No. 751,572. PATENTED FEB. 9, 1904.

J. R. TANNER.

HIGH PRESSURE VALVE.

APPLICATION FILED MAR. 24, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

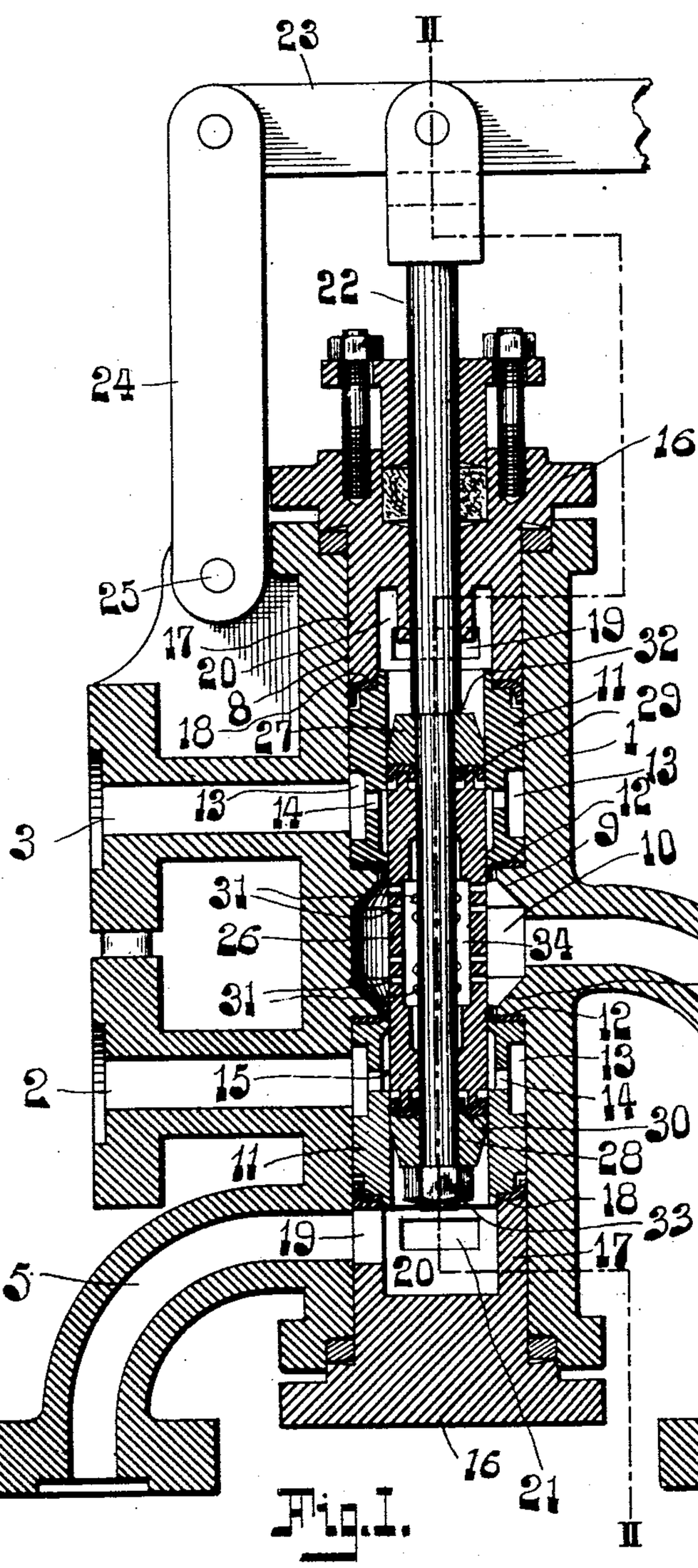

Fig. I.

