

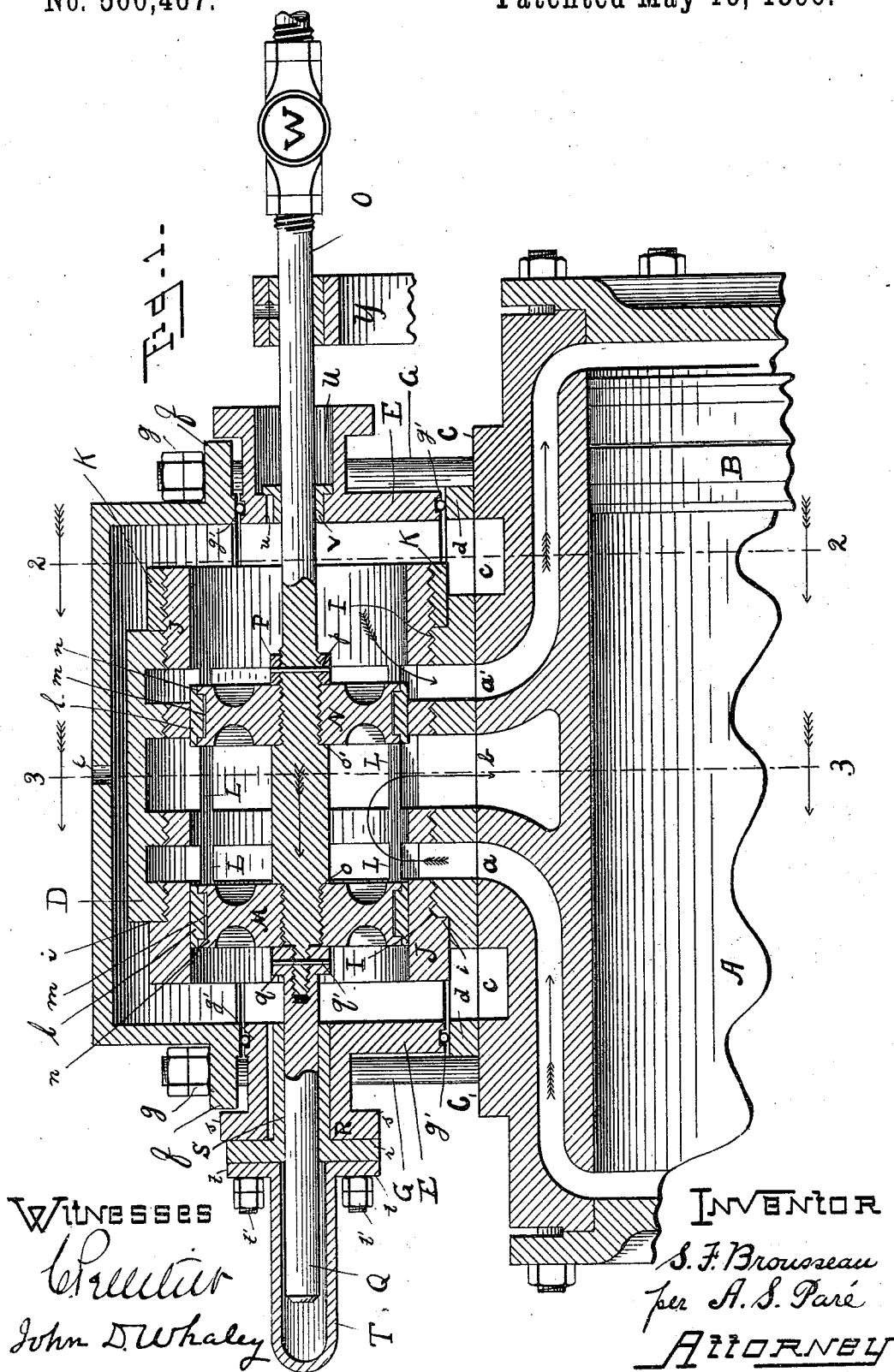
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4 Sheets—Sheet 1.

S. F. BROUSSEAU.
VALVE FOR STEAM ENGINES.

No. 560,467.

Patented May 19, 1896.



