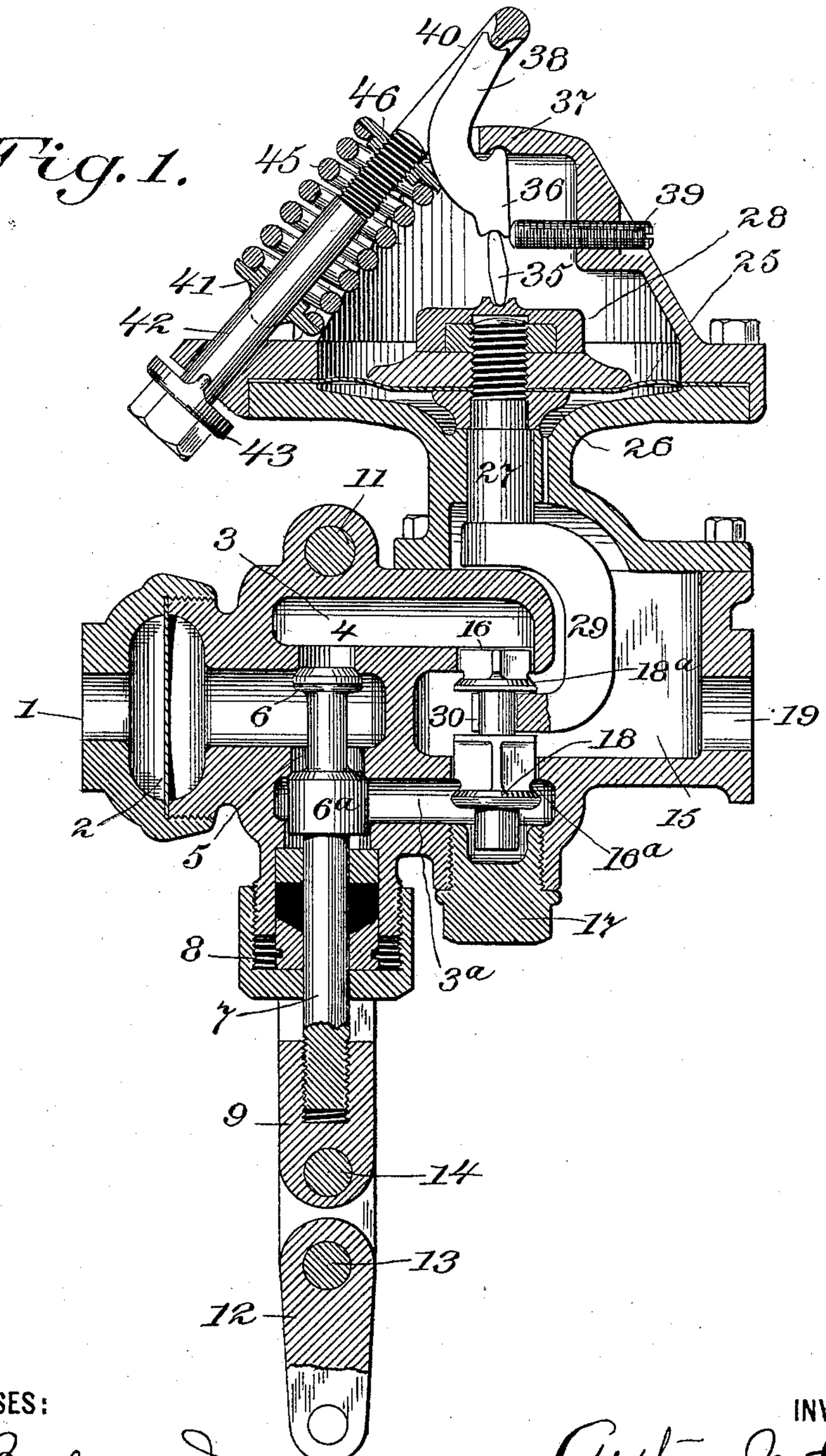
(No Model.) 2 Sheets—Sheet 1.

A. W. CASH.

COMBINED HIGH PRESSURE THROTTLE AND REDUCING VALVE.

