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E. W. CRAWFORD.

FLUID PRESSURE REGULATOR.

APPLICATION FILED AUG. 26, 1904.

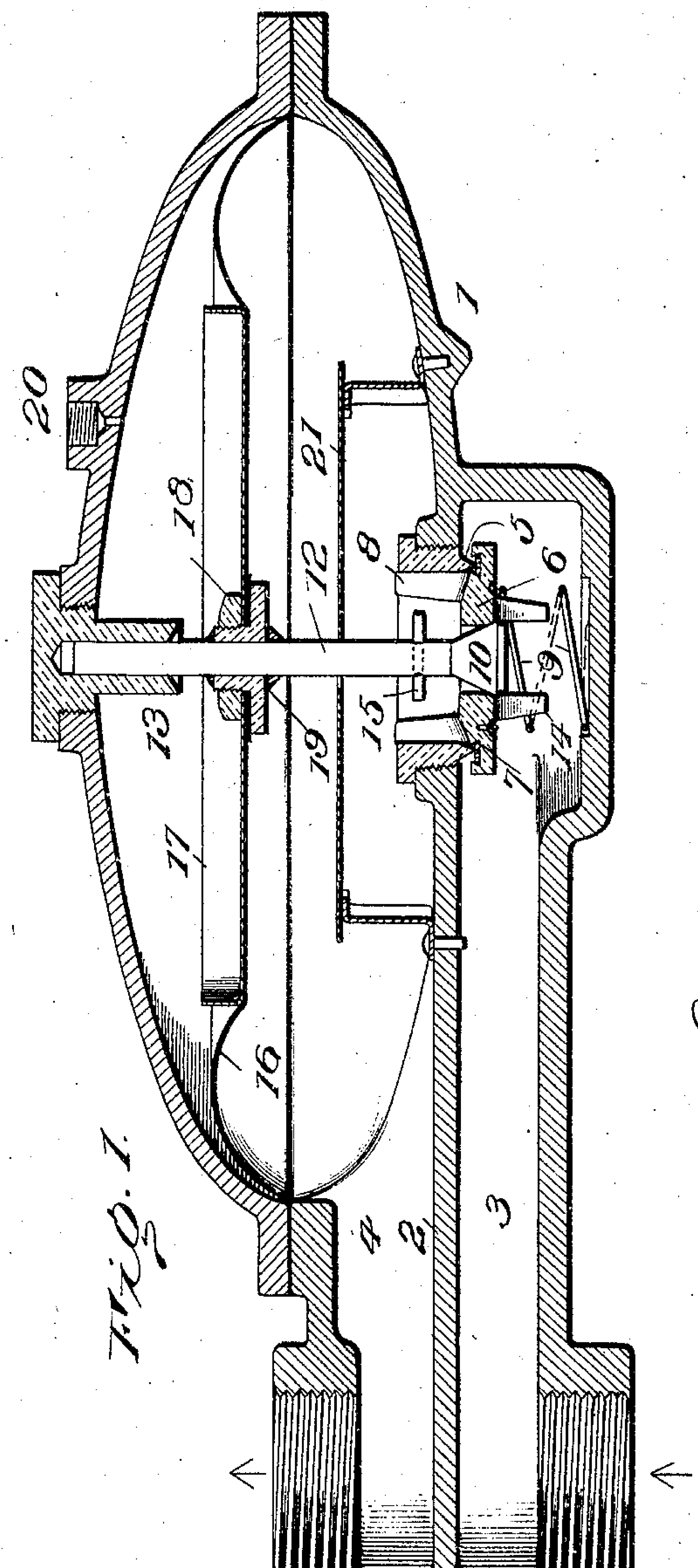

Fig. 1

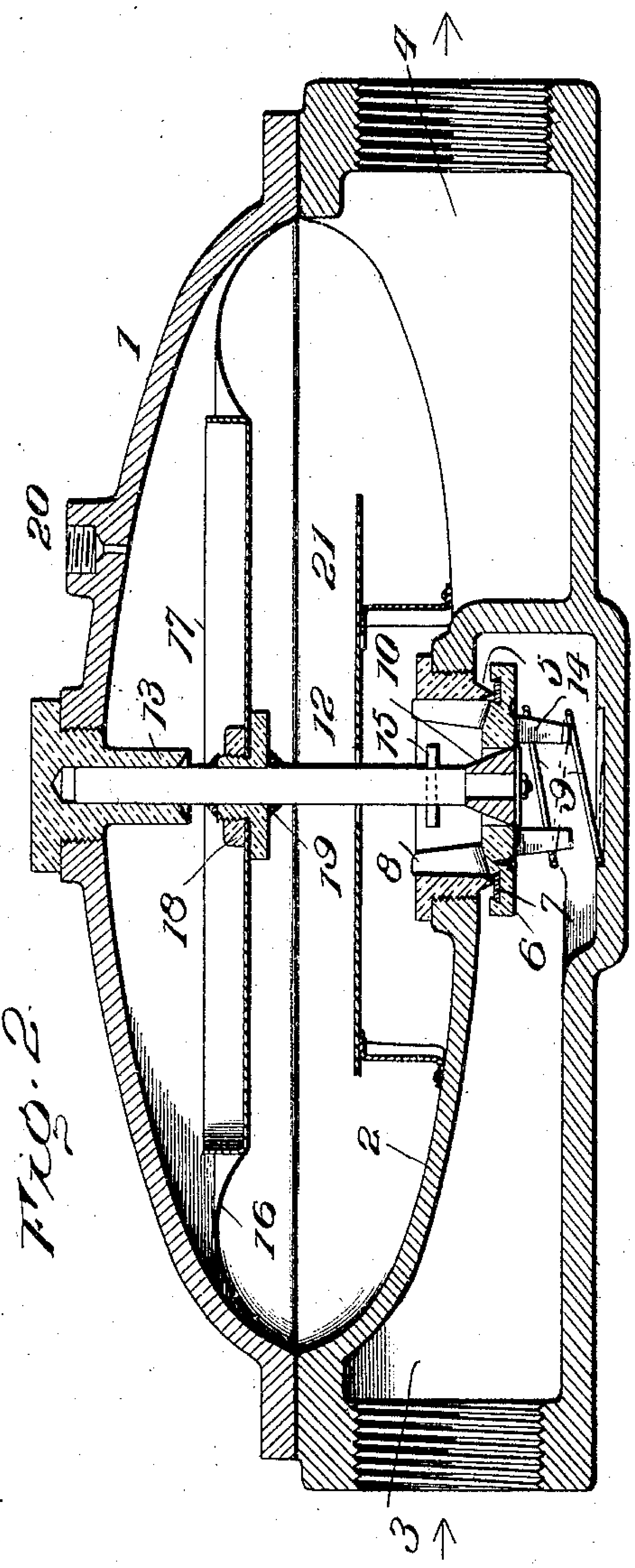

Fig. 2

Inventor

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Witnesses

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UNITED STATES PATENT OFFICE.

ERNEST W. CRAWFORD, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE CHAPLIN-FULTON MANUFACTURING COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 788,352, dated April 25, 1905.

Application filed August 26, 1904. Serial No. 222,297.

To all whom it may concern:

Be it known that I, ERNEST W. CRAWFORD, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Fluid-Pressure Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide improved means for automatically regulating fluid-pressure, such as gas, in such way that the service-supply may be maintained at a constant fixed pressure under all conditions of flow and irrespective of the overpressure from the main.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view of a regulator constructed in accordance with my invention, the casing being of the vertical type. Fig. 2 is a similar view with a horizontal type of casing.

Referring to the drawings, 1 designates a casing divided by a wall 2 into inlet and outlet chambers 3 and 4, the former having a receiving-opening and the latter a delivery-opening, such openings being shown in Fig. 1 as in the same vertical plane, while in Fig. 2 they are represented as being horizontally disposed. In wall 2 is an opening wherein is fitted a bushing forming a seat 5 for a valve 6, carrying in its upper face packing 7 for contacting with the reduced edge of the valve-seat, said face also having guide-wings 8. A spring 9 tends to hold this valve to its seat, being secured to the under side thereof at one end and resting at its other end on the bottom of the casing. The area of the passage-way between the two chambers—that is to say, the bore of the bushing fitted in wall 2—is equal to the area of each of the openings for the inlet and outlet.

