(No Model.)

O. J. McGANN.

PRESSURE REGULATOR AND CUT-OFF.

No. 354,719. Patented Dec. 21, 1886.

Fig. 1.

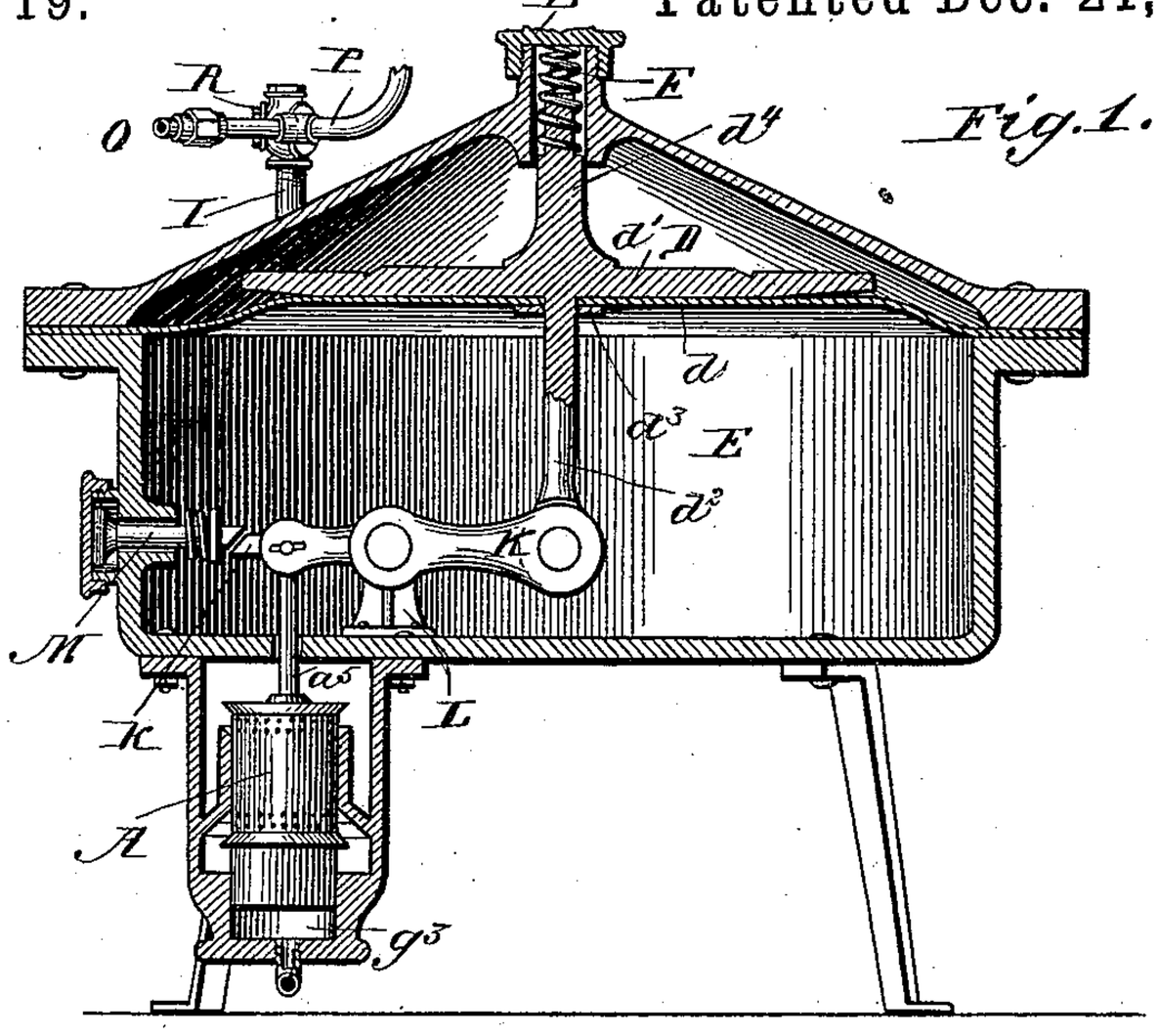


Fig. 4.

