(No Model.) 2 Sheets—Sheet 1.

H. H. WESTINGHOUSE.

STEAM ENGINE VALVE.

No. 332,689. Patented Dec. 15, 1885.

Fig. 1.

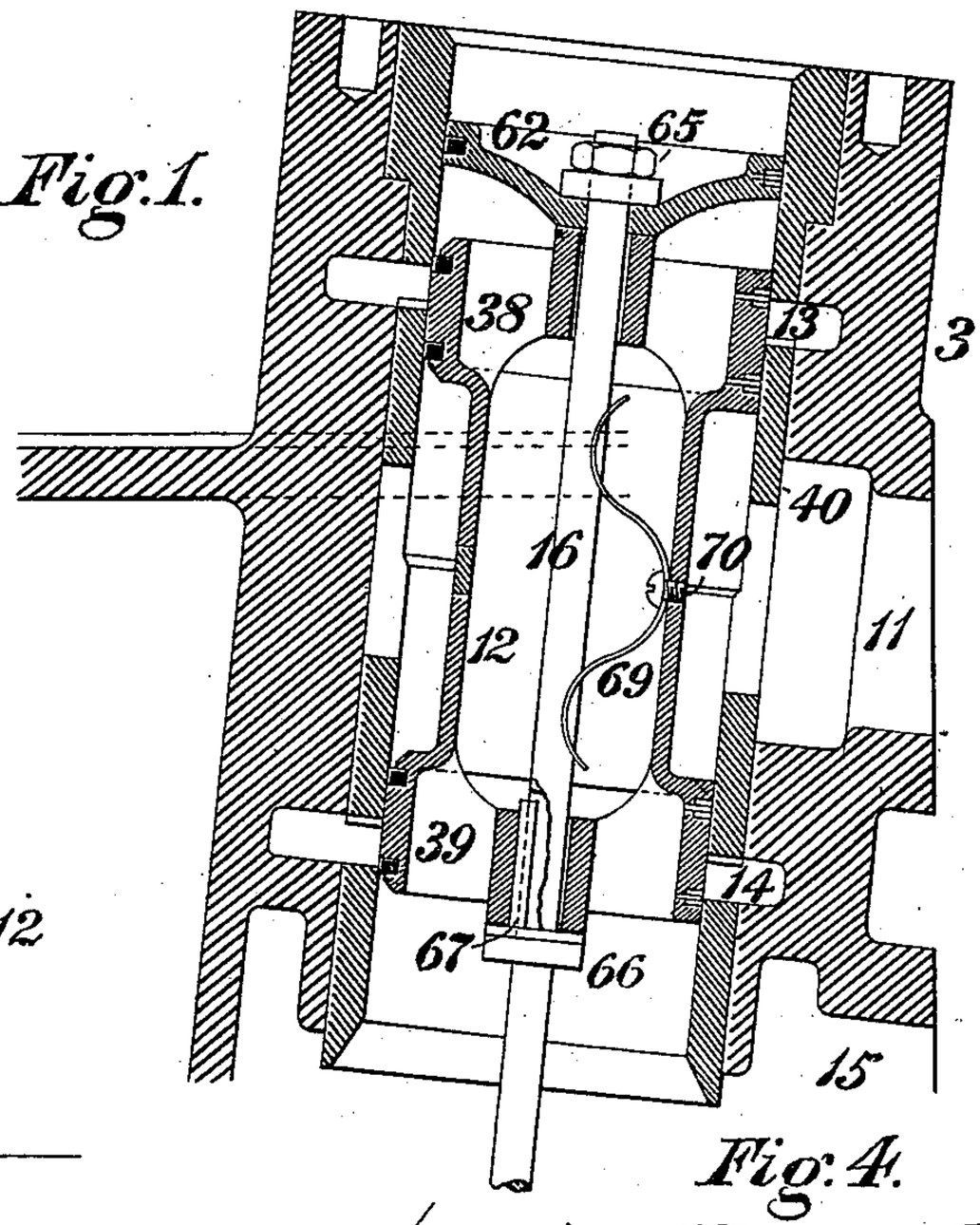


Fig. 2.

