F. L. JAHN.

PRESSURE REGULATING VALVE.

APPLICATION FILED SEPT. 8, 1908.

917,443.

Patented Apr. 6, 1909.

2 SHEETS—SHEET 1.

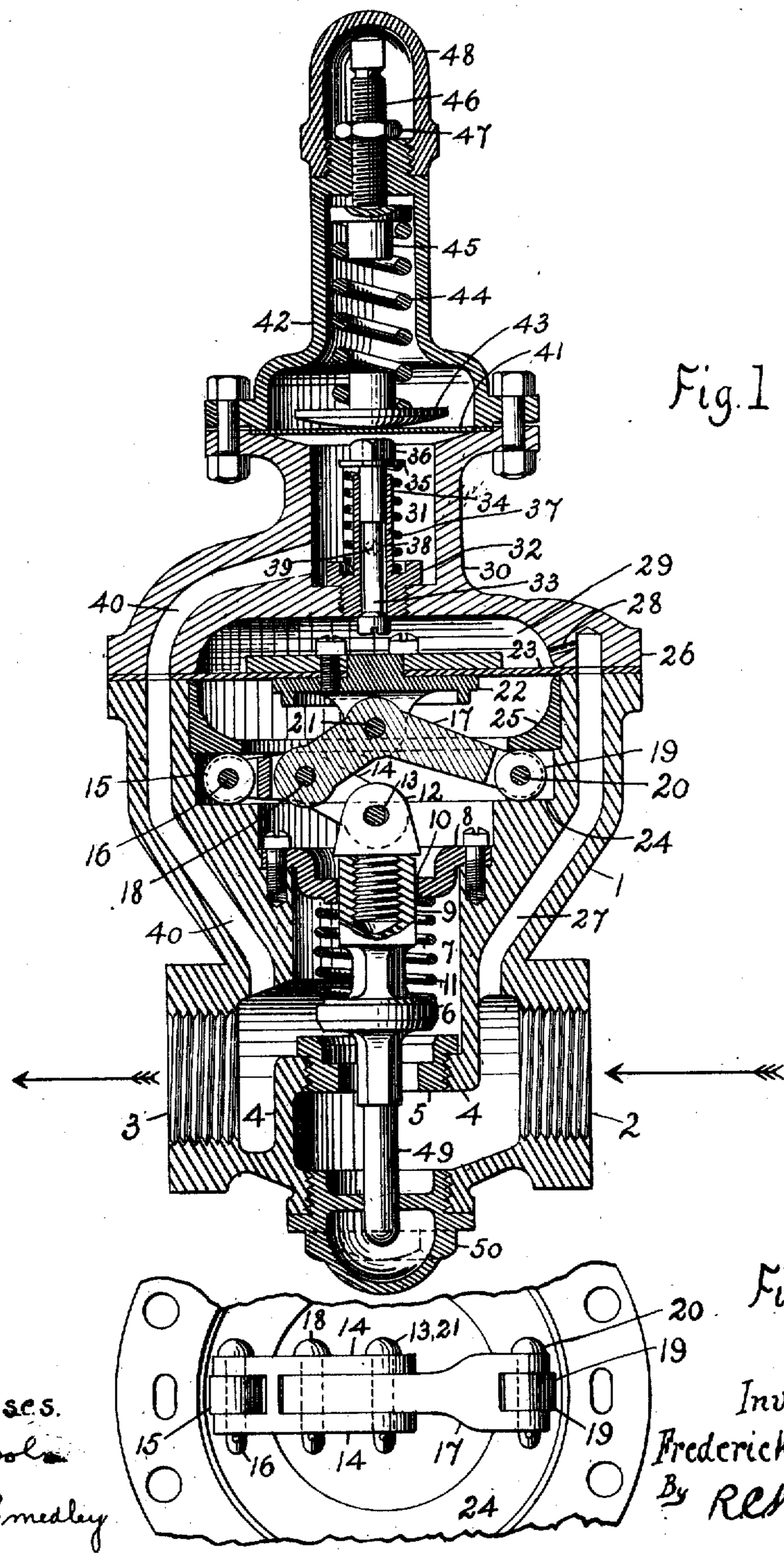

Fig. 1

Fig. 2

Witnesses.
Henry F. Cole
F. Helen Smedley

Inventor
Frederick L. Jahn
By R. C. Wright
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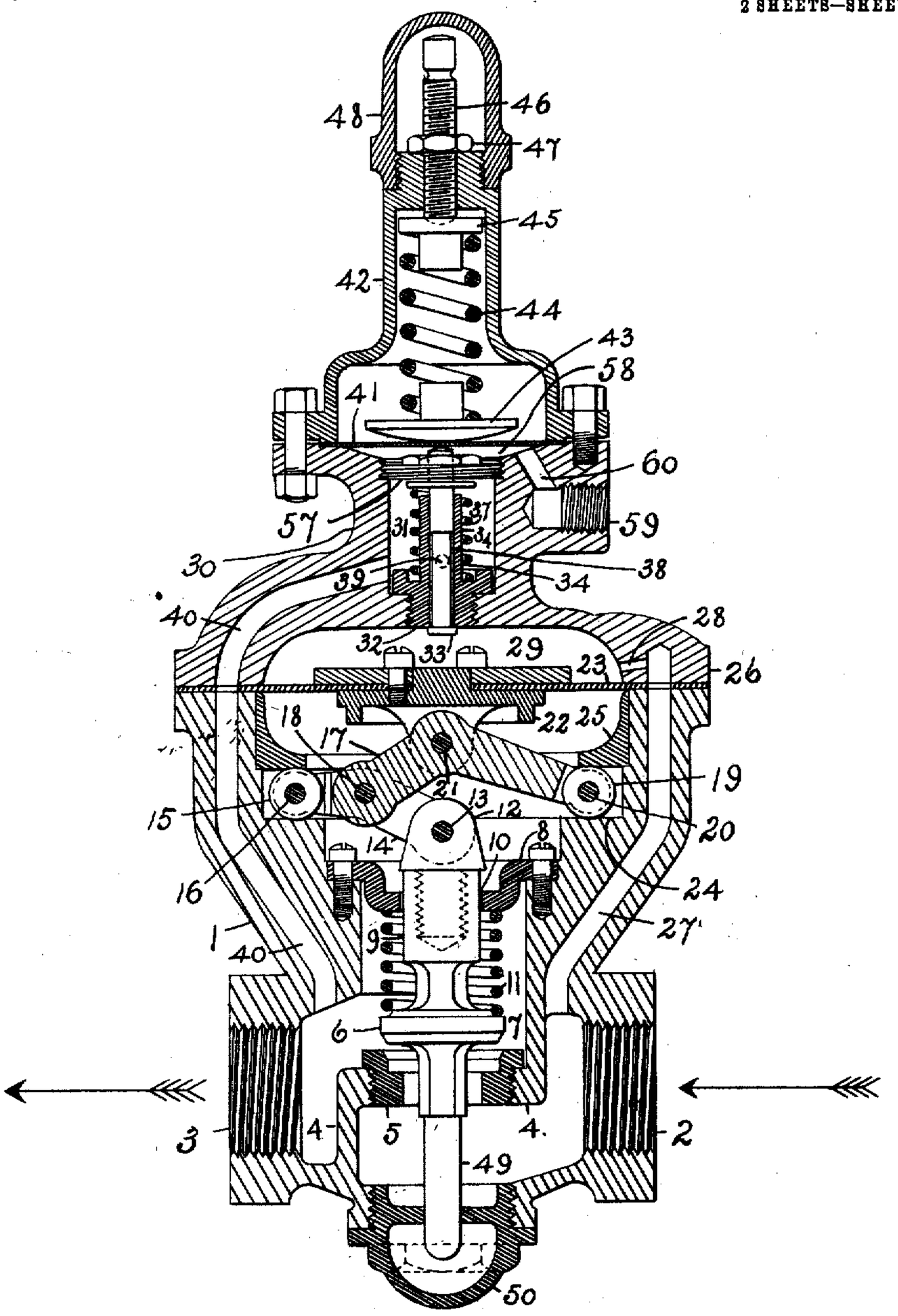

Fig. 3

Witnesses.
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UNITED STATES PATENT OFFICE.

FREDERICK L. JAHN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE WATSON AND McDANIEL COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PRESSURE-REGULATING VALVE.

No. 917,443. Specification of Letters Patent. Patented April 6, 1909.

Application filed September 8, 1908. Serial No. 452,037.

To all whom it may concern:

Be it known that I, FREDERICK L. JAHN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Pressure-Regulating Valves, of which the following is a specification.