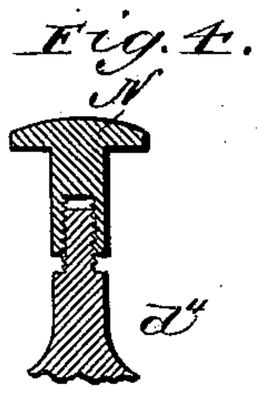


Fig. 2.

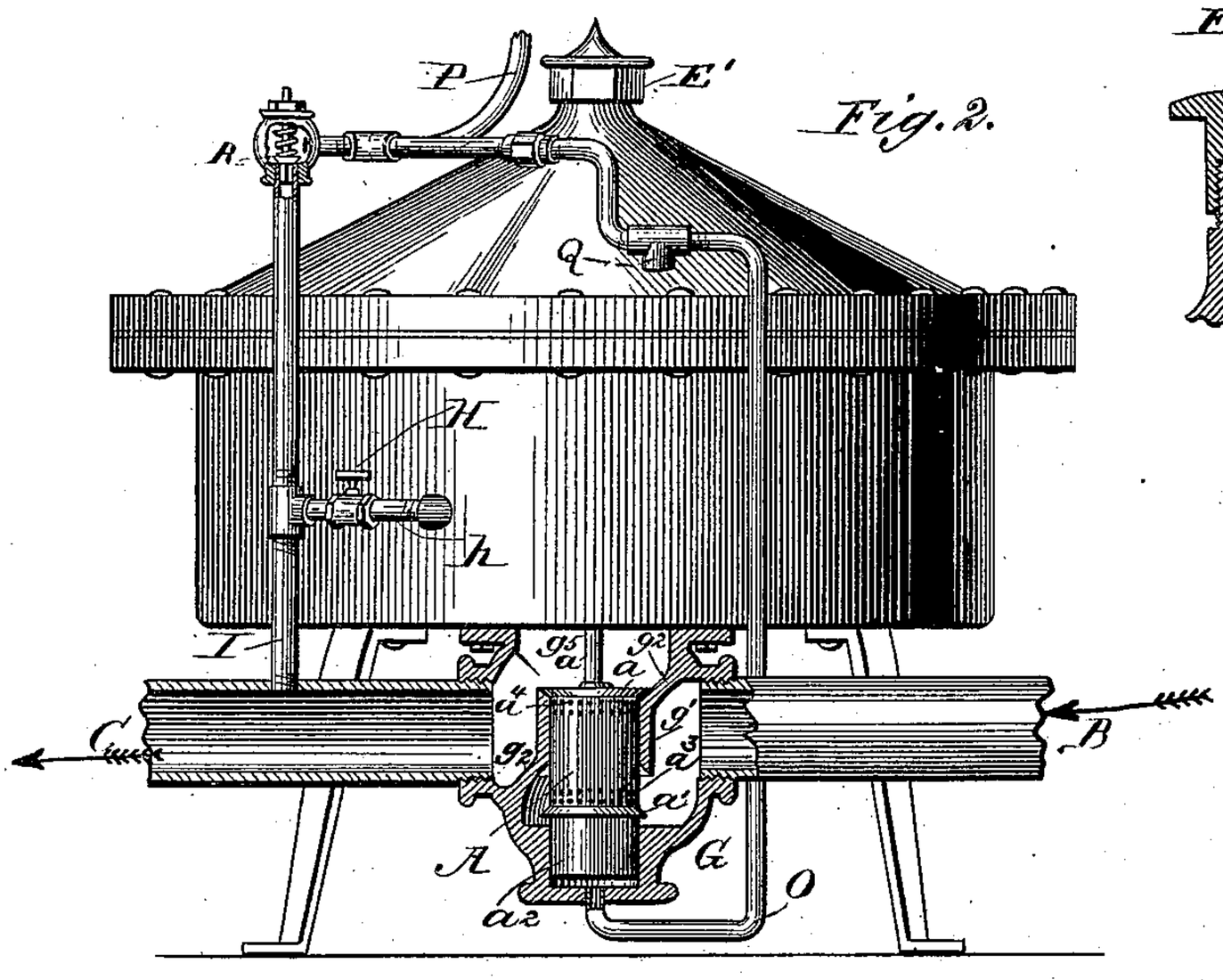
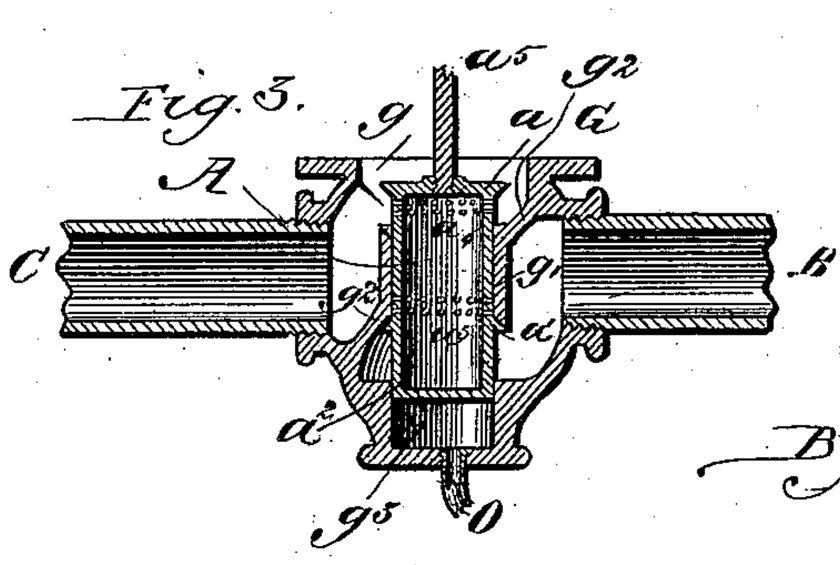


