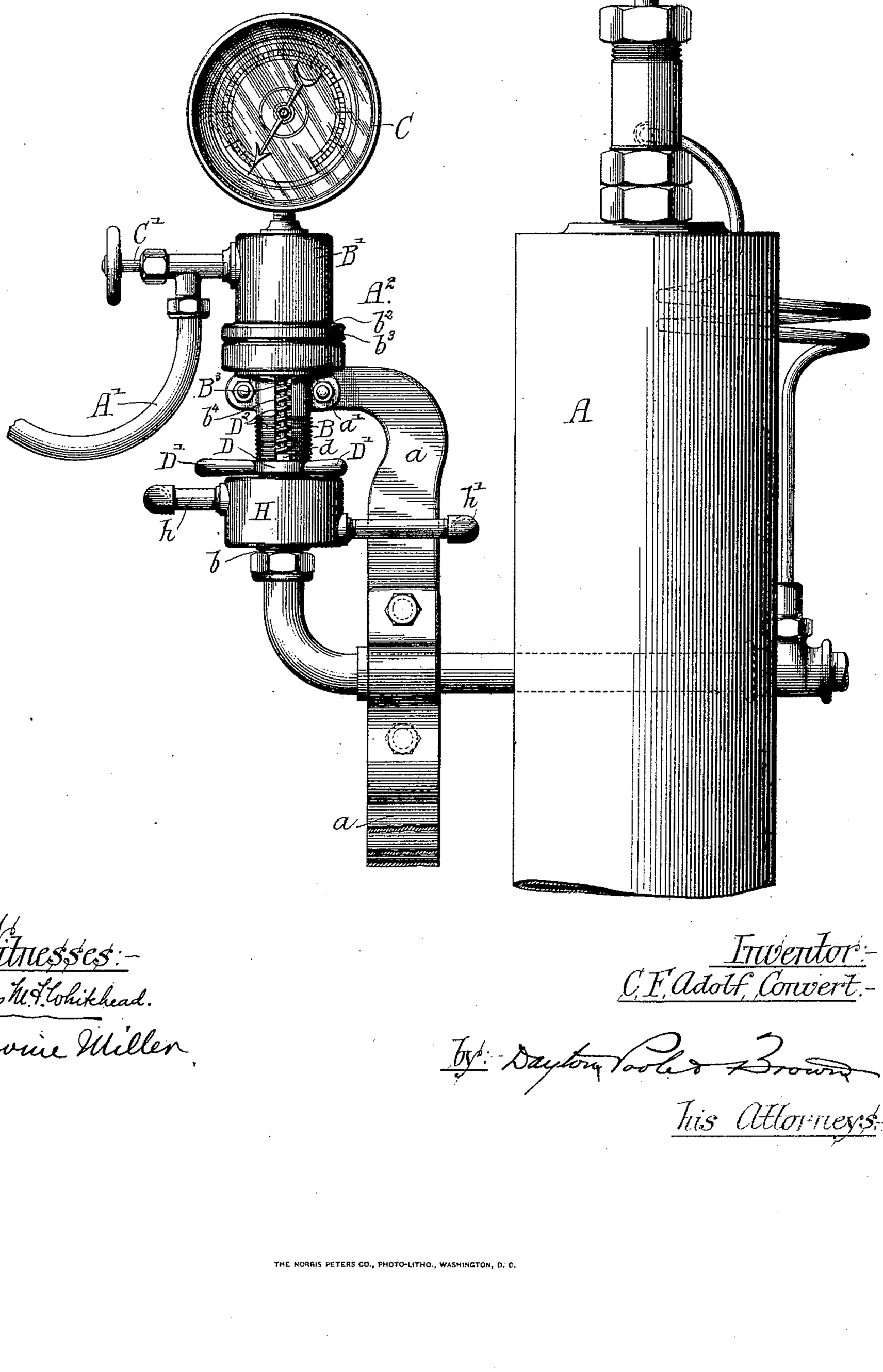
(No Model.) 2 Sheets—Sheet 1.

C. F. A. CONVERT.

PRESSURE REGULATING DEVICE.

No. 481,272. Patented Aug. 23, 1892.

Fig. 1.



Witnesses:-
Louis M. T. Whitehead.
Irvine Miller.

