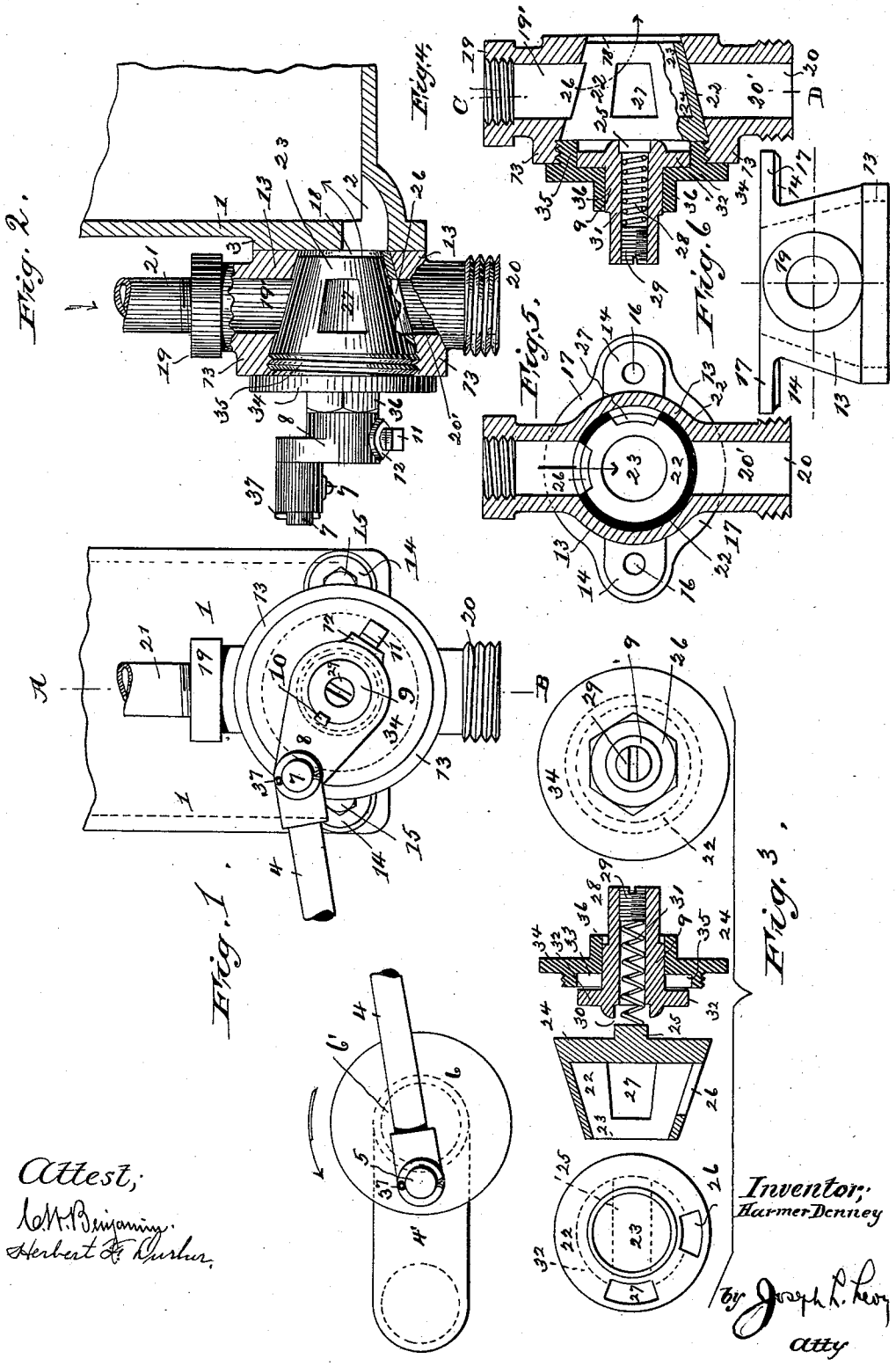
(No Model.)

H. DENNEY.

VALVE FOR STEAM ENGINES.