No. 587,670. Patented Aug. 3, 1897.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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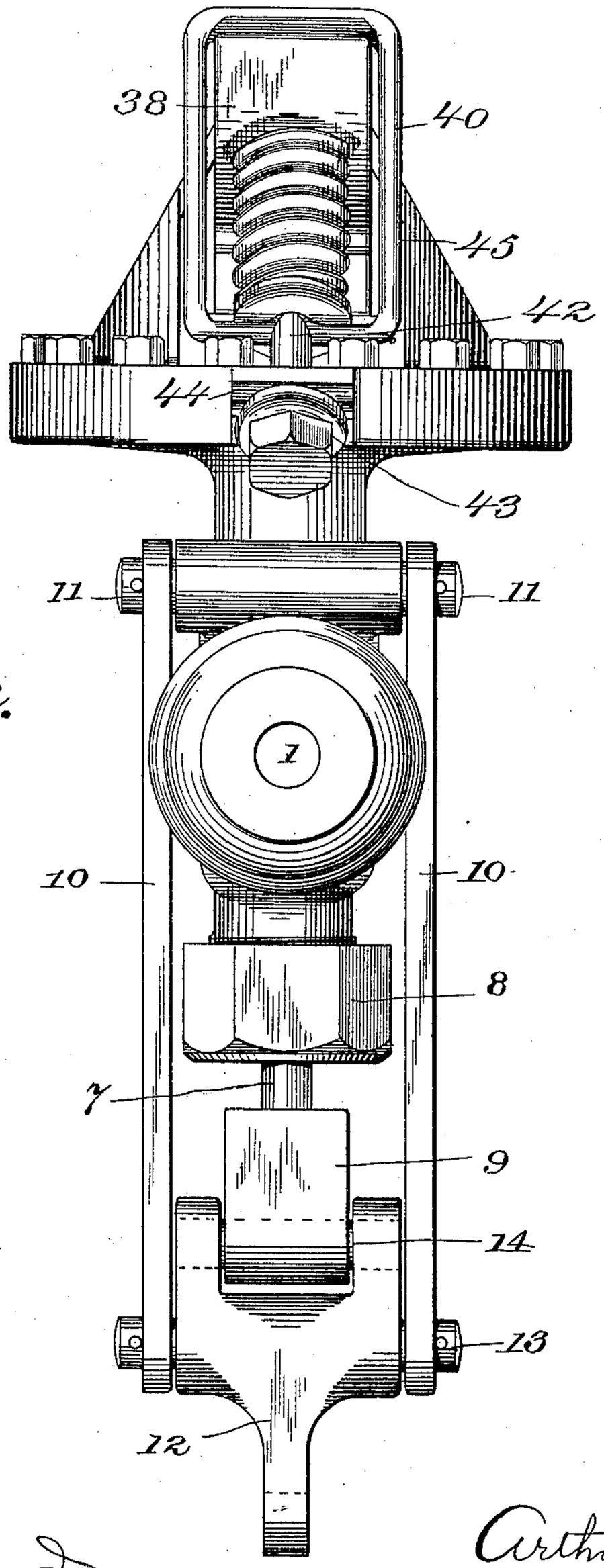

Fig. 2.

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UNITED STATES PATENT OFFICE.

ARTHUR W. CASH, OF WORCESTER, MASSACHUSETTS.

COMBINED HIGH-PRESSURE THROTTLE AND REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 587,670, dated August 3, 1897.

Application filed June 20, 1896. Serial No. 596,241. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. CASH, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in a Combined High-Pressure Throttle and Reducing Valve, of which the following is a specification.

The objects of my invention are to combine in a single casing a high-pressure throttle-valve and a reducing-valve and to improve the structure of the reducing-valve to enable it to more perfectly compensate for the varying pressure in the high-pressure reservoir.

In order that my invention may be fully understood, I will first describe the same with reference to the accompanying drawings and afterward point out the novelty with more particularity in the annexed claims.

In said drawings, Figure 1 is a central sectional elevation of my combined high-pressure throttle and reducing valve. Fig. 2 is a front elevation of the same.