In the center of valve 6 is an opening wherein works a second smaller valve 10 of approximately cone shape, said valve being mounted on the lower end of a stem 12, guided at its upper end by a cap 13, screwed into the top of the casing. This valve in its movements is guided by wings 14, depending from valve 6, and its stem carries a cross pin or lug 15, which upon contacting with valve 6 limits the independent movement of valve 10 and forces valve 6 from its seat.

16 is a diaphragm within the outlet-chamber rigidly secured at its center to the valve-stem 12. Upon this diaphragm rests a weight 17, which is held by a nut 18 on a collar 19, mounted on the valve-stem. This weight is shown in the form of a plate or disk, so that while being well distributed over the diaphragm is yet applied directly to the valve-stem, so as to center the downward pressure thereon.

In the top of the casing is an opening 20 to the atmosphere, and 21 is a baffle-plate to prevent the flow of gas through the valve from impinging against the diaphragm and disturbing the balance thereof, such baffle being formed with a central opening to accommodate stem 12.

As a general rule the pressure in the mains is considerably in excess of that required in service-lines for illuminating purposes. By my regulator under ordinary service conditions the smaller valve has sufficient area when open to provide the proper service-pressure up to the full capacity of the service-pipe. Hence this valve may be much smaller than the diameter of the pipes, since under the relative conditions stated the inlet-pressure is many times greater than the outlet-pressure; but since in practice the inlet-pressure may fall to a point where the full opening of the smaller valve is not sufficient to maintain the outlet-pressure at the desired point I have provided for increasing the area of the passage-way between the two chambers. This is effected by automatically unseating the valve 6, whereupon the opening between the two chambers equals the area of the inlet-opening. In this way I am enabled to maintain or control the pressure unless and until that at the

inlet falls to that required at the outlet. It is necessary to have the smaller valve control the high inlet-pressure and the small volumes accurately, and it is also necessary to have the larger valve equal in area to the pipe connections, so as to make the device a true regulator and not merely a reducing-valve.

