No. 671,441. Patented Apr. 9, 1901.

W. C. JENNINGS.

REDUCING VALVE.

(Application filed July 31, 1900.)

(No Model.)

Fig.3

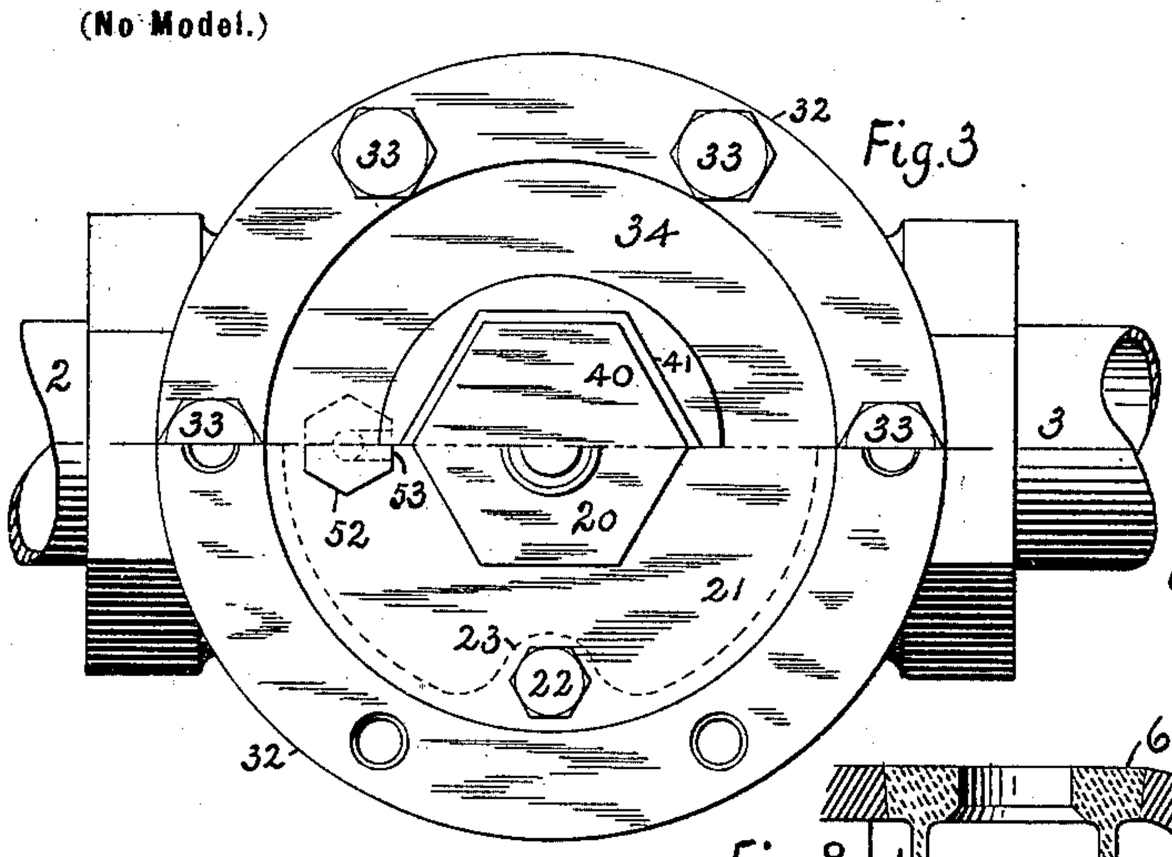


