(No Model.)

E. C. MERRILL.

GAS CUT-OFF

No. 313,750. Patented Mar. 10, 1885.

Fig. 1.

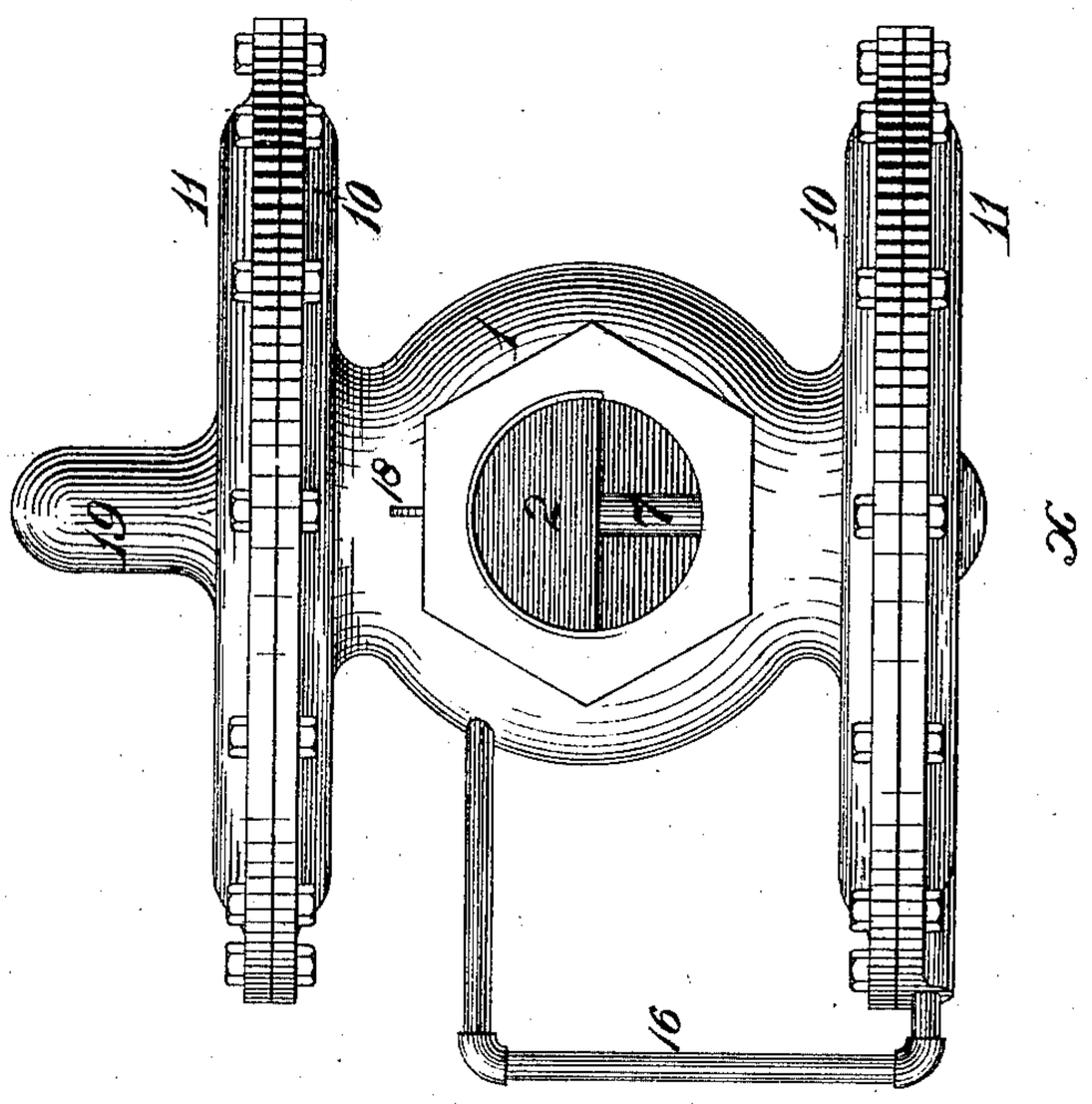
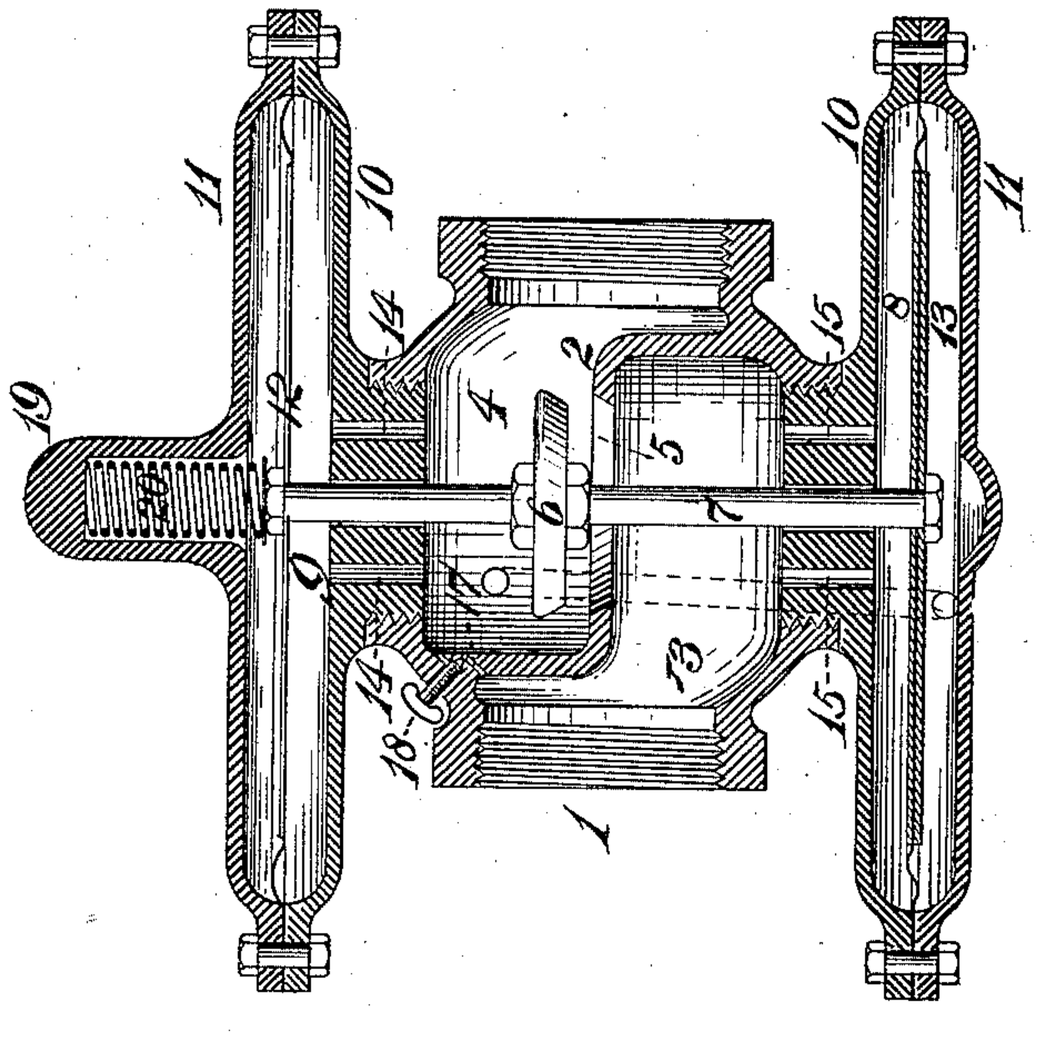


