No. 889,189. PATENTED JUNE 2, 1908.

V. E. BEAN.

GAS PRESSURE REGULATOR.

APPLICATION FILED SEPT. 3, 1907.

Fig. 2.

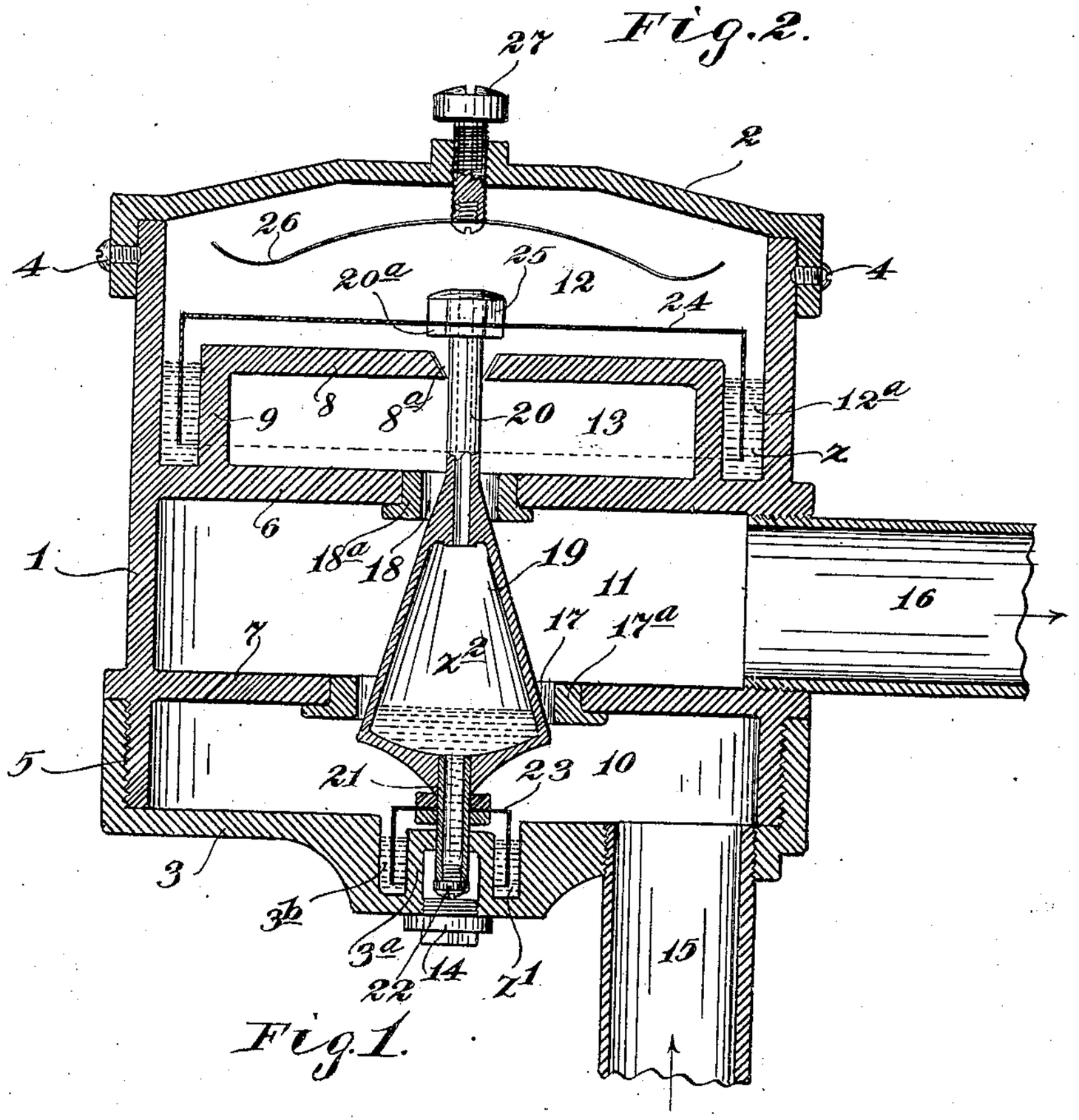
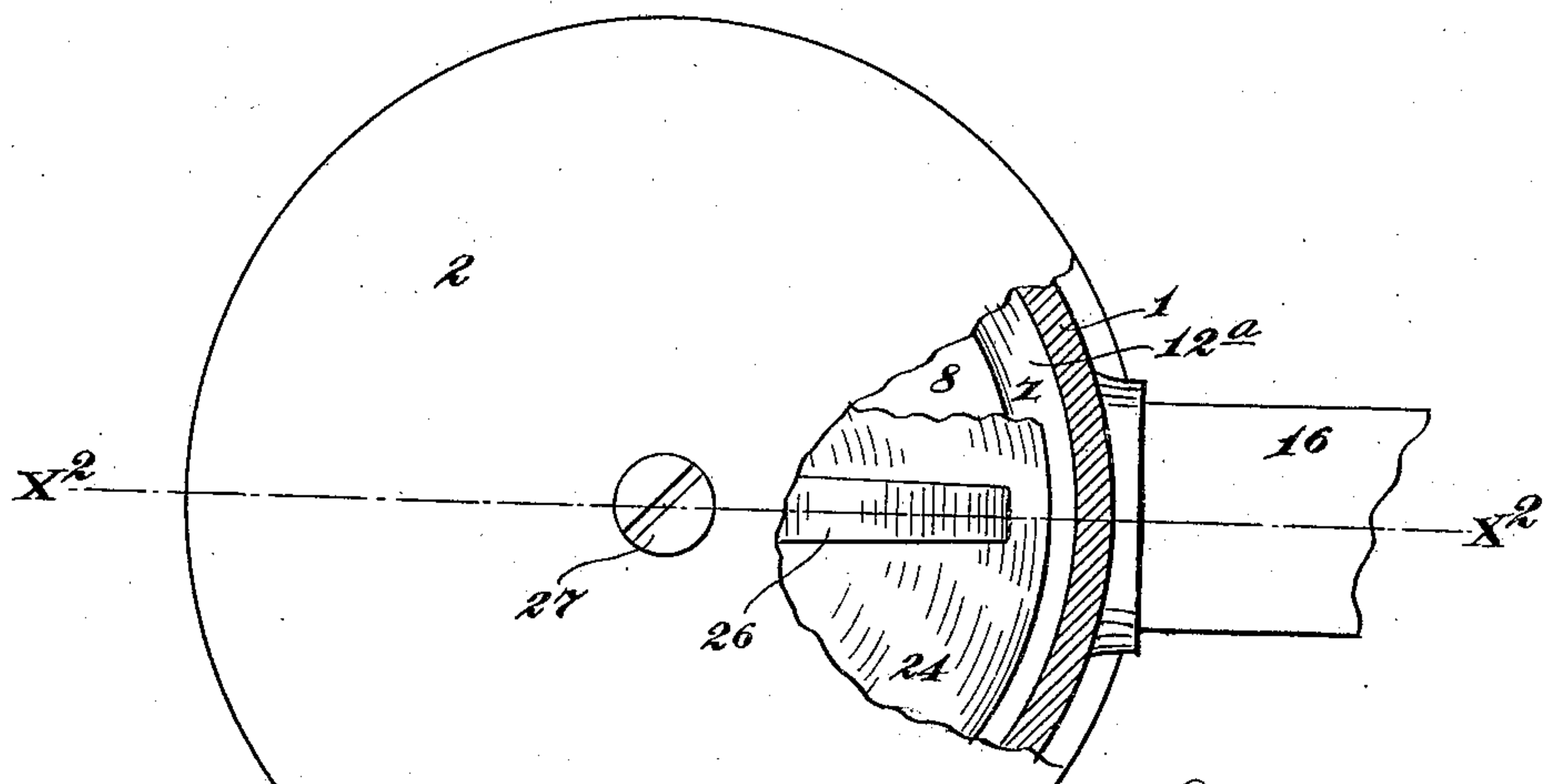


