(No Model.)

C. E. BELT.

GAS PRESSURE REGULATOR.

No. 578,621. Patented Mar. 9, 1897.

Fig. 2.

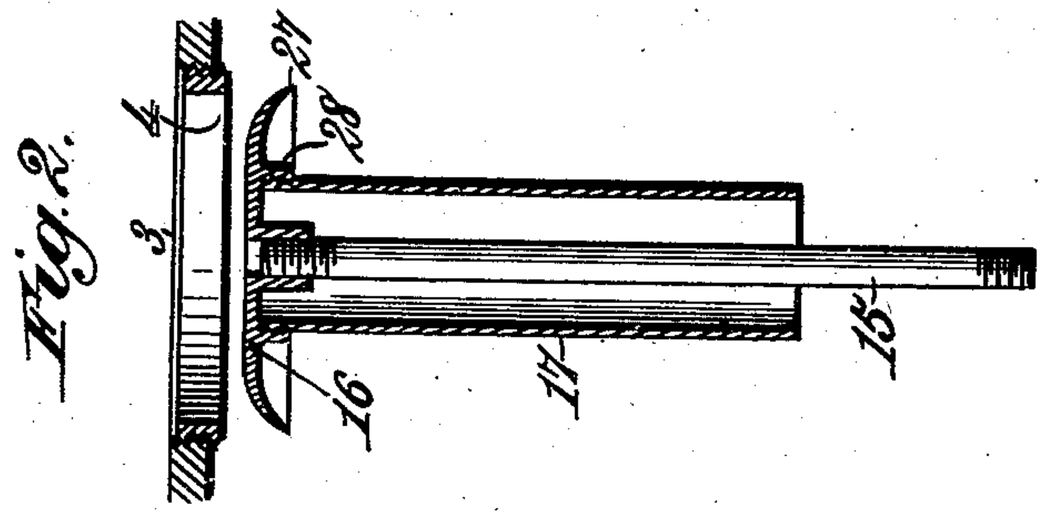
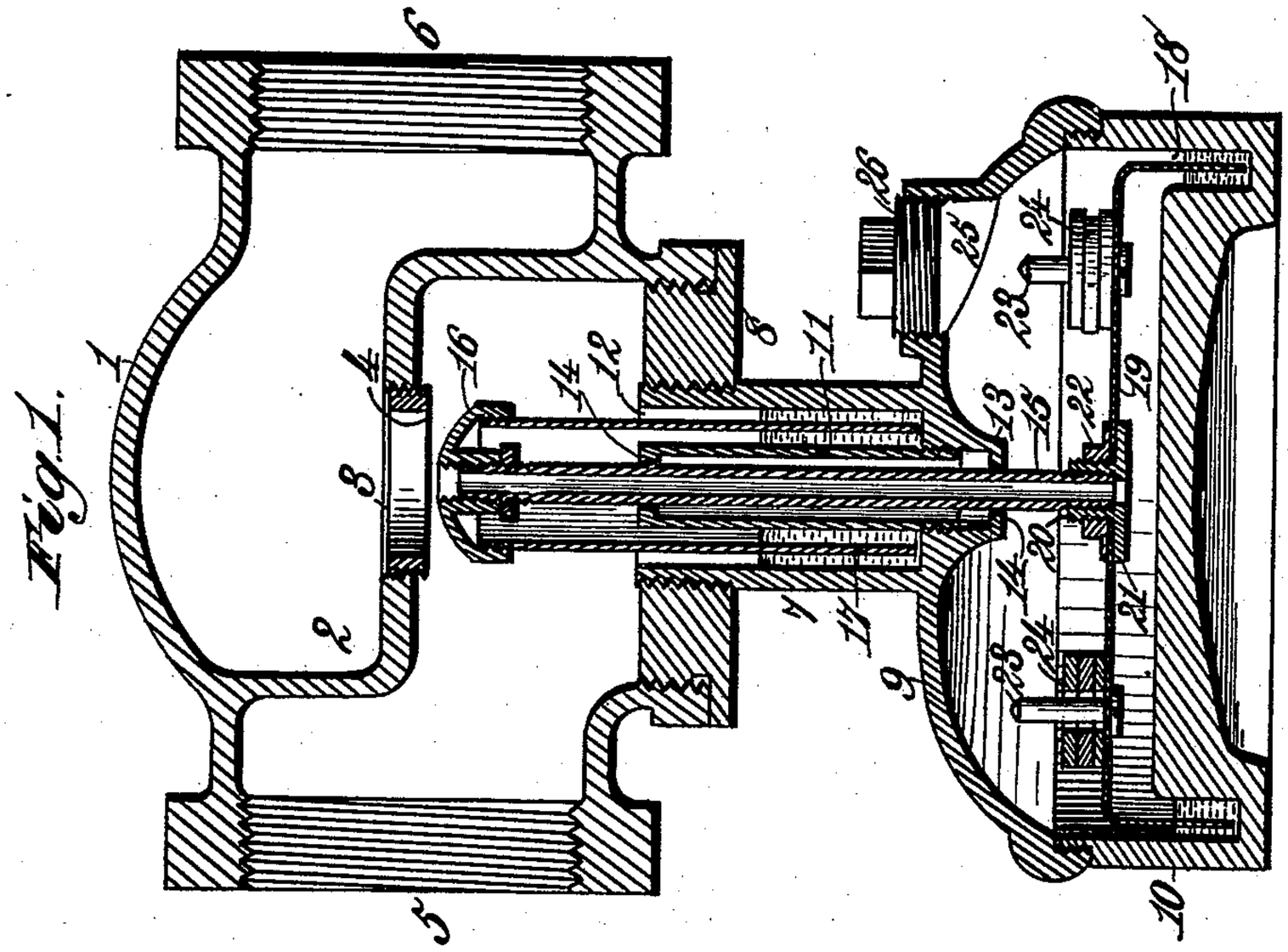


