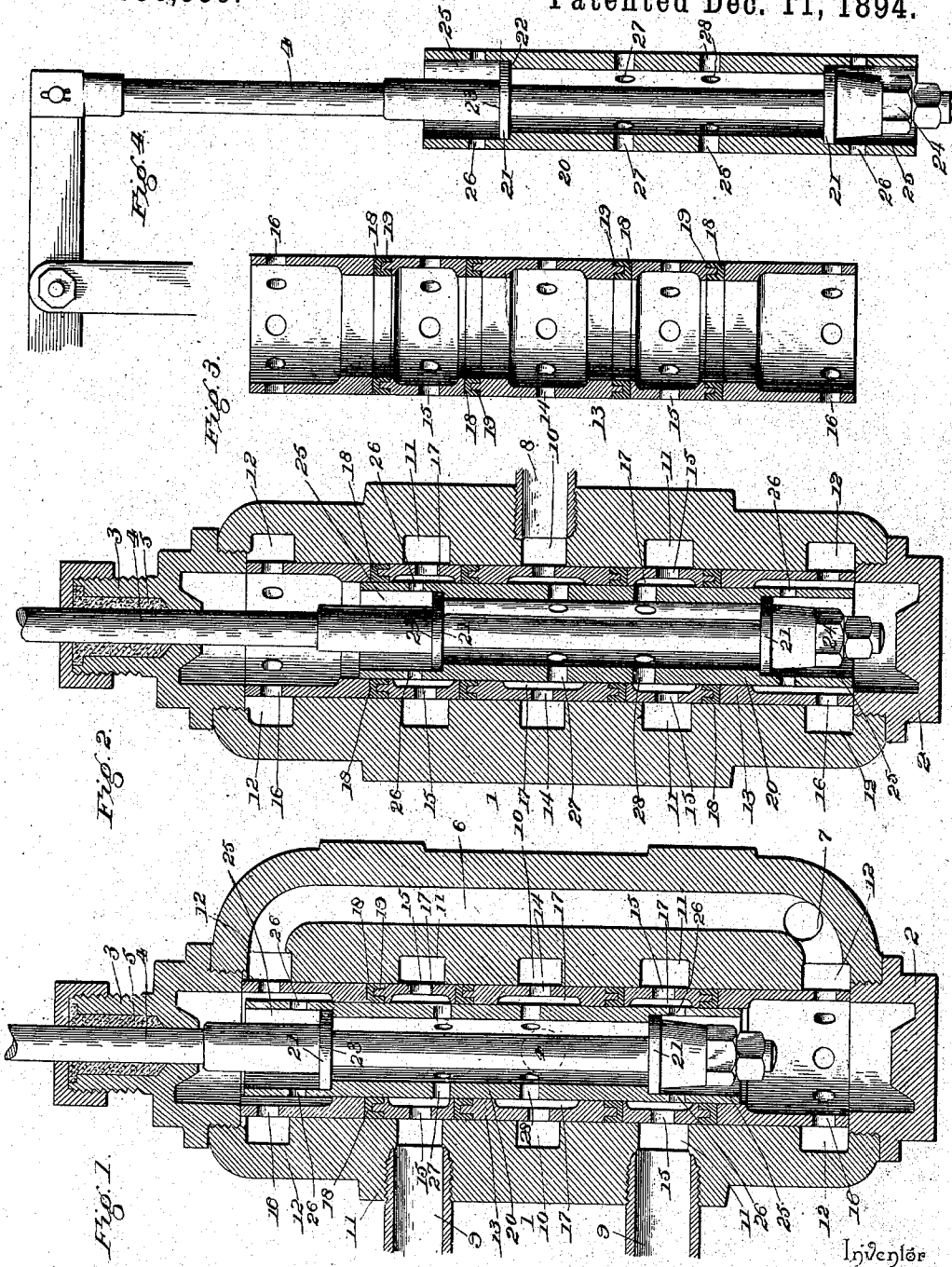


(No Model.)

J. A. SMITH.
BALANCED PISTON VALVE.

No. 530,559.

Patented Dec. 11, 1894.



Witnesses

John A. Smith
John A. Smith

By *his* Attorneys.

John A. Smith

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UNITED STATES PATENT OFFICE.

JOHN ADAM SMITH, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR OF TWO THIRDS TO JAMES HART AND ABRAHAM WILKINSON, OF SAME PLACE.

BALANCED PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 530,559, dated December 11, 1894.

Application filed August 31, 1894. Serial No. 521,842. (No model.)

To all whom it may concern:

Be it known that I, JOHN ADAM SMITH, a citizen of the United States, residing at Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and useful Balanced Piston-Valve, of which the following is a specification.

My invention relates to steam, hydraulic, and similar valves, of the class known as balanced valves, and the objects in view are to provide a piston-valve in which the pressure of the fluid prevents the packing-rings from expanding into the ports of the moving part or piston, and at the same time secure a balanced pressure upon the piston.

Further objects and advantages of the invention will appear in the following description, and novel features thereof will be particularly pointed out in the appended claims.

