(No Model.)

H. J. BELL.

GAS PRESSURE REGULATOR.

No. 417,135. Patented Dec. 10, 1889.

Fig. 1.

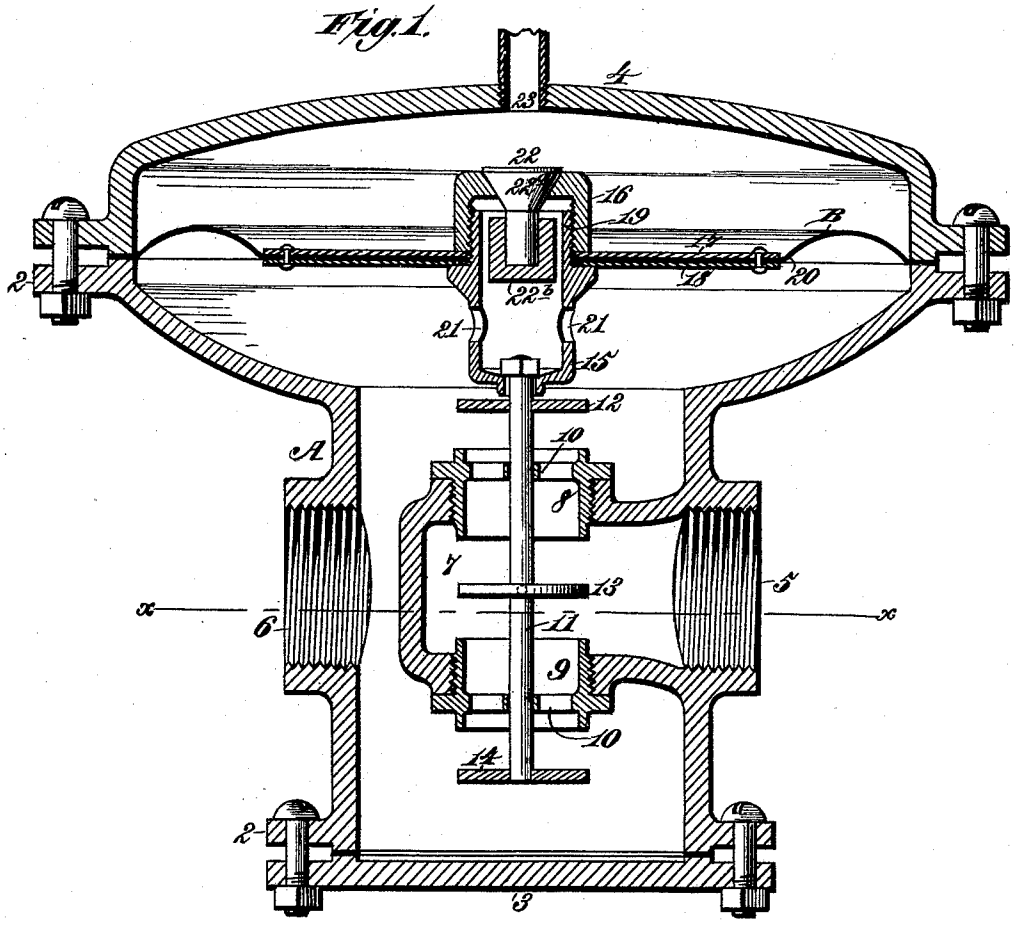
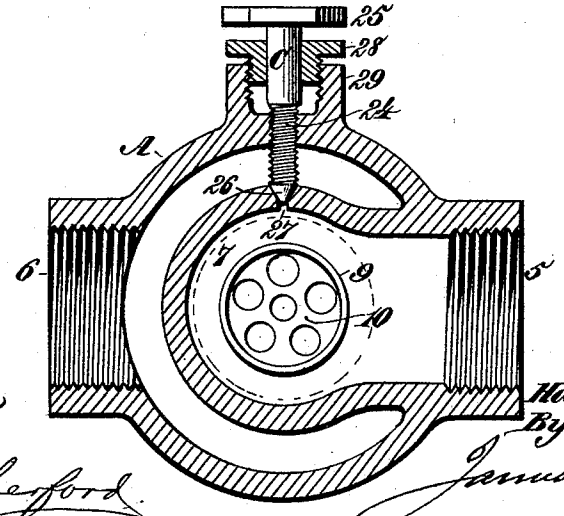


Fig. 2.



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UNITED STATES PATENT OFFICE.

HAROLD J. BELL, OF GLOUCESTER CITY, NEW JERSEY, ASSIGNOR TO THE WELSBACH INCANDESCENT GAS LIGHT COMPANY, OF NEW JERSEY.