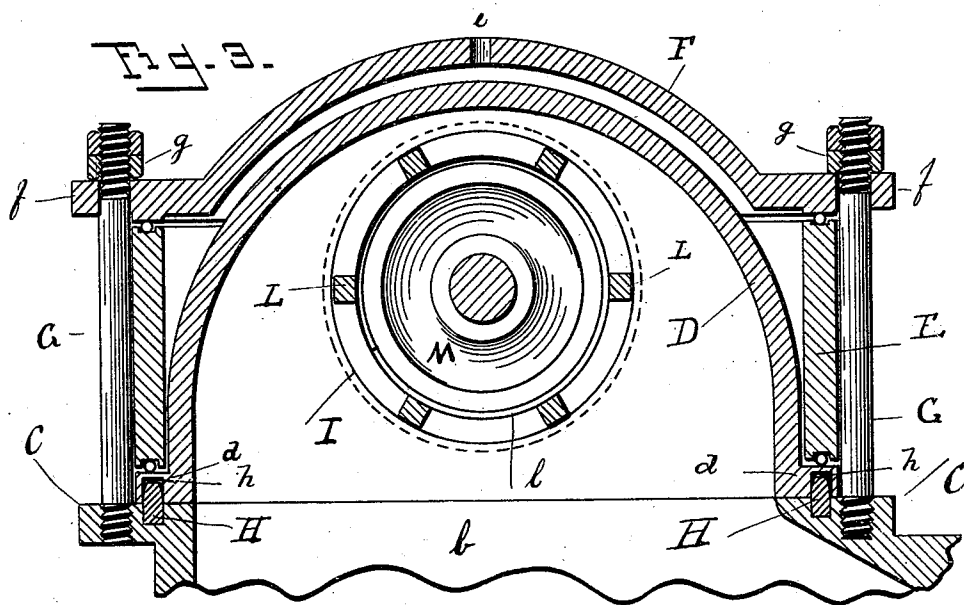
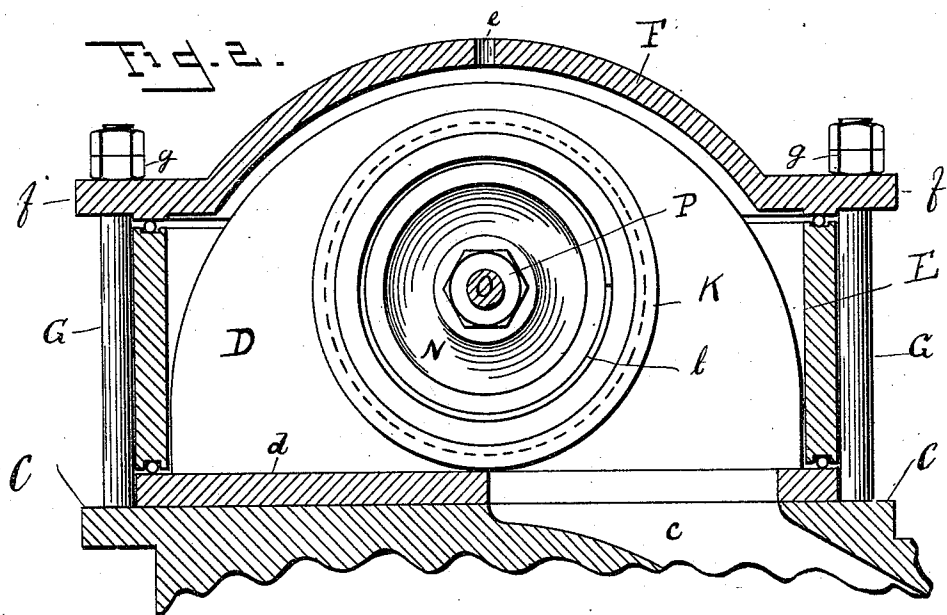
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WITNESSES

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(No Model.)