Fig. 3.



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PRESSURE-REGULATOR AND CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 354,719, dated December 21, 1886.

Application filed August 12, 1886. Serial No. 210,756. (No model.)

To all whom it may concern:

Be it known that I, OWEN J. McGANN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Pressure-Regulators and Cut-Off Apparatus, of which the following is a specification.

This invention relates to an improvement in pressure-regulators and cut off apparatus particularly applicable for controlling the supply of natural gas from a main supply-pipe to and through the branch pipes that are respectively allotted to the building or other points to be supplied with gas.

The principal objects of my invention are to automatically and with certainty reduce the pressure to a uniform standard to prevent leakage at the point where the supply may be cut off, and to automatically close communication between the supply and delivery pipes upon a cessation of the fluid-supply, in order that upon a resumption of the supply all danger of the escape of gas into the room or rooms of a building through any of the burner-cocks which may inadvertently have been left open shall be avoided.

To the attainment of these and other useful ends my invention consists in matters hereinafter described, and particularly pointed out in the claims.

In a pressure-regulator and cut-off embodying the principles of my invention I provide a tubular double-acting supply-valve, arranged to govern communication between the main or supply and the delivery pipes. Said supply-valve is provided with supply and delivery ports intermediate of its two seating portions, which latter are at a distance apart with relation to their respectively allotted seats to allow them to separately, but not conjointly or simultaneously, seat to cut off communication between the supply and delivery pipes.

It has been found an impracticable matter to grind the faces of the two seating portions of a double valve so as to provide fluid-tight joints between said seating portions and their seats when said seating portions seat or close simultaneously; but by providing the double valve with two seating portions which may close or seat alternately, but not simultaneously, said objectionable feature is avoided.

The tubular double-acting supply-valve is connected with and controlled by a movable abutment, which is subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-valve and to the action of a weight or spring. An excess of fluid-pressure against said movable abutment operates the latter so as to close the supply-valve by seating one of its aforesaid seating portions, while on the other hand the cessation of the fluid-supply and consequent absence of fluid-pressure against the movable abutment permits the spring or weight to operate the latter so as to close the supply-valve by seating the other one of its said two seating portions.

In order to prevent, upon a resumption of the fluid-supply, an accidental opening of the valve and consequent escape of gas through any of the burner-cocks which may have been left open at the time of the cessation of such supply, the apparatus is provided with a stop for automatically locking and holding the valve after it has been closed by the action of the spring or weight upon the movable abutment, in which way, while there may be a resumption of fluid-supply in the main or supply pipe, the same will be cut off from the delivery-pipe until after the stop has been manipulated in a manner to release the supply-valve.

