C. J. COLEMAN.

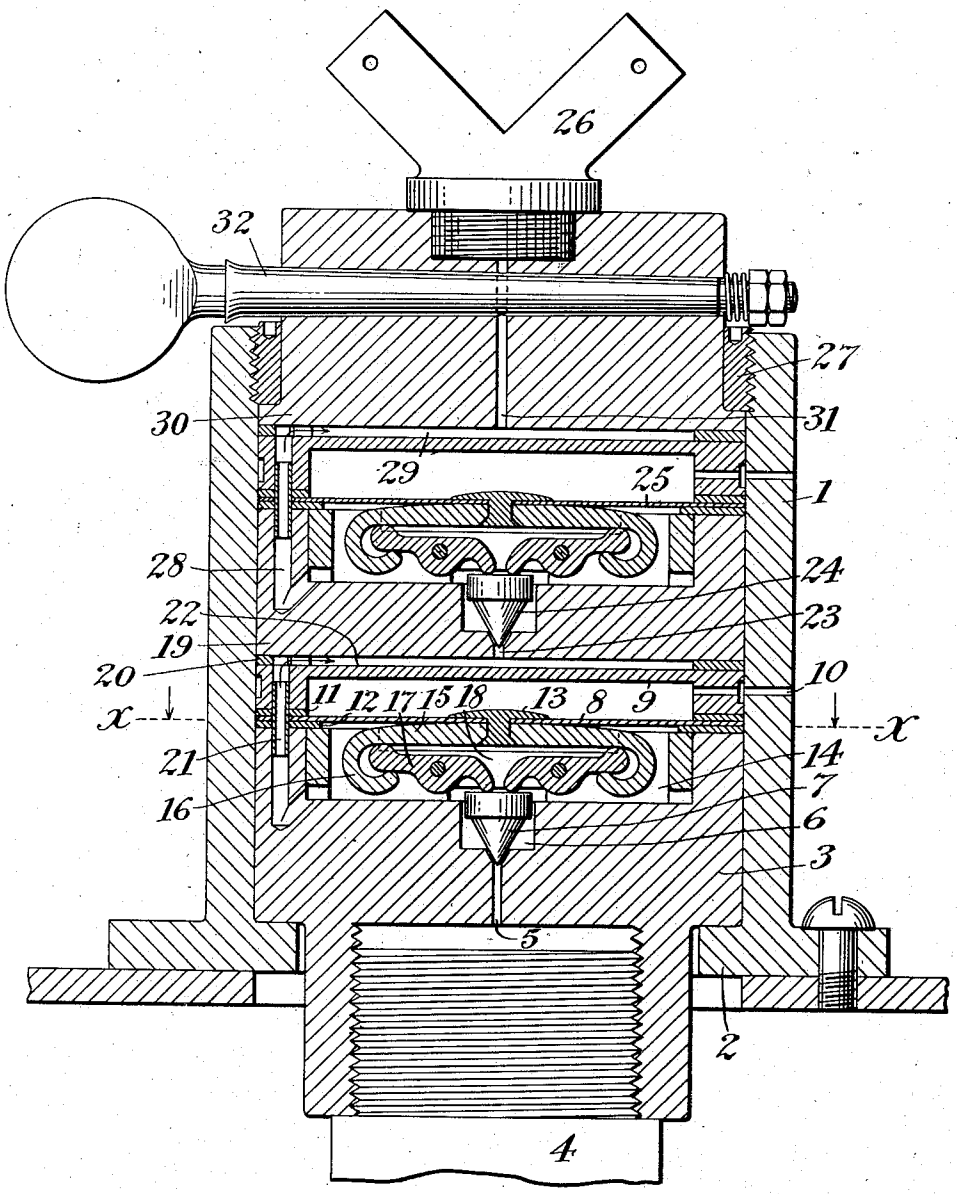
REDUCING VALVE.

APPLICATION FILED SEPT. 6, 1907. RENEWED DEC. 2, 1910.

997,272. Patented July 11, 1911.