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Fig. 4 -

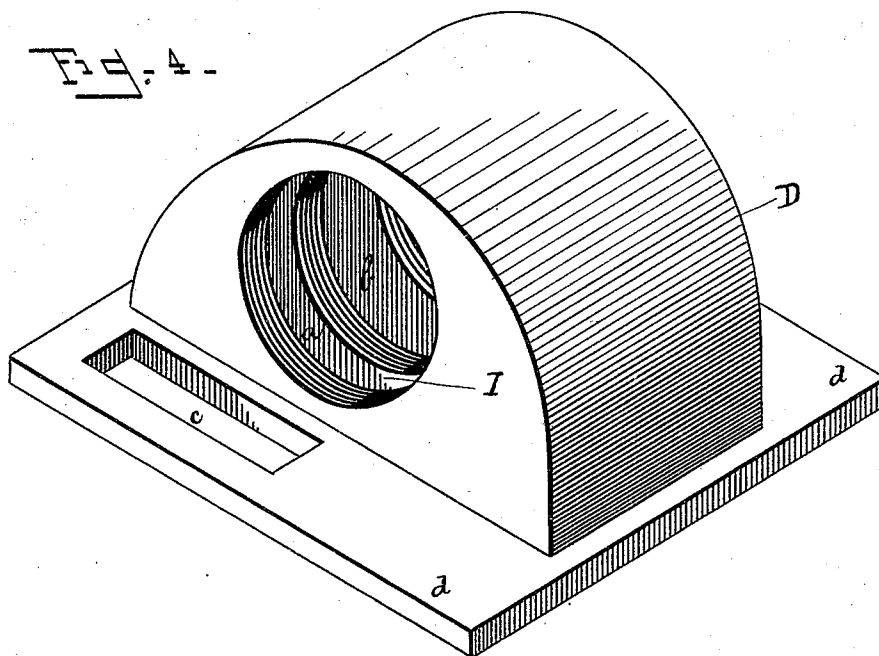
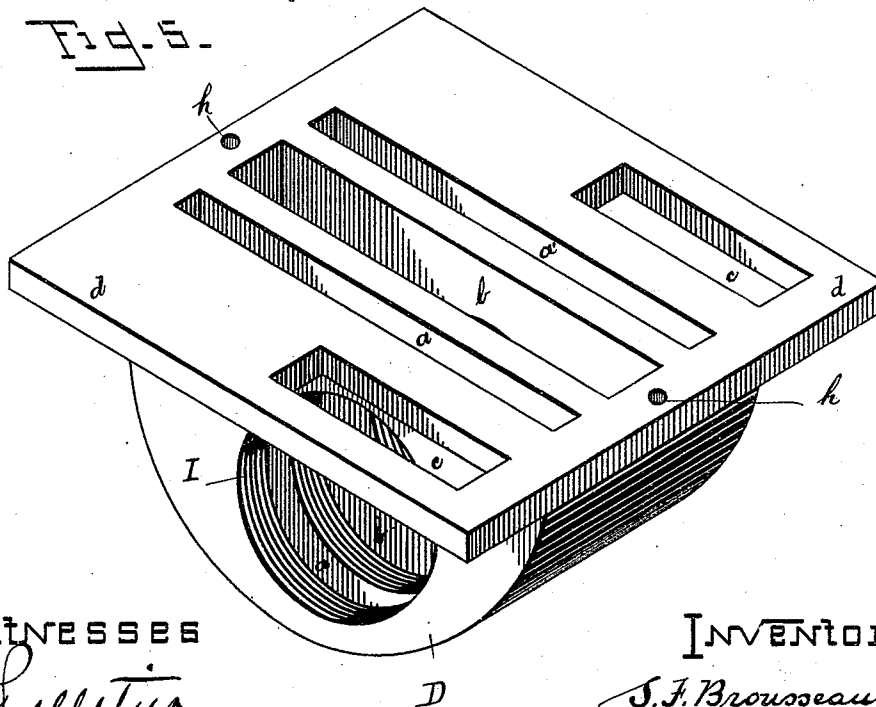