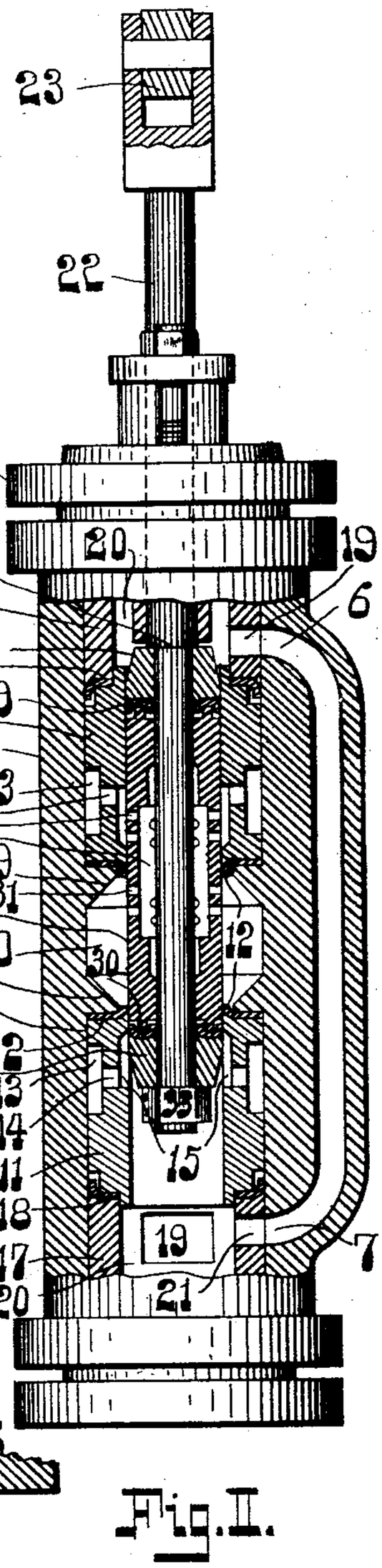

Fig. II.

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F. N. Barber

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NO MODEL. 3 SHEETS—SHEET 2.