Fig. 2



WITNESSES:

C. M. Clarke.

Dennis S. Wolcott

INVENTOR.

Edwin C. Merrill

BY George H. Christy

ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWIN C. MERRILL, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GEORGE WESTINGHOUSE, JR., OF SAME PLACE.

GAS CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 313,750, dated March 10, 1885.

Application filed September 13, 1884. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. MERRILL, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Gas Cut-Offs, of which improvement the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a view in side elevation of my improved gas cut-off. Fig. 2 is a sectional elevation of the same, the section being taken on line *x x*, Fig. 1.

My invention relates to an improved valve mechanism to be applied to gas-supply pipes for the purpose of automatically cutting off the gas entirely from the points of consumption when the gas-pressure in the mains is so reduced in any way as not to afford sufficient gas for combustion at the burners.

It frequently happens that by a reduction of supply or pressure in gas-mains the flame is extinguished at some or all of the points where it is in use, and when the pressure is restored the gas escaping from the burners forms a highly explosive compound, which ignites when brought in contact with a flame. This extinction of the flame and the consequent escape of gas by the variation of pressure most frequently occurs in furnaces where natural gas is employed, and where from its location the burner is not subject to instant inspection.

The object of my invention is to entirely cut off the flow of gas to the burners on the reduction of pressure, as above stated, and thereby prevent the escape of gas from the burners on the restoration of pressure until the burners have been closed or the cut-off valve is opened by an attendant; and to this end my invention consists in the construction and combination of parts, all as more fully hereinafter described and claimed.

The case 1 is provided with a diaphragm, 2, separating the case into inlet and outlet passages 3 and 4, said passages being provided with openings suitably constructed for the reception of supply and exit pipes. In the horizontal portion of the diaphragm is formed an opening, 5, connecting the passages 3 and 4, the edges of said opening being shaped to form a seat for the valve 6. This valve is secured to a rod or stem, 7, passing diametrically through the case and extending at each end into the chambers 8 and 9, formed at each end of the case. These chambers are formed of two half-shells, 10 and 11, one part of said shells being formed on or attached to each end of the case 1. These chambers 8 and 9 are divided by flexible diaphragms 12 and 13, secured at their edges between the shells 10 and 11, and to these diaphragms are attached the ends of the valve stem or rod 7. The chambers 8 and 9 are connected to the passages 3 and 4 in the case by the passages 14 and 15, as shown, and the outlet-passage 4 is connected to that portion of the chamber 8 inclosed between the diaphragm 13 and shell 11 by the pipe 16 passing outside of the case.

In addition to the opening 5 in the diaphragm 2 the supply and discharge passages 3 and 4 are connected by a small passage, 17, the size of said passage being regulated by the plug-valve 18.

On the shell 11 of the chamber 9 is formed the hollow boss 19, in which is placed the spring 20, having its lower end bearing on the end of the valve-stem 7, which projects above the diaphragm 12, the function of said spring being to insure the seating of the valve 6 on a dangerous reduction of the pressure of the gas.

In lieu of the spring 20, a weight may be placed on the diaphragm, or the diaphragm may be formed of elastic material, in which case neither spring nor weight will be necessary.

In using the above apparatus the passage 3 is connected with the gas-mains or supply-pipe, and the passage 4 with the service-pipe, so that the gas to be used will pass through the valved opening 5 in the diaphragm 2. As soon as the gas is admitted to the passage 3 from the mains, it will pass through the passages 15 and act upon the upper side of the valve, closing diaphragm 13, thereby seating the valve 6. Now, to open the valve, the attendant turns the plug-valve 18, so as to allow the gas to flow through the passage 17 into the outlet-passage 4, all the burners having

been closed. As the gas enters the passage 4 it will flow thence through the passages 14 into the chamber 9, and, acting on the diaphragm 12, will tend to raise said valve-opening diaphragm and the valve 6; but the same amount of pressure will be exerted on the upper side of the valve-closing diaphragm 13, and these two pressures acting equally in opposite directions the valve 6 will be held closed by its own weight and the action of the spring 20; but in addition to filling the passage 4 and chamber 8 the gas will flow from the passage 4 through the pipe 16 to the under side of the diaphragm 13, thereby equalizing the pressure on both sides of said diaphragm, and as soon as the diaphragm 13 is held in equilibrium the diaphragm 12 will be free to rise and lift the valve 6 from its seat, thereby permitting of a free admission of gas to the passage 4 and the service-pipes connected therewith. As soon as the valve 6 is raised the passage 17 should be entirely closed. As long as the pressure of the gas remains normal or sufficient to supply all the burners, the valve 6 will be held up by the diaphragm 12, the area of said diaphragm being such that a normal or safety pressure will be just sufficient to hold said valve up; but on any dangerous reduction of pressure the valve will drop to its seat and will there remain, even if the pressure be restored, said restored pressure acting on the upper side of the valve-closing diaphragm 13 to hold the valve shut until the plug-valve 18 is turned, so as to allow the gas to enter the passage 4, as above stated. If desired, the passage 17 may be left open sufficient to allow of a slight flow of gas therethrough—say one foot an hour. Now, should the valve 6 be closed by a reduction of pressure, as above stated, it will remain closed as before until the burners from which the slight flow through the passage 17 could escape have been closed, then the gas passing through the passage 17 will accumulate in the passage 4 and its connections until the gas-pressure therein and in the space under the diaphragm 13 would equal the pressure in the passage 3 and the mains, and as soon as this equilibrium of pressure is established the diaphragm 12 will be raised as above described, thereby opening the valve 6. It will be observed, however, that as long as any burner is open, so as to prevent any accumulation of pressure in the passage 4, the valve 6 will remain closed, thus preventing the gas from escaping to and through the burners in dangerous quantities.