This invention relates to fluid pressure regulating valves, and wherein are introduced certain improvements whereby the friction of the moving parts is reduced to a minimum by the use of metal diaphragms and compounding levers carried on rollers, and the elimination of all pistons which create friction; wherein the fluid pressure flows in the same direction as the main valve moves; and in which the arrangement of the parts permits their removal from the case without breaking pipe connections. The construction herein set forth insures a very sensitive action, and a uniform predetermined pressure upon the delivery side regardless of the fluctuations upon the initial side, and also insures a restricted flow upon the delivery side when the demand for pressure is decreased. The means by which these operations are accomplished will be more fully set forth in the specification, and illustrated in the drawings forming a part of this application. There is also a modified form of valve having a controlling inlet from a source of pressure supply wholly independent of the pressure passing through the valve.

The drawings comprise Figure 1, a vertical central section of a small size valve. Fig. 2, a view of the top of the compounding levers. Fig. 3, a vertical central section of a modified form having an independent pressure inlet.

In all the drawings similar parts bear the same characters of reference.

A case 1 has an inlet 2 and an outlet 3, between which is a partition 4 having a removable and renewable seat 5 for the main valve 6 placed in a chamber 7 having a removable cover 8 through which the upper stem 9 of the valve 6 is passed, leaving a slight space 10 around the stem for fluid passage. A spring 11 is seated between cover 8 and valve 6 to hold the valve closed when not in use. A head 12 is secured to stem 9 and is coupled by a pin 13 to a bifurcated bent lever 14, which at its opposite end carries a roller 15 on a pin 16; about midway of lever 14 there is attached a second bent lever 17 by a pin 18, having a roller 19 at its outer end on a pin 20, lever 17 being at the center line of the valve connected by a pin 21 to a plate 22 secured to the main metallic diaphragm 23. The compound lever action is the same as in the Chapman patent 656,594 of June 6, 1899 (owned by applicant's assignees) but of an improved construction which eliminates the friction at the seated ends of the former construction, by introducing free moving rollers, while permitting the same decreased movement of the diaphragm relative to the greater movement of the main valve.

Rollers 15, 19 rest upon a seat 24 encircling case 1, and are secured by a ring 25 under diaphragm 23, the diaphragm being secured by a cover 26. At one side of case 1 there is a high pressure passage 27 from inlet 2 into cover 26, and therefrom a restricted passage 28 into the high pressure chamber 29 under cover 26 and over diaphragm 23. Cover 26 has an upward extension 30 forming a low pressure chamber 31 wherein is a seat 32 opening into chamber 29, and containing a controller valve 33 guided in a neck 34 extending upward from seat 32 with a washer 35 and a nut 36 controlling a spring 37 normally holding valve 33 closed. An annular passage 38 around the upward extension of valve 33 is connected to the low pressure chamber 31 by an opening 39, there is also a low pressure passage 40 from chamber 31 to outlet 3. Mounted above chamber 31 there is a low pressure metallic diaphragm 41 secured by a casing 42, wherein is a round faced spring seat 43 carrying a spring 44 with an upper seat 45 controlled by a screw 46 having a check nut 47, the spring 44 being set by screw 46 to determine the pressure to be delivered from the pressure outlet, and a cover 48 incloses screw 46. Main valve 6 is guided at its lower end by its stem 49 in nut 50.

In Fig. 3 the arrangement of the parts is the same as in Fig. 1, except that chamber 31 is closed by a screw threaded top 57, leaving a space 58 between it and diaphragm 41 into which space there is a passage 59 60 from without the chamber. In the constructions presented, the pistons usual in valves heretofore employed for the same purpose, have been entirely omitted, as their use entails leakages

if fitted for free movement, or needless friction if closely fitted or provided with packing rings. The combinations of compound levers whereby metallic diaphragms can be effectively operated at a minimum amount of deflection with a greater valve movement is a very desirable improvement which insures long life for the diaphragm, and the rollers for the levers now first introduced reduces the friction, making the valve more sensitive. The flow of steam, or the fluid, in the direction of valve movement is also a distinct advantage. The easy removal of the operatively connected parts without breaking pipe joints, and the employment of a main valve with a single removable and renewable seat which can always be made tight, rather than a double seated balanced valve of two equal diameters, which are rarely tight or can be ground true, are features which go to make a perfect construction.