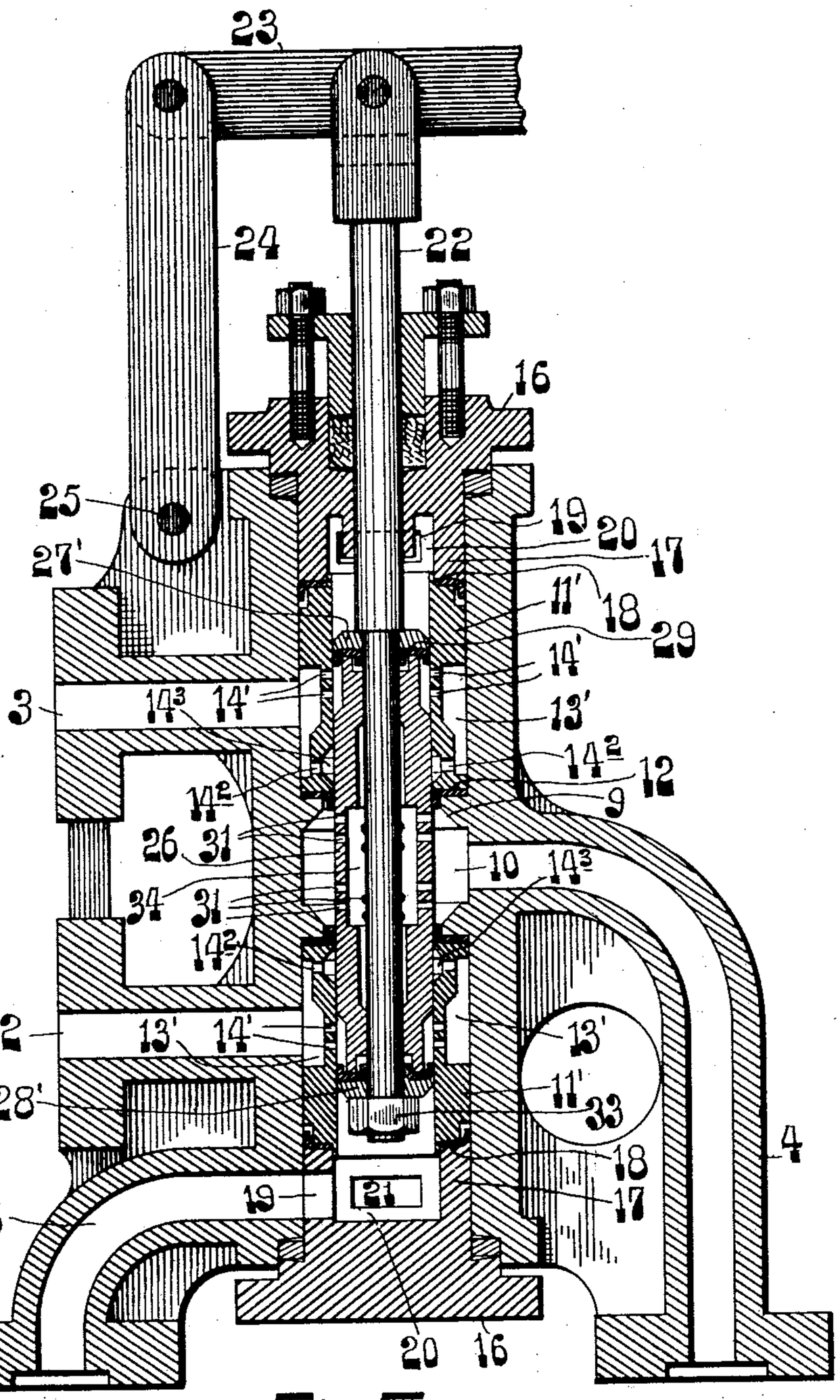

Fig. III.

WITNESSES:

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NO MODEL. 3 SHEETS—SHEET 3.