No. 483,996. Patented Oct. 11, 1892.



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VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 483,996, dated October 11, 1892.

Application filed January 12, 1892. Serial No. 417,788. (No model.)

To all whom it may concern:

Be it known that I, HARMER DENNEY, a citizen of the United States of America, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Valves for Steam-Engines, of which the following is a specification.

My invention relates to valves for governing the exhaust and entry of steam to and from a power-cylinder, and refers more particularly to that class which are known as "oscillating valves," although my valve could have a continuous rotary movement.

My invention primarily consists in the novel construction and arrangement of parts in the valve which are adapted specially to reduce the friction of the same, the most important feature of which is the holding of the valve to its seat by a spring and means for adjusting the tension thereof by the pressure of the atmosphere, and the arrangement by which these functions are secured is such that the parts may be readily assembled or disassembled.

The present invention involves the structure shown and described in an application filed by me on the 4th day of September, 1891, serially numbered 404,754.

In the accompanying drawings, forming part of this specification, Figure 1 is a front elevation of the valve and its casing attached to a portion of the power-cylinder, showing the crank-arm, disk-crank, and connecting-rod for operating the valve; Fig. 2, a side elevation of the valve and its casing attached to a portion of the power-cylinder, partly in section, taken approximately on the line A B, Fig. 1. Fig. 3 embraces front and end views of the valve and also a side view, showing the valve cap, stem, and body in section; Fig. 4, a sectional elevation of the valve and its casing, taken approximately on the line A B, Fig. 1; Fig. 5, a sectional elevation through the valve and its casing, taken approximately on the line C D, Fig. 4; Fig. 6, a plan of the valve-casing.

Similar figures of reference refer to like parts throughout the several views.

In the application before referred to the present invention is applied to a pumping-engine adapted for use for domestic purposes in which the piston of the power-cylinder is operated on the downstroke by atmospheric pressure and steam of about one atmosphere is caused to blow through the power-cylinder and thence into a condenser for the purpose of creating a vacuum to enable the atmosphere to operate the piston. My present invention, however, is not limited in its use to an engine of that class, as it may be used in an engine in which the piston is operated in both directions by steam-pressure. I have therefore not considered it necessary to illustrate a power-cylinder complete nor power-absorbing instrumentalities, it being considered for the purpose of this invention only necessary to show a cylinder in which the expansive force of steam may be utilized to move a piston and in which a vacuum could also be created. However, as the present structure is used and has been shown and described in the before-mentioned application with and in reference to an engine which is operated by atmospheric pressure I will continue such association here without limiting myself to that use, as before set forth.

The valve governing the entry and exhaust of steam is secured to the lower part of the power-cylinder 1, a proper port of entry and exhaust 2 being provided within a boss 3, cast integral with the power-cylinder, to which boss the valve-casing is secured.

The valve here shown and described is of the oscillating type, although it may have a continuous rotary motion, as before set forth, and is operated by means of the connecting-rod 4, secured to the crank-arm 5 of the disk-crank 6 at one end and to the pin 7 on the rocker-arm 8, fast upon the valve-stem 9, at the other end. The rocker-arm 8 may be made fast to the valve-stem 9 by means of either the pin 10 in the usual manner or by the set-screw 11, set in the lug 12 on the rocker-arm. If the set-screw 11 is used, an adjustment may be had which will control the oscillation of the rocker-arm 8.

The power-absorbing devices are not fully illustrated herein, as a full, clear, and exact description of said devices is had in the application before referred to. In this case, however, I have shown the crank-arm 4′, to which

a connecting-rod is secured, the disk-crank 6 being secured upon one end of the short shaft 6′, (shown in dotted lines,) to which the crank 4′ is also secured. The shaft 6′ is set in suitable bearings, its rotation being indicated by the arrow.