Fig.4

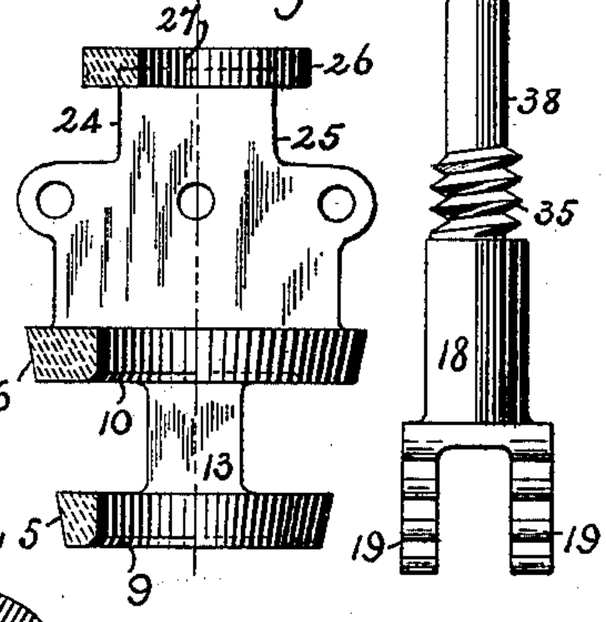


Fig.8

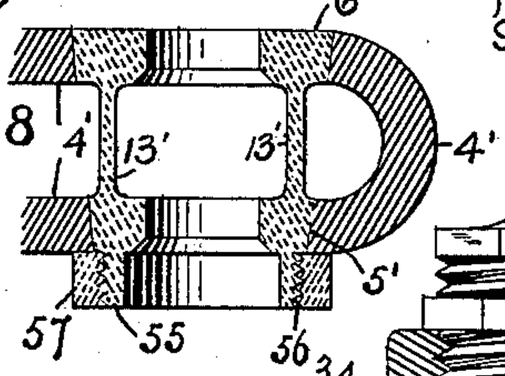
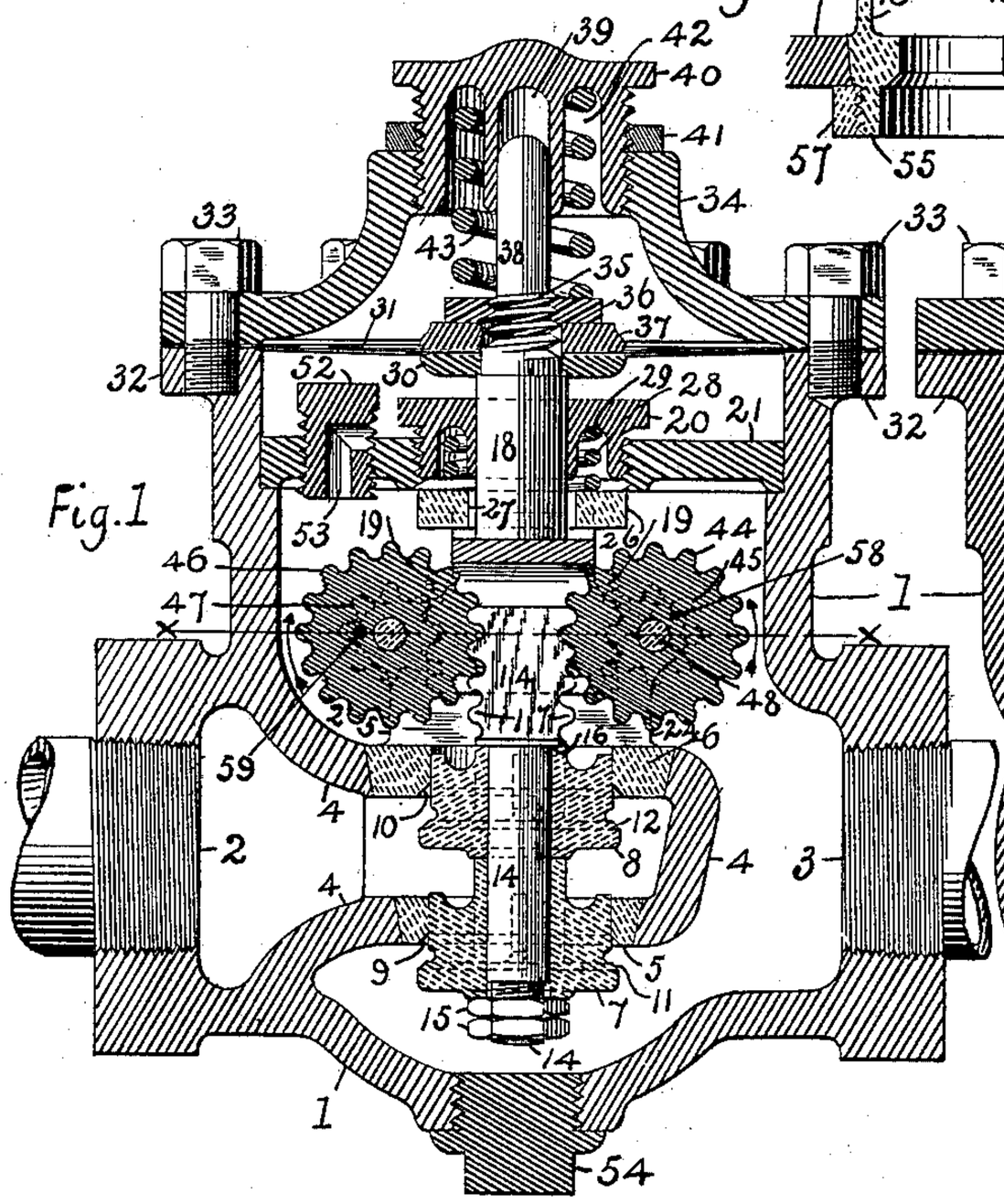