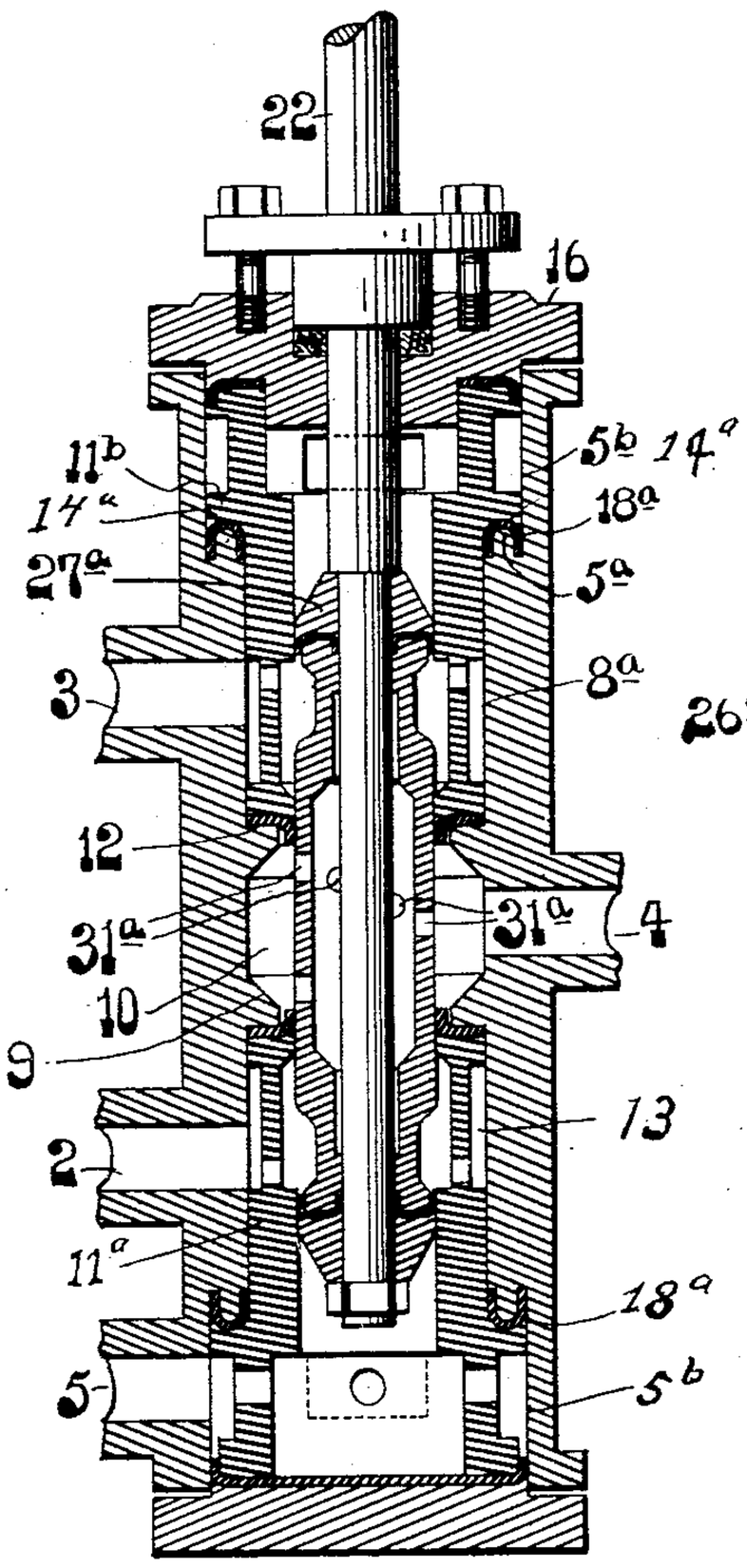

Fig. IV.

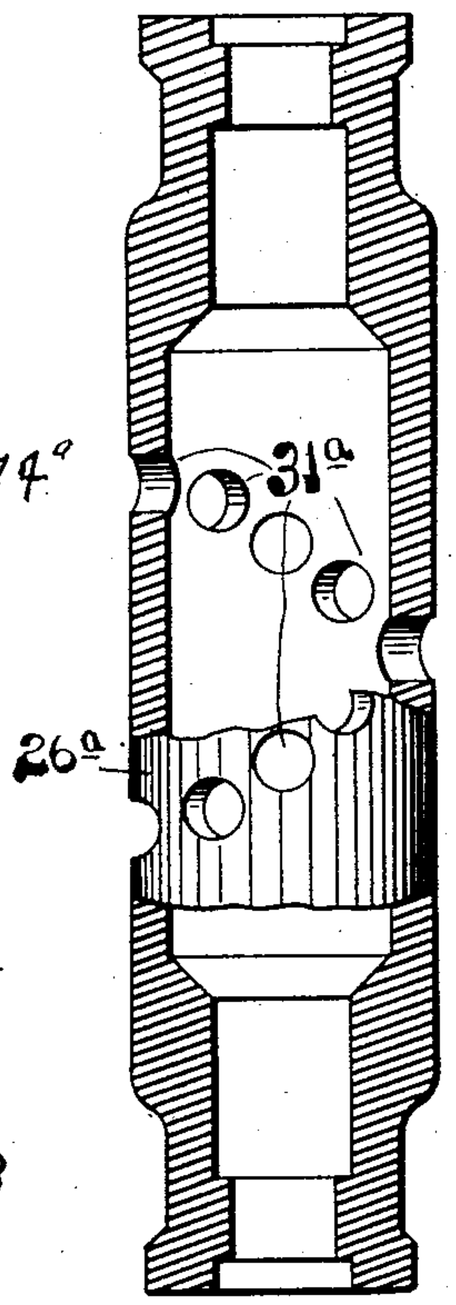

Fig. V.

WITNESSES:

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No. 751,572. Patented February 9, 1904.

UNITED STATES PATENT OFFICE.

JULIUS ROY TANNER, OF PITTSBURG, PENNSYLVANIA.

HIGH-PRESSURE VALVE.

SPECIFICATION forming part of Letters Patent No. 751,572, dated February 9, 1904.

Application filed March 24, 1903. Serial No. 149,313. (No model.)

To all whom it may concern:

Be it known that I, JULIUS ROY TANNER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in High-Pressure Valves, of which the following is a specification.

In the accompanying drawings, which make part of this specification, Figure I is a longitudinal central section of a fluid-pressure valve constructed in accordance with my invention; Fig. II, a similar section taken on the line II II of Fig. I; Fig. III, a view similar to Fig. I, but showing a modification thereof; Fig. IV, a view similar to Fig. I, but showing a second modification thereof; and Fig. V, a vertical section, partly in elevation, showing the piston-shell with a special arrangement of ports.

