(No Model.)

E. C. MERRILL.

GAS PRESSURE REGULATOR AND CUT-OFF.

No. 371,088. Patented Oct. 4, 1887.

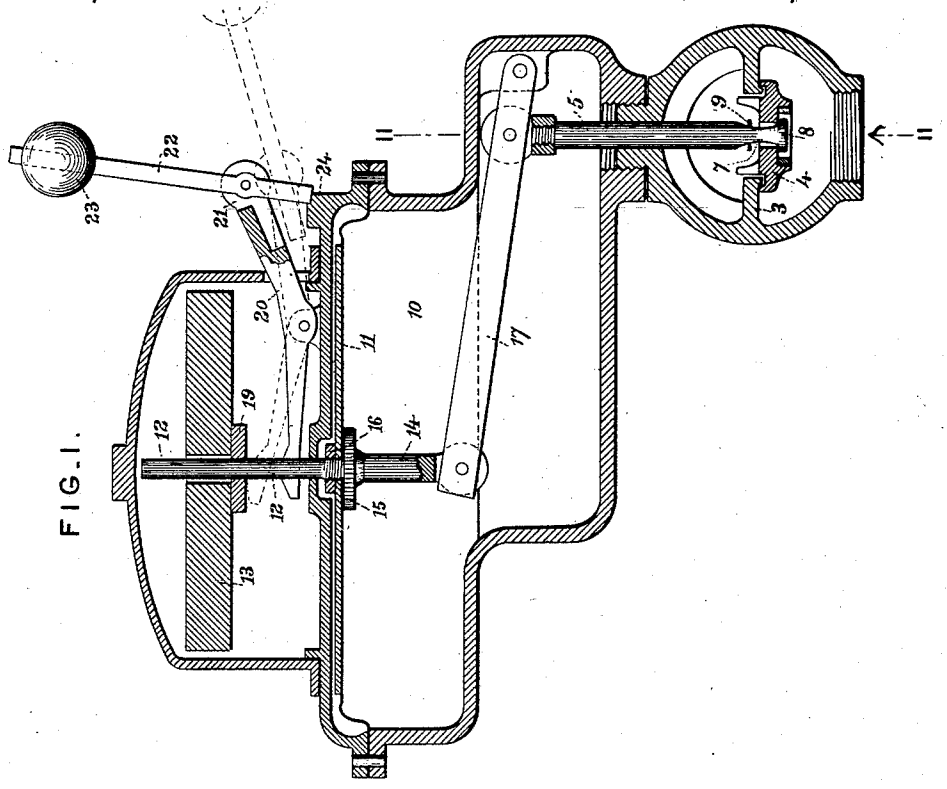


FIG. I.

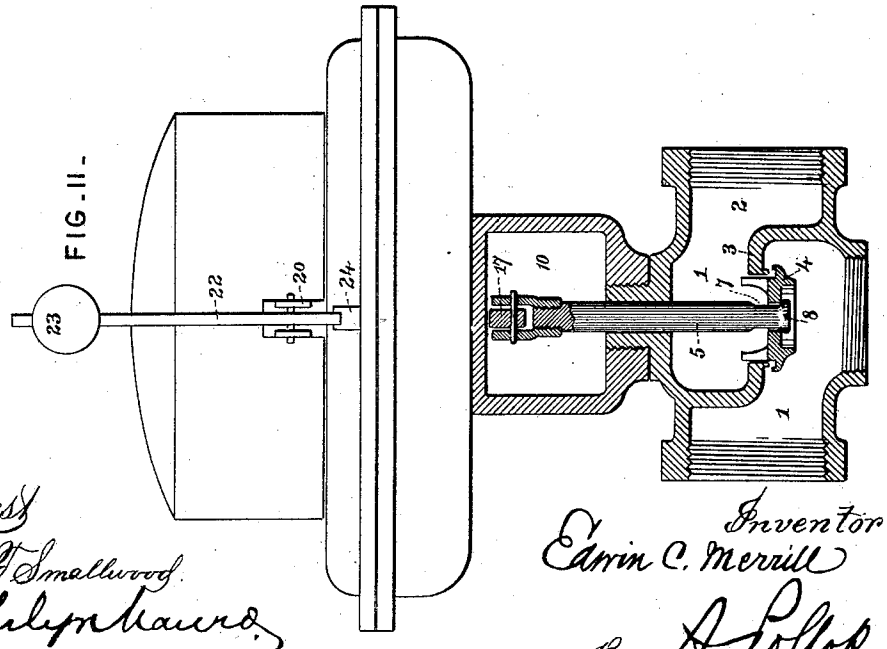


FIG. II.

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UNITED STATES PATENT OFFICE.