Fig.9

Fig.1



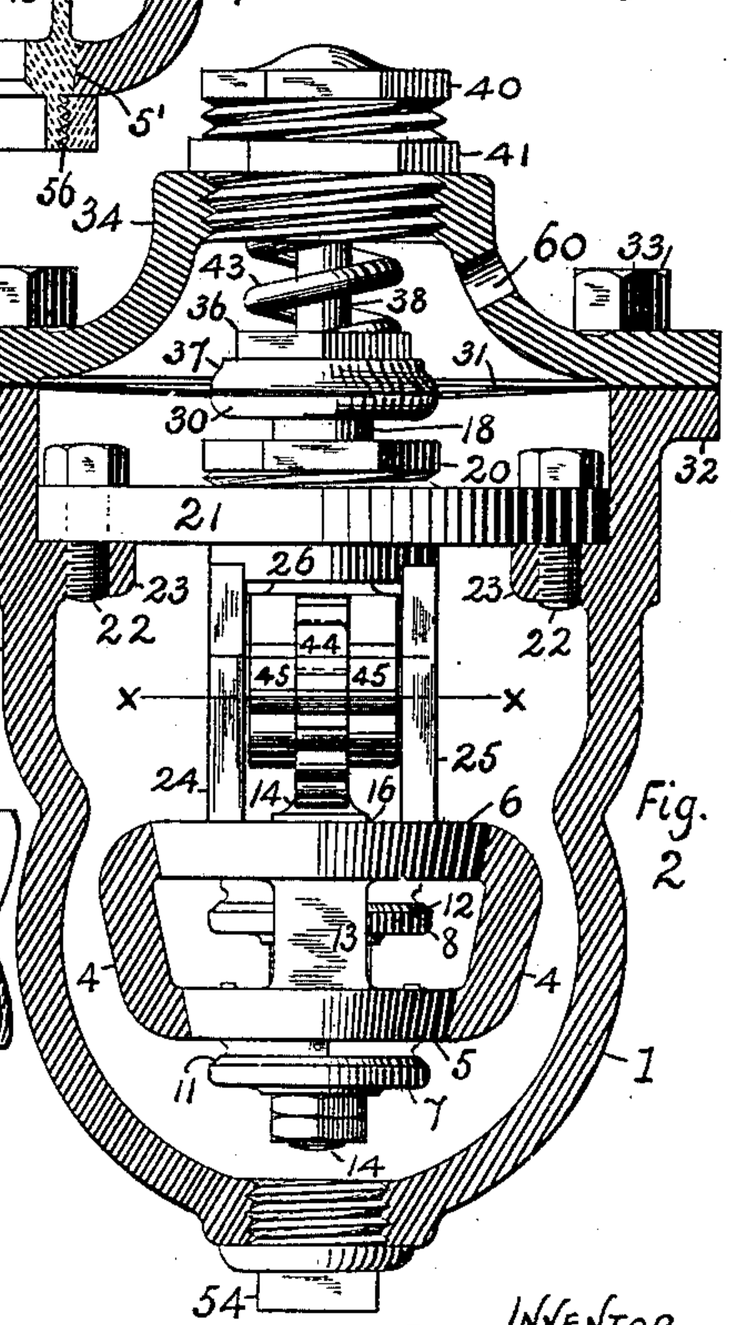


Fig. 2

Fig.7

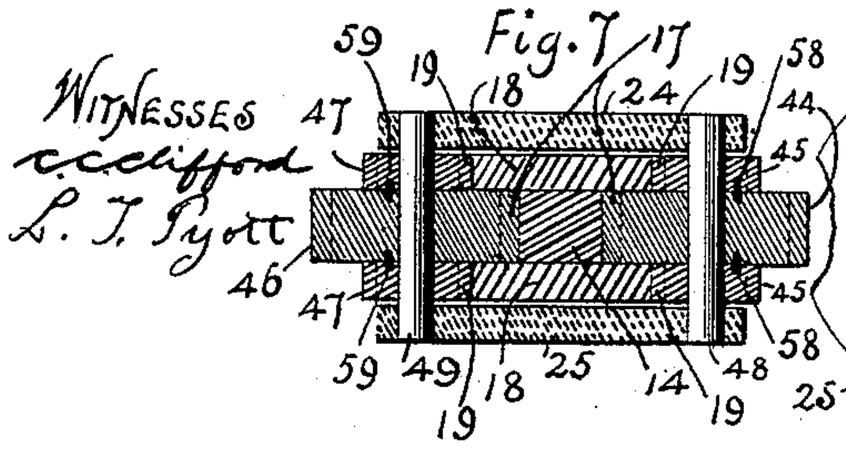
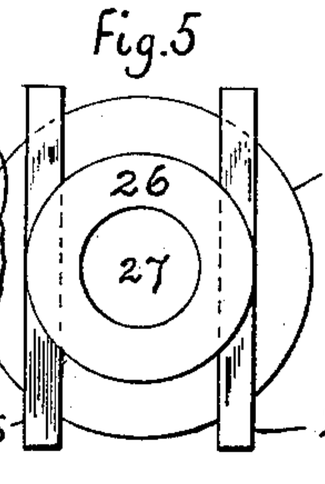


Fig.5



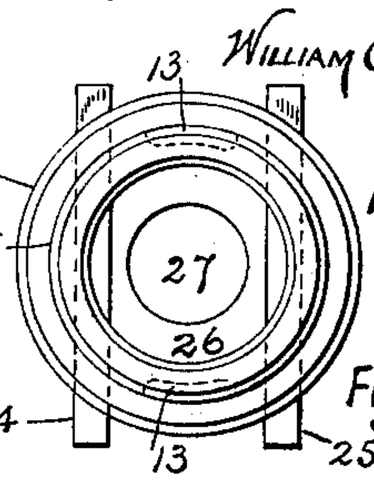


Fig.6

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WILLIAM C. JENNINGS, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE W. C. JENNINGS CO., OF SAME PLACE.

REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 671,441, dated April 9, 1901.

Application filed July 31, 1900. Serial No. 25,408. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. JENNINGS, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Reducing-Valves, of which the following is a specification.

