W. A. BAEHR.

GAS REGULATOR.

APPLICATION FILED JULY 14, 1910.

986,343.

Patented Mar. 7, 1911.

2 SHEETS—SHEET 1.

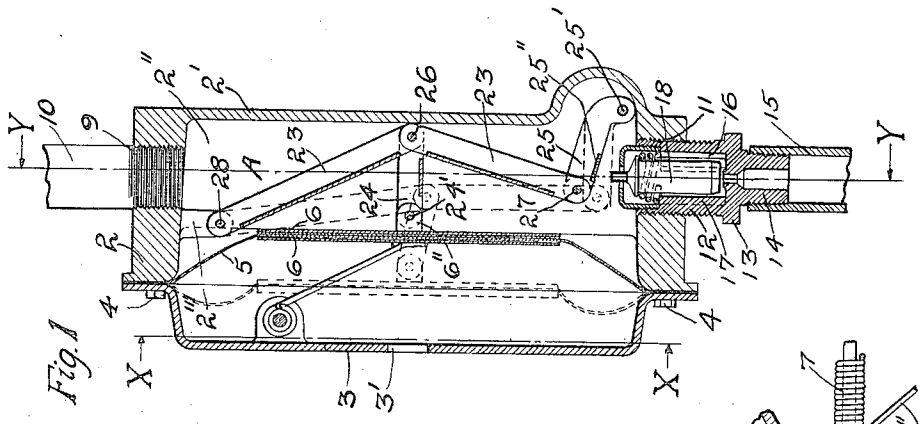

Fig. 1

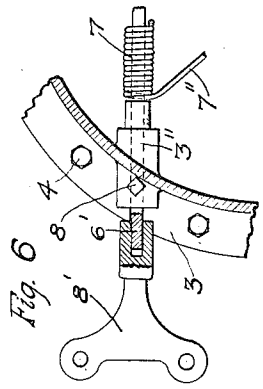

Fig. 6

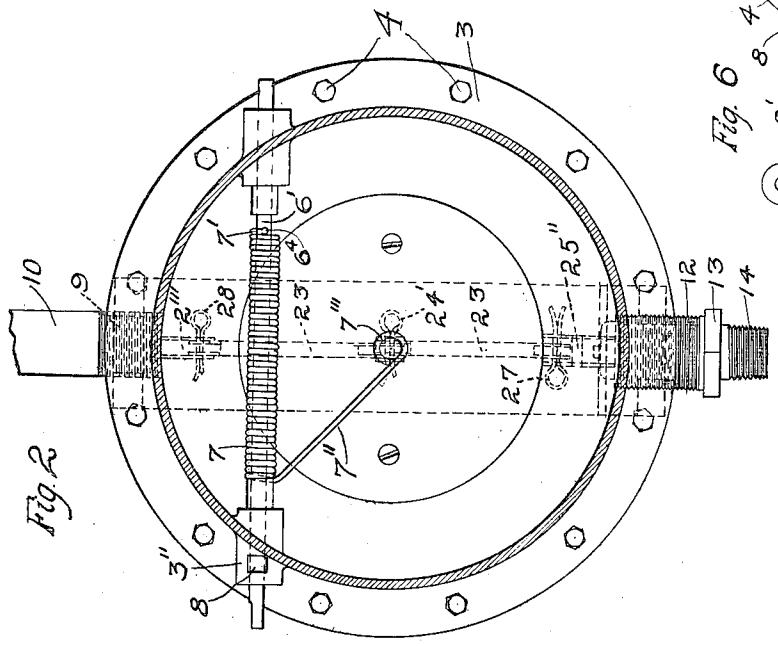

Fig. 2

Witnesses

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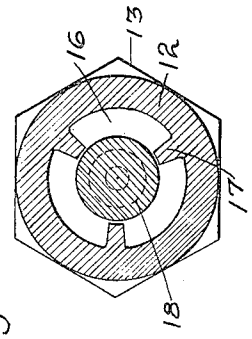