EDWIN C. MERRILL, OF WHEELING, WEST VIRGINIA.

GAS PRESSURE-REGULATOR AND CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 371,088, dated October 4, 1887.

Application filed March 23, 1887. Serial No. 232,106. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. MERRILL, of Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Improvement in Gas Pressure-Regulators and Cut-Offs, which improvement is fully set forth in the following specification.

This invention has reference to devices for regulating the pressure of gas supplied through mains and service-pipes to buildings, and to devices adapted to operate, in case of decrease of pressure to a point insufficient to maintain combustion at the burners, to cut off automatically the supply of gas or to prevent return after a temporary failure, so as to prevent its leaking or escaping unconsumed at the burners. The apparatus constructed in accordance with this invention acts both as a regulator and as a cut-off.

The invention comprises a duplex valve of peculiar construction. The valve-aperture of suitable size is closed ordinarily by a disk-valve, unbalanced, and in this valve itself there is another valve-opening of small size. Under ordinary conditions the valve-stem is in such position as to hold the smaller valve off its seat, the large valve being held in place by the pressure of the gas in the main. Should the supply of gas passing through this opening be insufficient, the valve-stem will move under the influence of a properly-weighted flexible diaphragm until projections thereon strike the larger valve, forcing it open, and thus admitting a larger quantity of gas. Upon a rise in pressure the diaphragm rises, restoring the former condition of things. The apparatus responds readily to the fluctuations in pressure and maintains a steady and uniform supply of gas. In order to close the valves when the pressure falls to a certain predetermined point, I provide a weight which is normally supported independently of the valve-stem and its connections, but which is adapted to be released from its support and apply its force to the valve-stem to close the valve whenever the valve-stem (or some connected part) falls to a certain point in consequence of a subsidence of the pressure. The release of the weight is practically effected by means of a trigger or trip-lever having an end projecting into such a position as to be struck by one of the moving parts at the proper moment, and having the other end arranged to spring or release the weight, causing it to exert its force upon the valve-stem. The connections between the weight and the valve-stem operated thereby may be of any suitable kind; but for the sake of simplicity I prefer to utilize the trip-lever itself as the vehicle of transmission of the power of the weight, when released, to the valve-stem. As herein shown, the weight is carried by an arm pivoted at the outer end of the trip-lever and resting normally in a nearly vertical position in a notch in the frame. When the trip-lever is operated, the arm is thrown off its support and falls into a horizontal position, the whole weight coming upon the trip-lever. The weight thus thrown on the end of the trip-lever lifts the valve-stem, closing the valve or valves and holding them closed until the trip-lever and its weighted arm are restored by hand to their normal position.

In the accompanying drawings, Figure I is a vertical section of an apparatus constructed in accordance with my invention; and Fig. II a view partly in elevation and partly in section on line 1 1, Fig. I.

The partition 3 separates the chamber 1, which is in communication with the main, from the chamber 2, which is in communication with the service-pipe. In the partition 3 is a valve-port of comparatively large area, which is closed by a valve, 4. This valve is controlled by a valve-stem, 5. The valve 4 has a central perforation, 6, constituting another valve-port, which is provided with a valve, 8, carried on the end of stem 5. The stem 5 is cut away or reduced in diameter at the part 7, which passes through the orifice in valve 4, leaving passages for the gas from chamber 1 to chamber 2. The stem can thus move freely through said orifice for a certain distance without disturbing the position of the main valve 4. The stem, however, is provided with projections 9 on the side above valve 4, and when the stem is sufficiently depressed these projections engage the top of the valve 4 and force it off its seat.

The pressure-chamber 10 contains a flexible diaphragm, 11, by which the movements of the valves are controlled, as common in appa-

ratus of this kind. To this diaphragm is secured a vertical rod, 12, carrying a weight, 13. The diaphragm 11 is also connected with a rod, 14, on its under side. As shown, the rod 14 has a disk, 15, at its top, and into this is screwed the end of rod 12, the diaphragm being clamped against the disk 15 by a nut, 16. The stem 5 is connected with rod 14 by a lever, 17. The weight 13 rests on a collar, 19, fixed on rod 12.

On the casting which forms the top of pressure-chamber 10 is pivoted a trip lever, 20, whose inner end projects into the path of the collar 19. The outer end of the lever extends outside the casing, and has a recess, 21, at its extremity, the shape of the recess being shown in Fig. I. In this recess is pivoted, near one end, an arm, 22, carrying at its other end a weight, 23. The lower end of arm 22 normally rests in a notch in the step 24 on the casing, which supports the arm and its weight in a position nearly vertical. Thus the lever 20 is held in the position shown in Fig. I. This portion of the device is designed to act as a cut-off.