My invention relates to reducing-valves employed for the purpose of receiving a high pressure from a boiler or passage leading therefrom and by means of the appliances employed in the valve to deliver a less pressure than the initial pressure received and to maintain a constant outflow or delivery pressure independent of any fluctuating pressure received; and I have introduced novel and desirable features of construction for the purposes of decreased first cost of production, easy inspection and repair, and other advantages, which will be further pointed out in the specification.

My invention and construction are illustrated in the accompanying drawings, in which—

Figure 1 is in general a vertical central section through the inlet and outlet. Fig. 2 is a vertical central section of the case at right angles to Fig. 1 with the attached parts not in section. Fig. 3 is one-half a top view of the whole structure and one-half with the cover and diaphragm removed. Fig. 4 is one-half in central vertical section and one-half in elevation of the removable expanding valve-seats. Fig. 5 is a top end view of the removable expanding valve-seats. Fig. 6 is a bottom end view of the removable expanding seats. Fig. 7 is a section on lines $x\ x$, Figs. 1 and 2. Fig. 8 is a modified form of securing the removable expanding seats. Fig. 9 is a view of the bifurcated diaphragm-stem.

Similar figures of reference indicate similar parts throughout the views.

The case 1 is provided with an inlet 2 and an outlet 3, to which are secured the pipes which convey the pressure to and deliver the pressure from the valve, and they may be secured by being screwed in, as illustrated, or by coupling-nuts or flanges, as best suited to their size or other conditions. Surrounding the inlet is a wall or partition 4, which effectually prevents any fluid flowing when the valves are closed. The upper and lower parts of wall 4 are bored to a suitable taper, which is preferably of the least diameter in the lower wall, and removably secured therein are seats 5 in the lower wall and 6 in the upper wall. These seats are straight-bored to receive valves 7 8 and countersunk at their lower edges 9 10 to receive seats 11 12 of valves 7 8. Seats 5 6 are connected by ties 13, and valves 7 8 are secured on a stem 14, between nuts 15 and shoulder 16, and above shoulder 16 the stem has at each side gear-racks 17, where it is met and overlapped on two sides by a bifurcated stem 18, having on each outer side of each bifurcation a gear-rack 19.

14 is the valve-stem, and 18 is the diaphragm-stem, and their movements are always in the same direction—up and down—but in unequal degrees. Above racks 19 stem 18 is round and passes freely through a recessed nut 20, screwed into plate 21, secured by bolts 22 into lugs 23 of case 1.

Mounted above seat 6 are uprights 24 25, made integral with seats 5 6 and ties 13, and seated upon the upper ends of 24 25 is a bearing-ring 26, having an opening 27 for the passing of stem 18. The parts just described are made of the same material as valves 7 8 for the purpose of securing equal expansion with the valves, and to permit such free expansion and still keep a tight joint between seats 5 6 and wall or partition 4 I have provided a spring 28, which seats on ring 26 at its lower end and in recess 29 of nut 20 at its upper end and is put in proper tension to hold seats 5 6 in place by screwing nut 20 into or out of plate 21. The advantages of this construction are that I am always enabled to prevent any leakage, as the valves and the seats they fit into being of metal having an equal coefficient of expansion remain tight, and I am also enabled at any time to quickly and inexpensively renew the valve-seats, if required, when new valves and valve-seats are introduced, and as the casing does not require to be removed from its place no pipe-joints need be broken. The double seats integrally connected are adapted to other forms of valves.

The first fitting or grinding and the regrinding of valves to a seat formed in the casing are both expensive and troublesome, and

my construction overcomes such cost and annoyance.

