

No. 817,153.

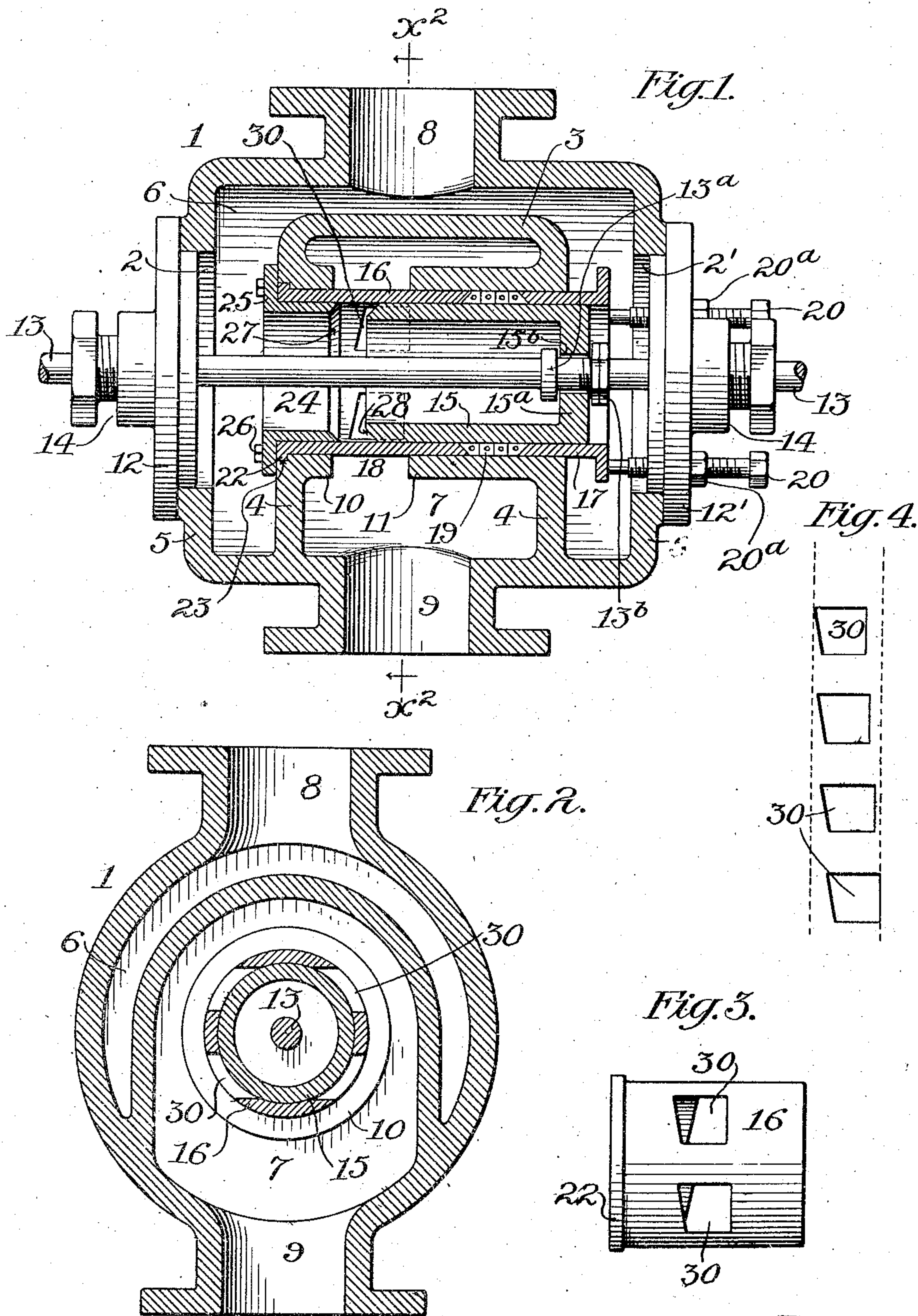
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N. S. BARR.

BALANCED THROTTLE VALVE.

APPLICATION FILED JUNE 21, 1905.



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# UNITED STATES PATENT OFFICE.

NORMAN S. BARR, OF TOMBSTONE, ARIZONA TERRITORY.

## BALANCED THROTTLE-VALVE.

No. 817,153.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed June 21, 1905. Serial No. 266,213.

*To all whom it may concern:*

Be it known that I, NORMAN S. BARR, a citizen of the United States, residing at Tombstone, in the county of Cochise, Territory of Arizona, have invented a certain new and useful Balanced Throttle-Valve, of which the following is a specification.

The main object of this invention is to provide a throttle-valve which will be balanced as regards the pressure of the steam thereon, so that it can be closed and opened with a minimum expenditure of force.

A further object of this invention is to provide a throttle-valve in which the admission or flow of steam or fluid can be graduated or closely regulated.