Fig. 5 -



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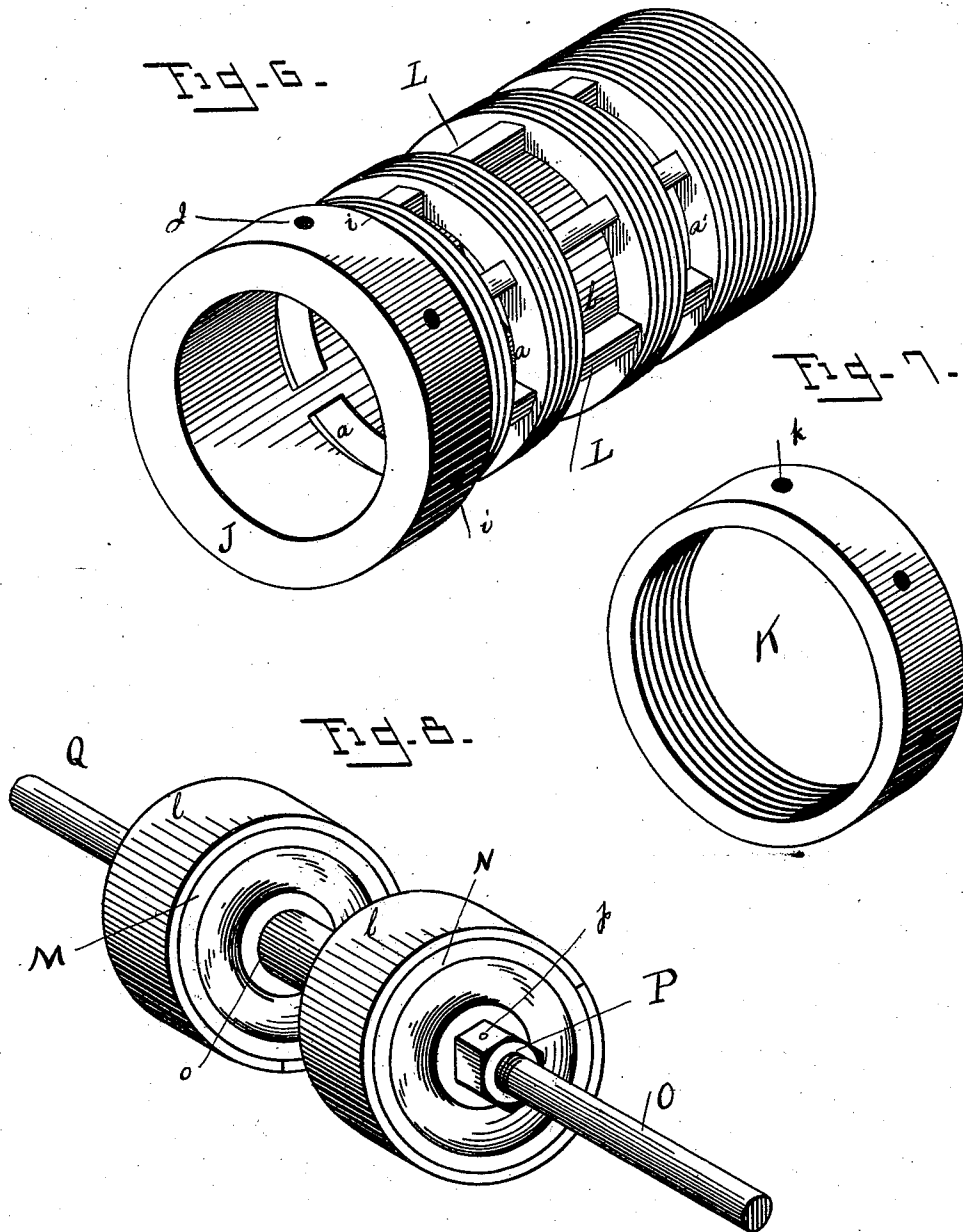
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UNITED STATES PATENT OFFICE.

STANISLAS F. BROUSSEAU, OF SAN FRANCISCO, CALIFORNIA.

VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 560,467, dated May 19, 1896.

Application filed February 28, 1894. Serial No. 501,856. (No model.)

To all whom it may concern:

Be it known that I, STANISLAS F. BROUSSEAU, a subject of the Queen of Great Britain, and a resident of San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Valves for Steam-Engines, of which the following is a full, clear, and exact description of said invention, which will enable others skilled in the art to which it appertains to make, use, and practice the same.

My invention relates to piston-valves; and it consists, first, of two pistons secured to the valve-stem traveling within a cylindrical shell or sleeve; second, of a novel method of constructing and adjusting the valve-seat; third, of means to secure the valve-seat to the cylinder.

The objects of my invention are, first, to produce a simple and convenient device adapted specially to locomotive-engine cylinders as they are built now, and can be adjusted also to other engines with slight alterations; second, to overcome the uneven pressure of the steam upon the valve; third, to prevent the friction caused by the weight of the valve upon its seat. I attain these objects by the mechanism illustrated in the accompanying drawings, which form part of this specification.

Figure 1 is a vertical section of the steam-chest, cut through the valve and part of an ordinary high-pressure locomotive-engine cylinder with its piston, showing the valve as if moving in the direction indicated by the arrow on the valve-stem. Fig. 2 is a transverse section of Fig. 1, taken from line 2 to 2, showing in elevation the valve and its seat and the seat-holder provided with the steam-passage. Fig. 3 is another transverse section of Fig. 1, taken from line 3 to 3, showing the exhaust-port and the valve-seat cut away, also in elevation one-half of the valve and the method of securing the valve-holder and steam-chest to the cylinder. Figs. 4, 5, 6, 7, and 8 are detailed views of my invention, illustrated obliquely, and are as follows: Fig. 4 is the valve-seat holder. Fig. 5 is a reverse view of Fig. 4. Fig. 6 is the valve-seat. Fig. 7 is the threaded ring or nut used to tighten the valve-seat to the seat-holder. Fig. 8 is the double piston-valve.