The operation of the mechanism is as follows. High pressure is admitted at inlet 2 and flows into passage 27 and in a less degree through the restricted passage 28 into high pressure chamber 29, as the pressure increases the diaphragm will be deflected downward, and on account of its greater area than that of valve 6 it will have an excess of pressure over and above that against the valve, and this excess of pressure will close the valve. Then in order to regulate the amount of required low pressure, or the pressure to be delivered from outlet 3, the screw 46 is turned to force spring 44 against the low pressure diaphragm 41 to resist and regulate the desired amount of low pressure. As the diaphragm 41 is forced down it contacts with nut 36 and this closes spring 37, opens controller valve 33 and permits the high pressure in chamber 29 to escape much faster than it flows in through the restricted passage 28; the pressure above the diaphragm 23 now being less than the pressure against valve 6 the valve will be opened and a reduced pressure will flow to outlet 3, through space 10 to the underside of the diaphragm 23, and through passage 40 into chamber 31 and against the low pressure diaphragm 41. As long as the delivered low pressure is uniform diaphragm 41 and controller valve 33 will remain inactive, but should there be an excess of low pressure it will back up and force diaphragm 41, close controller valve 33 and permit high pressure to accumulate in chamber 29, close down valve 6 and restrict the flow and the consequent volume of pressure permitted to flow to outlet 3. A slight movement of controller valve 33 is sufficient to instantly regulate the flow past valve 6. The action of the controller valve 33 is due wholly to an excess or diminution of low pressure upon diaphragm 41, and its sensitive action insures a uniform action of the valve in delivering a uniform pressure from the low pressure side regardless of fluctuations in high pressure or increased or decreased demands for low pressure.

I claim—

1. In a regulating valve, a case having a high pressure inlet and a low pressure outlet; a valve between the outlet and inlet; a metallic diaphragm; a system of compound levers, resting upon rollers, and forming a connection from the valve to the diaphragm; a high pressure passage and a high pressure chamber above the diaphragm to which the pressure leads; a low pressure passage to a low pressure chamber located above the high pressure chamber; a resiliently depressed metallic diaphragm above the low pressure chamber; a passage between the chambers, and a valve therein opened by the low pressure diaphragm, and resilient means for its closing.

2. In a pressure regulating valve, a casing, a high pressure inlet thereto and a low pressure outlet therefrom, a valve seated against the high pressure; a metallic diaphragm, a high pressure chamber above the diaphragm and in communication with the inlet to the casing; a system of compound levers connected to the diaphragm and the valve and by which the diaphragm movement is less than the valve movement, rollers pivotally mounted at the ends of the levers, and a circular seat whereon the rollers are placed; a low pressure chamber in communication with the outlet to the casing; a diaphragm mounted above the low pressure chamber; a controller valve, and a passage between the chambers aforesaid intercepted by said valve; resilient means to close the valve, and resilient means mounted above the low pressure diaphragm to depress it, open the valve, and permit the pressure in the high pressure chamber to flow to the low pressure chamber.

3. In a pressure regulator, a case, a high pressure inlet thereto, a low pressure outlet therefrom, a valve controlling the flow from the high pressure inlet to the low pressure outlet and opened by the high pressure; a removable seat for the valve; a resilient means to normally seat the valve; a lower stem and a lower guide for the valve; an upper stem and an upper guide for the valve; a fluid pressure passage around the upper stem and a metallic diaphragm above the upper stem; a bent lever connected to the stem and having a pivotal roller at its opposite end, a second bent lever attached to the first lever about midway, and its outer end having a pivotal roller, a circular seat for the rollers, said rollers and levers permitting the diaphragm to move a less degree than the valve; a high pressure chamber above the diaphragm and passages from the high pressure inlet thereto, one of said passages being restricted; a low pressure chamber with a connection to the low pressure outlet,

and to the high pressure chamber; a controller valve for the passage between the chambers, and resilient means for its closure; a low pressure diaphragm above the low pressure chamber and resilient means whereby it is made to open the controller valve upon an accumulation of excessive pressure in the high pressure chamber, and to permit it to close upon an accumulation of back or low pressure in the low pressure chamber.

4. In a pressure regulator, a case having an inlet thereto and an outlet therefrom, a valve intercepting the passage between the inlet and the outlet and opened by the pressure from the inlet, a renewable seat therefor, an upper and a lower guide therefor, and resilient means for its closure; a metallic diaphragm and compound lever connections therefrom to the valve, with pivotal roller supports; a high pressure chamber above the diaphragm and connections therefrom to the inlet; a low pressure chamber with connections to the outlet and to the high pressure chamber; a controller valve in the high pressure connection with resilient means for its closure, a removable top for the chamber and through which the valve extends and is guided; a low pressure diaphragm above the valve extension and in contact therewith, and resilient means for its adjustment; and an inlet between the chamber top and the low pressure diaphragm for the admission of pressure other than that passing through the valve.

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

FREDERICK L. JAHN.

Witnesses:
R. C. WRIGHT,
WILLIAM C. STOEVER.