Fig. 1.



Witnesses.

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UNITED STATES PATENT OFFICE.

VERNON E. BEAN, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO HAROLD O. WHEELER, OF MINNEAPOLIS, MINNESOTA.

GAS-PRESSURE REGULATOR.

No. 889,189. Specification of Letters Patent. Patented June 2, 1908.

Application filed September 3, 1907. Serial No. 391,542.

To all whom it may concern:

Be it known that I, VERNON E. BEAN, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Gas-Pressure Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has for its object to provide an improved automatic gas pressure regulator adapted for use in connection with dwellings, and elsewhere, to maintain a supply of gas under constant pressure regardless of variations in the gas pressure in the supply conduit or street pipe.

To the above ends, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

An automatic gas pressure regulator, embodying the several features of our invention, is indicated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings; Figure 1 is a plan view with some parts broken away and some parts sectioned, showing the improved gas pressure regulator; and Fig. 2 is a vertical section taken on the line x^2 x^2 of Fig. 1.

The improved regulator involves a casing 1 preferably of cylindrical form, and provided with a removable upper head 2 and removable lower head 3. The head 2 is shown as secured in working position by screws 4, while the head 3 has threaded engagement at 5 with the lower end of the said cylindrical casing 1, although, of course, the said heads might be otherwise detachably secured. The casing 1 is provided with two horizontally extended vertically spaced partitions 6 and 7, and it is further provided with a partial partition 8 located above the partition 6 and is shown united therewith by an integrally cast cylindrical rim 9. The interior of the casing is thus divided into four compartments 10, 11, 12 and 13. The upper compartment 12 is formed with a depending annular sealing channel 12^a adapted to contain a sealing liquid, such as mercury, indicated by the character z. The lower head 3 is formed with a hollow central hub portion 3^a and a surrounding annular sealing channel b, which latter is adapted to contain a sealing liquid, such as mercury, indicated by the character z^1. The cavity formed in the hub 3^a is shown as normally closed by a threaded plug 14.

The gas from the supply conduit or water main is delivered into the lower compartment 10 of the casing through a pipe 15 which, as shown, is tapped through the said cap 3. The gas is conducted from said casing to the branch or distributing pipes, and thence to the burners through a pipe 16 which, as shown, is tapped through one side of the casing 1 and opens directly from the intermediate compartment 11 thereof. The partition 7 is provided with a centrally located valve port 17 shown as formed in a bushing 17^a, and the partition 6 is provided with a relatively small valve port 18 formed in a bushing 18^a. The partial partition 8 is provided with a passage 8^a located in axial alinement with the valve ports 17 and 18. The ports 17 and 18 are adapted to be simultaneously opened and closed by a hollow inverted conical valve 19. This valve 19 has an upwardly projecting tubular stem 20 and a depending tubular stem 21. The stem 20 works with clearance through the passage 8^a and the partition 8, and the stem 21 works through a seat in the upper portion of the hub 3^a, and its lower end is normally closed by a plug 22.

A sealing cap 23 is secured to the stem 21 and works in the sealing liquid z^1, thereby maintaining a gas tight joint between the compartment 10 and the chamber in the hub 3^a. A much larger inverted sealing cap 24 is secured to the upper end of the stem 20, as shown, by means of a collar 20^a on said stem and a nut 25 detachably secured to said stem. This so-called cap 24, which is made of thin sheet metal, acts as a sort of floating diaphragm or piston from which the cut-off valve 19 is suspended and by which the said valve is raised into a closed position under predetermined pressure on said diaphragm 24.

A leaf spring 26 is supported within the upper compartment 12, as shown, by a screw 27 which works through the central portion of the upper head 2.

A weighting liquid z^2, preferably of mercury, is introduced into the interior of the valve 19 through the hollow stem 20 thereof. The amount of mercury introduced into said valve depends upon the gas pressure that it

is desired to maintain at the burners or other point of distribution. The mercury may be drained from said valve 19 when the plug 14 is removed from the hub 3^a and the plug 22 is removed from the depending stem 21 of the said valve. The sealed joint afforded by the mercury z^1 in the lower cap 23, while not absolutely necessary, is desirable because it prevents the escape of gas when the plug 14 is removed, as above stated.

