No. 642,039. Patented Jan. 23, 1900.

W. L. GARRELS.

THROTTLE VALVE.

(Application filed July 24, 1899.)

(No Model.)

Fig. I.

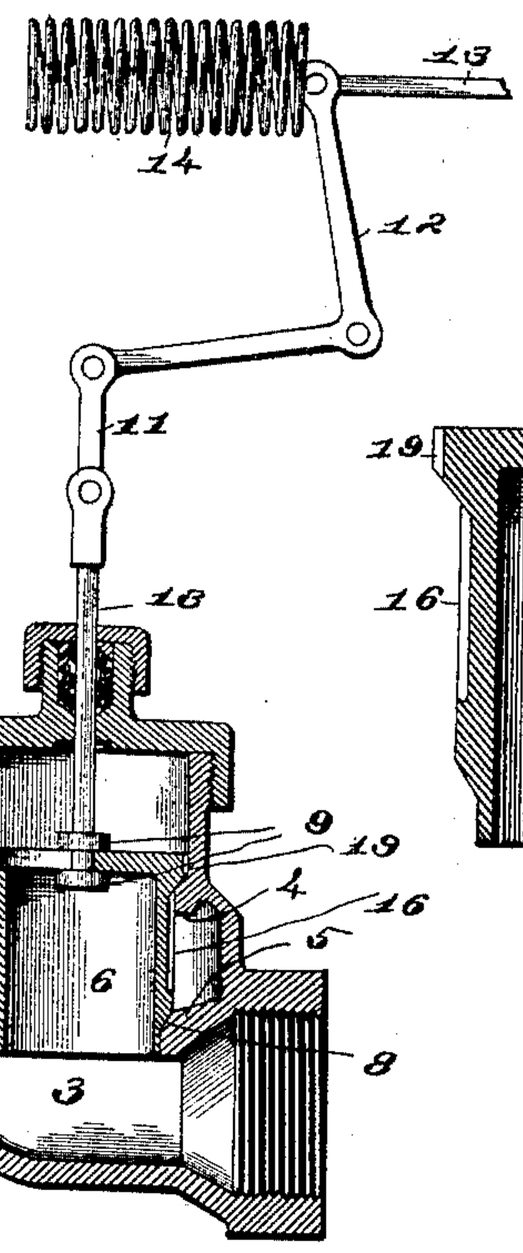


Fig. II.

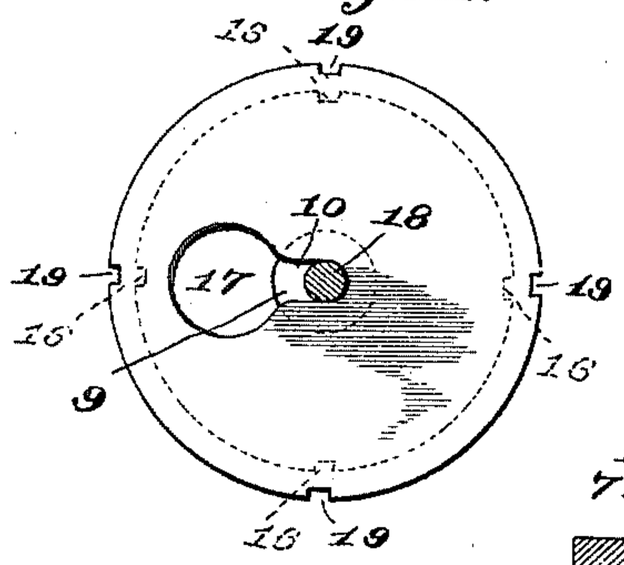


Fig. III.