Inventor:-
C. F. Adolf Convert.-
By: Dayton Pooler & Brown
his Attorneys.

(No Model.) 2 Sheets—Sheet 2.

C. F. A. CONVERT.

PRESSURE REGULATING DEVICE.

No. 481,272. Patented Aug. 23, 1892.

Fig. 2.

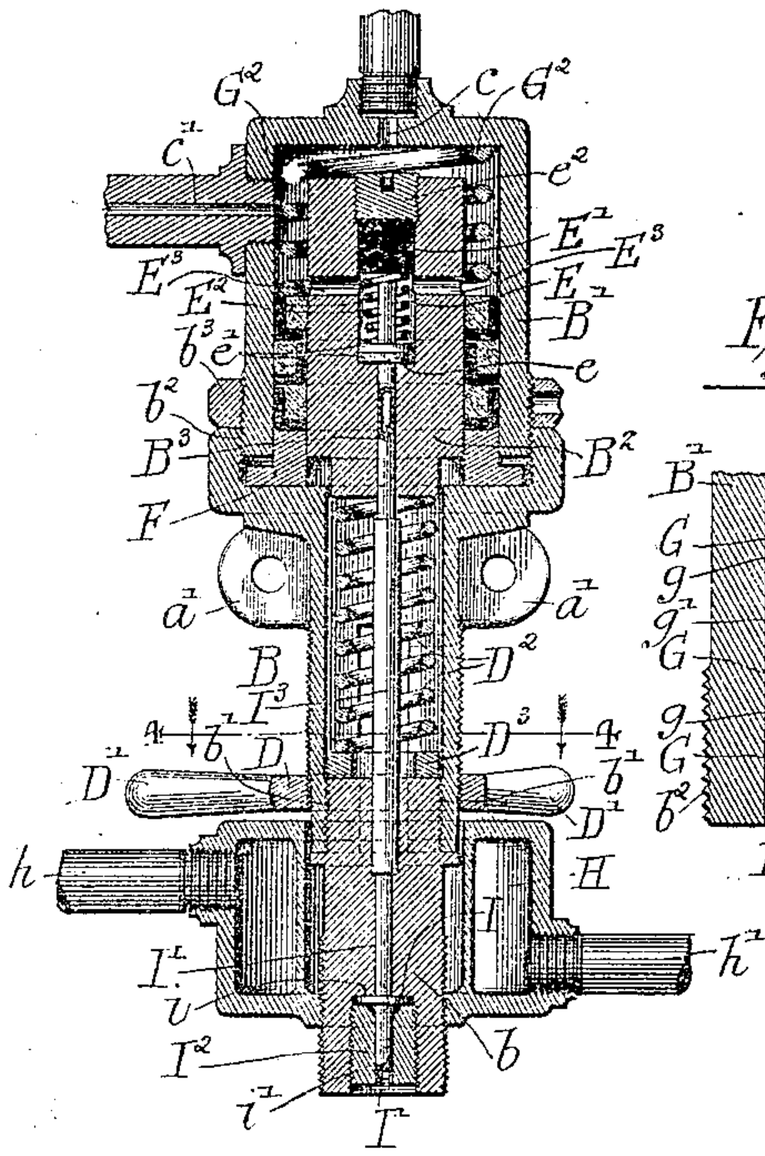


Fig. 5.

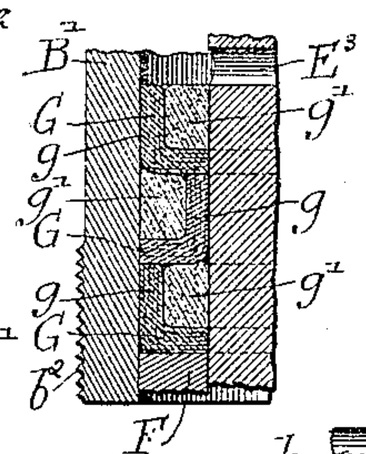


Fig. 3.