The power-cylinder 1, as before set forth, is cast with the boss 3, to which the valve-casing 13 is secured by means of the ears or flanges 14 and bolts 15, the said ears being provided with bolt-holes 16 for this purpose. The casing is also provided with a concentric flange 17, upon which the ears 14 are formed, for the purpose of enabling it to better fit the boss 3. The inner face of the valve-casing is apertured, as at 18, Figs. 2 and 4, which aperture aligns with the port 2 in the boss 3, and which port alternately acts as a port of inlet and exhaust. If the valve is used as a rotary valve, proper port or ports of entry and exhaust would have to be constructed for it.

The valve-casing is provided with two elbows 19 20, which are apertured, the elbow 19 being interiorly threaded for the reception of the steam-pipe 21, which leads to a suitable source of supply, the lower elbow 20 being exteriorly threaded to connect it with the exhaust. As this featare is unimportant in this case, it is not my intention to limit myself to threading the elbows either exteriorly or interiorly for the purpose of receiving the steam and exhaust pipes. Two channels 19′ (the steam) and 20′ (the exhaust,) lead to the valve.

The valve 22 is cast in the form of a truncated cone, the valve-casing being likewise interiorly conformed and ground to make a proper steam-tight seat for the valve. The inner end 23 of the valve is open, the opposite end 24 being closed. This end is provided with a rib 25, which is diametrically extended across the said closed end. The steam-port 26 and the exhaust-port 27 are cut in the face of the valve, they being so distanced apart that at every quarter-turn of the disk-crank 6 they will alternately open and close the entry and exhaust ports.

As before stated, this valve was for the special purpose of adapting it to the low pressure used in the pumping-engine of my application before referred to, and by reason of this and also by reason of the general benefit which will be derived by the following, whether used in that class of engine or not, I desire to reduce the friction of the moving parts as much as possible, and to that end I have provided that the valve may be permitted to have a slight movement radial to its perpendicular axis without pressing the valve onto its seat by nuts and bolts, as has hitherto been done, so far as I now know, so as to make the union between the valve-body and valve-stem a flexible one, and I furthermore provide means for regulating the pressure of the valve on its seat at will without necessitating the uncapping of the valve-casing or resorting to any of the usual expedients for such regulation. By this flexible union of the valve and stem I can utilize atmospheric pressure (when a vacuum is created in the power-cylinder) for the purpose of assisting a spring or other equivalent means to keep the valve on its seat, and in some cases I can dispense with the spring altogether.

The valve-stem 9, to which the rocker-arm 8 and connecting-rod 4 are secured, is apertured, as shown at 28, Figs. 3 and 4, and is interiorly screw-threaded to receive the abutment-screw 29, which should be fitted steam-tight. The inner end of the valve-stem is slotted transversely, as at 30, Fig. 3, to receive the rib 25, they being so proportioned in relation to each other that a slight movement can be had between them. Between the abutment-screw 29 and rib 25 a spiral spring 31 is placed, its tension being regulated by the screw 29. The inner end of the valve-stem is further provided with a disk-like flange 32, which is adapted to fit upon the inner face 33 of the casing-cap 34 within an exteriorly-screw-threaded annulus 35, formed integral with the said casing-cap, said casing-cap being thereby adapted to close the open end of the valve-casing, the flange 32 of the valve-stem and the inner surface of the casing-cap 34 being ground together to make joint. The cap 34 is also provided with a nut 36, by means of which it can be screwed home or unscrewed.

It will be seen by reference to Figs. 1 and 3 that the abutment-screw 29 is readily accessible, the only act necessary to regulate the tension of the spring 21 being the application of a screw-driver to said screw. The connecting-rod 4 is secured upon the crank-arm 5 of the disk-crank 6 and the pin 7 of the rocker-arm 8 by the split pins 37, although any means of securing those parts together can be used. It will be seen by this arrangement that the tendency is to reduce the friction of the moving parts to a very small degree, doing away with the necessity of packing, as the valve can be said to pack itself, and I am further enabled to expeditiously adjust, assemble, and disassemble the parts thereof, the arrangement of parts permitting the atmosphere to press the valve on its seat should a vacuum be used in a power-cylinder, as hereinbefore set forth.