The operation of the device is substantially as follows: Whenever the pressure of gas in the compartments 11 and 13 reaches or falls slightly below a certain predetermined desired pressure (determined by the amount of mercury in the valve 19), the valve 19 will lower and simultaneously open up the ports 17 and 18, thereby admitting gas from the supply pipe 15 into the intermediate compartment 11, and from thence through the pipe 16 to the point or points of distribution. This opening of the port 18 also admits the gas under increased pressure into the equalizing compartment 13, and from thence through the port 8^a into the upper compartment 12 below the cap or floating diaphragm 24. It is, therefore, evident that when the ports 17 and 18 are open, the pressure in the equalizing compartment 13 and on the under side of the said floating diaphragm 24 will be equalized by the pressure in the intermediate compartment 11. Hence, whenever the pressure in the said compartment 11 slightly exceeds the predetermined desired pressure, the diaphragm 24 will be raised carrying with it the valve 19 and causing the latter to simultaneously close the ports 17 and 18. In this way, the pressure of the gas in the compartment 11 and distributing pipe 16 will be maintained practically constant, regardless of variations in pressure in the main or supply pipe above the predetermined desired pressure. The equalizing compartment 13 very greatly assists in maintaining an even pressure on the diaphragm or cap 24 and prevents sudden movements thereof, and hence, fluctuations or bumping movements of the valve to or from its seated position. At all times the port 8^a affords a very restricted passage for the gas between the so-called equalizing chamber 13 and the interior of the inverted float or flanged diaphragm 24; and when the valve 19 is in an open position, the port 18 affords a restricted passage between the chamber or compartment 11 and the said equalizing chamber 13. These restricted passages are important because they permit only a slow passage of gas into and from the equalizing chamber 13, and hence, prevent the float 24 and valve 19 from being suddenly moved or caused to jump from one position to another. At the same time, said equalizing chamber holds a sufficient quantity of gas to maintain a pressure on the diaphragm or float, and is very even except for variations caused by continued varying pressure in the gas supply conduit.

The spring 26 may be moved to and from an operative position by means of its supporting screw 27. When it is in operative position, it is adapted to engage the diaphragm or cap 24, so that it will add its force to the weight of the valve 19 and mercury z^2, and thus assist in opening the valve when it is desired to maintain a high pressure in the distributing point or points.

The lower compartment 10 of the casing serves as an expansion chamber for the gas, and causes the valve 19 to be completely surrounded by gas, so that the gas will pass evenly through the port 17 and around the said valve when the valve is open. The two pipes 15 and 16 extend at such an angle to each other and tap the casing at such a closely adjacent point that the casing is adapted to be applied as a substitute for an ordinary elbow. This feature in practical construction is very important, and considerably reduces the cost of installing the regulator.

The term "floating plate" is herein used in the broad sense, and would include a diaphragm or other body arranged to rise and fall under varying gas pressure.

What I claim is:—

1. In a gas pressure regulator, the combination with a casing having inlet and outlet compartments forming part of a gas conduit, of a regulating valve controlling the port between said two compartments, a third compartment and an equalizing chamber distinctive and independent from said inlet and outlet compartments, a floating plate in said third compartment connected to and operating said valve, the said equalizing chamber having a restricted communication with said third compartment and with said outlet compartment, substantially as described.

2. In a gas pressure regulator, the combination with a casing having three vertically spaced compartments connected by upper and lower ports, of a supply pipe leading to the lower compartment, a distributing pipe leading from the intermediate compartment, a pressure actuated floating plate working in the upper compartment of said casing, and a valve connected to and actuated by said floating plate and arranged to simultaneously open and close said two ports, substantially as described.

3. In a gas pressure regulator, the combination with a casing having upper, lower and intermediate compartments and an equalizing chamber or compartment interposed between said upper and intermediate compartments, the said four compartments being connected by axially alined ports, of a pressure actuated floating plate in said upper com-

partment, and a valve in said casing arranged to simultaneously open and simultaneously close the ports between said lower and intermediate compartments and between said intermediate and equalizing compartments, substantially as described.

4. In a gas pressure regulator, the combination with a casing having upper, lower and intermediate compartments, and an equalizing compartment interposed between said intermediate and upper compartments and coöperating with said upper compartment to form an annular liquid containing sealing channel, the said four compartments being in communication with each other through axially alined ports 17, 18 and 8^a, of a floating plate 24 having a depending rim working in said sealing channel, a conical valve arranged to simultneously open and simultaneously close said two ports 17 and 18 and having an upwardly projecting stem connected to said floating plate, a gas supply pipe opening into the lower compartment of said casing, and a distributing pipe leading from the intermediate compartment of said casing, substantially as described.

5. In a gas pressure regulator, the combination with a casing and a pressure actuated valve arranged to open and close a port therein through which the gas must be passed, said valve having a depending stem working through a hub in the lower portion of said casing, of a sealing cap connected to said valve and having a depending annular flange working in an annular channel formed in the bottom of said casing surrounding said hub, and a sealing liquid contained in said sealing channel, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

VERNON E. BEAN.

Witnesses:

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F. D. MERCHANT.