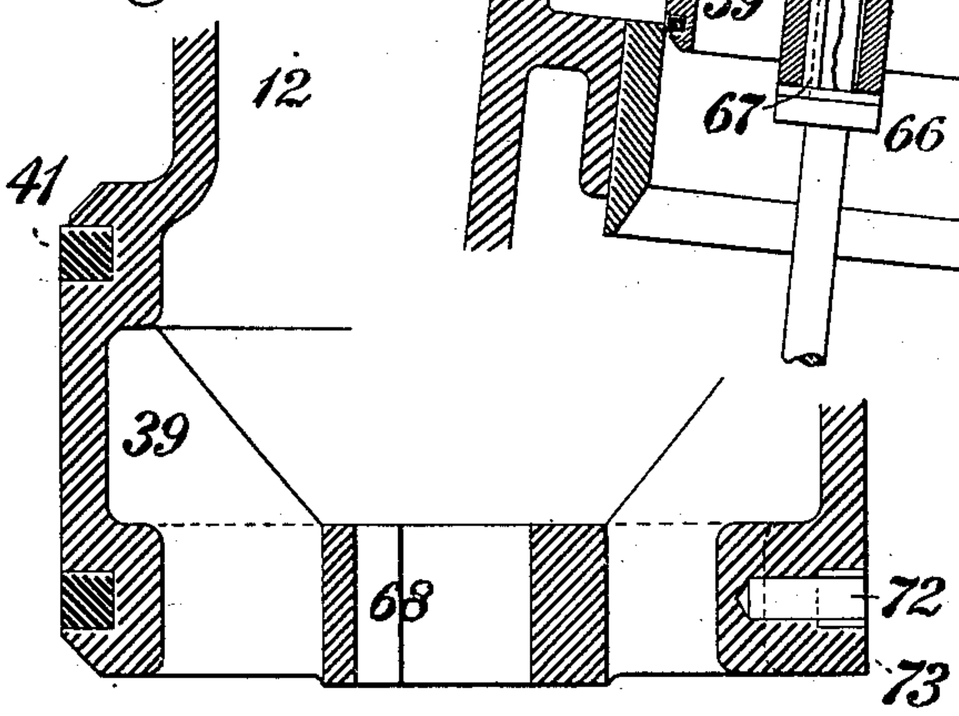


Fig. 3.

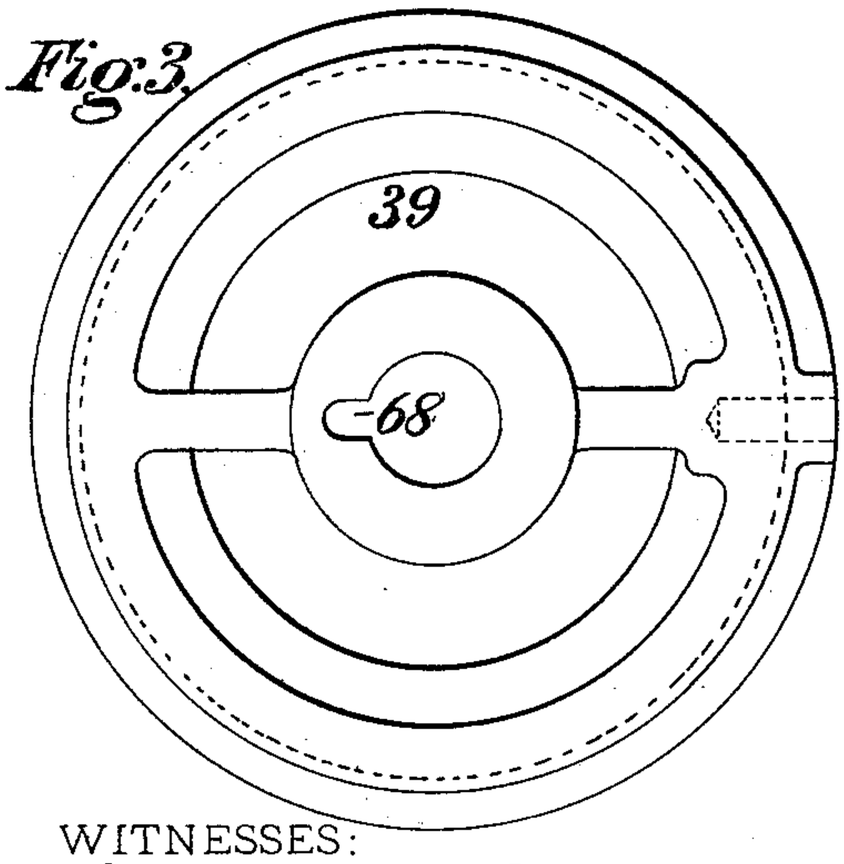


Fig. 7.

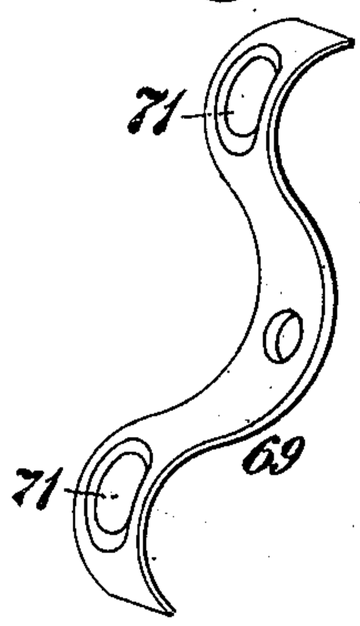


Fig. 4.