In the drawings: Figure 1 is a vertical central section of a valve embodying my invention, the same being constructed for use in connection with a double-acting cylinder. Fig. 2 is a similar section, at right-angles to the plane of Fig. 1, showing the piston in its depressed position. Fig. 3 is a view of the bushing cylinder, detached. Fig. 4 is a view of the piston.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates the valve-casing, preferably cylindrical in construction, which is provided at one end with a cap 2 and at the opposite end with a cap 3 perforated for the stem 4, a stuffing-box 5 being arranged in the cap 3. Communicating with opposite ends of the casing is an exterior duct 6, with which connects the exhaust-port 7, and tapping the casing at its center is the inlet port 8 and upon opposite sides thereof the cylinder-ports 9. The inner surface of the casing, in communication with the inlet-port is channeled as shown at 10, in communication with the cylinder-ports is channeled as shown at 11, and in communication with the terminals of the duct 6 is channeled as shown at 12, whereby fluid entering or leaving the casing through either of the said openings passes entirely around the bore of the casing.

Arranged in the casing, and extending from

one of the end caps to the other, is the cylindrical bushing 13, provided opposite each of the openings in the casing with an annular series of perforations or ports, those opposite the inlet port being designated at 14, those opposite the cylinder ports at 15, and those opposite the ends of the exterior duct at 16. Communicating severally with these annular series of perforations are the channels 17, formed by cutting away the inner surface of the bushing upon opposite sides of the perforations.

The bushing is preferably sectional in construction, the joints between the sections being arranged between the planes of the various ports, and the terminals of the sections being fitted with interposed packing-rings 18, grooved as shown at 19 and fitted upon the reduced extremities of the sections.

Arranged to reciprocate within the bushing, and connected for operation with the stem 4, is the cylindrical piston 20, having closed extremities. The ends of the piston are closed by the heads 21, arranged in contact with annular shoulders 22 formed in the inner surface of the same, and being held in place by a shoulder 23 on the stem bearing against one head and a removable nut 24 threaded upon the extremity of the stem and bearing against the other head. The shoulders 22, or the seats against which the heads abut, are set back from the ends of the shell of the piston, and the projecting hollow portions 25 are provided with annular series of perforations 26 to communicate, successively, with the counterbored portions of the bushing, and hence with the terminal ports of the exterior duct. The shell is further provided, at intervals, with annular series of ports 27 and 28, which are adapted to communicate, respectively, with the counterbore of the ports in communication with the inlet port and the counterbore in communication with one of the cylinder-ports.

With the parts in the position shown in Fig. 1 the live steam, or other actuating fluid, enters through the inlet port, and after passing through the openings in the bushing enters the bore of the shell and thence passes through the upper cylinder port. It is obvious that the pressure within the shell is balanced. The exhaust fluid, escaping from the

cylinder, passes through the other cylinder-port, and through the perforations in the extension at the lower end of the shell, thence into the connecting duct, and out through the exhaust-port. This exhaust-fluid, owing to the said duct bears with equal force upon opposite ends of the piston, thereby balancing that element. When the position of the piston is reversed, as shown in Fig. 2, the conditions are reversed accordingly, and the steam after entering the shell passes through the other cylinder-port, while the exhaust-fluid escapes through the upper cylinder-port, and through the perforations in the extension of the upper end of the shell, to the exterior duct, and thence to the exhaust-port.

From the above description it will be seen that the pressure of the fluid is from the interior of the shell outward, and hence as the ports of the shell pass the packing-rings the latter are expanded and thus prevented from entering or crowding into the latter. Thus, the packing rings are relieved from excessive wear and leakage is prevented.

The pressure of the terminal caps of the casing upon the ends of the bushing holds the latter in place, and when necessary to replace the packing-rings one of the caps may be removed and the sections of the bushing withdrawn.

Having described my invention, I claim—

1. The combination of a casing having open ends, an exterior duct connecting the ends of the bore thereof, an inlet and a cylinder port, a sectional bushing arranged in the casing and provided with perforations communicating with the openings in the shell of the casing, caps fitted in the ends of the casing and bearing against the ends of the bushing, packing-rings interposed between the sections of the bushing, and a cylindrical terminally-closed piston arranged in the bushing and provided with ports to register with said inlet and cylinder ports, substantially as specified.

2. The combination of a casing having an exterior duct connecting its ends, and an inlet and a cylinder port, a sectional bushing arranged in the casing, packing-rings interposed between the ends of the sections, and a hollow piston provided with ports to register with the inlet and cylinder ports, substantially as specified.

3. The combination of a casing having an exterior duct connecting its extremities, and inlet and cylinder ports, said casing being counterbored in communication with the ports and the terminals of the duct, a sectional bushing provided with ports and counter-bores in communication with the openings in the casing, packing-rings arranged between sections of the bushing, and a piston, cylindrical in construction, provided with an annular series of ports adapted to register with the counter-bores in the bushing, substantially as specified.

4. The combination of a casing provided with inlet and cylinder ports, communicating with counterbores, and an exterior duct connecting the ends of the casing and also communicating with counterbores, a sectional bushing provided with ports and counterbores, packing-rings interposed between the ends of the sections of the bushing, and a hollow piston having closed extremities and intermediate ports adapted to register with the inlet and cylinder ports, and also provided with hollow extensions having openings to register with the counterbores communicating with the ends of the said duct, substantially as specified.

5. The combination of a casing provided with inlet and cylinder ports, communicating with counterbores, and an exterior duct connecting the ends of the casing and also communicating with counterbores, a sectional bushing provided with annular series of ports, packing-rings arranged between the extremities of the sections of the bushing, and a piston having a cylindrical shell provided with intermediate ports and terminal ports and having interior annular seats, perforated heads fitting said seats, and a stem having a shoulder to engage one of the heads and a nut engaging the other head, said seats being set in from the extremities of the shell, between the intermediate and the terminal ports, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN ADAM SMITH.

Witnesses:

W. P. REESE,
F. E. REESE.