Another object of the invention is to provide for convenient renewal of the wearing parts.

Another object is to provide for maintenance of the steam-tight packing of the valve by the pressure of the steam itself and for adjustable tightening of said packing.

The accompanying drawings illustrate the invention.

Figure 1 is a longitudinal section. Fig. 2 is a transverse section on the line  $x^2 x^2$ , Fig. 1. Fig. 3 is a side elevation of the valve-bushing. Fig. 4 is a development of the ports in said bushing.

The valve body or casing (indicated at 1) is preferably cast in one piece and may be of a more or less cylindrical form, having openings 2 2' at the respective ends of the cylinder. An inner valve-casing 3 is formed within and preferably integral with the casing 1, said casing 3 extending from one side wall of the outer casing 1 in approximately semicylindrical form and having end walls 4 parallel to the end walls 5 of the outer casing, the said outer and inner casings forming an external valve-chamber 6 between the outer and inner casings and an inner valve-chamber 7 within the inner casing. An inlet or pressure connection 8 leads through the outer casing into the outer valve-chamber 6, and an outlet connection 9 leads through said outer casing at the place where it forms a part of the wall of the inner chamber, so that said outlet communicates from said inlet-chamber.

The inner casing 3 has hubs or cylindrical flanges 10 11 projecting from its ends 4 inwardly toward one another, the bores or cylindrical passages within said hubs being in alignment with the openings 2 2' in the

outer casing. Said openings in the outer casing are closed by end plates 12 12', bolted to the outer casing and centrally perforated to receive the valve-rod 13, the end plates 60 being provided with stuffing-boxes 14 to permit steam-tight passage of the valve-rod 13. Said valve-rod 13 operates the valve or valve-plug 15, which slides in a valve-cylinder formed by the cylindrical tubular bushing or valve-support 16 and a cylindrical gland 17, which are supported within the hubs 10 11 aforesaid.

The valve 15 is preferably formed as a hollow cylinder having a head or end wall 15<sup>a</sup> at one end, with an opening 15<sup>b</sup>, through which valve-rod 13 passes, said opening being sufficiently large to allow a little play between the valve and valve-rod and the valve-rod having a shoulder or collar 13<sup>a</sup> and a nut 13<sup>b</sup>, engaging on opposite sides of said end 15<sup>a</sup> of the valve to operate the valve in the movement of the valve-rod.

The hub or projecting flange 11 is longer than the hub of the adjacent flange 10, and the bushing 16 extends from within the hub 10 across the intervening annular port or opening 18 between the hubs to some distance within the hub 11. The gland 17 extends within the hub 11 toward the bushing 16, and an intermediate packing 19, preferably a semimetallie packing, is interposed between the gland and bushing, means, such as screws 20, working in the head or end plate 12', being provided to press the gland 17 against said packing. The ends of bushing 16 and gland 17 are preferably beveled, as at 16' 17'. Nuts 20<sup>a</sup> on said screws serve to lock same and give a tight joint.

The bushing 16 has a flange or shoulder 22 engaging in a countersink or rabbet 23 in the end 4 of the internal valve-casing 3. The valve-seat member 24 is formed as a tube or cylinder having a flange 25 extending over the end of the bushing 16 and secured by screws 26 to the end wall of the inner valve-casing, the inner end of said valve-seat being preferably beveled, as at 27, and the end of the valve-plug 15 being correspondingly beveled, as indicated at 28. The opening 2 in end of outer casing 1 is larger than valve-seat member 24, so that on removing the end plate 12 and unscrewing screws 26 the valve-seat can be removed and renewed, as can also the bushing 16, which is normally held in place by seat member 24. Similarly, gland 17 can be removed at the other end.



The portion of the bushing that bridges across the space between the hubs 10 11 is provided with lateral ports 30, which are arranged in circumferential order around said bushing and are preferably offset progressively in a longitudinal direction, as indicated in the development in Fig. 4, so that they will come into action successively as the valve is moved, thereby allowing graduation or closer regulation. To increase the closeness of regulation, each of the ports may have its end toward the seat formed slanting or oblique, so as to give a gradual cut-off by co-operation with the valve.