Similar letters of reference are used to denote corresponding parts throughout the entire specification and several views of the drawings.

A is the cylinder, in which plays the piston B, (shown about at the beginning of the return stroke;) C, the top surface of the cylinder; *a a'*, steam-ports; *b*, exhaust-port, and *c* openings for admitting steam into the chest. These elements constitute the well-known cast cylinder for high-pressure locomotive-engines.

Placed upon the top surface C of the cylinder is the valve-seat holder D, fitted tight therewith and projecting upwardly within the steam-chest E and provided with passages corresponding diametrically with the steam-ports *a a'*, and exhaust-port *b*, and steam-openings *c*. This holder may be made in various shapes or forms, notwithstanding that I have shown it semicircular and provided with flange *d*, projecting under the steam-chest. This arrangement constitutes an important feature of my invention, as the chest rests upon the surrounding flange of the holder and makes thereby a much better joint.

The steam-chest E is provided with the usual cover F, having its oil-pipe aperture *e* and flange *f* extending outwardly from the chest, and may be made semicircular, corresponding with the shape of the valve-seat holder, so that a space may be left within the chest between the cover and the top part of the seat-holder for the circulation of the steam.

G is a stud screwed to the top surface of the cylinder and passing through the flange *f* for securing the cover, steam-chest, and flange *d* of the seat-holder to the cylinder, as shown particularly in Fig. 3; *g*, nuts screwed to the upper part of the studs to tighten them together; H, projecting pins (shown exclusively in Fig. 3) secured to the surface C of the cylinder, corresponding diametrically to hole *h*, provided for beneath the projecting flange of the valve-seat holder to prevent said holder from shifting out while tightening the nut *g*. *g'* is the usual copper joint placed between the steam-chest and flange *d* of the holder, also between the steam-chest and its cover. Through the entire width of the semicircular projecting portion of the seat-holder and

across the steam and exhaust passages is the cylindrical shell or valve-seat J, placed in the hole I and screwed thereto, within which the valve travels. The ends of said shell project outwardly from its holder in equal length, but must be long enough to cover the full travel of the valve. I have provided it at its rear end with shoulder *i*, which rests against the holder when in position, and a series of small holes J are bored around its circumference to enable me to tighten it with a key, (these holes are shown exclusively in Fig. 6,) while at the forward end I screw the threaded ring K, which serves as a jam-nut. This ring is also provided with a series of small holes *k* to facilitate the turning when screwing. The valve-seat is perforated, corresponding diametrically with the steam and exhaust ports when in position, leaving a series of small connecting-struts L. It will be noticed that the valve-seat and its holder, provided with flange *d*, have no bolt or screw whatever to secure them to the cylinder. Still they are firmly held in position by the method heretofore described, notwithstanding the shaking of the machine. The valve-seat may be secured effectively to its holder in various ways. However, I prefer to carry out this feature in the manner shown particularly in Fig. 1 of the drawings, as I obtain a much better joint. The valve is composed of two pistons M and N, secured to the valve-stem in such manner that each piston regulates the admission and exhaust of the steam through the ports for each end of the cylinder, as the case may be.

As shown in the drawings, Fig. 1, the piston N permits the admission of steam through port *a'*, while piston M allows the steam to exhaust through ports *a* and *b* into the exhaust-cavity, as indicated by the arrow.

The valve may be adjusted directly to the valve-seat holder D without the cylindrical shell J, and the result will be exactly the same as far as the working of the valve is concerned; but I prefer to carry out this feature in the manner shown and described, as it will be much cheaper to replace the cylindrical shell, if any accident should happen, than it would be to replace the holder.

The pistons are provided with packing-ring *l*, adjusted within a circular depression *m*, cut upon the circumference of the pistons and overlapping upon the projecting edges *n* of the depression, making the ring equal in width with the pistons. Thus, constructed in this manner, when the ring opens the ports the piston does not leave any obstruction in the port, as it will otherwise occur with an ordinary packing-ring.