The operation of the apparatus is as follows: The weight 13 is so adjusted that under normal pressure the smaller valve, 8, will be open and the gas admitted through the same (*i. e.*, around the stem 5) into the low-pressure chamber 2. Should the pressure in chamber 10 (which is the same as in chamber 2) be decreased to such an extent that the supply of gas is insufficient to meet the wants of the user, the diaphragm falls under the influence of the weight, and in falling it gradually depresses the stem 5 until the lugs or projections 9 strike the top of the main valve 4 and open it, admitting a larger quantity of gas. Should the pressure then increase, the diaphragm raises the stem 5, reducing the supply of gas passing through the valve. The apparatus will thus respond to variations of pressure within proper limits. Should, however, the pressure fall below the safety limit, or the supply of gas suddenly fail, the cut-off devices are brought into operation by the falling of the diaphragm until the collar 19 strikes the trip-lever 20. When this happens, the end of arm 22 is disengaged from the notch in which it rests, and the arm falls over into a horizontal position, as indicated in dotted lines, Fig. I. Thus the whole force of the weight is thrown on the lever 20, and at a point so far from its fulcrum as to furnish sufficient power to lift the weight 13 and, through the connections shown, close both valves, thus cutting off entirely the supply of gas. In this position of the apparatus the valves are held closed, even should the pressure rise in the main, until the trip-lever and its weighted arm are restored by hand to their normal position.

I do not limit myself to the precise forms, proportions, and details of the different parts, as these may obviously be modified without departing from the spirit of the invention; and while the cut-off mechanism described is deemed of special utility in connection with the particular valves herein set forth, it is obvious that it may be applied to other forms of valves, and also that the particular valves described could be used without the cut-off mechanism, if desired.

Having now fully described my said invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of the main valve having an aperture through the same, the valve-stem of less diameter than said aperture and passing through the same, a valve on said stem for opening and closing said aperture, projections on said stem adapted to make contact with and open the main valve, and means, as specified, whereby the movements of said stem are automatically effected by the rise and fall of pressure, substantially as described.

2. The combination, with the flexible weighted diaphragm, of the two valves of different sizes, the valve-stem connected rigidly with the smaller valve, but capable of a limited motion independently of the larger valve, and devices, as specified, for connecting said diaphragm and valve stem, substantially as described.

3. The combination, with a valve controlling a gas-inlet and a valve-stem for operating the same, of a weight normally supported independently of said stem, a releasing-lever adapted to throw the weight off its support when struck by a part moving with said stem, and connections whereby the power of said weight, when released, is exerted to lift said stem, thereby closing the valve, substantially as described.

4. The combination, with the valve, the diaphragm, a weighted rod connected therewith, and connections for operating said valve upon movements of said diaphragm, of a trip-lever in the path of a projection on said rod, and a weight normally supported by the frame, but adapted to be released by said lever when struck by said projection and to lift the diaphragm, closing said valve, substantially as described.

5. The combination, with a valve and a weight acting against the pressure of the gas to open said valve, of a second weight normally supported on the frame of the apparatus, but adapted, when released, to overcome the force of the first weight and close the valve, and a trip-lever or releasing device adapted to release said second weight when the pressure falls below a predetermined limit, substantially as described.

6. The combination, with a valve, its stem, and operating connections, of a weight normally supported by the frame of the apparatus, a trip-lever for releasing said weight, and means whereby said weight, when released, acts upon said valve-stem and closes said valve, substantially as described.

7. The combination of the valve, the weighted diaphragm connected therewith, a rod movable with said diaphragm, a trip-lever adapted

to be struck by a projection on said rod when the diaphragm falls to a certain point, and a weighted arm pivoted to said lever and normally engaged with and resting upon the frame, but adapted to be disengaged by said lever when struck by said projection, thereby lifting said rod and closing the valve, substantially as described.

8. A combined gas regulator and cut-off, comprising, in combination, two valves of different sizes, a common valve-stem, a weighted diaphragm controlled by the pressure of the gas and connected with said valve-stem, and mechanism for automatically closing said valves when the diaphragm falls to a certain point, substantially as described.

9. In a gas pressure-regulator and cut-off, the combination of two valves of different sizes, the smaller valve controlling a valve opening through the main valve, a valve-stem acting in one position to open both valves, in another to close both, and in an intermediate position to open the smaller valve, a flexible diaphragm connected with said stem and adapted to move with the rise and fall of pressure, a trip-lever projecting into the path of a device movable with said diaphragm, and a weighted arm pivoted to said lever and normally resting in a notch in the frame, and adapted, when released, to fall upon said lever, and thereby raise the diaphragm, closing both valves, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

E. C. MERRILL.

Witnesses:
WM. K. GRAY,
FRANCIS H. TORRENS.