Fig. 5

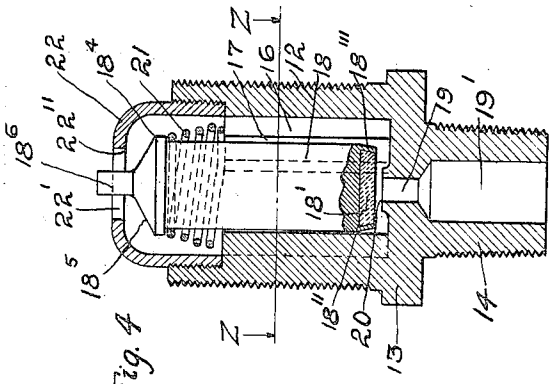

Fig. 4

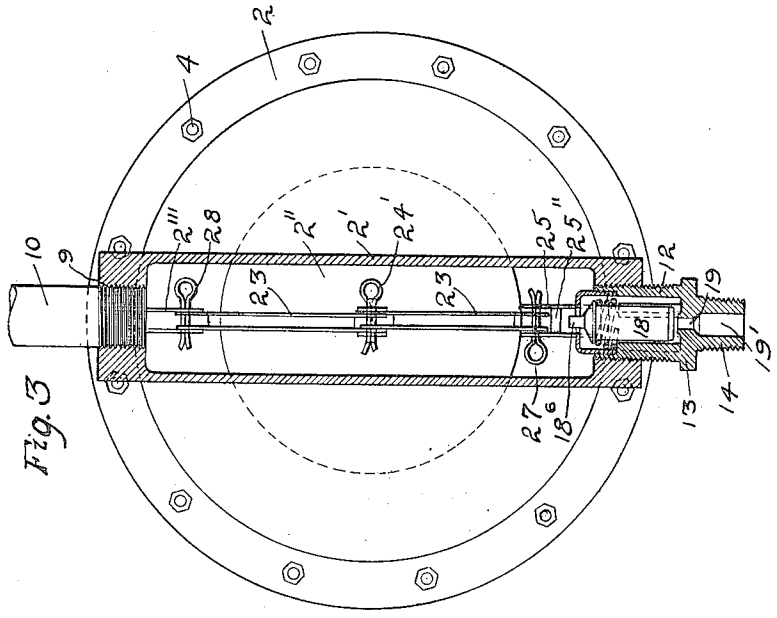

Fig. 3

Witnesses
Robert McCready
Edward F. Wilson

Inventor
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by Baehr & Baehr Atty.

UNITED STATES PATENT OFFICE.

WILLIAM A. BAEHR, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE RELIANCE ENGINEERING & MANUFACTURING COMPANY OF CHICAGO, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

GAS-REGULATOR.

986,343. Specification of Letters Patent. Patented Mar. 7, 1911.

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To all whom it may concern:

Be it known that I, WILLIAM A. BAEHR, a citizen of the United States, and resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Gas-Regulators, of which the following is a full, true, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to gas regulators, and has particular reference to improvements in automatic regulators for reducing the pressure between service gas pipes and the consumption pipes of the building in which the gas is used. I apprehend that in the future illuminating and other gas will be distributed through mains under high pressure, and, as high pressure gas cannot be employed in the burners commonly found throughout the country, that it will be necessary to supply to each house or point of consumption a simple and yet efficient reducing valve or regulator by which the pressure in the consumption pipes may be kept down to a very few ounces. The object of my invention is to provide such a regulator for such uses.

My invention consists generally in an automatic gas pressure reducing valve and regulator of the kind hereinafter described and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings forming a part of this specification and in which;

Figure 1 is a vertical transverse section of a gas regulator embodying my invention; Fig. 2 is a sectional view thereof substantially on the line X—X of Fig. 1 viewed in the direction of the arrows; Fig. 3 is a similar section on the line Y—Y of Fig. 1; Fig. 4 is an enlarged detailed sectional view of the valve of my regulator; Fig. 5 is a sectional view of the valve on the line Z—Z of Fig. 4, and Fig. 6 is a fragmentary section of a portion of the regulator case showing the key for adjusting the tension of the pressure spring.