Other features of construction tending to the general efficiency of the apparatus will be hereinafter specially set forth.

In the drawings, Figure 1 represents, partly in elevation and partly in vertical section, an apparatus embodying the principles of my invention. Fig. 2 represents said apparatus principally in elevation, the valve-casing being, however, in section. Fig. 3 is a detail representing in vertical section the tubular valve and the shell or casing. Fig. 4 is a sectional detail representing a device whereby the movable abutment can be raised by hand against the spring resistance in order to open the valve after the stop has been manipulated in a manner to release said valve.

In said drawings, A indicates the tubular double-acting supply-valve adapted to govern communication between the main or supply pipe B and the delivery-pipe C, which latter may be in direct connection with the burners in a building. The said supply-valve A is connected with and controlled by the movable abutment D, which is arranged to operate within a chamber, E, wherein it is subject on its lower side to the pressure of fluid delivered past the supply-valve and on its upper side to the action of a weight or a spring, F.

The supply-valve A consists of a tube or hollow cylinder closed at both ends and provided with the two externally-arranged annular seating portions a and a', the seating portion a being desirably arranged at one end of said cylinder, and the seating portion a' back to some extent from the opposite end of said cylinder, in order to provide the tubular valve with a prolongation or extension, a^2, formed beyond one of its seating portions. The supply-port a^3 and the delivery-port a^4 are arranged intermediate of the two seating portions, and are each conveniently formed by means of one or more annular lines of perforations formed through the tubular body of the valve. As herein shown, the supply-port a^3 is adjacent to the seating portion a', while the delivery-port a^4 is adjacent to the seating portion a of the valve.

The main shell or casing G, for inclosing the supply-valve, is provided with a chamber, g, connected at opposite sides, respectively, with the supply and delivery pipes. Said chamber contains a centrally-arranged short cylindric shell or casing, g', which is open at both ends, and which provides a chamber or bearing wherein the tubular supply-valve is fitted to work. Said casing or bearing g' is supported within the main chamber g by partitions g^2, which serve to divide the main chamber g in two portions, one of said partitions being connected with the casing or bearing g' at one end of the same, while the remaining partition unites with said casing or bearing at its opposite end. When the supply-valve is arranged to work vertically, as herein shown, the seat for the seating portion a of the valve is arranged at the upper end of the casing or bearing g', which said casing or cylindric bearing is provided at its lower end with a seat for the seating portion a' of the supply-valve.

The distance between the two seating portions of the tubular supply-valve is greater than the distance between the two seats, in which way said seating portions may be seated alternately, but not simultaneously; or both may be removed and held away from their seats at one and the same time. Thus, for example, when the valve is open, as in Fig. 1, both of said seating portions will be unseated and the valve held balanced in a position to bring its supply and delivery ports, respectively, beyond the two ends of the tubular bearing g', in which way the supply-port of said valve will be in open communication with that portion of chamber g with which the supply-pipe B connects, while the delivery-port will open into that portion of chamber g which connects with the delivery-pipe C. On the other hand, said valve may be closed, as in Fig. 2, wherein the seating portion a of the valve is seated so as to bring its delivery-port within the tubular bearing g', while in Fig. 3 the valve is closed by reason of its seating portion a' being seated so as to bring its supply-port with the tubular bearing g'.

Fluid delivered past said supply-valve and into the delivery-pipe C is to a greater or less extent delivered to the movable abutment by means of suitable pipe-connection arranged to lead from the delivery-pipe C to the lower portion of the abutment-chamber E, as in Fig. 2, wherein said pipe-connection is provided with a valve-cock, H, for regulating the flow of fluid into the abutment-chamber, and thereby avoiding any sudden shock or jar resulting from sudden back-pressure. In said figure, pipe-connection between the delivery-pipe and the abutment-chamber is formed by means of a tube or pipe, I, connected with the delivery-pipe and provided with the valved branch pipe h, which connects with the lower portion of said abutment-chamber.