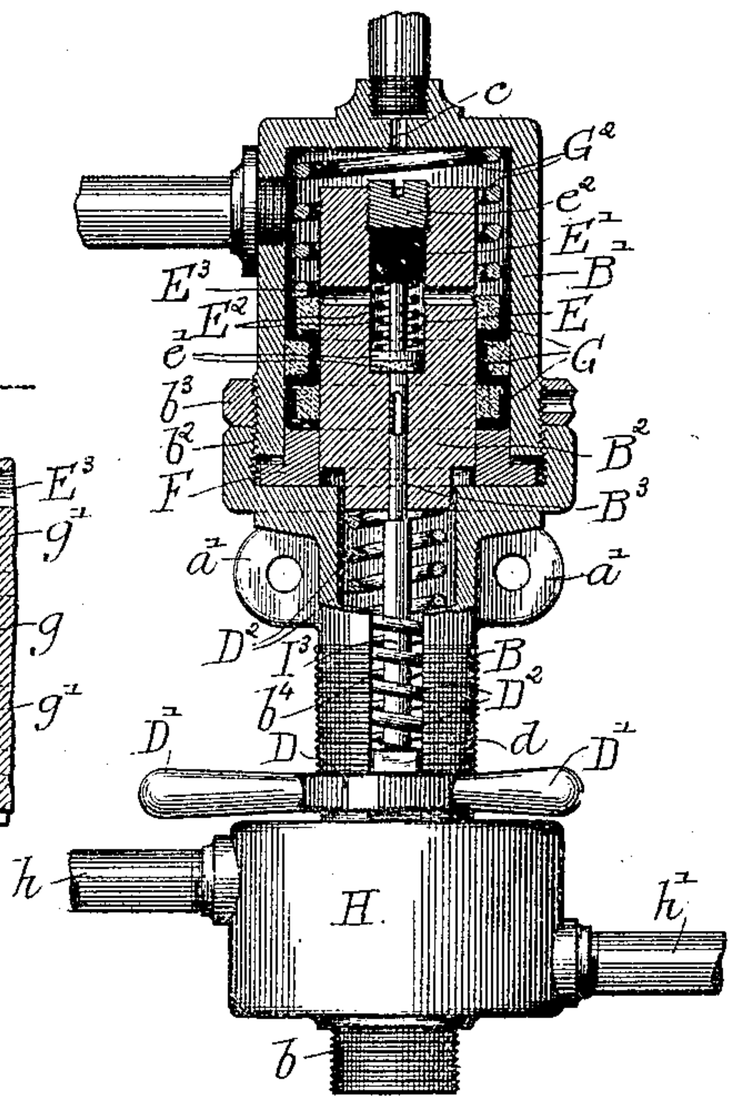
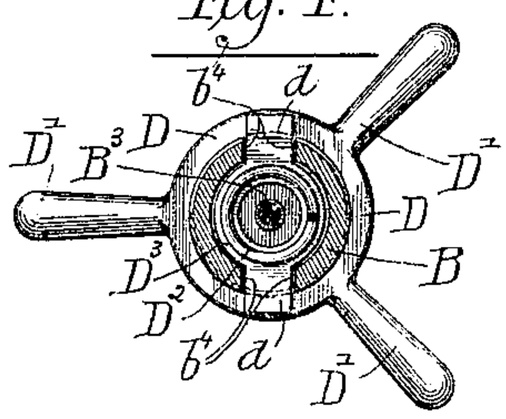


Fig. 4.



Witnesses:-
Louis M. Whitehead.
Irvine Miller.

Inventor:-
C. F. Adolf Convert.
By:- Dayton, Lockwood & Brown
His Attorneys.-

UNITED STATES PATENT OFFICE.

CHARLES F. ADOLF CONVERT, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE LIQUID CARBONIC ACID MANUFACTURING COMPANY, OF SAME PLACE.

PRESSURE-REGULATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 481,272, dated August 23, 1892.

Application filed February 18, 1891. Serial No. 381,781. (No model.)

To all whom it may concern:

Be it known that I, CHARLES FREDERIC ADOLF CONVERT, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pressure-Regulating Devices; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to regulating devices applied between tanks or drums containing a liquid or gas under a high pressure and another drum or tank into which the liquid or gas is to be delivered at a relatively low pressure—as, for example, between the reservoirs or tanks containing compressed carbonic-acid gas and a smaller tank, from which the gas is supplied to bottles, beer-barrels, or to soda-water fountains; and the same consists in the novel arrangement of parts herein illustrated and claimed.