2 SHEETS—SHEET 1.

Fig. 1



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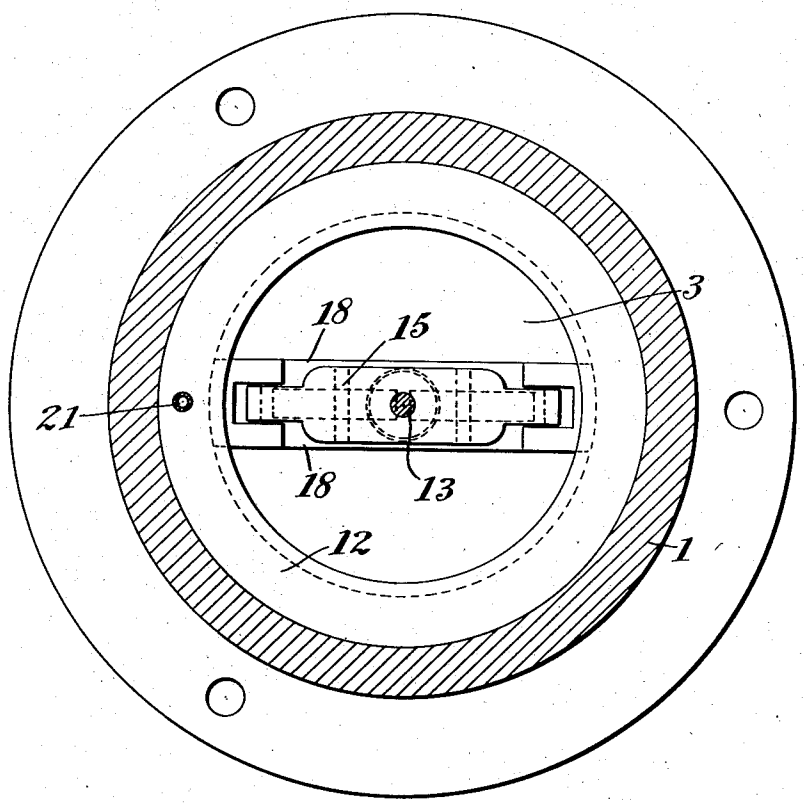
2 SHEETS—SHEET 2.

Fig. 2



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UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW YORK, N. Y., ASSIGNOR TO CONRAD HUBERT, OF NEW YORK, N. Y.

REDUCING-VALVE.

997,272. Specification of Letters Patent. Patented July 11, 1911.

Application filed September 6, 1907, Serial No. 391,704. Renewed December 2, 1910. Serial No. 595,328.

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States of America, residing at borough of Manhattan, in the county of New York and State of New York, have invented a certain new and useful Improvement in Reducing-Valves, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to reducing valves of the type in which the valve proper is controlled in its operation by a diaphragm exposed to the pressure of the fluid of which the pressure is to be controlled, and the object of the invention is to produce a reducing valve of simple and compact construction in which the use of sliding or packed joints is dispensed with. To this end the valve proper is connected with the diaphragm by mechanism comprising a lever and located entirely within the chamber in which the diaphragm is subjected to fluid pressure, so as to avoid all joints through which leakage might occur.

The invention comprises, further, the location of the diaphragm and the inlet valve at opposite points in the pressure chamber the lever mechanism connecting these parts being arranged to close the inlet valve in a direction opposite to the direction in which the diaphragm is moved by the pressure of the fluid in the chamber.

I will now describe the embodiment of my invention illustrated in the accompanying drawings, and will thereafter point out my invention in claims.

In the drawings Figure 1 is a vertical median section of a reducing valve embodying the invention, and Fig. 2 is a horizontal section on line *x x* Fig. 1.

The illustrated embodiment of the invention has a cylindrical casing 1 which contains the working parts. At the bottom of the casing is a shoulder 2 upon which rests a chambered member 3 which is connected with a pipe 4 from which the fluid under high pressure is received. The fluid passes through an inlet passage 5 to a valve seat 6 formed in the member 3 and coöperating with a conical inlet valve 7.

The upper end of the member 3 is provided with a shallow chamber 14 which constitutes what is hereinafter referred to as the "pressure chamber," and the upper wall of this chamber is formed by a diaphragm 8 of flexible sheet metal. Above the diaphragm 8 is a diaphragm-retaining cup or partition 9 forming above the diaphragm an atmospheric chamber communicating with the outer air by a passage 10. Washers 11 and 12 are placed above and below the diaphragm to insure fluid-tight joints.

By means of a rivet 13 a yoke 15 is secured to the center of the diaphragm. The yoke has hooked ends 16 which engage the outer ends of two levers 17 which are pivoted near their centers on a slotted cross-bar or frame 18. The frame is fixed at its ends between the washer 12 and the bottom of the pressure chamber. This lever-carrying frame is separable from the other parts of the device and is retained in place by virtue of its position in the pressure chamber or valve cup 14. In assembling the device it is merely necessary to place such frame in position in the valve cup. The inner ends of the levers 17 engage the top of the inlet valve 7.