GAS-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 417,135, dated December 10, 1889.

Application filed June 6, 1889. Serial No. 313,326. (No model.)

To all whom it may concern:

Be it known that I, HAROLD J. BELL, a citizen of the United States, residing at Gloucester City, in the county of Camden and State of New Jersey, have invented new and useful Improvements in Gas-Pressure Regulators, of which the following is a specification.

The object of my invention is to improve the construction of that class of high-pressure gas-regulators which are especially designed for use between the gas-meter and supply-main; and the invention consists in the features and combination of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a vertical section of my improved gas-pressure regulator provided with automatic safety cut-off and regulating valves, an independent starting-valve, and an automatic safety relief-valve. Fig. 2 is a horizontal section on the line *x x*.

Referring to the drawings, it will be seen that the outer casing A, which comprises the gas-chamber and contains the flexible diaphragm, consists of a central body portion, which may be provided with flanges 2 for connection with a detachable bottom plate 3 and a detachable top or cover 4, whereby access can be had to the valves inclosed in said case.

In one side of the casing is an inlet 5, that is adapted to connect with a gas-supply pipe leading from a main or elsewhere, and in the other side is an outlet 6 for connection with a delivery-pipe leading to a gas-meter or to the gas-burners. The gas-inlet 5 communicates directly with the interior of a chamber 7 in a valve-casing that is located wholly within the gas-chamber formed by the outer casing A. The valve-casing is provided at top and bottom with suitable openings to receive an upper bushing 8 and a lower bushing 9, each of which forms a double valve-seat, one in the chamber 7 and one on the outer side. Each of these bushings 8 and 9 is provided with a spider or perforated plate 10 for passage of gas and having a central guide-opening for a vertical stem 11, to which valves 12, 13, and 14 are attached. The valve-stem 11 is suspended from a hollow casting 15, that is connected by means of a cap 16 to a flexible diaphragm B, supported in the upper part of the casing A above the valve-casing, and the latter, at its top and bottom, opens directly into the gas-chamber. The diaphragm B comprises two central annular metallic plates 17 and 18, arranged one above the other around the screw-threaded neck 19 of the hollow casting 15, to which they are secured by the cap 16, which is screwed onto said neck. Between the superposed plates 17 and 18 is secured the inner edge of an annular piece of leather, rubber, or other flexible material 20, the outer edge of which is securely clamped between the body and top of the outer casing.

In opposite sides of the casting 15 are perforations 21 for the passage of gas, and in the top of the cap 16 is an opening that is controlled by a weighted safety relief-valve 22, preferably formed in two parts for convenience of attachment to the cap. This safety relief-valve 22 consists of an inverted conoidal portion 22^a, that is seated in the correspondingly-formed opening in the top of the cap, and a weighted cylindrical portion 22^b, of sufficient diameter to prevent the valve from becoming dislodged by its sudden rise under a high pressure of gas. Above the safety relief-valve 22 is a vent 23 in the top of the valve-casing.

The valves on the stem 11 are so arranged that the upper one 12 is above the valve-casing, the intermediate valve 13 is within the chamber 7, and the lower valve 14 is below said valve-casing By this arrangement the upper valve 12 and intermediate valve 13 seat on the upper ends of the bushings 8 and 9, respectively, when the gas is cut off; but when there is a sufficient accumulation of gas in the regulator to exert a lifting pressure on the under side of the flexible diaphragm the intermediate valve 13 and lower valve 14 will act in conjunction with the valve-seats on the lower ends of said bushings 8 and 9 to control the volume and pressure of gas delivered. These valves are therefore adapted to act in the double capacity of safety cut-off and pressure-regulating valves, according to circumstances. It will be observed that when the valves 12 and 13 are lowered onto the bushings 8 and 9 they will

remain closed, even though subjected to the pressure of gas, until the weight of the diaphragm and connected valves is overcome by an accumulation of pressure under the diaphragm, which will occur only when all the burners supplied through the regulator are closed.

In one side of the casing A is located an adjustable starting-valve C, which is independent of the cut-off and regulating valves. This starting-valve comprises a screw-threaded stem 24, having a hand-wheel 25 on its outer end and provided on its inner end with a conical point 26, to control a by-pass opening 27 in the side of the valve-casing. The screw-threaded portion of the valve-stem 24 engages an opening in the side of the outer casing, and may be provided with a stuffing-box 28, supported in a boss 29, provided with suitable packing.