In the drawings, Figure 1 is a side elevation of the regulating device. Fig. 2 is a central vertical sectional view of the same. Fig. 3 is a view showing the moving parts in a changed position. Fig. 4 is a horizontal sectional view taken upon line 4 4 of Fig. 2. Fig. 5 is an enlarged section of the packing-rings for the piston of the device.

In the drawings, A indicates a main drum containing the gas under high pressure, A′ a pipe leading to another drum to which gas is to be supplied under a reduced pressure, and A^2 a regulating device as a whole connected with the drum A and supported on suitable framework *a* by means of lugs *a′ a′*.

The regulator comprises as its main features a tubular casing formed by a lower hollow frame or supporting part B, to which the lugs *a′* are attached, and a cylinder B′ and containing a piston B^2, together with a hollow centrally-located tube or conduit B^3, the upper end of which with the piston B^2 constitutes the valve proper.

For convenience in construction, the frame or housing B is made in two portions, the lowermost section *b* having the form of a plug secured to the main portion by screw-threads, as shown at *b′*, and being provided with screw-threads at its lower end for the attachment of the supply-pipe which leads from the tank A to the regulating device. The tube or conduit B^3 is permanently secured at its lower end in this plug. The cylinder B′ is secured to the upper end of the frame B by means of screw-threads, as shown at b^2, and is locked firmly in position by means of a jam-nut b^3.

C is a pressure-gage secured to the upper end of the cylinder B′ and in communication with the interior thereof by means of the small passage *c*.

c′ is a passage leading from the interior of the cylinder B′ to the pipe A′.

C′ is a valve in the passage-way *c′*, which valve may be of any ordinary construction. The outer surface of the frame B is cylindric and screw-threaded, and a screw-threaded ring or nut D, provided with radial arms, constituting handles D′ D′, is placed thereon. At diametrically-opposite points the said frame B is cut away or slotted longitudinally, as shown in Fig. 1, thereby forming elongated vertical slots or openings b^4 b^4 therein. Within the hollow or tubular frame B is located a spiral spring D^2, which spring acts at its upper end against the under surface of the piston B^2 and rests at its lower end upon an annular plate or follower D^3. This follower D^3 is provided with laterally-projecting arms *d*, which arms project through the slots b^4 and rest upon the nut D. It will be understood that by turning the handles D′ D′ to the right or left the nut D will be raised or lowered, carrying with it the follower D^3, thereby contracting or expanding the springs D^2 to provide for the movement or yielding of the piston B^2 at a desired pressure, as will be hereinafter more fully pointed out. The piston B^2 is provided with a longitudinal centrally-located opening, the lower portion of which is only of such diameter as to admit of the passage of the upper portion of the tube or conduit B^3 therethrough. The upper portion of said opening is larger in diameter than the lower portion, thus forming a recess E, at the bottom of which is a shoulder *e*, upon which one or more suitable gaskets or packing-rings *e′* are placed. The upper portion of the recess E is filled by a rubber cushion or packing E′, secured in place by a screw-threaded plug e^2,

inserted in the recess above the cushion. The upper end of the tube B^3 passes through the gasket *e* and projects into the recess E, the lower surface of the packing standing normally away from the upper open end of the tube B^3. A spiral spring E^2, the upper end of which presses against the rubber cushion E′ and the lower end of which rests upon the gasket *e′* serves to hold the packing-rings or gaskets *e′* tightly around the tube B^3, and thus prevent the escape of gas at this point.

E^3 are radially-arranged openings or passage-ways leading from the recess E into the interior of the cylinder B′. The piston B^2 does not occupy the entire space within the cylinder B′, said piston being of less diameter than the diameter of the interior of the cylinder.

