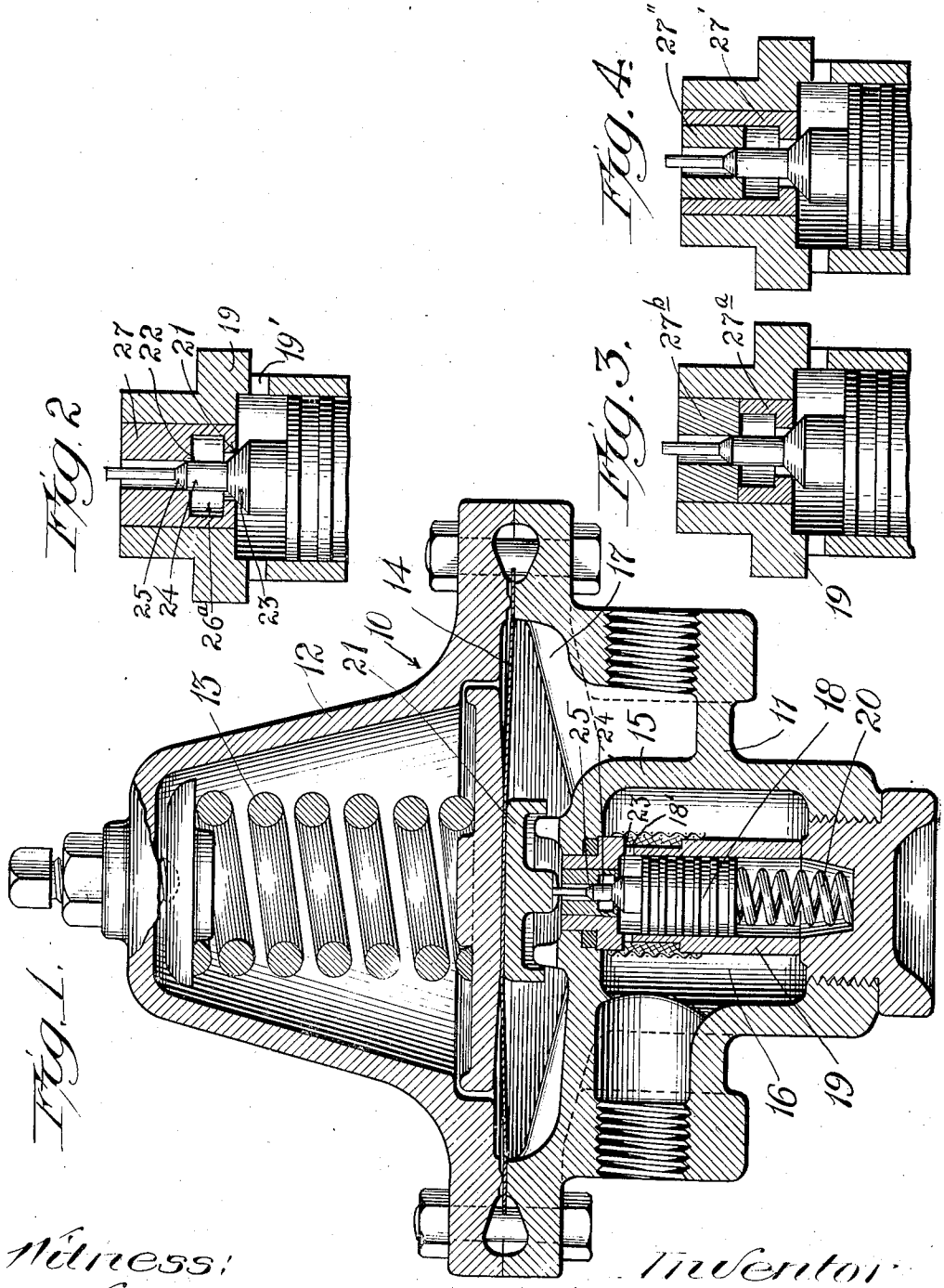
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C. M. TERRY

VALVE

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UNITED STATES PATENT OFFICE.

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VALVE.

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To all whom it may concern:

Be it known that I, CHARLES M. TERRY, a citizen of the United States, residing at Decatur, in the county of Macon and State of Illinois, have invented certain new and useful Improvements in Valves, of which the following is a specification.

My invention relates to valves, and more particularly to pressure-reducing valves.

One grave difficulty practically encountered in the use of pressure-reduction valves when pressure is to be reduced very greatly (as in ammonia-expansion valves, for instance) is the deterioration of the valve seat due to "wire-drawing". When the valving element is narrowly opened or "cracked" from its seat, the high-pressure fluid, throttled through a very narrow space, and at high velocity owing to the great difference in pressures between the inlet and delivery sides of the valve, wears away the seat rapidly, so that the valve soon becomes unable to close effectively. A particular object of my invention is to eliminate this cutting of the seat through wire-drawing, thereby increasing the life and serviceability of the structure, and without sacrificing its effectiveness in any way. A further object of my invention is to provide a particularly simple and advantageous construction for the intended purpose.

