J. E. LEWIS.

Regulators for Gas and other Fluids.

No. 196,301. Patented Oct. 23, 1877.

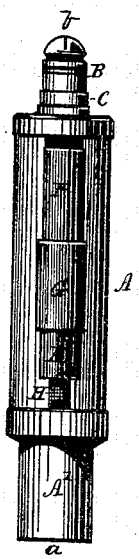


Fig. 1

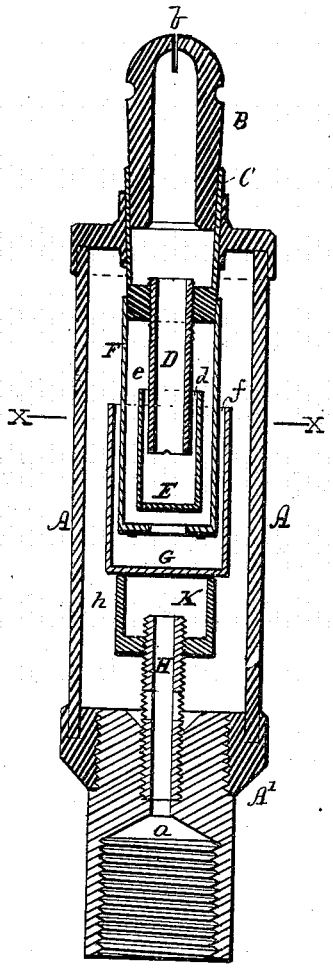
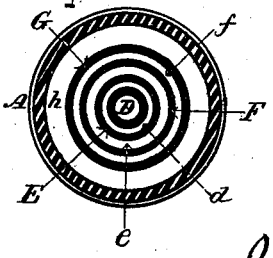


Fig. 2

Fig. 3



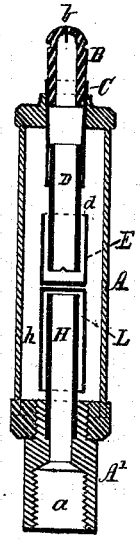


Fig. 5

Fig. 4

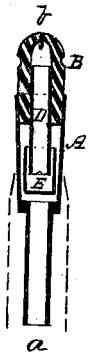


Fig. 6

Witnesses.

S. R. Barton

S. Ira Barton

Inventor.

J. Edwin Lewis

by Chas. H. Burleigh

Atty

UNITED STATES PATENT OFFICE.

J. EDWIN LEWIS, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN REGULATORS FOR GAS AND OTHER FLUIDS.

Specification forming part of Letters Patent No. **196,301**, dated October 23, 1877; application filed July 7, 1877.

To all whom it may concern:

Be it known that I, J. EDWIN LEWIS, of the city and county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Pressure-Regulators for Gases and Fluids; and I declare the following to be a description of my said invention, sufficiently full, clear, and exact to enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a side view of a gas-burner having my improved pressure-regulator applied thereto. Fig. 2 is a central vertical section of the same enlarged, showing a double arrangement of the regulator or check devices. Fig. 3 is a horizontal section of the same at position X X. Figs. 4, 5, and 6 are vertical sectional views, showing modifications in the construction and arrangement of the regulator.

The nature of my invention consists in an automatic check device, constructed and operating, substantially as hereinafter described, for regulating the flow of gases or fluids through tubes or pipes to give a uniform discharge under varying pressure or head; also, in a gas-burner constructed with an automatic regulator or check device, such as described, and in the combination with the burner-tip of a dependent tube and check, as hereinafter explained, the subject-matter claimed being hereinafter definitely specified.

The accompanying drawings illustrate my invention as it may be employed in the construction of gas-burners, several modifications being shown, in all of which, however, the check or regulator valve operates in similar manner.

The gas passes through the apparatus in an upward direction, or from the inlet *a* to the outlet *b*.

In Figs. 1, 2, 3 is shown an apparatus with two checks or regulators adjusted to act at different degrees of pressure.

A indicates the outer casing or main body, which may be of any suitable material and of any suitable size and form. C indicates a thimble or ferrule, supported in the upper end of the casing A for embracing or holding the burner-tip B or discharge-nozzle. D denotes the throat-tube, dependent from the tip or its thimble C, and forming the only passage through which the gas passes to the outlet *b*.

Tube D may be adjustably secured to the tip or thimble, so that its position can be varied up or down.

E indicates the check or valve, made in the form of a cylindrical cup, and arranged on the end of the dependent tube D. The inner diameter of the cup E is slightly greater than the outer diameter of the tube D, thus leaving a small annular passage, *d*, between the parts. The check-cup E is free to rise and fall on the throat-tube D, but is retained from dropping entirely below the end of said tube, while small grooves or projections are provided on the end of the tube, which prevent the check or valve from entirely closing the passage when pressed up against the end of the tube.