The movable abutment herein shown consists of a flexible diaphragm, d, arranged within the abutment-chamber, and a plate or disk, d', which rests upon said diaphragm, and which is provided with a pendent stem, d^2, extended down through the diaphragm and provided with a nut or shoulder, d^3, arranged to abut against the under side of the flexible diaphragm.

The connection between the stem a^5 of the supply-valve and the stem d^2 of the movable abutment consists of a lever, K, which is fulcrumed upon a support, L, within the abutment-chamber, one end of said lever being pivotally connected with the stem of the movable abutment, and its other end being pivotally connected with the valve-stem, which latter extends into the abutment-chamber through an opening in the shell or casing of said chamber.

When the movable abutment is arranged as in Fig. 1, it is raised by fluid-pressure against its under side and depressed by the action of a weight or spring against its upper side, the spring F herein shown being confined within a tubular neck at the top of the casing of the abutment-chamber and adapted to act against the stem d^4, which rises from the plate or disk d' of said movable abutment.

When the pressure is at the desired standard, the supply-valve will be open, as in Fig. 1, the pressure against the under side of the movable abutment being sufficient to overcome a portion of the spring resistance, and thereby maintain the movable abutment in position to hold the valve open. An excess of pressure will, however, raise the movable abutment sufficiently to close the valve by seating its seating portion a, as in Fig. 2.

Should for any reason the supply fail in the main supply-pipe, the spring will force down the movable abutment so as to raise the valve and close its seating portion *a'* upon its allotted seat, as in Fig. 3, thereby automatically cutting off communication between the supply and the delivery pipe.

In order to lock the supply-valve when closed, as in the last-mentioned instance, in order that upon a resumption of the supply escape of gas into any burner-cocks which may have been left open shall be prevented, I provide a stop device, M, arranged to work through the side of the casing of the abutment-chamber and adapted to lock the lever K after the latter shall have been brought into position to close the valve, as in Fig. 3. Said stop consists of a spring-controlled push-pin provided with a beveled inner end, which, when the lever K is in a horizontal position, as in Fig. 1, is in juxtaposition to and matches the beveled end of a finger, *k*, with which said lever is provided. By such arrangement, when the movable abutment is depressed from its position shown in Fig. 1, the end of the lever which is provided with the beveled finger *k*, will be raised, during which action said finger will push back the stop and ride up over the same, the stop, as soon as the finger is above its line of action, being instantly forced by its spring under the finger, thereby locking the valve until an operator shall have taken hold of the stop and withdrawn the same from under the finger. After the lever has been thus released, it is necessary to raise the movable abutment so as to open the valve, it being observed that said stop constitutes an auxiliary safeguard for locking and holding the lever against accidental movement while the supply-valve is in the position shown in Fig. 3. Various means could be employed for raising the diaphragm or movable abutment, one of which is shown in Fig. 4, wherein the device consists of a handle, N, provided with a threaded socket, which can be engaged with a threaded portion of the stem d^4 of the movable abutment, it being necessary in applying said handle to first remove a cap, E', which is herein shown screwed upon the neck which contains spring F.

The prolongation or extension a^2 of the tubular supply-valve is fitted to work in a short cylindric chamber, g^3, formed at the bottom of the main chamber *g* of the valve-casing, it being observed that a space is left between the tubular bearing *g'* and said socket or chamber g^3. The socket or chamber *g* provides an additional bearing for steadying the valve, and in order to connect it with the open air, so as to prevent the presence of an air-cushion therein, which would obstruct the action of the valve, it is connected at its bottom with a relief-passage formed through a pipe, O, which extends above the apparatus and connects with an exit-pipe, P, that communicates with the open air.

To permit the free action of the diaphragm and prevent the presence of an air-cushion between its upper side and the top wall of the abutment-chamber, I provide a relief-passage formed by a pipe, Q, which serves to connect the upper portion of the abutment-chamber with the pipe O.

The pipe I is provided at its upper end with a relief pressure-valve, R, arranged externally to the abutment-chamber, with its valve-chamber, at a point above the said valve, connected with the discharge-pipe P, in which way an exceedingly great pressure within the apparatus may be relieved.