Fig. 1.



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UNITED STATES PATENT OFFICE.

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GAS-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 578,621, dated March 9, 1897.

Application filed August 5, 1896. Serial No. 601,719. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BELT, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented new and useful Improvements in Gas-Pressure Regulators, of which the following is a specification.

This invention relates to gas-pressure regulators, and especially to gas-pressure regulators that operate to maintain an even and uniform pressure of gas at the burners irrespective of the pressure in the service-pipe or the number of burners that may be supplied by the latter.

Heretofore a serious objection has been urged against the employment of gas-pressure regulators in which mercury has been employed as a liquid seal, for the reason that great difficulty has been experienced in preventing the mercury from coming in contact with the soldered portions and connections of the gas-meter, owing to excessive variations of the pressure of the gas or from jarrings or vibrations imparted to the regulator through various different causes, whereby the solder is quickly consumed or rendered porous and the escape of gas thus permitted, making the atmosphere unwholesome and dangerous to inhale and frequently resulting in destructive explosions.

It is therefore one of the objects of my invention to provide means for preventing the escape of any portion of the mercury from the regulator to the meter or its connections.

It has for a further object to provide a gas-pressure regulator very sensitive and quick in operation and simple, inexpensive, and durable of construction, and has for its final object to provide improved means for adjusting the regulator without disconnecting any of its operative parts.

To these ends my invention consists in the features and in the construction, arrangement, or combination of parts hereinafter described, and afterward pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a vertical central section of my improved gas-pressure regulator, and Fig. 2 is a similar detail view of a modified form of valve and its seat.

Referring to the drawings, the numeral 1 indicates the valve-casing, comprising a T-coupling having a transverse inclined diaphragm 2, in which is formed a port 3, fitted with a horizontal valve-seat 4.

The numeral 5 indicates the gas-inlet of the casing, and 6 the gas-outlet. The under side of the valve-casing 1 is apertured and interiorly threaded, as shown, in which apertured and threaded portion is fitted the cylindrical portion or neck 7 of the casing 8. Said cylindrical portion or neck terminates at its lower end in a dome-shaped cap 9, which is interiorly threaded and has fitted within it a base 10, said cap and base forming a chamber for the cup hereinafter described.

Fitted within the neck 8 is a tube 11, that projects centrally upward within the neck and is concentric with the latter, whereby an annular space or pot 12 is formed between the neck and tube, for the purpose hereinafter described. The vertical center of the tube 11 is in alinement with the center of the valve-seat 4, and the lower end of the neck 8 is formed with a downwardly-projecting hollow boss 13, with which the tube 11 communicates. The lower end of the boss 13 and the upper end of the tube 11 are each provided with an inwardly-turned flange 14, serving as guides for the valve-spindle.