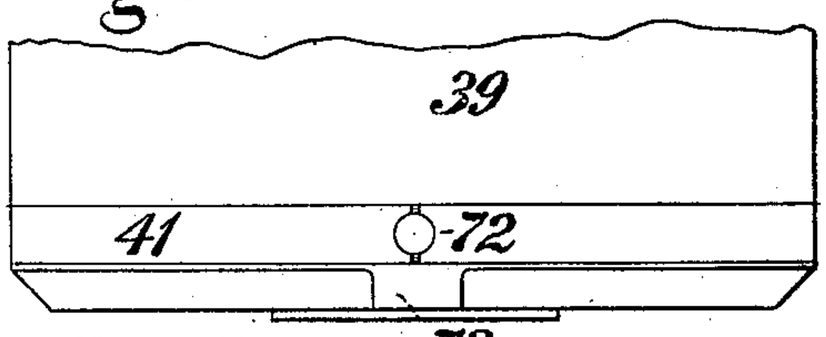


Fig. 5.

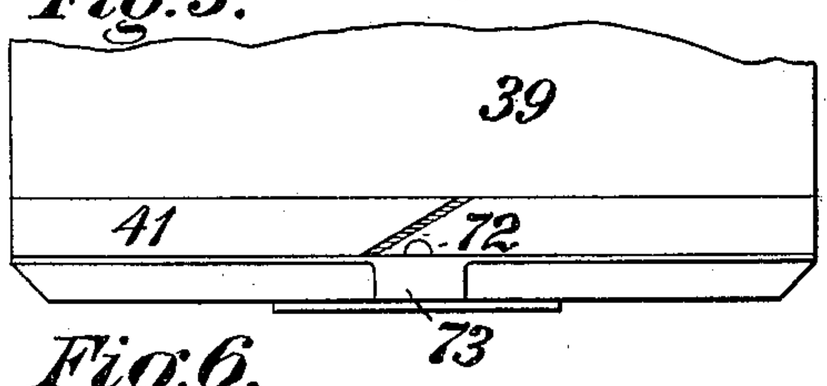
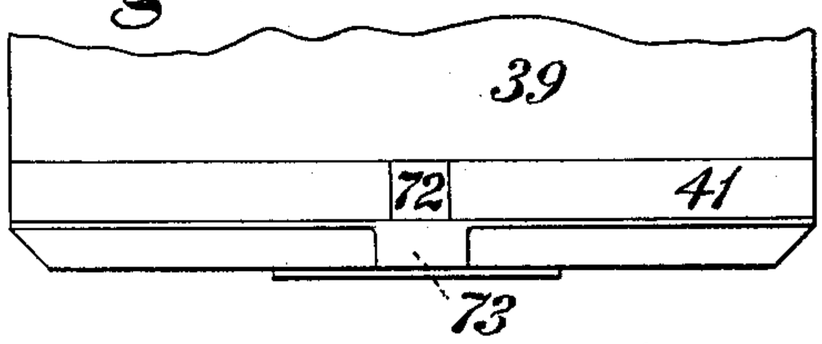


Fig. 6.



WITNESSES:

J. Howden Bell.

L. M. Clarke

INVENTOR,

H. Herman Westinghouse,

BY George N. Christy

ATTORNEY.