As shown in the drawings, my novel gas regulator comprises a substantially circular casing made in two parts 2 and 3, the part 2 forming the body of the casing and the part 3 being a cover secured thereto by a number of cap screws 4. Between the body 2 and the cover 3 is a diaphragm 5 reinforced at the center by metallic plates 6. The cover 3 contains a hole 3′ so that atmospheric pressure is maintained upon the outer side of the diaphragm, *i. e.*, the side toward the cover.

In the upper part of the cover, upon the atmospheric side of the diaphragm and at one side of the center of the cover, I arrange a cross shaft 6′ carrying a torsion spring 7. The shaft is arranged in bearings 3″ in the cover and is adjustably secured against rotation by a set screw 8 in one of the bearings. One end 7′ of the torsion spring is secured to the shaft 6′ while the other end is formed into an arm 7″ terminating in a curl 7‴ and pressing upon the center of the diaphragm. Thus formed the spring exerts its pressure to hold the diaphragm away from the inner wall of the cover in opposition to any gas pressure which may accumulate within the body 2—that is, within the chamber A back of the diaphragm. This spring is made adjustable as to its tension to adjust or vary the normal pressure of gas in the chamber A. This adjustment is effected by the rotation of the shaft 6′ in its bearings, the shaft having one of its projecting ends squared or flattened to receive a key 8′, by which it may be rotated when the set screw 8 is loosened.

The back of the body of the casing is provided with a wide vertical rib 2′ containing an elongated vertical recess 2″ which opens into the circular portion of the chamber A. The top of the part 2 contains a threaded hole 9 to receive the exit or consumption pipe 10. The bottom contains a threaded hole 11 to receive the entrance valve or regulator valve proper through which the high pressure gas enters the chamber A. The largest part of the valve constitutes a threaded plug 12 having a hexagonal shoulder 13 at its lower end terminating in a threaded nipple 14 to which the supply pipe 15 is attached. The upper end of the plug is tapered slightly so that a very tight joint between the stem and the casing may be made by screwing the plug into place. The exact height to which the plug is adjusted in the casing is determined by the toggle lever mechanism which coacts therewith as hereinafter explained. The upper part of the plug 12 contains a vertical cylindrical chamber 16 reduced in effective diameter by

the internal guide ribs 17, the inner edges of which are finished to serve as guides for the valve member 18. The bottom of the chamber 16 contains a central inlet hole 19 at the upper end of which is an annular seat 20 to receive the valve member 18. The central duct 19′ in the lower end of the plug communicates with the smaller passage 19.

In the lower end of the valve 18 is a recess 18′ which is utilized to hold a soft seat packing 18″. It will be observed that the annular wall 18‴ surrounding the packing 18″ is relatively thin, and in manufacturing the member 18 I preferably swage or compress this wall annularly upon the packing 18′ thereby securing the latter firmly in place upon the lower end of the member 18. The upper end of the member 18 has a shoulder 18^4 and the member 18 is supported by a conical spring 21, the upper end of which engages the shoulder 18^4 while the spring rests upon the upper ends of the internal ribs 17, as best shown in Fig. 4. The spring is strong enough to support the valve member 18 out of contact with the seat 20, and such is its condition except under an abnormal pressure of gas within the chamber A, at which time the valve is pressed down by the hereinafter described toggle lever mechanism which is actuated by the diaphragm. The upper end 18^5 of the member 18 is conical and, in conjunction with the member 22, forms a safety valve adapted to close the passage into the casing when the pressure upon the consumption side thereof is suddenly released, as by the disruption or bursting of the diaphragm. The member 22 is an inverted cup containing the valve hole 22′, the lower edge 22″ of which is a valve seat for the conical end 18^5 of the member 18. The member 22 is threaded into the upper end of the plug portion 12.