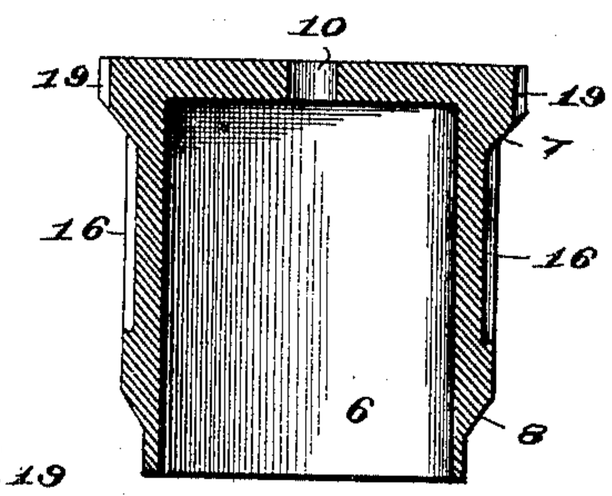
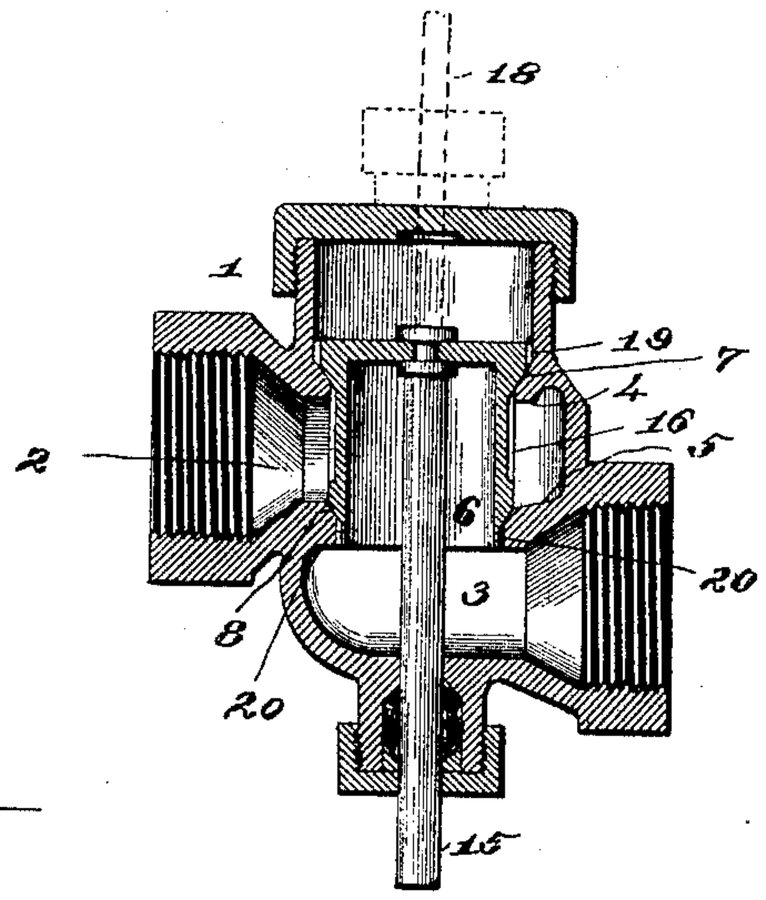


Fig. IV.



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UNITED STATES PATENT OFFICE.

WILLIAM L. GARRELS, OF ST. LOUIS, MISSOURI.

THROTTLE-VALVE.

SPECIFICATION forming part of Letters Patent No. 642,039, dated January 23, 1900.

Application filed July 24, 1899. Serial No. 724,879. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. GARRELS, a citizen of the United States, and a resident of the city of St. Louis and State of Missouri, have invented a new and useful Throttle-Valve, of which the following is a specification.

My invention relates to valves, and has for its principal object to produce a valve which can be operated with slight power, which will have a tendency to close and remain closed, and which will be simple and cheap in construction.

To these ends my invention consists in the construction and combinations of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur, Figure I is a central sectional view of my valve. Fig. II is a plan of the valve-plug. Fig. III is a central sectional view of the valve-plug at right angles to the plane of Fig. I, and Fig. IV is a central section of a modification.

The valve-casing 1 has a main chamber, preferably cylindrical, provided with an admission-port 2 at the side thereof and an exhaust-port 3 at the bottom. Two annular flanges 4 5 are formed on the inner wall of the chamber, one above and the other below the admission-port. The lower flange 5 projects farther inwardly than the upper flange 4, so that the opening through the upper flange is larger than the opening through the lower flange. The upper edge of each of these flanges is beveled to form a valve-seat and the inner faces thereof constitute guides for the valve-plug 6.

Inside of the valve-chamber is a reciprocating valve-plug 6, which has beveled shoulders 7 8, adapted to fit the respective beveled valve-seats simultaneously. The sectional area of the plug through the lower valve or shoulder is equal to the area of opening through the upper flange, so that when the plug is cylindrical there is no tendency of the steam to move the valve in any direction. When the two valves are connected by a stem of less diameter, the area exposed to the upward pressure of the steam is the same as that exposed to downward pressure, and the plug remains balanced. The space in the chamber above the valve-plug is in open communication with the space below said plug. A suitable device for maintaining such communication is to form a hole 17 through the plug, as shown in Fig. II; but other means of communication may be used. Preferably the plug is made hollow in order to make it light, in which case the end of the valve-stem 18 may be formed with two parallel shoulders 9, spaced apart the thickness of the end of the hollow plug, and the hole through said end is made large enough to let the lower shoulder pass and has a lateral extension 10 to the center of the plug of sufficient size to accommodate the part of the valve-stem between said shoulders. The stem may thus be attached simply by passing the lower shoulder through the hole and then centering the stem in the plug, as in a buttonhole-joint. The stem of the valve-plug passes through a stuffing-box in the cap of the valve-case and is actuated by any suitable device. In Fig. I the valve-stem is connected by a link 11 to a bell-crank lever 12, which is pivotally connected to a reach-rod 13, adapted to be manipulated by a hand-lever. (Not shown.) A bell-crank lever has a helical extension-spring 14, fastened thereto and arranged to maintain a force thereon which tends to seat the valve-plug when the valve is open. Obviously this same effect may be produced by substituting a different form of spring or other equivalent device in place of the helical extension-spring, and any suitable connecting devices may be used instead of the link and bell-crank lever.