F is an annular guide placed in the lower end of the cylinder B′ and within which the lower end of the piston B^2 is adapted to fit and slide, said guide resting upon a shoulder formed at the upper end of the frame B. Resting upon the upper end of the guide F and between the piston and walls of the cylinder are placed suitable packing-rings to prevent the escape of any liquid or gas from the upper portion of the cylinder B′; but I prefer to use the particular packing-rings here shown and described, which constitute a separate improvement. I make no claim herein to said packing-rings, reserving the right to claim any invention therein in another separate application. The said packing, illustrated more clearly in Fig. 5, consists of three annular metallic rings G, each provided at one of its edges with a cylindric flange *g*. In the drawings the upper and lower rings G are provided with upturned flanges *g* at their outer margins, while the central ring G is provided with an upturned flange upon its inner margin. Obviously this arrangement may be reversed, if desired. Upon each of the rings is placed a suitable rubber gasket or packing-ring *g′*. Within the cylinder B′, surrounding the upper end of the piston B^2, is placed a coiled spring G^2, the upper end of which presses against the top wall of the cylinder and the lower end of which presses against the uppermost packing-ring G, thereby forcing said rings together and tending to expand the gaskets *g′* laterally, the gaskets *g′* being made of greater vertical width or depth than the distance from the top of the ring G to the top edge of the flange *g*. The packing thus made serves the double purpose of making a tight joint and of affording an additional guide for the piston B^2.

As a separate and still further improvement I provide around the tubular casing of the apparatus a hollow drum or chamber H, of annular form or of ring shape, to which chamber are connected steam-supply and outlet-pipes *h* and *h′*, by means of which steam may be continuously circulated in said chamber to keep the same at a high temperature. The chamber being thus kept hot, the casing which it surrounds is prevented from becoming cold, with obvious advantages in the operation of the device. The gas expanding in the cylinder B′ absorbs the heat in the surrounding parts to such an extent that there is a great accumulation of frozen moisture about the regulator, the operation of which is injuriously affected thereby, and I find that better results are obtained when the metal parts of the regulator are heated and when the gas is passed through a heated conduit before it is permitted to expand. The annular drum or chamber H is preferably secured to the lower end of the part *b* by screw-threaded connection.

It will of course be understood that hot water may be substituted for steam as a means of heating the drum or chamber II.

Near the lower portion of the tubular conduit B^3 is an annular flange I. The lower part or plug *b* of the frame is provided with a central opening I′, through which the conduit B^3 passes, said opening I′ being enlarged at its lower portion to form an annular shoulder *i* and being screw-threaded in its enlarged part, as shown. A plug I^2, provided exteriorly with screw-threads, is placed in the enlarged portion of the opening I′, said plug being also provided with a central opening *i′* for the conduit B^3. The conduit B^3 is secured to the part *b* of the frame by being passed through the central opening I′ until the flange I engages the shoulder *i*, in which position it is rigidly secured by the plug I^2, being screwed up against the under side of the flange I, so as to hold said flange against the shoulder.

I^3 is a tubular guide for the central portion of the conduit B^3. It is secured at its lower end in the upper portion of the lower part *b* of the casing, as shown.

The operation of my invention is as follows: Suppose, for example, that it is desired to furnish a gas—say carbonic-acid gas—at a pressure of forty pounds to the square inch to a tank with which the pipe A′ is connected, said gas being obtained from the supply-drum A, in which it is contained under a pressure of, say, eight hundred pounds to the square inch. The parts of the regulator having been adjusted, the gas will pass from the drum A through the opening *i* of the plug I^2 into and through the central tube B^3, from which it passes into the space E, then through the radial passage-way E^3 into the cylinder B′, and thence through the passage-way *c′* into the pipe A′. When the cylinder and tank connected with the pipe A′ are filled with gas, compression will begin and continues until a pressure of forty pounds to the square inch—the desired pressure in this instance—is reached. The continued inflow of gas will then produce pressure upon the upper end of the piston B^2, and thereby cause said piston to move vertically downward against the action of the spring D^2. The tube B^3 being stationary, it follows that the upper

end thereof will be closed as soon as the packing E′ presses upon it and the supply of gas from the drum A cut off. If this pipe A′ be connected with a bottling apparatus or a beer-barrel from which gas may be drawn in small quantities at frequent intervals, it is obvious that when any considerable quantity of gas has been drawn from the said apparatus or beer-barrel the pressure of gas therein and in the cylinder will become less than forty pounds to the square inch. The piston B^2 will then rise in the cylinder by reason of the upward pressure of the spring D^2, thus opening the mouth of the tube B^3 and permitting the further inflow of high-pressure gas to the cylinder. The operation is thus repeated as long as desired, the regulator automatically supplying or stopping the supply of gas to the cylinder.

