressure in excess of the required pressure and volume, and that the float or floating pressure-chamber can be adjusted with reference to the normal condition of the valve and its allotted function of graduating the area of the supply-port 1 by weighting the float in accordance with requirements.

In Fig. 4 the passage 12 of Fig. 1 is not present, and the body is tapped at its sides for the reception of the hollow burner-arms 24. In said constructions the body is provided with a cap I, which can be removed in order to permit access to be had to the float. The cap I can be closed, as in Fig. 4, or provided with a centrally-arranged opening in its top for a burner, as in Fig. 1.

With further reference to Fig. 1 it will be seen that the annular mercury-chamber and annular pressure-chamber are arranged to surround a vertical centrally-arranged portion of the gas-conducting passage. Thus in said Fig. 1 the mercury-chamber and pressure-chamber surround a passage 12, which constitutes an outlet for the flow of gas from the pressure-distributing chamber to the burner-tip. This arrangement is exceedingly serviceable and permits the regulator to be incorporated within a gas-fixture without rendering the same in any wise objectionable.

The special construction of divided annular mercury-holding chamber and inverted annular cup-shaped float adapted to provide a pressure-chamber and arranged so that its concentric vertical flanges shall dip, respectively, into the inner and outer annular concentric compartments of said mercury-holding recess or chamber is also a matter of importance with reference to the general construction and arrangement of the device. The annular wall between the two concentric mercury-holding compartments permits the arrangement of the valve and its stem at one side of the vertical center of the shell or body, thereby leaving room for an unobstructed inlet and outlet passage, and further provides a bearing for a steady-pin at the opposite side of said vertical center of the shell or body. The float and divided mercury-holding chamber also occupy a minimum extent of space.

The bosses or bearings 29, in which the upper ends of the valve-stem and steady-pin are screwed, are arranged to extend through the annular top of the float and have each an annular flange 30, which fits against the float so as to provide a tight joint between the two. The lower ends of the bearings 29 extend below the top wall of the float and are beveled or tapered in correspondence with the flared or enlarged upper ends of the passages which are formed in the annular wall 9 for the valve-stem and steady-pin. By such arrangement the float preparatory to applying the valve and steady-pin can be depressed and adjusted so that the lower ends of the bearings 29 shall enter the upper ends of said passages in the annular wall, and hence without trouble and loss of time the ends of the valve-stem and steady-pin can be applied to said bearings.

Certain matters of improvement herein involved are also applicable to the construction of the mercurial gas-governor described in our application, Serial No. 412,988, filed November 24, 1891, as a division of this application and involving a construction which provides for the downward flow of gas through the governor.

What we claim as our invention is—

1. In a mercurial gas-governor, the pressure-distributing chamber provided with an inlet-port valved at its supply side and arranged to establish direct communication between the pressure-distributing chamber and the main-service supply, an open delivery-passage leading from the pressure-distributing chamber and permitting the uninterrupted flow of gas from said chamber to the point of service, the two concentric mercury-holding compartments separated by a partition-wall and each containing a body of mercury, the open-bottom float constructed with concentric side walls which dip into the mercury within the two mercury-holding compartments and providing a pressure-chamber which is in open communication with the pressure-distributing chamber by a passage formed through the partition-wall between the two mercury-holding compartments, and the valve arranged to open at the supply side of the inlet-port for the pressure-distributing chamber and having its stem extended upwardly within a passage through the partition-wall between the two mercury-holding compartments and connected with the float, substantially as described.

2. In a mercurial gas-governor, the governor shell or body provided with a centrally and horizontally arranged pressure-distributing chamber D, an inlet-port formed through the bottom wall of the pressure-distributing chamber and arranged to establish direct communication between said chamber and the main-service supply, an open delivery-passage 12, leading directly upward from the central portion of the pressure-distributing chamber and arranged to permit the uninterrupted flow of gas from said chamber to a burner, and an annular mercury-holding chamber surrounding the delivery-passage, combined with an annular inverted cup-float E, positioned for operation around said delivery-passage and arranged to dip into the mercury in the annular mercury-holding chamber, and a valve arranged to open at the supply side of the pressure-distributing chamber and having its stem extended upwardly and connected with the float, the pressure-chamber provided by the space within the float being in open communication with the pressure-distributing chamber by a passage

leading directly upward from the latter, substantially as described.

3. In a mercurial gas-governor, the governor shell or body A, provided with a centrally-arranged pressure-distributing chamber D, having an inlet-port, a receiving-chamber C, arranged below the pressure-distributing chamber and communicating therewith through the said port, a neck 13, arranged at the center of the bottom portion of the shell or body and providing a passage 14, which opens into the receiving-chamber C, and which, together with said chamber, constitutes a portion of the main-service-supply passage, an open passage 12, leading directly upward from the center of the pressure-distributing chamber and in alignment with passage 14, and an annular mercury-holding chamber arranged over the pressure-distributing chamber and divided by an annular partition-wall into two compartments, each containing a body of mercury, combined with an annular cup-float E, arranged to dip into the mercury in said mercury-holding compartments, and a valve B, arranged to open at the supply side of port 1 and having its stem extended upwardly through a passage in the annular partition-wall and connected with the float, the pressure-chamber which is provided by the space within the float being in open communication with the pressure-distributing chamber, substantially as described.

4. In a mercurial gas-governor, the governor shell or body provided with the pressure-distributing chamber D, having a supply-port 1, and the annular mercury-holding chamber divided by an annular partition-wall 9 into two compartments, combined with the annular inverted cup-float E, having its concentric walls arranged to dip into mercury within the two compartments of the mercury-holding chamber, said float forming a pressure-chamber which is in open communication with the pressure-distributing chamber through a passage in the annular wall 9, a valve B, arranged at the supply side of port 1 and having its stem 2 extended up through both the pressure-distributing chamber D and a passage 10 in the annular partition-wall 9 and connected with the float between the two annular concentric walls of the same, and a steady-pin connected with the float and also working within a vertical passage through said annular wall 9, the governor shell or body being provided with an opening temporarily closed by means, substantially as set forth, and extending up from its lower side, so as to permit access to be had to the steady-pin, substantially as described.

5. In a mercurial gas-governor, the governor shell or body provided with an inlet and outlet and a partition having a port which the governing-valve is adapted to close, and further provided with an annular mercury-holding chamber subdivided by an annular partition-wall 9 into two concentric compartments, each containing a body of mercury, combined with the annular inverted cup-float having its concentric walls arranged to dip into the mercury in the mercury-holding compartments and a governing-valve having its stem extended up through a passage in the annular partition-wall 9 and connected with the float, substantially as described.

6. In a mercurial gas-governor, the governor shell or body provided with an inlet and an outlet and a port which the governor-valve is adapted to close, and further provided with an annular mercury-holding chamber divided by an annular wall 9 into two mercury-holding compartments, in combination with a float E, provided with a downwardly-projecting bearing 29, and the governing-valve having its stem connected with the float, said bearing being arranged at a point over the annular wall 9, and said wall being provided with a passage having its upper end adapted to receive the said bearing, substantially as and for the purpose described.

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