The operation is as follows: The steam or fluid pressure medium entering through inlet connection 8 fills the outer chamber 7, and if the valve is open said medium communicates through the cylindrical valve-seat member 24 and one or more of the ports 30 into the internal valve-chamber 7 and out through the outlet 9. By operating the valve-rod the valve can be moved more or less toward its seat, thereby cutting off or closing the lateral ports 30 progressively, and after the last port has been closed the final movement of the valve brings it against the valve-seat 24 to give a tight closure, the end of the valve abutting against the valve-seat, thereby preventing access of steam between said valve and seat and eliminating the pressure at that point at the end of the valve and reducing the endwise pressure on that end of the valve, so as to enable the excess of pressure in the other direction on the valve to hold the valve closed. Assuming that valve is closed, steam will surround the valve-casing and both ends of the valve. On account of the valve being closed against the seat the steam-pressure cannot act against the area taken up by the seat. Therefore the other end of the valve will have an excess of pressure equal to the pressure on the area of the seat. This serves to hold the valve tight against the seat, but is not enough to be appreciably felt on the end of the throttle-lever. (Not shown in drawings.) When the valve is pulled out away from the seat, the exposed area on both ends is exactly the same. Therefore the valve is in absolute balance. When the valve is closed, the seat holds the steam from going through to outlet on that end, and the packing and gland keep the steam from going through on the other end, thus keeping the joint steam-tight until the packing is worn out.

What I claim is—

1. A valve comprising outer and inner casings formed with outer and inner chambers provided with inlet and outlet connections, a tubular valve-support extending within the inner chamber and having lateral ports opening into the said inner chamber, a valve slidably mounted in the said tubular valve-support to close and open said ports, the outer

chamber extending to each end of the tubular valve-support and of the valve, to expose both ends of the valve to the pressure in said chamber, and an operating-rod connected to said valve and extending through the wall of the outer chamber.

2. A valve comprising outer and inner casings formed with outer and inner chambers provided with inlet and outlet connections, a tubular valve-support extending within the inner chamber and having ports opening into the said chamber, a valve slidably mounted in the said tubular valve-support to close and open said ports, an operating-rod connected to said valve and extending through the wall of the outer chamber, a tubular valve-seat within said valve-support and engaged end abutting the valve when the latter is closed to reduce the endwise pressure in one direction on the valve and enable the excess of pressure in the other direction to hold the valve closed.

3. A valve-chamber having lateral ports, and a valve sliding in said chamber and exposed at both ends to the pressure in said chamber to balance the pressure on the valve when the valve is open, and a seat in said chamber, said valve having a portion abutting said seat when the valve is closed to relieve the pressure in one direction on the valve and cause excess of pressure in the direction tending to hold the valve closed.

4. A valve-cylinder having lateral ports and a tubular seat member, in combination with a valve sliding in said cylinder and closing said lateral ports and engaging said seat member, and an outer chamber surrounding said valve-cylinder and extending to both ends of the valve to produce pressure on each end thereof.

5. A valve-cylinder having lateral ports and a tubular seat member, in combination with a valve sliding in said cylinder and closing said lateral ports and engaging said seat member, an outer chamber surrounding said valve-cylinder and extending to both ends of the valve to produce pressure on each end thereof, and a valve-rod operatively connected to said valve and extending through the walls of the outer chamber.

6. A valve-cylinder having lateral ports and a tubular renewable seat member, in combination with a valve sliding in said cylinder and closing said lateral ports and engaging said seat member, an outer chamber surrounding said valve-cylinder and extending to both ends of the valve to produce pressure on each end thereof, and having an opening for removal of the seat member, and a detachable closure for said opening.

7. The combination of outer and inner valve-chambers, the inner valve-chamber having a cylindrical passage extending therethrough and communicating at its ends with the outer chamber, a tubular bushing in one



end of said passage having ports opening to the inner chamber, a gland in the other end of said passage, a valve sliding within said bushing and gland, and packing between the bushing and gland.

8. The combination of outer and inner valve-chambers, the inner valve-chamber having a cylindrical passage extending therethrough and communicating at its ends with the outer chamber, a tubular bushing in one end of said passage having ports opening to the inner chamber, a gland in the other end of said passage, a valve sliding within said bushing and gland, packing between the bushing and gland, and means for adjustably pressing said gland toward said bushing.

9. The combination of outer and inner valve-chambers, the inner valve-chamber having a cylindrical passage extending therethrough and communicating at its ends with the outer chamber, a tubular bushing in one end of said passage having ports opening to the inner chamber, a gland in the other end of said passage, a valve sliding within said bushing and gland, packing between the

bushing and gland, and means for adjustably pressing said gland toward said bushing consisting of screws engaging with said gland and with the end wall of the outer chamber.

10. A valve-cylinder formed of a bushing and a gland with intervening packing, a valve within said cylinder, an inner chamber formed with a passage therethrough containing said bushing, gland and packing, a valve-seat member detachably secured to a wall of said inner chamber and extending within the bushing and holding the bushing in place, and an outer chamber extending to both ends of the inner chamber and to both ends of the valve, and having an opening opposite the detachable valve-seat, and a detachable closure-plate for said opening.

In testimony whereof I have hereunto set my hand, at Tombstone, Arizona, this 10th day of June, 1905.

NORMAN S. BARR.

In presence of—

A. WENTWORTH,  
W. DECKERAW.