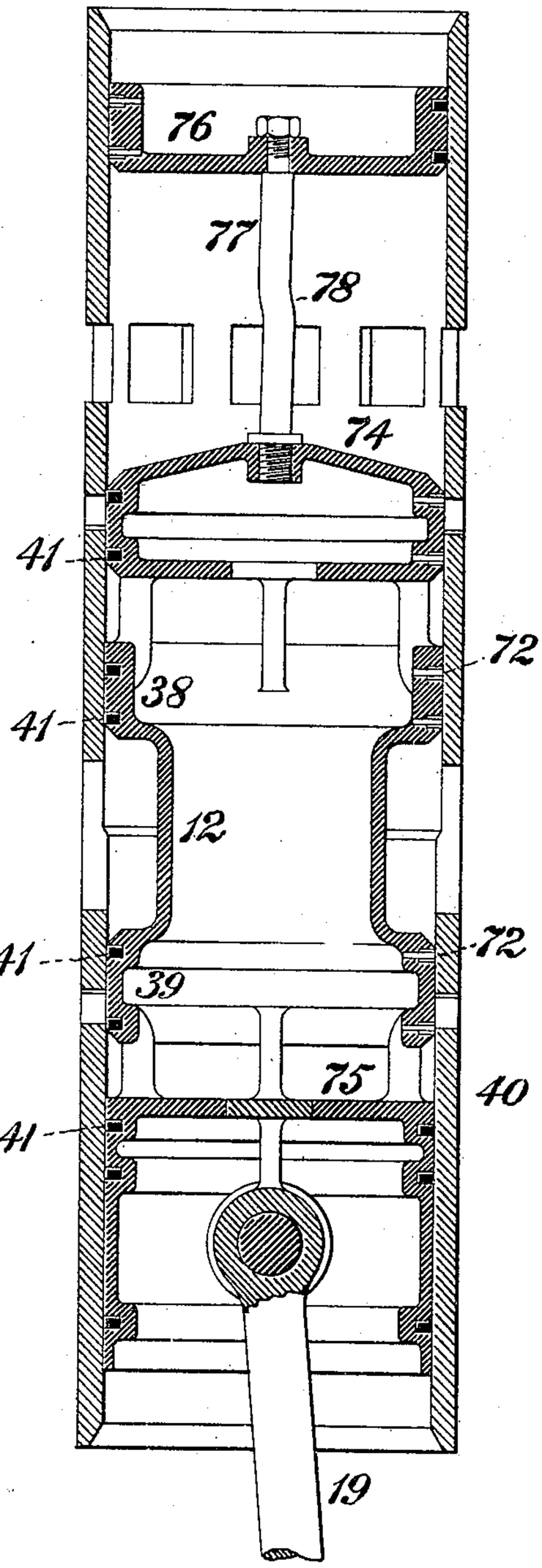
(No Model.) 2 Sheets—Sheet 2.

H. H. WESTINGHOUSE.

STEAM ENGINE VALVE.

No. 332,689. Patented Dec. 15, 1885.

Fig. 8.



WITNESSES:

J. Howden Bell.

C. M. Clarke.

INVENTOR,

H. Herman Westinghouse,

BY George N. Christy

ATTORNEY.

UNITED STATES PATENT OFFICE.

H. HERMAN WESTINGHOUSE, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, OF PITTSBURG, PENNSYLVANIA.

STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 332,689, dated December 15, 1885.

Application filed October 1, 1885. Serial No. 178,712. (No model.)

To all whom it may concern:

Be it known that I, H. HERMAN WESTINGHOUSE, residing at New York, in the county of New York, and State of New York, a citizen of the United States, have invented or discovered certain new and useful Improvements in Steam-Engine Valves, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a longitudinal central section through a steam-engine distribution-valve and its chest or chamber, illustrating the application of my invention; Fig. 2, a similar section, on an enlarged scale, through the lower end of the valve; Fig. 3, an end view, in elevation, of the valve; Figs. 4, 5, and 6, side views, in elevation, of the end portion of the valve, illustrating modifications in the division of a packing-ring; Fig. 7, a view in perspective of the bearing-spring of the valve; and Fig. 8, a longitudinal central section through a valve and its fixed bushing, illustrating a modification of my invention.

My invention relates to piston distribution-valves for steam-engines, and its object is to reduce, as far as practicable, tendency to leakage between the valve and its case, without inducing undue friction or wear.

To this end my invention, generally stated, consists in the combination of a piston-valve, a packing ring or rings fixed therein, and a device for maintaining the packing ring or rings in contact with the valve casing or chest at its or their points of division.

The improvements claimed are hereinafter fully set forth.

My invention is herein shown as applied in a distribution-valve, 12, which in its general construction accords substantially with that of Reissued Letters Patent No. 10,603, granted and issued to the Westinghouse Machine Company, as my assignee, May 26, 1885, said valve being composed of two end pistons, 38 39, connected by an intermediate hollow or tubular body portion and fixed upon a valve-stem, 16, adapted to be connected to an eccentric-rod, by which the valve is reciprocated within a sleeve or bushing, 40, secured to and forming the lining of a valve chest or chamber, 3. Steam is admitted to the space between the pistons 38 39 through ports in the bushing communicating with a steam-supply nozzle, 11, and passes to the cylinders, in the reciprocation of the valve, through ports 13 and 14. The exhaust from the cylinder supplied by the port 13 passes through said port and through the interior of the valve to the exhaust-passage 15, and that from the port 14 passes directly to the exhaust-passage below the valve. The valve 12 is held against longitudinal movement on its stem 16 by a nut, 65, and collar or shoulder 66 thereon, and is prevented from axial movement on the stem by a key, 67, engaging a keyway or groove, 68, in the valve, and a groove in line therewith on the stem. A slight degree of lateral or transverse movement on the valve-stem is permitted to the valve by slightly elongating the openings therein through which the valve-stem passes, in the direction of the cuts or points of division in the packing-rings, to be presently described. Each of the pistons 38 39 is fitted with one or more packing-rings, 41, of metal, which are split or divided and sprung into recesses of corresponding section in the valve-pistons, said rings expanding against the bushing 40, and by their bearing thereon acting to prevent the leakage of steam from one side of the pistons to the other.