It will be observed that the above-described operation of the cut-off is automatic, closing on a reduction of pressure, and opening when the burners have been closed on a restoration of the pressure.

When the cut-off is to operate automatically, as above stated, the passage 17 may be omitted, the valve 6 or its seat being so constructed as to permit of a slight flow to the passage 4 when the valve is upon its seat, or the passage 17 may be retained and its capacity so regulated as to permit only of a slight flow of gas.

If desired, the diaphragms 12 and 13 may be located in the passages 3 and 4, said passages being suitably changed in size and shape for their reception.

The terms "upper" and "under" side are only used relatively, as if the cut-off be arranged horizontally, as it can be, the terms "front" and "rear" sides should be substituted for upper and under.

In lieu of the pipe 16 a passage may be formed in the wall of the case, said passage connecting the outlet-passage 4 and the chamber 8.

In some cases it may be desirable to omit what I have termed the "valve-closing diaphragm," 13, in which case the spring or weight applied to the valve-opening diaphragm should be made of such a tension or weight as to hold the diaphragm and valve down as against any pressure acting against the valve alone, the valve-opening diaphragm being made of such an area as to raise the weight and valve or spring and valve at normal pressure of the gas when such pressure has been equalized in the supply and discharge passages by the leakage through the port 17 or around the valve. It will be understood that when the lower diaphragm is omitted the pipe 16 is unnecessary.

I claim herein as my invention—

1. In a gas cut-off, the combination of a case provided with inlet and outlet passages separated by a perforated diaphragm, a valve, 6, for opening and closing the perforation in the diaphragm, a flexible diaphragm connected to one side of the valve 6 and operated by the pressure of the gas in the inlet-passages to close said valve, a valve-opening diaphragm connected to the opposite side of the valve 6, and operated by the pressure of gas in the outlet-passage to open the valve, and a pipe to conduct the gas from the outlet-passage to the under side of the valve-closing diaphragm, substantially as set forth.

2. In a gas cut-off, the combination of a case provided with inlet and outlet passages separated by a perforated diaphragm, a valve, 6, for opening and closing the perforation in said diaphragm, a valve-closing diaphragm connected to one side of the valve 6 and operated by the gas-pressure in the inlet-passage 3, a valve-opening diaphragm connected to the opposite side of the valve 6 and operated to open the valve by the gas-pressure in the outlet-passage 4, a pipe to conduct the gas from the out-passage 4 to the under side of the valve-closing diaphragm, and a port for permitting a slight flow of gas from the inlet 3 to the outlet 4, substantially as set forth.

3. An automatic cut-off valve-case containing a valve tending to seat itself by mechanical agency, a supply-port, a discharge-port, a reduced or leakage port in direct line of main supply from one to the other of said supply

and discharge ports, combined and suitably proportioned, substantially as set forth, whereby on an abnormal reduction of the pressure of supply the valve will be automatically closed and remain closed until the cock or cocks at the place or places of use are all closed.

4. A valve-case, a supply-port, a discharge-port, an interposed valve mechanically seated on an abnormal reduction of supply-pressure, and a leakage-port around or through the valve in direct line of main supply from one to the other of said supply and discharge ports, whereby the valve can be automatically opened by and only by an accumulation of pressure through the leakage-port, substantially as set forth.

5. In combination with the user's stop-cocks of a gas-supply system, a valve-case, a diaphragm therein, a cut-off valve governing a port in said diaphragm arranged in the line of supply to the user's stop-cocks, said valve being clear of its seat under normal gas-pressure, mechanical means tending to move said valve to its seat on an abnormal reduction of pressure on its supply side, and a port leading from its supply to its discharge side of suitable capacity to accumulate a pressure on its discharge side when and only when the user's stop-cocks are closed, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EDWIN C. MERRILL.

Witnesses:
R. H. WHITTLESEY,
DARWIN S. WOLCOTT.