Above nut 20 the stem 18 is decreased in diameter, forming a shoulder, whereon is placed a collar 30, on which rests diaphragm 31 at its center, its outer edge resting on flange 32 of case 1 and held by bolts 33, which also hold cover 34 to the diaphragm and flange 32. A thread 35 on stem 18 has a nut 36, which secures collar 37 upon the top of diaphragm 31. The upper part 38 of stem 18 is guided in a pocket 39 in nut 40, screwed into the top of cover 34, and it has a check or jam nut 41. A pocket 42 in nut 40 has a spring 43 therein, which at its lower end seats on nut 36, so that by manipulating nut 40 pressure may be exerted or released on diaphragm 31. At line *x x*, Figs. 1 and 2, (see also Fig. 7,) within uprights 24 25, I secure gears 44 45 46 47, as follows: gears 44 45 on shaft 48 and gears 46 47 on shaft 49. Gears 44 46 are the largest and are placed central on the shafts, where they engage racks 17, formed on each side of valve-stem 14. Gears 45 47, of about one-half the pitch diameter of gears 44 46, are placed on the shafts at each side of the larger gears 44 46, and each gear engages a rack formed on the diaphragm-stem 18, which is bifurcated at this point to pass stem 14 and has a rack each side of each gear 44 46. An adjusting plug or valve 52 passes through plate 21 and has a passage 53 therein, which extends upward from its lower end and then turns at a right angle and passes through the side of plug or valve 52, so that by screwing the plug or valve into plate 21 to have passage 53 open above plate 21 pressure will be admitted from the interior of case 1 when the valves are open to the space above plate 21 and under diaphragm 31 to bring pressure to bear under the diaphragm, and the opening, and likewise the pressure, may be varied or entirely cut off by the simple turning of plug or valve 52. A cleaning-opening is made in the bottom of the case, and a plug 54 is used to close it. An opening 60 is made in cover 34 to admit atmosphere above the diaphragm.

When repairs or inspection are necessary, my construction affords every facility for the easy and quick doing of these operations, as when the cover 34 and diaphragm 31 are removed the displacement of plate 21 permits all parts to be at once withdrawn. No moving parts are exposed exterior to the case, thus lessening liability to breakages or derangement and damage from without the case. As seen in Fig. 1, valves 7 8 are open. To close them, nut 40 is screwed out or up, releasing pressure on spring 43, which is used to force down diaphragm 31 and stem 18, with its racks 19, thus revolving gears 45 47 in the direction of the arrows, or their inner diameter teeth down, when, the valves 7 8 not being forced down or open, the steam or fluid pressure is free to close them. Gears 45 are secured at each side of gear 44 and held for positive revolving therewith by dowel-pins 58, while dowel-pins 59 serve the same purpose for gears 46 47. Gears 45 47 being, as illustrated, of one-half the pitch diameter of gears 44 46 at their pitch-line they will move always one-half as far, and stem 18 and diaphragm 31 will in consequence move one-half as much as stem 14 and valves 7 8 in opening or closing the valves. A reverse movement of nut 40 or unscrewing it or screwing it out will reverse the movement of all the parts attached and affected and allow the valves 7 8 to close.

The slight movement of the diaphragm in proportion to the valve movement not only insures its durability, but makes it very sensitive to any variations of initial pressure from the boiler or pipe to which the valve is attached, and the added movement of the valves insures free fluid flowing.

The proportions of gears as illustrated are not arbitrary, and for other sizes of valves other ratios of gear diameters may be employed or to suit different diameters of diaphragms or any desired relative amount of movement of valves or diaphragms. As in very small valves it is not always desirable or necessary to employ any mechanism to move the valves and the diaphragm in different degrees, but still is desirable to use the removable and expanding seats, and to provide for their holding in a manner to insure their free expansion I show in Fig. 8 a modification for such purpose, where seats 5′ 6′ are seated in the partition or wall 4′, and under seat 5′ I construct an extension 55, having upon its outer diameter a screw-thread 56, whereon is screwed a ring 57, which has a bearing under wall or partition 4′, securing seats 5′ 6′ and allowing for their free expansion. Seats 5′ 6′ are connected by ties 13′. This form of securing free expansion of removable seats for double-seated or balanced valves can be applied to many other forms besides those used for reducing or equalizing pressure, and in some cases it may be well or necessary to reverse the taper of seats 5′ 6′ and secure them for removal from the bottom of the casing, which can readily be done by enlarging the opening closed by plug 54 without departing from my invention.