My invention relates to four-way valves for governing the flow of fluids under high pressure, so that not only may all flow be cut off, but also that pressure may be transmitted by way of either one of two ports or passages, while an exhaust may be had by way of the other of two said ports or passages.

The external casing or chest 1 is provided with the two radial passages 2 and 3, which may be connected to hydraulic cylinders or other pressure devices, the radial inlet or supply passage 4, located on the opposite side of the casing 1 from the passages 2 and 3 and between said passages, the exhaust-passage 5, leading from the side of the lower end of said casing, and the exhaust-passage 6, leading from the side of the upper end of said casing and into the lower end of said casing at the opening 7.

The casing 1 has a longitudinal opening 8, having near the central portion thereof the two annular shoulders 9, preferably integral with the casing and arranged one on either side of the supply-passage 4. These shoulders are beveled on their opposing faces to increase the size of the "supply-chamber," which is a term applied to that chamber between said shoulders and is designated by the numeral 10.

Within the chest 1 and beyond each shoulder 9 is a tubular section forming an inner casing or lining 11, separated from the adjacent shoulder by a leather or packing-ring 12, whose free edges are directed toward each other and into the supply-chamber 10. The section of the lining has external annular passages 13, with which the passages 2 and 3 communicate, and ports 14, which connect the annular passages 13 with the interior of the lining 11. The interior surfaces of the linings 11 have narrow annular passages 15, into which the ports 14 open.

The outer ends of the opening 8 are closed by caps 16, having annular flanges 17, which clamp packing-rings 18 between themselves and the outer ends of the linings 11. These rings 18 have their free ends extending toward each other and prevent the passage of fluid between the casing 1 and linings 11 from the pressure-chambers 13 to the exhaust-passages 5 or 6.

The annular flanges 17 have ports 19, which communicate with the hollows or exhaust-chambers 20, formed by the flanges and the exhaust-passages 5 and 6. The outlet 7 of the exhaust-passage 6 communicates by port 21 with the lower exhaust-chamber 20.

The lower cap 16 is not bored entirely through centrally as the upper cap is. The stem 22 of the valve-piston extends through the upper cap and is pivotally secured at its upper end to the operating-lever 23, which has one end pivoted at the upper end of the link 24, pivoted at 25 to the chest or casing 1.

The valve proper is strung on the valve-stem 22, and consists of the hollow middle section 26, the two end sections 27 and 28, separated from the middle section by packing-rings 29 and 30, whose outer edges extend toward each other.

The central section 26 of the valve proper has a large chamber 34, provided near each end with rows of holes 31, to allow fluid to pass from the valve-chamber into the supply or pressure chambers 10 or 13, as will be soon explained. The valve-stem has a shoulder 32, against which the outwardly-tapering end section 27 rests. The several sections of the valve are held tight on the stem 22 by means of the nut 33, which is screwed up against the end of the section 28.

In Fig. I the valve is shown in its central position. Here all the ports of the central section 26 of the valve are within the supply-chamber, and no fluid from passage 4 can pass beyond the supply-chamber 10. In this position of the valve the mechanism connected with the distributing-passages 2 and 3 will remain stationary.

In Fig. II the valve is shown in its upper position. Here the fluid in the supply-chamber 10 can pass by lower holes 31 into the valve-chamber 34 and out through upper holes 31, passage 15, ports 14, and distributing-chamber 13 into passage 3. At the same time fluid in passage 2 flows out through lower distributing-chamber 13, ports 14, and passage 15 into the lower exhaust-chamber 20, whence it escapes through port 19 and exhaust-passage 5. In this position that part of the valve having the holes rests within the upper packing-ring 12, the packing-ring 29 prevents the passage of fluid from the upper distributing-chamber 13 and the upper exhaust-chamber 20, and the lower packing-ring 12 prevents the fluid in chamber 10 from passing downward into lower chamber 20. The rate of the exhaust of water from lower distributing-chamber 13 to the lower exhaust-chamber 20 can be regulated by the distance the largest portion of the conical or tapered section 28 is lifted above the lower part of the passage 15. When the valve is pushed downward, so that the lower ports 31 of the valve register with lower passage 15 and conical section 27 passes the upper shoulder of upper passage 15, the flow of fluid will be reversed in the passages 2 and 3, and the exhaust fluid from passage 3 will pass by way of connecting-passage 6 into lower exhaust-chamber 20 and out through passage 5.