F indicates a tubular shell or casing open at its lower end, and dependent from the thimble C, to which it is attached. Said casing F surrounds and forms a chamber, *e*, for the valve E, while at the same time it serves as a tube for the second check or valve, G, which is arranged upon its lower end in a manner similar to the valve E and tube D, an annular passage, *f*, being left between the parts F and G for the passage of the gas from the chamber *h* to the opening of the tubular casing F.

H indicates a tube secured in and projecting upward from the base or shank A′ in the lower end of the casing A, and through which the gas enters the chamber *h*.

K is an adjustable head screwed onto the tube H for supporting the check or valve G at the proper position, and preventing it from dropping below the end of tube F. By raising or lowering the head K the valve or check G is adjusted to act with a greater or less variation of pressure.

By screwing in or out the tube D to change the length of its projection below the tip or thimble, the valve or check E may be adjusted to act at any desired degree of pressure.

The degree of pressure required for operating the checks or valves depends somewhat on their length or the distance to which the cup-cylinder extends over the end of its tube, and also on the relative size of the annular

passage *d* or *f* in relation to the size of the cup or check and its tube, a small passage requiring less pressure to raise the cup.

The shank A′ is screw-threaded for attachment to the supply-pipe (not shown herein) in the ordinary manner.

The gas, entering under pressure at *a*, passes through tube H and fills the chamber *h*. It then flows down the passage *f*, between the cup G and shell F, and up into the chamber *e*, thence downward through passage *d* and up through the throat-tube D to the burner-tip B or exit *b*.

The pressure within the chamber *h* being normal, the valves or checks E G remain quiet at their lowest position, permitting the gas to flow freely through the several passages. With an increase of pressure, the check or valve is buoyed or forced upward on its tube D, thereby partially closing the passage between the cup and tube end, so that the flow of gas under the increased pressure is through a smaller area, and the amount delivered at the burner-tip is not materially changed by the variation of pressure in the supply-pipe.

The checks E and G are adjusted to act with different degrees of pressure—the second check acting at a pressure beyond the limit of the first, and serving to reduce the pressure on the first.

Any number of checks or valves may thus be arranged in series, forming an apparatus capable of regulating the flow under any variations of pressure or head.

The check-cup, buoyed up by the excess of pressure from below, balances at a position which gives the proper opening or flow of gas, and there remains, as it were, floating in its space, rising with any increase of pressure, and descending as the pressure diminishes, thus proportioning the area of passage to the pressure of gas, and keeping the rate of discharge uniform.

The regulator, when used for an ordinary gas-burner, where the variation of pressure is slight, may be made with a single check-valve, E, and the casing A made to suit the requirements of the particular use or situation, as in Figs. 4, 5, and 6.

Fig. 4 shows a modified form of burner, with tip B, thimble C, tube D, check E, and casing A arranged for insertion in the end of a pipe or tube or similar situation.

Fig. 5 shows a modified form, with single check E, and having an inverted cap, L, placed over the end of tube H for deflecting and delivering the gas at the bottom of the chamber *h*. If desired, this cap L and the valve E may be made in a single piece, as shown at L′.

Fig. 6 shows a modification wherein the tube D is fitted directly to the interior of the burner-tip B, which latter is fitted into the top end of the inclosing casing A, and the casing offset or reduced, forming a shoulder, which serves to support the check-valve E when not buoyed up by the pressure of gas.

The regulator devices, constructed substantially as described, can be employed for regulating the pressure or flow of water, or other liquids, if desired, by connecting a discharge pipe or nozzle in place of the burner-tip B.

It will be understood that the effect and operation of the devices would be the same by a reduction of the pressure, or exhaustion above the check E, as it is with an increase of pressure below.

Having described my improved pressure-regulator for gas or fluids, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The cup E, loosely arranged on the end of the dependent tube D, with annular space *d* for regulating the flow of gas or liquid through said tube, substantially in the manner hereinbefore set forth.

2. In combination with the discharge-tip or exit-orifice, a dependent tube, open at its ends, through which the gas or fluid passes to said orifice, and a loose check cup or valve arranged over the end of said tube, with a narrow annular space between the parts for the flow of gas or fluid to the entrance of the tube, whereby said valve is balanced, to be automatically actuated by excess or variation of pressure in the lower surrounding space or chamber, for reducing or changing the area of passage into said tube, and thereby regulating the flow of gas or fluid so as to give a uniform rate of discharge under varying head or pressure, substantially as hereinbefore set forth.

3. In combination, the loose cup E, dependent tube D, and shell or casing A, substantially as and for the purposes set forth.

4. The combination, with the tip or nozzle B or its thimble C, loose cup or check valve E, and its surrounding case, of the longitudinally-adjustable tube D, substantially as and for the purpose stated.

5. The combination, with the inlet-tube H, throat-tube D, and inclosing-case A, of two or more check-valves, E G, and intermediate tubular casings F, substantially as and for the purpose set forth.

6. In combination with check-cup G and screw-threaded tube H, the screw cap or head K, as and for the purposes described.

Worcester, Massachusetts, July 3, 1877.

J. EDWIN LEWIS.

Witnesses:

CHAS. H. BURLEIGH,

J. E. BARTON.