A short stem or stud 18^6 rising centrally from the top of the member 18 extends considerably above the inverted valve seat member 22. This stud or stem is engaged by the diaphragm mechanism when the diaphragm is extended by pressure within the chamber A. The said mechanism comprises a toggle lever 23 composed of two links,—a strut link 24 and a valve actuating link 25, the same being joined by pivot pins 26 and 27. The upper link or arm of the toggle lever is attached by a pin 28 to an internal lug 2‴ at the top of the casing. The strut 24 is attached by a pin 24′ to a lug 6″ on the diaphragm, and the lower end of the link 25 is pivoted to the casing by a cross pin 25′. The several links are preferably U-shaped in cross section and are wide enough to afford lateral stability to their pivots. The lower part 25″ of the link 25 is directly above the stud 18^6 of the valve and when the diaphragm is extended by pressure within the chamber A the toggle lever is straightened to such an extent that the link 25 is moved down against the said stud of the valve and the valve is thereby forced down against its spring until the lower end of the member 18 is seated about the opening or passage 19, to close the latter. This relation of the parts is shown by dotted lines in Fig. 1. The full lines of Fig. 1 illustrate the position of the valve member 18 and the toggle mechanism at the moment when the pressure in the chamber A is *nil* or much less than normal. Normally the link 25 has a fixed pivot and a relatively fixed position within the casing. The valve plug is made adjustable in the manner hereinbefore explained, and, being adjustable, it may be raised or lowered in the thread of the opening 11 until the valve member 18 properly coacts with the toggle mechanism.

The operation of the regulator herein disclosed is as follows: When there is no pressure within the regulator the diaphragm and the toggle mechanism occupy the positions shown in Fig. 1 and the valve member 18 being at that time supported by the spring will stand midway between the two valve seats 20 and 22″. When gas is supplied to the pipe 15, it will flow through the passage 19, the chamber 16 and the opening 22′, until the accumulating pressure in the chamber A is sufficient to distend the diaphragm so far as to straighten out the toggle lever and cause the lower end thereof to engage the stud of the valve member 18. The parts will remain in this condition until the distension of the diaphragm is increased to the point where the toggle mechanism forces the valve member firmly against the lower valve seat 20 and thus closes the entrance passage 19. The return of the diaphragm when pressure is reduced in chamber A suffers the valve to be lifted by its spring and to admit a further supply of gas. In event the diaphragm is broken or the consumption pipe is suddenly opened, the high pressure of the gas in the supply pipe 15 being no longer opposed by the diaphragm and toggle mechanism will cause the valve suddenly to rise beyond the point of normal support by the spring 21 and close the opening or passage 22′. Once closed in this manner the valve will remain against the seat 22″ until the balance of pressures is restored. Obviously the valve member 18 performs the function of a safety or automatic emergency valve, and a chief feature of my invention arises from the fact that the single member 18 performs the functions of both entrance and emergency valves, and its use enables the production of a regulator of remarkable simplicity, efficiency and reliability.

A particularly desirable feature of my improved gas regulator resides in the ease with which the regulating valve may be removed for repairs without disturbing the consump-

tion pipe or the diaphragm and toggle lever mechanism.

The structure herein shown may be considerably modified without departing from the spirit of the invention, and I therefore do not limit or confine my invention to this precise structure.

I claim:

1. A fluid pressure regulator comprising a chambered casing and mechanism therein responsive to fluid pressure, a valve-member carried by said casing and controlled by said mechanism for regulating the inflow of fluid to said casing, said valve member being removable from the casing independently of said mechanism, and means for checking the inflow of fluid upon the failure of said mechanism.

2. A fluid pressure regulator comprising a chambered casing and mechanism therein responsive to fluid pressure, and a valve-member carried by said casing and controlled by said mechanism for regulating the inflow of fluid to said casing, said valve member being removable from the casing independently of said mechanism, a spring for supporting the valve member away from its seat when the pressure in the chamber is substantially balanced with the pressure in the supply pipe, and an auxiliary valve seat for the inner end of the valve upon which the valve member is adapted to be seated and close the inlet passage, by fluid pressure, upon an abnormal decrease of pressure within the chamber substantially as described.

3. A fluid pressure regulator comprising a chambered casing and mechanism therein responsive to fluid pressure, a valve member carried by said casing and controlled by said mechanism for regulating the inflow of fluid to said casing, a spring for supporting the valve member away from its seat when the pressure at the two ends of the valve is substantially balanced, an auxiliary valve seat for the inner end of the valve upon which the valve is adapted to be seated, by fluid pressure, upon an abnormal decrease of pressure at the inner end of the valve substantially as described.