1 is the inlet from the high-pressure reservoir, and 2 is a strainer located in said inlet-passage for excluding any dust or other impurities from the valve-chamber. The inlet-passage communicates with the divided high-pressure ports or passages 3 3^a through the ports 4 and 5.

6 and 6^a are the valve-clappers of the puppet throttle-valve, said valve-clappers being mounted upon a common valve-stem 7 and seated against valve-seats formed in the ports 4 and 5. The valve-stem 7 projects through the packing-box 8 and is adjustably secured to a head 9, in which its outer end is threaded.

10 10 are toggle-links pivoted to the casing upon a bolt 11 and to a toggle-link 12 by means of a pin 13. The toggle-link 12 is pivoted to the head 9 by means of the bolt 14. By moving the toggle-link 12 either forward or backward of the dead-center the puppet throttle-valve will be drawn outwardly into open position.

The high-pressure ports 3 3^a communicate with a common low-pressure port or chamber 15 through the ports 16 and 16^a. The port 16^a is larger than the port 16 for the purpose which will presently appear, and beneath the port 16^a is a removable cap 17 by means of which the reducing-valve can be inserted and removed.

The reducing-valve is of the puppet-valve shape. It comprises the valve-clappers 18 and 18^a, mounted upon a common valve-stem, the clapper 18 being adapted to seat against a valve-seat in the port 16^a, while the clapper 18^a seats against a seat in the port 16. The clappers 18 and 18^a are formed of differential area for the purpose of more completely compensating for the varying pressure in the high-pressure reservoir, as will be more fully explained in connection with the description of the operation of the valve, and for the additional purpose of facilitating the insertion of the valve through the opening beneath the valve-seats. 19 is the low-pressure outlet.

Supported above the valve-casing is a diaphragm 25, located in the diaphragm-chamber 26, in communication with the low-pressure chamber 15.

27 is a rod or stem secured to the head 28 of the diaphragm and projecting down into the low-pressure chamber 15, where it is attached to an arm or yoke 29, having a bifurcated lower end 30, which fits upon and engages the valve-stem of the reducing puppet-valve.

35 and 36 are endwise-engaging toggle-levers, engaging, respectively, the head 28 of the diaphragm and a suitable bearing 37 of the casing.

38 is a bent arm or crank-arm formed integral with the toggle-lever 36 and extending above the casing.

39 is an adjustable screw-stop adapted to limit the movement of the toggle-levers in one direction.

40 is a yoke or link engaging the upper end of the bent arm 38 and formed with a perforated collar 41, through which extends a bolt 42. Confined upon the bolt 42 is a fulcrum-head 43, which engages a suitable grooved lug or projection 44 of the diaphragm-casing, through which the bolt extends.

45 is a stout spiral spring mounted upon the bolt 42, confined between a screw-nut 46, engaging the end of the bolt, and the collar 41 of the yoke 40. The tendency of the spring 45 is to hold the diaphragm 25 in normal position with the reducing-valve open.

When the throttle-valve is open, the fluid under high pressure will pass through the ports 3 and 3ª into the low-pressure chamber 15 and immediately act upon the diaphragm 25 for partially closing the reducing-valve, the pressure upon the larger valve-clapper 18 assisting in this action and the pressure of the spring 45 tending to regulate the closing action. The initial pressure is high, and the excess of pressure on the larger valve-clapper 18 tends to hold the valve close to its seat, effecting a wire-drawing of the compressed air. As the pressure in the reservoir gradually weakens, the pressure upon the valve-clapper 18 will be reduced and the valve will be allowed to open to a larger extent, thereby compensating for the varying pressure. The endwise-engaging toggle-levers 35 and 36 and the crank-arm 38 materially assist the differential valve-clappers 18 18ª in compensating for the rapidly-increasing resistance to the diaphragm as it moves outwardly in the act of closing the valve-clappers against their seats. Such arrangement of toggles and crank-arm also compensates for the rapidly-increasing resistance of the spring 45 as it is compressed.