The pistons are preferably screwed to the valve-stem O, in the manner shown exclusively in Fig. 1 of the drawings, and rest against shoulders *o* *o'*, made upon the valve-stem between the pistons. P is a nut screwed likewise to the stem against piston N and serves as a jam-nut to prevent the unscrewing of the piston. *p* is a pin placed through the

nut and the valve-stem to make a safer attachment; Q, stem extension screwed to the main valve-stem, provided with a flange *q*, corresponding in size with jam-nut P, and used also as a jam-nut to the piston M and provided with a safety-pin *q'*. Thus, the stem made in such manner, I facilitate the inserting of pistons M in the valve-seat, which will be otherwise very difficult. The stem Q passes through an elongated chamber R, projecting outwardly from the chest and supported centrally within said chamber by an adjustable brass bushing S, provided with flange *r*, secured to the flange *s* of projection R; T, cap to cover the end of the stem, also provided with flange *t*; *t'*, studs to secure the cap and bushing to the flange *r* of projecting chamber R. The hole bored through the flange *r* of the bushing, through which the stud *t'* passes, is of an elongated shape to permit the bushing to move up or down within chamber R while adjusting the valve-stem. The valve-stem proper, O, passes out of the steam-chest through the ordinary stuffing-box U, provided also with brass bushing V, working up or down within an elongated opening *n*, bored through the stuffing-box to facilitate the adjustment of the steam-chest joint; Y, the usual adjustable stem-bearing, which may be secured to any suitable place on the engine-frame; W, knuckle-joint attached to the valve-stem to prevent the transmission of any oscillating motions from the stem connections to the valve and facilitate thereby its working.

It will be readily seen that the stem proper and its extension, being held in the manner above described, and clearly shown in Fig. 1 of the drawings, constitute a very important feature of my invention, as the entire weight of the valve will be only on the bearing Y and bushing S instead of the valve-seat, as heretofore. By this method I facilitate considerably the working and prevent, so to speak, the wearing of the valve and its seat, except the packing-rings *l*; but they can be replaced at a trifling cost. Furthermore, I overcome altogether the uneven pressure of the steam, as the valve travels always within its cylindrical seat and pistons M and N, with their connections, being of an even area, so that the pressure of the steam is well equalized at each end of the valve, or, in other words, the valve while moving backward and forward replaces simultaneously the same amount of displaced steam.

Various modifications in the details of construction might be made without departing from the scope of my invention. For instance, the shape of the valve and its seat might be altered with good result; but I prefer to make them cylindrical, as I obtain thereby much cheaper and tighter fitting.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a balance-valve for a steam-engine,

the combination with a valve-casing having a removable cap and independent sides, of an independent removable valve-seat holder formed with an arched top and a flanged base, the flanges extending beneath the sides of the casing, securing-bolts located beyond the flange of the holder securing the casing in place and retaining the sides of the casing in contact with the flanges of the holder and a removable valve-seat in the holder, substantially as described.

2. In a balance-valve for steam-engines, the combination with a valve-seat holder, having an arched holding portion and a flanged base, a casing resting on the flange of the base having a cap or top formed with overhanging edges, and means for securing the casing on the flange arranged beyond and out of contact with the flange, consisting of bolts passing through the overhanging edges and directly into the cylinder-casing substantially as described.

3. In a balance-valve for steam-engines, the combination with a valve-casing, of a valve-seat holder secured in the casing having a holding-section formed with a series of threaded flanges and an alining bore through the holder and flanges and a removable valve-seat formed of a plurality of rib-sections spaced apart having threaded peripheries engaging the threads of the flanges and holder, means for connecting the sections and means for removably securing the seat in the holder, substantially as described.

4. In a balance-valve for steam-engines, the

combination with the valve-casing, of a valve-seat holder having end and intermediate threaded flange-sections and a removable valve-seat formed of rib-sections spaced apart and united with each other and threaded to engage with the flange-sections of the holder, substantially as described.

5. In a balance-valve for steam-engines, the combination with the valve-casing, a valve-seat holder, a valve-stem, two piston-heads removably secured on the stem, a valve-seat in which the pistons work, a removable extension on the stem, a vertically-sliding box in which the extension is secured having a flange thereon, adjusting means engaging the flange, and means for adjusting the opposite end of the stem, substantially as described.

6. In a balance-valve for steam-engines, the combination with a steam-cylinder, of an independent removable valve-seat holder having a plurality of ports therein registering with the ports of the steam-cylinder, a valve-seat formed with rib-sections spaced apart and having screw-threaded peripheries, a shoulder at one end of the seat, the opposite end of the seat extending beyond the holder and having a threaded periphery, and a jam-nut on said extension engaging the sides of the holder, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

S. F. BROUSSEAU. [L. S.]

Witnesses:

C. PELLETIER,

JOHN D. WHALEY.