As ordinarily constructed, the liability to leakage past the packing-rings is greatest at their cuts or points of division, inasmuch as no means have heretofore been provided for insuring the contact of the rings at these points with the surface of the valve-case or its lining. To obviate such objection, I provide a device whereby lateral pressure is exerted outwardly upon the valve in the direction of the cuts in its packing-rings, and the rings are thereby maintained in effective contact at these points with the bushing. As illustrated in Figs. 1 and 7, such pressure is applied through a curved or elliptical plate-spring, 69, which is secured at its center by a stud, 70, to the body of the valve, on the side thereof nearest the cuts of the packing-rings, and bears at its ends against the valve-stem 16, slots 71 being preferably formed in the spring to afford a more effective bearing against the valve-stem. The cuts or points of division of the packing-rings are held in axial position in the direction of the applied outward pressure by

dowel-pins 72, passing through the rings and entering the valve-pistons, said pins preventing the rings from turning in their recesses in the pistons. The dowel-pins may either pass through the cuts, preferably at or near their steam sides, being thus interposed between the ends of the rings, and either partially or entirely filling the space between them, as in Figs. 4 and 6, or be located exterior and adjacent to the cuts, as in Fig. 5.

The ends of the valve-pistons 38 39 are, as heretofore, inwardly tapered or beveled exteriorly to their packing-rings to effect cut off and exhaust closure, and to further promote the tightness of the joints at the cuts of the rings segmental bearing-surfaces 73, the curvature of which corresponds with that of the bushing 40, are formed upon each of the pistons 38 39, said bearing-surfaces extending longitudinally from the packing-rings 41 to the ends of the pistons, and circumferentially for a sufficient distance to provide a bearing exterior to the entire extent of the cuts, such surface being maintained in contact with the bushing by the pressure of the spring 69.

In the modification illustrated in Fig. 8 my invention is illustrated as applied in a valve adapted to use in a compound engine, said valve having supplemental pistons 74 and 75 and a back-pressure piston, 76, exterior to its main pistons 38 39, and being coupled directly, without the employment of a valve-stem, to its eccentric-rod 19. The valve is therefore held against axial movement by the eccentric-rod, and the packing-rings 41 are prevented from turning by dowel-pins 72, as in the construction before described.

In lieu of employing a spring to exert lateral pressure on the valve, as in the previous instance, such result is attained by employing as a pressure device a stem, 77, connecting the back-pressure piston 76 with the upper supplemental piston, 74, said stem having a slight lateral bend or twist, (indicated at 78,) the action of which is to press the cuts of the upper packing-rings against the valve-bushing in a similar manner to the spring 69. The contact of the cuts of the lower rings with the bushing is maintained by the oblique action of the eccentric-rod 19, the cuts being located substantially at right angles to the axis of the pin 79, by which said rod is coupled to the valve.

I claim herein as my invention—

1. The combination of a piston-valve, one or more packing-rings fitting therein, and a pressure device, substantially as described, for maintaining said rings in contact with the casing or chest of the valve at and adjacent to their cuts or points of division, substantially as set forth.

2. The combination of a piston-valve, a packing-ring fitting a recess therein and held in said recess against axial movement, a stem on which the valve is fixed with the capacity of a slight degree of lateral movement, and a spring bearing against the valve-stem and valve and exerting lateral pressure in the direction of the cut or point of division of the packing-ring, substantially as set forth.

3. The combination of a valve having two end pistons, which are inwardly tapered or inclined on one or both of their ends, packing-rings fixed as against lateral movement in said pistons, a pressure device for maintaining said rings in contact with the casing or chest of the valve at and adjacent to their cuts or points of division, and segmental cylindrical bearing-surfaces, each raised above the tapered portion of one of the pistons and extending from a packing-ring toward the end of the piston at and adjacent to the cut or point of division of said packing-ring, substantially as set forth.

In testimony whereof I have hereunto set my hand.

H. H. WESTINGHOUSE.

Witnesses:
W. L. McCULLAGH,
E. A. TERHUNE.