Of course it will be understood that before the apparatus will operate at the pressure named the spring D^2 must be regulated to yield at such pressure, and this can be done by means of the nut D and handle D′, operated as heretofore explained.

The area of the cylinder and of the piston B^2, as well as the area of the opening at the upper end of the supply-pipe B^3, are obviously factors in determining the tension in the spring required for giving a desired pressure, and for convenience in regulating the pressure-gage C and valve C′ are employed. In regulating the device the valve C′ is closed and gas is allowed to flow into the chamber or cylinder B′, and the nut D is then raised or lowered, thus contracting or expanding the spring D^2, as desired, until the pressure-gage indicates a desired pressure of gas within the cylinder. Thereafter when the valve C′ is opened the apparatus will operate automatically to furnish gas from the drum or tank A, wherein it is under higher pressure, to a tank connected with the pipe A′ at the reduced and desired pressure.

I am aware that it is not new to employ a regulating device to take gas from a tank under a high pressure and deliver it for consumption at a lower pressure, and I therefore do not claim, broadly, any such apparatus.

It will be observed that the arrangement of the heating drum or chamber is such as to prevent the heating-chamber supplying heat at a point where the packing-rings in the cylinder are located, and thus destroying the usefulness of said rings, the location of the annular chamber around the lower part of the casing, or near the point where the supply-pipe is connected therewith, obviously securing the heating of the compressed gas or liquid before it reaches the point where it is allowed to expand.

I claim as my invention—

1. The combination, with a tubular casing and a stationary tube in the casing, of a piston sliding in the casing and surrounding the tube, said piston having a cylindric recess at its outer or upper end and holes leading from said recess outwardly to the interior of the casing, a packing in said recess opposite the open end of the tube, a screw-plug closing the recess and holding the packing within the same, a spring for actuating the piston, a packing-ring located in said recess of the piston and surrounding the tube, and a second spring located within said recess and bearing against said packing-ring, substantially as described.

2. The combination, with a slotted tubular casing and a stationary tube within the casing, of a piston sliding in the casing and surrounding the tube, said piston being provided with holes extending outwardly from the recess and with a packing located opposite the open end of the tube, a spring for actuating said piston, located within the casing, a follower sliding in the casing and provided with arms extending outwardly through the slots in the same, and a nut having a screw-threaded engagement with the casing and adapted to engage said arms for moving the follower, substantially as described.

3. A regulating-valve comprising a tubular casing, consisting of a cylinder, a tubular frame attached thereto, and a plug closing the end of the tubular frame and screw-threaded on its outer surface, said casing being provided with a longitudinal passage for the liquid or gas and a spring-actuated valve controlling the same, and a hollow annular drum or chamber surrounding the tubular frame and attached to the latter by screw-threaded attachment to the said plug, substantially as described.

4. The combination, with a tubular casing consisting of a cylinder and a tubular frame having screw-threaded connection with the cylinder, of a stationary tube secured within the tubular frame, a piston smaller than the cylinder and surrounding the tube, said cylinder having a packing located opposite the open end of the tube, a plurality of laterally-expansible packing-rings located within and filling the space between the cylinder and piston, and a spring also located in said space and acting upon said packing-rings, substantially as described.

5. The combination, with a tubular casing consisting of a cylinder and a tubular frame, the cylinder being larger than the frame and connected with the same by a screw-joint, of a stationary tube secured within the tubular frame, a piston smaller than the cylinder surrounding the tube, said cylinder having a packing located opposite the open end of the tube, an annular guide for the piston, located in the cylinder in contact with a shoulder on the frame, packing-rings located in the space between the piston and cylinder and in contact with said guide, and a spring also located in said space and acting on the packing-rings, substantially as described.

6. The combination, with a casing consisting of a cylinder, a tubular frame attached thereto, and a screw-plug closing the end of the frame, of a tube secured in the plug, a

piston in the cylinder surrounding the tube and provided with a packing opposite the open end of the same, a spring within the frame acting on the piston, and a tubular guide rigidly secured in the plug and extending into the frame, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

C. F. ADOLF CONVERT.

Witnesses:
TAYLOR E. BROWN,
GEORGE W. HIGGINS, Jr.