To these ends, and others that will become apparent hereinafter, my invention consists in the features of construction and the combinations and arrangements of parts hereinafter set forth and claimed.

In the drawings, Fig. 1 is a vertical cross-section through an ammonia expansion valve embodying my invention; Fig. 2 is an enlarged detail of the valving parts; and Figs. 3 and 4 show respectively slight modifications of the structure shown in Fig. 2.

Save for the porting structure and arrangement and the cooperative valving structure, the valve mechanism shown in Fig. 1 is of a character known on the market and needs only general description. The valve shell 10 comprises the body portion 11, spring-cover or cap 12, the latter containing the adjustable valve-opening spring 13 which acts against the diaphragm 14 clamped between the two castings. A partition wall 15 divides the body into an inlet chamber 16 and a delivery chamber 17, the latter having the diaphragm 14 as one wall thereof. The valving element 18 is shown as of the piston-type guided in a removable cylinder 19 and acted on by a light spring 20 to keep the valve-pin and contact head 21 in proper coaction with the diaphragm 14. The throat of the cylinder makes tight contact with the partition around an orifice in the latter.

Between the high-pressure chamber 16 and low-pressure chamber 17 two ports are arranged through which in tandem, or successively, the fluid must flow in passage from the first to the second chamber and between these ports is an intermediate pressure-space. With these two ports there coact respective surfaces of the valving element, the valve-surfaces working in such relation to the ports that the port toward the high-pressure chamber 16 is partly open when the other begins to open.

In the specific construction shown the cylinder 18 has screened openings 18′ through which the high pressure fluid enters freely, and preferably the two ports through which the fluid is to pass in tandem are arranged in vertical alignment, for mechanical simplicity, the lower port 21, that is adjacent the high pressure side and may be called the "high-pressure" port, being larger than the upper "low-pressure" port 22. For coaction with these tandem ports the valving element has appropriate surfaces that in preferred detail are respectively shown as the larger conical surface 23 for coaction with the seat-edge of high-pressure port 21 and a cylinder surface 24 that may extend into the cylindrical bore of low-pressure port 22. Cylindrical surface 24 meets a conical or graduated surface 25 which may vary the extent of port-opening after the cylindrical portion 24 is withdrawn from the port 22. Of course, in the broadest aspect of my invention the port-positions may be changed and valving element may be varied to suit the port arrangement, but the valving arrangement should afford a partial opening of the high pressure port before the low-pressure port is opened and between the ports there should be a space specifically indicated in Fig. 2 at 26^a, and that I term the intermediate pressure space, so that when both ports are partly opened velocity may be reduced by stages in flow from the high-

est pressure area through the intermediate pressure area to the low pressure side of the partition.

In the construction specifically shown in Figs. 1 and 2 the tandem ports are formed in a bushing 27 (Fig. 2) of hard material, tightly fitted in the throat of cylinder 19, and the ports 21 and 22 are the edges of a bore of two diameters through said bushing. The cylindrical surface 24 of the valve is of a size neatly to fit in the smaller bore of the bushing and, when the conical valve surface 23 is tightly closed on port 21, this shoulder extends a short distance into the smaller bore.

In use, as the pressure spring 13 overcomes the counter-pressure exerted by the fluid chamber 17 and the diaphragm pushes down the valving element, port 21 stands opened somewhat before port 22 opens. When the valve extension 24 is pressed down partly to open port 22, the velocity of flow through each of the ports is less than if a like area of opening were given through either port alone, and cutting of the seat upon which valve-closure depends is avoided or minimized.

If desired the two seats may be afforded by two separate pieces arranged one on top of the other as shown at 27^a and 27^b in Fig. 3, or one inside of the other as shown at 27′ and 27″ in Fig. 4. Replacement of either seat individually is therefore possible.

While I have herein described in detail specific features that I may claim for their particular advantage, It will be apparent that many changes of detail may be made without departure from the spirit of my invention within the scope of the appended claims.

I claim:

1. In a pressure-reducing valve, the combination of a casing having a partition separating the high-pressure space from the low-pressure space, there being two ports in tandem for the fluid-flow from the high-pressure space to the low-pressure space and between said ports an intermediate pressure space of substantially larger diameter than either of said ports; pressure-controlled valve operating means responsive to pressure conditions in the low-pressure space and a valve controlled thereby and coacting with both of said ports to give partial opening to the port near the high-pressure space before opening the port near the low-pressure space.

2. In a pressure-reducing valve, the combination of a casing having a partition separating the high-pressure space from the low-pressure space, two removable bushings each having a port for fluid-flow from the high-pressure space to the low-pressure space with an intermediate pressure-space between said ports of larger diameter than either port; pressure-controlled valve operating means responsive to pressure conditions in the low-pressure space, and a valve controlled thereby and coacting with both of said ports to give partial opening to the port near the high-pressure space before opening the port near the low-pressure space.

CHARLES M. TERRY.