My improved arrangement equalizes the diaphragm strain, which increases rapidly as the valve closes, and enables me to produce an exceptionally effective and regular valve.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A combined throttle and reducing valve, having a central inlet-chamber with ports on opposite sides thereof and a throttle puppet-valve coöperating with said ports, a central outlet-chamber, with ports on opposite sides thereof and communicating with the aforesaid ports, and a reducing puppet-valve coöperating with both of the ports of the outlet-valve space, whereby the fluid is first directed outwardly from the inlet-chamber and then inwardly to the outlet-chamber.

2. A combined throttle and reducing valve having inlet and outlet chambers located centrally and in line with each other, ports leading outwardly from both sides of the inlet-chamber and ports communicating with aforesaid ports and leading inwardly to both sides of the outlet-chamber, and throttle and reducing puppet-valves for coöperating respectively with the two inlet-ports and the two outlet-ports.

3. In a combined throttle and reducing valve, the combination of the centrally-located inlet and outlet chambers, ports extending outwardly from opposite sides of both of said spaces, passages connecting each of the inlet-ports with one of the outlet-ports, and two valves coöperating respectively with the two inlet-ports and with the two outlet-ports.

4. A combined throttle and reducing valve comprising centrally-located inlet and outlet chambers, passages on each side of and overlapping the same, ports connecting said chambers and passages and throttle and reducing valves coöperating with said ports.

5. A valve-casing having high-pressure inlet 1, low-pressure outlet 19, and divided communicating ports or passages 3, 3ª, throttle-valve seats, and reducing-valve seats in said ports or passages, the puppet throttle-valve 6, 6ª and the puppet reducing-valve having differential valve-clappers 18, 18ª, substantially as set forth.

6. The combination in a reducing-valve of a low-pressure chamber, a high-pressure chamber overlapping said low-pressure chamber and communicating therewith by a port, a puppet-valve coöperating with said port, a diaphragm in communication with the low-pressure chamber and a bent yoke connected to the diaphragm and the puppet-valve and extending around the overlapping portions of the high-pressure chamber.

7. The combination in a reducing-valve, of a low-pressure chamber, high-pressure passages outside of and overlapping the same, and communicating therewith by ports, a puppet-valve coöperating with said ports, a controlling-diaphragm in communication with the low-pressure chamber and a bent yoke connecting said diaphragm and puppet-valve and extending around the overlapping portion of the high-pressure chamber.

8. A reducing-valve comprising a valve-casing having two high-pressure ports and a low-pressure chamber between said ports and communicating therewith, a puppet reducing-valve having differential valve-clappers controlling the high-pressure ports, a yoke-arm supported in the low-pressure chamber and having a bifurcated end engaging the puppet-valve stem between the clappers, a diaphragm in communication with the low-pressure chamber, a bar extending from the yoke-arm and connecting it with the diaphragm and a spring tending to hold the diaphragm in normal position, as set forth.

9. The combination with the diaphragm of a reducing-valve of toggle-levers engaging respectively at their outer ends with the said diaphragm and with a fixed support the points of engagement being substantially in the line of motion of the diaphragm and a spring connected to one of the toggle-levers and controlling its movement.

10. The combination with the diaphragm of a reducing-valve of toggle-levers bearing respectively, at their outer ends, against said diaphragm and against a fixed support substantially in the line of motion of the bearing-point on the diaphragm and a spring connected to one of said levers and controlling the movement of the toggle and diaphragm.

11. The combination with the diaphragm of a reducing-valve, of the toggle-levers engaging with said diaphragm and with a fixed support, the points of engagement being substantially in the line of motion of the diaphragm and the toggle working outward from a nearly-locked position to position of in-

creasing leverage and a spring connected to one of said levers and pressing the toggle toward the locked position.

12. The combination with the diaphragm of a reducing-valve of the toggle-levers engaging therewith and with a fixed support and working outward from a nearly-locked position to position of increasing leverage, a spring connected to one of said levers and pressing the toggle toward the locked position and a stop engaging with the toggle and preventing it from reaching the locked position.

13. In a reducing-valve, the combination of the valve the diaphragm connected therewith, the compensating toggle-levers engaging the diaphragm and one of the levers being formed with a bent arm or crank-arm, a link or yoke engaging said arm, a bolt, and a pressure-spring confined on the bolt between the yoke and a nut on the bolt, as set forth.

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Witnesses:
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