The valve-spindle 15 is hollow throughout its length and extends vertically through the tube 11 and projects above and below the latter, and at its upper end is exteriorly threaded and has fitted thereon a dome-shaped valve 16. Said valve in its vertical movement operates to control or regulate the passage of the gas through the valve-seat 4 by enlarging or contracting the space between said valve and seat, as will more fully hereinafter appear. The lower portion of the dome-shaped valve 16 is interiorly threaded and has fitted therein the upper end of a depending hollow plunger 17, that projects down into the pot 12 and dips into a body of mercury contained therein.

The base 10 is formed with an annular channel 18, adapted to contain a body of mercury, and dipping into the mercury is an inverted cup 19, which is attached to the lower end of the valve-spindle 15, as follows: The cup 19 is centrally apertured, and through the aper-

ture is passed an exteriorly and interiorly threaded sleeve 20, having formed on its lower end a flange 21, that bears against the under side of said cup. Tapped over the sleeve 20 is a nut 22, which locks the sleeve gas-tight to the cup, and the threaded lower end of the valve-spindle 15 is tapped into the upper threaded end of the sleeve 20.

Projecting from the top of the inverted cup 19 are a plurality of vertical pins 23, over which are arranged annular weights 24. The number of weights disposed over each pin will depend upon the initial average pressure of gas in the service-pipe and the pressure desired to be maintained in the burner-pipes. In order to permit of the weights being placed in position or removed without disconnecting or disturbing any of the operative parts of the device for the purpose of adjusting the device to maintain the desired pressure, I form a threaded aperture 25 in the cap 9 and removably fit therein a threaded plug 26. By rotating the cup 19 the pins 23 may successively be brought directly beneath the opening 25 and the weights be dropped over or lifted from the pins.

In Fig. 2 I have illustrated a slightly-modified form of valve. Constructed as shown in said figure the central portion of the valve 16 is flat and is provided with an outwardly and downwardly flaring portion 27, and is provided on its under side with a downwardly-depending annular flange 28, screw-threaded interiorly and fitted over the upper end of the hollow plunger 17. The operation of this valve is precisely the same as that before described, the only difference being that the valve shown in Fig. 2 may be employed with a valve-seat having a large port without necessitating the employment of a plunger having a corresponding enlarged area in cross-section.

The operation of my improved pressure-regulator is as follows: The valve-casing 1 is coupled between two sections of the service-pipe and intermediate the gas-meter and the burners in the position shown in Fig. 1. Before fitting the neck 8 to the valve-casing 1 a sufficient quantity of mercury to properly seal the lower end of the plunger 17 is introduced into the pot 12 by pouring it between the upper end of the pot and the tube 11, and the mercury necessary to seal the inverted cup 19 in the channel 18 is introduced through the upper end of the hollow valve-spindle 15, down through which it flows onto the top of the inverted cup, and from thence flows off into the channel 18. The neck is then fitted to the valve-casing 1, when the regulator is ready for operation. The weights 24 are then adjusted on their pins to cause the regulator to maintain the desired pressure. The gas enters the valve-casing 1 and passes through the valve-seat 4 and out through the outlet-port 6 to the burners, and the gas also flows down through the hollow valve-spindle to the under side of the inverted cup 19. The pressure of the gas being entirely on top of the valve and this pressure being the same as the pressure of the gas in the outlet portion of the valve-casing, the combined weight of the weights 25 will counterbalance a given pressure of gas exerted beneath the inverted cup and will hold the valve at rest in a state of equilibrium, thus maintaining a flow of gas at the desired pressure through the regulator. Should the pressure of gas in the service-pipe increase, the excess of pressure will overbalance the weight on the cup and raise the valve until only a sufficient quantity of gas is permitted to pass the valve to maintain the former pressure beneath the cup, when the valve again comes to a state of rest. Should the pressure of gas in the service-pipe decrease, the weight on the cup will overbalance the pressure of the gas beneath the cup, permitting the valve to drop and allow an increased flow of gas through the regulator until the pressure of gas beneath the cup again becomes sufficient to balance the weight on the cup. It will thus be seen that the pressure of gas as it leaves the regulator will be maintained even and uniform, irrespective of the pressure in the service-pipe or the amount consumed by the burners.

By sealing the plunger 17 in the manner shown it is rendered impossible for any gas to pass to the casing above the inverted cup, and gas is in like manner prevented from escaping from beneath the cup.