Many changes and modifications may be made in the structure and relation of parts herein described and illustrated without departing from the spirit of my invention.

What I claim is—

1. A valve having an open end and a closed end and interiorly chambered and steam and exhaust-ports leading from its exterior to the interior, the open end acting alternately as a steam and exhaust port and leading to a cylinder, substantially as described.

2. A conoidal valve having an open end and a closed end and interiorly chambered, steam and exhaust ports, the open end acting alternately as a steam and exhaust port and lead-

ing to a cylinder, and a rib on the closed end having a valve-stem flexibly secured thereto, substantially as described.

3. A valve having an open end and a closed end, a rib on the closed end, steam and exhaust ports, the open end acting alternately as a steam and exhaust port and leading to a cylinder, a stem flexibly secured to the rib, and a spring between the rib and stem, substantially as described.

4. A valve having an open end and a closed end, a transverse rib on the closed end, a jawed stem flexibly engaging the rib, a spring between the rib and stem, and means in said stem for adjusting the tension of the spring, substantially as described.

5. A valve having an open end and a closed end, a rib on the closed end, a hollow stem flexibly secured to the rib, a spring in the hollow stem, and a set-screw in one end of the stem, the spring normally bearing against the set-screw and rib, substantially as described.

6. A valve-casing, a valve having an open end and a closed end seated in the casing, a rib on the closed end of the valve, a flange-stem flexibly secured to the rib, and a spring between the rib and stem, the said flange on the stem bearing against a portion of the casing, substantially as described.

7. A conoidal valve having an open end and a closed end and interiorly chambered, steam and exhaust ports leading to the chamber, a casing having a conoidal seat for the valve and a mutual steam and exhaust port aligning with the open end of the valve, a stem flexibly secured to the valve, and means carried by said stem for packing it and pressing the valve to its seat, substantially as described.

8. A conoidal valve having an open end and a closed end and interiorly chambered, steam and exhaust ports leading to the chamber, a casing having a conoidal seat for the valve, a flanged stem, the flange bearing on a portion of the valve-casing, and a spring between the valve and stem, substantially as described.

9. A conoidal valve having an open end and a closed end and interiorly chambered, steam and exhaust ports leading to the chamber, a casing having a conoidal seat for the valve, a rib on the closed end of the valve, a flanged stem flexibly secured to the rib, and a spring between the rib and the stem, the spring pressing the valve to its seat and the flanged stem against a portion of the casing, substantially as described.

10. A valve-casing having outwardly-extending apertured elbows, an orifice extending through the casing, a cap for closing one end of the orifice, a valve having an open end and a closed end within said orifice, the open end of the valve being adjacent to the open end of the orifice, a rib on the closed end of the valve, and a stem flexibly secured to the rib extending through the said cap, substantially as described.

11. A valve-casing having outwardly-extending apertured elbows, an orifice extending through the casing, a cap for closing one end of the orifice, a valve having an open end and a closed end within said orifice, the open end of the valve being adjacent to the open end of the orifice, the valve being interiorly chambered, steam and exhaust ports in the valve, a stem on the valve extending through the said cap, and means for pressing the valve to its seat and packing the stem, substantially as described.

12. A valve conformed to a frustum of a cone and interiorly chambered, having an open and closed end, steam and exhaust ports in the valve, a valve-casing surrounding the valve and having a steam-inlet and an exhaust-outlet, and means for alternately aligning the steam and exhaust ports with the steam-inlet and exhaust-outlet, substantially as described.

13. A valve-casing 13, having the aperture 18 at one side, apertured cap 32 at the other, outwardly-extending apertured elbows 19 20, flange 17, and outwardly-extending ears 14, substantially as described.

14. A valve having an open and closed end, a rib on the closed end, a hollow stem flexibly secured to the rib, a spring in the stem bearing on said rib, and a set-screw adapted to move in said stem against the spring, substantially as described.

Signed at the city, county, and State of New York this 11th day of January, 1892.

HARMER DENNEY.

Witnesses:

HERBERT F. DURBUR,

M. E. STODDARD.