It will be observed that while a pressure-regulator and cut-off has been provided with a supply-valve having two seating portions, said seating portions have been arranged to seat conjointly or simultaneously. In practice it has been found to be a matter of extreme difficulty, and, in fact, almost an impossibility, to grind such two seat faces or portions true to their allotted seats when said seating portions both seat at one and the same time; but by arranging them so as to seat alternately, as herein shown, said difficulty is entirely obviated.

It will also be observed that when the supply-valve is closed by reason of the absence of fluid-pressure against one side of the movable abutment, and the spring or weight action against the opposite side of said abutment, the position of the valve will be such as to permit pressure in the supply-pipe B, consequent upon a resumption of fluid-supply in the main, to act in a manner to assist the valve-controlling apparatus or device in holding the valve closed. Thus, for example, when the valve is closed, as in Fig. 3, pressure from pipe B will act against the lower exposed surface of the lower seating portion of the valve, thereby assisting in holding the valve in its raised position.

The stop device effectively guards against any accidental opening of the valve from its closed position of Fig. 3, and in case the lower seating portion of the valve should be constructed so that when seated it shall not present any material portion of its surface to pressure in the supply-pipe, said stop device will become all the more necessary.

What I claim as my invention is—

1. In a pressure-regulator and cut-off, a tubular double-acting supply-valve provided with supply and delivery ports intermediate of its two seating portions, which latter are at a distance apart to allow them to separately, but not conjointly, close or seat to cut off communication between the supply and delivery pipes, in combination with a movable abutment connected with and controlling said supply-valve, and subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-valve and to the action of a weight or spring, substantially as described.

2. In a pressure-regulator and cut-off, a double-acting supply-valve governing communication between the supply and delivery pipes, in combination with and controlled by a movable abutment subject on opposite sides,

respectively, to the pressure of fluid delivered past the said supply-valve and to the action of a weight or spring, and a stop adapted to lock the supply-valve, when the latter is closed by the action of the spring or weight, against the movable abutment, substantially as described.

3. In a pressure-regulator and cut-off, the valve-casing provided with a chamber connected at opposite points, respectively, with a supply and a delivery pipe, a tubular supply-valve governing communication between said pipes, and a movable abutment controlling the supply-valve, and subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-valve and to the action of a weight or spring, in combination with the relief-pipe connected with the valve-chamber at a point opposite one end of the tubular supply-valve, and leading to an escape pipe or passage, substantially as described.

4. In a pressure-regulator and cut-off, the tubular double-acting supply-valve provided with supply and delivery ports intermediate of its two seating portions, in combination with the valve-casing connected with the supply and delivery pipes and provided with a short cylindric valve-chamber having seats at both ends, the said tubular supply-valve being applied to work within said cylindric chamber, and being prolonged so as to fit and work within a separate cylindric chamber with which the valve-casing is provided, substantially as described.

5. In a pressure-regulator and cut-off, the tubular supply-valve governing communication between the supply and delivery pipes and a chamber containing a movable abutment subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-valve and to the action of a weight or spring, in combination with a relief-pipe connected with a chamber within which a prolongation of the tubular supply-valve is fitted to work and leading to an escape-passage, and a relief-passage leading from the upper portion of the chamber containing the abutment, substantially as described.

6. The combination, with a movable abutment, substantially as described, of the supply-valve A, governing communication between the supply and delivery pipes, the lever H, fulcrumed within the chambers containing the movable abutment, and connected at its ends, respectively, with the movable abutment and the stem of the supply-valve, and the stop or latch for engaging and locking said lever, which latter is provided with a finger which matches the beveled or wedge-shaped end of the latch, whereby when the lever is actuated by a depression of the movable abutment its said finger will push back the latch so as to pass above the same, substantially as set forth.

7. In a pressure-regulator, a supply-valve controlling communication between the supply and delivery pipes and a movable abutment connected with the supply-valve, and subject on opposite sides, respectively, to the pressure of fluid delivered past the supply-pipe and to the action of a weight or spring, in combination with the relief pressure-valve located external to the chamber containing the movable abutment, and connected both with the delivery-pipe and with the fluid-receiving portion of said chamber, substantially as described.

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