Fig. III is exactly like Fig. I except in the construction of the linings and the ends of the valve proper. The numerals on both views are the same where the parts are identical and are used with prime-marks where they are similar.

The linings 11′ in Fig. III each have two rows of ports 14′ instead of one row, as in Fig. I, and an additional row of ports 14^2 near their inner ends. In Fig. III the passage 13′ is elongated, so as to bridge the ports 14′ and 14^2, and the ports 14^2 communicate with an annular chamber 14^3 wide enough to bridge the two rows of holes 31 in the valve when the latter is moved to its upper or lower position. The end sections 27′ and 28′ are not conical, the rate of exhaust being dependent upon the number of rows of ports 14′ uncovered by said end sections or the number of rows open to the exhaust-chambers.

The operation of the invention shown in Fig. III will be readily understood without further explanation.

In Fig. IV the construction is the same as in Fig. I with the exception of the arrangement of the ports in the piston and of the packing and the unitary nature of the linings. In this figure the linings 11^a at each end are in one piece only, each piece having a shoulder 14^a, between which and an opposing shoulder 5^a on the casing 5 is arranged the packing-ring 18^a. The central hole or bore 8^a is somewhat enlarged at each end, as shown at 5^b, to form the shoulders 5^a and accommodate the enlarged ends 11^b of the linings. The form of linings shown in this figure is very simple and easily made. The whole valve is made of very few parts, and all the packing-rings are so placed as to be subject to but little wear and to collapse when passing the ports of the piston or the linings.

The central section 26^a of the piston is shown in Fig. V and does not differ materially from those shown in the other figures, except that the ports 31^a are arranged in a spiral, so that as the said ports pass from one chamber to another, as from supply-chamber 10 to one of the distributing-chambers 13, the flow of water will be proportional to the distance the piston travels. This piston has the frusto-conical ends 27^a.

The annular ribs 9 may be made separate from the main casing, if desired.

Having described my invention, I claim—

1. A high-pressure valve, having a central supply-chamber, a distributing-chamber on each side of the supply-chamber, and an exhaust-chamber beyond each distributing-chamber, and a piston composed of a rod, a ported central shell, two end sections strung and secured on the rod, and a packing-ring between the shell and each end section, the ports of the shell being located so as to connect either distributing-chamber with the supply-chamber and the packing-rings being at the same time so located as to permit connection between the other distributing-chamber and its respective exhaust-chamber.

2. A high-pressure valve consisting of an outer casing having a longitudinal opening a pair of annular ribs centrally arranged therein and forming between the same a depressed supply-chamber, a lining beyond each rib, each lining having therein a distributing-chamber, caps for said opening, an exhaust-chamber between each cap and distributing-chamber, packing-rings between said lining and said caps and ribs, and a piston composed of a separable three-part shell, a rod for securing the parts together, and packing-rings between the said parts of the shell so located as to permit connection of the supply-chamber with either distributing-chamber and a simultaneous connection between the other distributing-chamber and an exhaust-chamber.

3. A high-pressure valve, having a central supply-chamber, a distributing-chamber on each side of the supply-chamber, and an exhaust-chamber beyond each distributing-chamber, and a piston composed of a rod, a

ported central shell, two end sections strung and secured on the rod, and a packing-ring between the shell and each end section, the ports of the shell being located so as to connect either distributing-chamber with the supply-chamber and the packing-rings being at the same time so located as to permit connection between the other distributing-chamber and its respective exhaust-chamber, and so as to prevent the passage of fluid between the rod and the end sections.

Signed at Pittsburg, Pennsylvania, this 16th day of March, 1903.

J. ROY TANNER.

Witnesses:
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A. M. STEEN.