In practice the tension of spring 9 is equal to the weight of valve 6, and its tendency is to hold the valve to its seat, as is also that of the pressure which initially contacts with the outer face of the valve. With the pressure required at the outlet ascertained the diaphragm is weighted to coincide. Connections are then made on the inlet side with the pressure-main and on the outlet side to the service-line. At this time both valves 6 and 10 are unseated under the weight on the stem of valve 10, the pin of the latter engaging valve 6 and forcing it downwardly to the bottom of the casing as against the tension of the spring. Now when gas is admitted to the inlet it will flow through both valves from one chamber to the other until the pressure builds up in the outlet-chamber. This pressure acting on the under side of the diaphragm tends to lift or float it, the upper side of the diaphragm being open to the atmosphere. Assuming that the inlet-pressure exceeds that for which the device is weighted, the pressure building up beneath the diaphragm will raise the latter and elevate valve 10. Thus all weight is removed from valve 6. The spring will then force this valve up, and it will follow the pin 15 until seated. As the outlet-pressure builds up by the flow through the small valve the latter moves upwardly until the outlet-pressure reaches the predetermined pressure, and the small valve is thereupon closed. As there is now no open passage-way from the inlet to the outlet, the pressure thus acquired will be maintained until relieved, whereupon the diaphragm being deprived of the lifting action of the gas will lower and unseat one or both valves to the extent necessary to restore the proper pressure at the outlet. The unseating of valve 6 is not effected, however, until the smaller valve 10 has reached its maximum opening movement. If the pressure is restored upon the opening of the small valve, the unseating of the larger valve will not occur, and the seating of the small valve happens only when the pressure within the outlet-chamber reaches the predetermined point, such valve automatically opening up once such pressure ceases to be maintained.

From what has been said the advantages of my invention will be apparent to those skilled in the art. It will be noted that under ordinary conditions the area of the opening controlled by the smaller valve is sufficient to maintain the necessary pressure within the outlet-chamber notwithstanding the fact that such area is considerably less than that of the outlet-opening; but once the pressure passing through this reduced opening is insufficient to maintain the proper pressure within the outlet-chamber the area of the passage-way between the two chambers is made to equal the area of the inlet and outlet openings by the automatic unseating of the second larger valve.

I claim as my invention—

1. A pressure-regulator comprising a casing having inlet and outlet chambers with a communicating passage-way of area corresponding to the respective inlet and outlet openings of said chambers, a valve normally closing said passage-way, a second valve controlling an opening between said chambers of considerably less area than that of said passage-way, means for unseating said second valve, such unseating movement within the full limit thereof admitting high inlet-pressure while said former valve is closed, the opening of said former valve occurring during the further movement of said second valve when the outlet-pressure is below a predetermined point.

2. A pressure-regulator comprising a casing having inlet and outlet chambers with a communicating passage-way of area corresponding to the respective inlet and outlet openings of said chambers, a valve for said passage-way, means for normally holding said valve seated, a second valve controlling an opening between said chambers of considerably less area than that of said passage-way, means for unseating said second valve to admit high inlet-pressure while said former valve is closed, such means being independent of that by which said former valve is held seated, and means carried by said second valve for engaging and unseating said former valve when the pressure at the outlet falls below a predetermined point.

3. A pressure-regulator comprising a casing having inlet and outlet chambers with a communicating passage-way of area corresponding to the respective inlet and outlet openings of said chambers, a valve fitted in said opening and normally held to its seat by the pressure in the inlet-chamber acting initially against its outer face, said valve having an opening forming a passage-way of reduced area between the two chambers, a second valve for closing said opening, means for unseating said second valve when the pressure in the outlet-chamber falls below a predetermined point, the first-mentioned valve remaining seated, and means for unseating said first-mentioned valve when it is necessary to maintain equal pressures in both chambers.

4. A pressure-regulator comprising a casing having inlet and outlet chambers with a communicating passage-way of area corresponding to the respective inlet and outlet openings of said chambers, a valve fitted in said opening and normally held to its seat by the pressure in the inlet-chamber acting initially against its outer face, said valve having

an opening forming a passage-way of reduced area between the two chambers, a second valve for closing said opening, means for unseating said second valve when the pressure in the outlet-chamber falls below a predetermined point, the first-mentioned valve remaining seated, and means for also unseating said first-mentioned valve when the second valve is fully unseated.

5. The combination with the casing having inlet and outlet chambers, a communicating passage-way, and a diaphragm, of a valve for closing said passage-way having an opening forming a second passage-way between the two chambers, a high-pressure valve closing said opening, and having its stem connected to said diaphragm, means for weighting such stem, independent means for normally holding said first-mentioned valve seated, and means carried by the high-pressure valve for unseating the first-mentioned valve when the high-pressure valve is fully unseated.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ERNEST W. CRAWFORD.

Witnesses:
C. E. McCargo,
C. W. Townsend.