A very important feature of my invention resides in arranging the cup and plunger underneath or below the valve and valve-casing and beneath and below the level of the service-pipe, whereby, no matter how excessive the variations of the pressure of the gas may be or no matter how violent the jarrings or vibrations communicated to the regulator may be, it will be utterly impossible for the mercury to find its escape to the service-pipe and from thence to the meter or meter connections, thus obviating all danger of the solder being damaged and permitting the escape of gas. Owing to the pressure of the gas beneath the cup counterbalancing the weight resting thereon the valve is rendered very sensitive and quick to respond to any variation of pressure in the service-pipe.

Having described my invention, what I claim is—

1. In a gas-pressure regulator, the combination with a valve-casing having inlet and outlet chambers and a valve-port intermediate said chambers, of a closed cup-chamber arranged below the valve-casing and communicating therewith, an inverted cup sealed in a body of mercury contained in said chamber, a hollow valve-spindle attached at its lower end to said cup and communicating with the space beneath the latter, and a valve fitted on the upper open end of said valve-spindle, said valve being exposed to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the

passage of the gas through the said valve-port, substantially as described.

2. In a gas-pressure regulator, the combination with a valve-casing having inlet and outlet chambers and a valve-port intermediate said chambers, of a closed cup-chamber arranged below the valve-casing and communicating therewith, an inverted cup sealed in a body of mercury contained in said chamber, means for adjusting the weight of said cup, a hollow valve-spindle attached at its lower end to said cup and communicating with the space below the latter, a valve fitted on the upper open end of said valve-spindle, said valve being exposed to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the passage of the gas through the said valve-port, and means for preventing the entrance of gas into the cup-chamber above the cup, substantially as described.

3. In a fluid-pressure regulator, the combination with a valve-casing having inlet and outlet chambers and a valve-port intermediate said chambers, of a closed cup-chamber arranged beneath the valve-casing and communicating therewith and provided on its bottom with an annular sealing-channel adapted to contain mercury, an inverted cup dipping into the mercury contained in said channel, means for weighting said cup, a hollow valve-spindle attached at its lower end to said cup and communicating with the space below the latter, a valve fitted on the upper open end of said valve-spindle, said valve being exposed to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the passage of the gas through the said valve-port, and means for preventing the entrance of gas into the cup-chamber above the cup, substantially as described.

4. In a gas-pressure regulator, the combination with a valve-casing having inlet and outlet chambers and a valve-port intermediate said chambers, of a closed cup-chamber arranged beneath the valve-casing and communicating therewith and provided on its bottom with an annular sealing-channel adapted to contain mercury, an inverted weighted cup dipping into the mercury contained in said channel, a hollow valve-spindle attached at its lower end to said cup and communicating with the space below the latter, a valve fitted on the upper open end of said valve-spindle, said valve being exposed to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the passage of the gas through the said valve-port, and a hollow plunger depending from said valve and sealed at its lower end in a body of mercury surrounding the hollow valve-spindle, substantially as described.

5. In a gas-pressure regulator, the combination with a valve-casing having inlet and outlet chambers and a valve-port intermediate said chambers, of a hollow neck depending from said valve-casing and terminating at its lower end in a cup-chamber, an annular sealing-chamber formed in the walls of said neck, an inverted cup dipping into a body of mercury contained in said cup-chamber, a hollow valve-spindle passing through said hollow neck and at its lower end attached to said cup and communicating with the space beneath the latter, a valve fitted on the upper open end of said valve-spindle, said valve being exposed on its upper side to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the passage of the gas through the said valve-port, and a hollow plunger depending from said valve and sealed at its lower end in a body of mercury contained in the annular sealing-chamber in said neck, substantially as described.

6. In a gas-pressure regulator, the combination with a valve-casing having a valved port, a hollow neck depending from said casing and terminating in a cup-chamber, an inverted cup sealed in a liquid contained in said cup-chamber, a hollow valve-spindle passing through the hollow neck and at its lower end attached to said cup and communicating with the space below the latter, a valve fitted on the upper open end of said valve-spindle, said valve being exposed on its upper side to the pressure of the gas in the outlet-chamber of the valve-casing and operating to control the passage of the gas through the valve-port, means for preventing the entrance of gas into the cup-chamber above the cup, a plurality of vertical projecting pins arranged on the upper side of the cup, removable weights disposed about said pins and a plug for closing an aperture formed in the upper portion of the cup-chamber and adapted to successively register with the said pins when the cup is rotated, substantially as described and for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES E. BELT.

Witnesses:
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