4. A fluid pressure regulator comprising a chambered casing and controlling mechanism therein responsive to fluid pressure, an inlet valve member mounted in the path of one portion of said mechanism and positioned thereby to control the inflow of fluid to said chamber, a spring supporting the valve away from its seat during such time, and an auxiliary seat for the inner end of the valve member against which said valve member is adapted to be closed by fluid pressure upon an abnormal relative decrease of pressure within said chamber, substantially as described.

5. A fluid pressure regulator comprising a chambered casing and mechanism therein responsive to fluid pressure, an inlet port for said casing, a valve plug in said port, a valve carried by said valve plug and controlled by said mechanism to regulate the inflow of fluid to said casing, said plug being adjustably mounted in said port to adjust the position of said valve relative to said mechanism.

6. A fluid pressure regulator comprising a chambered casing and controlling mechanism therein responsive to fluid pressure, a valve-member carried by said casing and controlled by said mechanism for regulating the inflow of fluid to said casing, means for adjusting the position of said valve-member relative to said mechanism and said valve-member being removable from said casing independently of said mechanism.

7. A fluid pressure regulator comprising a chambered casing and mechanism therein responsive to fluid pressure, an inlet passage for said casing, a plug member movably mounted therein, a valve chamber in said plug having a valve seat at each end, a valve in said valve chamber, and resilient means for maintaining said valve in an intermediate position, said valve being controlled by said mechanism for moving said valve relative to one of its seats against the action of said resilient means for controlling the inflow of fluid to said casing and said valve being automatically operated by an abnormal flow of fluid to close upon the other valve seat and check the flow.

8. In a gas regulator, a casing having a gas chamber provided with an inlet and an outlet passage, a floating valve member operable in said inlet passage, a valve seat arranged at each end of said valve member, means within said casing responsive to variations in pressure therein, adapted to control the movement of said valve-member in relation to one of its seats to regulate the flow of gas through said passage, said valve being adapted to automatically close upon its other seat to stop the flow of gas through said passage upon an abnormal decrease of pressure within said chamber.

9. In a gas regulator, a casing having a chamber provided with an inlet and an outlet passage, a floating valve-member operable within said inlet passage and controlling the flow of gas therethrough, a valve seat arranged at each end of said valve, a pressure operated diaphragm in said casing, a toggle lever mechanism within said chamber operable by said diaphragm and controlling the movement of said valve-member relative to one of its seats to regulate the flow of gas through said passage, said valve being adapted to automatically close upon its other seat to stop the flow of gas through said passage upon an abnormal decrease of pressure within said casing.

10. A gas regulator comprising a casing,

a gas pressure chamber within said casing having an inlet and an outlet passage, a pressure responsive diaphragm within said casing, means for resisting the movement of said diaphragm in one direction, a valve-member operable in said inlet passage, a valve seat arranged at each end of said valve-member, a valve controlling mechanism in said chamber operable by said diaphragm to control the movement of said valve relative to one of its seats to regulate the flow of gas through said inlet passage, said valve operating means being adapted to be moved out of the path of said valve-member and permit it to be automatically closed upon its other seat upon an abnormal decrease of pressure within said casing.

11. A gas regulator comprising a casing, a gas pressure chamber within said casing having an inlet and an outlet passage, a pressure responsive diaphragm within said casing, a pressure balancing spring associated with said diaphragm adapted to position said diaphragm within said casing, a double seated valve controlling the flow of gas through said inlet passage, a valve operating mechanism within said chamber operatively associated with said diaphragm adapted to control the movement of said valve relative to one of its seats to regulate the flow of gas through said inlet passage, said spring operating to move said valve operating mechanism out of the path of said valve upon an abnormal decrease of pressure within said chamber and permit said valve to close automatically upon its other seat to stop the flow of gas through said inlet passage.

In testimony whereof, I have hereunto set my hand, this 29th day of June, 1910, in the presence of two subscribing witnesses.

WILLIAM A. BAEHR.

Witnesses:
ARTHUR W. NELSON,
JOHN R. LEFEVRE.