The reducing valve of the drawings is designed to operate against high pressures, and is accordingly provided with two similar valves and diaphragms arranged to operate in succession so as to reduce the pressure in two stages. It is of course understood that provision could be made for any desired number of stages of pressure reduction. A second chambered member 19 forms a second pressure chamber or valve cup for the next succeeding stage of pressure reduction. The pressure chamber 14 is provided with a service-outlet 21 which communicates with a sealed gas-passage or service-passage 22 formed between the cup 9 and the member 19 by an interposed packing-ring 20. The fluid issuing from the outlet 21 of the first pressure chamber 14 passes across the space 22 above the partition 9, and thence it passes through a short passage 23 to a second valve 24 controlled by a diaphragm 25. The construction of this second valve mechanism is similar in all respects to that of the first, except that the diaphragm is made somewhat thinner and less resistant, to adapt it to operate at a lower pressure than the diaphragm 8. From the second pressure chamber the fluid is delivered to the point of use through its outlet 28 and final service-passage 29, formed between the second disk-retaining cup and an end-plug or clo-

sure-member 30, and thence to a final service-passage 31 in the plug 30, shown as controlled by a usual turn-cock 32. In the illustrated device the fluid operated upon is compressed illuminating gas, and the gas is delivered at a low pressure to a burner 26 carried by the plug 30.

The several parts of the valve mechanisms are secured in the casing 1 by a threaded sleeve 27 screwed into the upper end of the casing and acting against a shoulder formed on the plug 30 to compress the several chamber-forming members together. It is to be noted that each diaphragm-retaining cup or partition is separable and forms at one of its sides an atmospheric space and at its other side forms a gas-passage leading from the outlet of one stage of pressure reduction to the inlet of the next lower stage, or to the final service-passage, as the case may be. This manner of construction contributes largely to economy and convenience of manufacture and greatly facilitates cleaning of the various parts and passages.

In assembling the device it is only necessary to place the parts successively in the casing 1 in proper juxtaposition and screw in the clamping-ring 27. The pressure of the gas tends constantly to open the valves, but as the pressure rises in the pressure chambers the diaphragms, operating through the lever mechanisms, tend with increasing force to resist the opening of the valves, and thus the pressure is automatically reduced to a constant degree in the manner usual in such devices. It is obvious that a great reduction of pressure may be effected by each valve, owing to the great difference in the areas of the valve and the diaphragm exposed to pressure, and thus the device is adapted for controlling the delivery of gas from tanks in which it is stored under high pressure. The reduction of pressure may be more or less modified, however, by so arranging the parts that the elasticity of the diaphragm tends either to assist or resist the closing of the valve, according as a greater or smaller reduction is required. Since the mechanism connecting each valve with its diaphragm is located entirely within the pressure chamber there are no moving joints at which leakage may occur nor is any packing required, so that the valve will operate indefinitely without attention.

The invention may be used in connection with liquids as well as with gases, and is susceptible of a wide variety of uses. The construction illustrated in the drawings may be modified in various ways without departure from the nature and scope of the invention as defined in the succeeding claims.

I claim:

1. A reducing valve comprising a pressure chamber provided with an outlet and an inlet, a diaphragm forming a wall of the chamber, means for retaining the diaphragm in place, an inlet valve controlling the inlet, a frame fitted into the pressure chamber and retained in place by the diaphragm-retaining means, and a lever pivoted on the frame and connecting the diaphragm and the valve.

2. A reducing valve comprising a pressure chamber provided with an outlet and an inlet, a diaphragm forming a wall of the chamber, means for retaining the diaphragm in place, an inlet valve controlling the inlet, a frame fitted into the pressure chamber and retained in place by the diaphragm-retaining means, and connections between the diaphragm and the inlet valve comprising a yoke secured to one of said members and two levers pivoted to the frame and engaging the other said member and the opposite ends of the yoke.

3. A reducing valve comprising a pressure chamber provided with an outlet and an inlet, a diaphragm forming a wall of the chamber, a diaphragm-retaining cup forming an atmospheric chamber at the other side of the diaphragm from the pressure chamber, a member coöperating with the cup to form a service-passage at the other side of the cup from the atmospheric chamber and communicating with the outlet, and an inlet valve in control of the inlet and controlled by the diaphragm.

4. A reducing valve comprising a pressure chamber provided with an outlet and an inlet, a diaphragm forming a wall of the chamber, an inlet valve controlling the inlet, and connections between the diaphragm and the inlet valve comprising a yoke secured to one of said members and provided with hooked ends, and two levers pivoted within the chamber and engaging the other said member and having portions entering into and embraced by the hooks of the yoke, whereby positive movement in either direction is communicated between the yoke and the levers.

In testimony whereof I affix my signature in presence of two witnesses.

CLYDE J. COLEMAN.

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