When the regulator is put in position and before gas is admitted beneath the diaphragm, the valves 12 and 13 will rest or be seated on the upper ends of the bushings 8 and 9, respectively. If gas is now permitted to enter the chamber 7, its downward pressure on the valve 13, together with the weight of the diaphragm and connected valves, will be greater than the upward pressure on the valve 12, so that both valves will remain closed.

In order to start the regulating-valves, it becomes necessary to overcome the weight of the diaphragm and connected valves, and this is effected by opening the starting-valve C, thereby permitting the passage through the by-pass opening 27 of sufficient gas to exert a lifting pressure on the flexible diaphragm B, whereby the valves 12 and 13 are started from their seats. Gas will now flow freely through the bushings 8 and 9 into the casing A, and, accumulating beneath the flexible diaphragm, will cause it to sustain the valves 13 and 14 in position to operate in conjunction with the lower ends of the bushings 8 and 9 for the purpose of regulating the volume and pressure of gas passing through the regulator. Under a high pressure of gas the ascent of the flexible diaphragm B will carry the valves 13 and 14 upward toward or in temporary contact with their seats, so as to diminish the flow of gas by said valves. Should the pressure of gas in the valve-casing A become excessive while the burners are closed, it will escape at the safety relief-valve 22 and through the vent 23 above said valve, thereby avoiding unnecessary and often dangerous pressure.

After the automatic safety cut-off and regulating valves 12, 13, and 14 have been started by opening the starting-valve C, said starting-valve should be adjusted to pass a small quantity of gas—say one cubic foot per hour—for the purpose of providing for a future automatic starting of the regulating-valves by simply closing all the burners, as above mentioned.

It sometimes happens that the supply of gas to a building is temporarily cut off or withdrawn, by accident or otherwise, while the burners are open and in use, thereby extinguishing the lights. Now, if the gas is turned on again before the burners are closed it will result in great waste, serious inconvenience, and possible danger, all of which are obviated by my invention.

It will be seen that in my improved gas-pressure regulator the valves 12 and 13 will drop onto their seats at the upper ends of the bushings 8 and 9 the instant that the supply of gas to the regulator is cut off, and if the burners have been left open and the starting-valve C has been adjusted to permit the flow of only a small quantity of gas through the by-pass the gas when again turned on or admitted to the regulator will be prevented by the weight of the diaphragm from exerting sufficient pressure to open the cut-off valves 12 and 13, and consequently gas will not be able to pass beyond the chamber 7 in any large quantity until the burners are closed, thereby permitting the gas that flows through the by-pass to accumulate gradually beneath the diaphragm and exert thereon a sufficient lifting force to start the cut-off valves from their seats. In the meantime, before the burners are closed, the escape of gas into the building will be inconsiderable, owing to the small quantity that can flow through the by-pass.

I do not herein broadly claim the combination of a casing having a gas-chamber containing a flexible diaphragm, a valve-casing arranged wholly within the chamber beneath the diaphragm and having a quadruplex valve-seat which is adapted to communicate at its top and bottom with the chamber of the casing beneath the diaphragm, a triple valve for the valve-casing, a by-pass from the valve-casing to the gas-chamber, a starting-valve adjustable to stand more or less open, and a connection between the diaphragm and the triple valve, as such combination is claimed in my application for Letters Patent filed of even date herewith, Serial No. 313,325.

What I claim as my invention is—

1. The combination, in a gas-pressure regulator, of an outer casing comprising a gas-chamber containing a flexible diaphragm, a valve-casing located wholly within the said gas-chamber beneath the diaphragm and having both its upper and lower ends opening directly into the gas-chamber beneath the diaphragm and provided, respectively, with a bushing forming a duplex valve-seat, and a triple valve for the valve-casing, having its stem joined to the diaphragm, substantially as described.

2. The combination, in a gas-pressure regulator, of an outer casing comprising a gas-chamber containing a flexible diaphragm and having a gas-inlet and a gas-outlet, a valve-casing located wholly within the gas-chamber and having its upper and lower ends opening directly into the latter and provided at each

end with a duplex valve-seat, and a triple valve for the valve-casing, having the upper end of its stem suspended from and in line with the center of the diaphragm, substantially as described.

3. The combination, in a gas-pressure regulator, of an outer casing comprising a gas-chamber containing a flexible diaphragm, a hollow casting suspended from the center of the diaphragm, a valve-casing located wholly within the gas-chamber, a valve-carrying stem arranged vertically in line with the center of the diaphragm and valve-casing and suspended from said hollow casting, a cap-piece located on the upper side of the diaphragm and having a valve-seat, and a relief-valve supported by said cap, substantially as described.

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

H. J. BELL.

Witnesses:

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JAMES A. RUTHERFORD.