I claim—

1. In a reducing-valve, a casing, and located thereon a diaphragm and means for its deflection and for its release from deflection, a stem for the diaphragm, double valves and a stem for the valves, racks upon the stems and gears engaging the racks, in manner and form set forth.

2. In a reducing-valve, a casing, a diaphragm secured to the casing, double valves, a stem for the diaphragm and a stem for the valves, the diaphragm-stem being bifurcated and each stem being provided with gear-racks, gears supported to engage the diaphragm-stem, gears of larger diameter supported to engage the valve-stem, and means for the attachment of the valve-stem gears

to the diaphragm-stem gears, in manner and form as described.

3. In a reducing-valve, a casing, a diaphragm, a spring mounted above the diaphragm, means to compress or release the spring, a stem for the diaphragm; double valves, a stem for the valves, revolving means to connect the stems for coacting and at different ratios of movement; removable and expansible seats for the valves, having double seats, taper-fitted in the casing, integrally connected, and means to secure the seats to the casing in manner to allow for their expansion therein, substantially as set forth.

4. In a reducing-valve, a case therefor, a diaphragm and double valves, a stem for the diaphragm, a stem for the valves, the diaphragm-stem being bifurcated and overlapping the valve-stem, and revolving means connected to the stems at the overlapping to cause them to coact and move the stems in the same direction and in different degrees of movement, as set forth.

5. In a reducing-valve, a case, a diaphragm secured to the case, a stem for the diaphragm, double valves within the case, a stem for the valves, a seat removably attached to the case and extending upward by the stems, valves upon the seats, a removable bearing-ring upon the extensions, a plate secured to the case, under the diaphragm, and adjustable and yielding means thereto attached to bear upon the upward extensions and ring of the removable valve-seat, in manner and form set forth.

6. In a reducing-valve, a case, a diaphragm secured to the case, a stem for the diaphragm, double valves seated within the case, a stem for the valves, means to connect the stems for coaction in different degrees of movement in the same direction, a seat for the valves removably attached to the case and having upward extensions whereon are secured and supported the stem-connecting means, a bearing-ring seated on the extensions, a plate secured to the case below the diaphragm, and adjustable and yielding means secured thereto to bear upon the ring and the extensions and thereby hold the seat to the case and allow for its expansion.

7. In a reducing-valve, a case, a diaphragm secured to the case, a stem for the diaphragm having at its upper end means exterior to the case for its movement, and at its lower end revolving means to adjoin a valve-stem and for its coacting therewith, double-balanced valves within the case, a stem for the valves, and at its upper end revolving means to adjoin the diaphragm-stem and for its coacting therewith but in a greater degree of movement, double seats for the valves integrally connected, and each being taper-fitted to the case, and means to hold the seats to the case while permitting their free expansion.

8. In a reducing-valve, a case, a diaphragm and valves therein, a separate and removable plate secured in the case between the diaphragm and the valves, an adjustable plug or valve having an opening therethrough and affording communication between the chamber above the valves and the space below the diaphragm secured through the plate, and means to adjust the plug or valve within the case to permit fluid flowing from the valves to the diaphragm in greater or less degree, as desired.

9. In a valve, a case, a removable seat therein adapted to receive and seat double valves, and means to secure the seat to the case in manner to permit its free expansion.

10. In a valve, a case, removable seats taper-fitted to the case and adapted to receive and seat double valves therein, and means to secure the removable seats to the case and to each other in manner to permit their free expansion.

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

WILLIAM C. JENNINGS.

Witnesses:
R. C. WRIGHT,
W. H. ALCOCK.