The operation of my device is as follows: When the valve is closed, the boiler-pressure is the same on all sides of the plug. As the pressure per square inch in the valve-chamber is the same above the plug as below it and the upper end of the plug is of larger area than the lower end, there is an excess pressure against the upper end, which tends to keep the plug on its seat. When the plug is raised by manipulation of the hand-lever, the pressure on the plug is balanced, except for the amount by which the steam-pressure on an area equal to the sectional area of the valve-stem exceeds the atmospheric pressure on such area less the weight of the plug.

This unbalanced pressure tends to open the valve; but it is slight and is overbalanced by the spring, so that the plug tends to close even when open.

Fig. IV illustrates a modification wherein the tendency of the valve to close and remain closed is secured without springs or connecting devices. This modification consists merely in mounting on the valve-plug a second stem 15 opposite the first. This second stem extends through a stuffing-box in the bottom of the valve-case into the open air and has no connection to other parts. In this construction, when the plug is open, there is atmospheric pressure on the outside part of the two stems, while the remaining areas are exposed to boiler-pressure. Thus the smaller the upper valve-stem the larger is the area exposed to steam-pressure, and if the diameter of the lower stem is larger than the diameter of the upper stem there is an excess pressure on the upper end of the plug tending to seat it equal to the amount by which the boiler-pressure on an area equal to the difference between the cross-sectional areas of the two valve-stems exceeds the atmospheric pressure thereon. When a throttle-valve is closed, the pressure on the exhaust side usually becomes approximately the same as atmospheric pressure, in which case, owing to the excess area of the upper plug-surface exposed to said pressure, there is a tendency of the valve to remain on its seat. As a further development of this modification the upper valve-stem may be omitted and the manipulating devices attached to the lower stem.

As the valve-plug ought to fit nicely in its guides, I prefer to cut longitudinal slots 16 in the plug to avoid the formation of a vacuum when the plug rises from its seat. These slots extend from the upper beveled valve of the plug down opposite the steam-port, as shown in Fig. III. The pressure of the steam thus admitted between the upper valve and its seat may be balanced by slotting the upper edge of the plug down to the edge of the bevel, as shown at 19 in Fig. III, or such pressure may be balanced by having the lower edge of the plug slotted up to the lower bevel, as shown at 20 in Fig. IV, or both the upper and lower edge may be slotted.

Among the special advantages of this construction not hereinbefore specified are the following: The guides do not obstruct the steam-passage. The spring or other automatic retracting device is not exposed to the steam. The packing is only exposed to boiler-pressure when the valve is open. No water is trapped in the valve. The parts are so designed that they can be made with automatic machinery. There is practically nothing to get out of adjustment or repair, and the spring is accessible at all times. While the valve is primarily designed as a throttle-valve for steam-engines, it is capable of use for other purposes, and I do not wish to restrict myself to any particular purpose or form of construction. For instance, the chamber may be a plain cylinder without flanges and the valve-plug may be a plain cylinder fitting therein.

What I claim is—

1. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, two flanges on the inner wall of said chamber above and below the admission-port respectively and constituting valve-seats, and the lower flange extending farther inwardly than the upper flange, and a cylindrical plug having shoulders to fit said valve-seats simultaneously, substantially as described.

2. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, two flanges on the inner wall of said chamber above and below the admission-port respectively and constituting valve-seats, two valves rigidly connected to fit said valve-seats simultaneously, the sectional area of the lower valve being equal to the area of opening through the upper flange and said device having an open communication on the exhaust side between the spaces above and below said valves, substantially as described.

3. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, two flanges on the inner wall of said chamber above and below the admission-port respectively and constituting valve-seats, and the lower flange extending farther inwardly than the upper, and a plug having shoulders to fit said valve-seats simultaneously, said plug having a hole therethrough whereby the space above said plug is in open communication with the space below it, substantially as described.

4. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, two flanges on the inner wall of said chamber above and below the admission-port respectively and constituting valve-seats, two valves rigidly connected to fit said valve-seats simultaneously, said device having an open communication on the exhaust side between the spaces above the upper valve and below the lower valve, and a spring or equivalent device connected by suitable connecting devices to the stem for forcing said valves toward their seats, substantially as described.

5. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, two flanges on the inner wall of said chamber above and below the admission-port respectively and constituting valve-seats, the lower flange extending farther inwardly than the upper, and a plug having shoulders to fit said valve-seats simultaneously, said plug having a hole therethrough whereby the space above said plug is in open communication with the space below it, and said plug having a stem extending through the lower end of the casing whereby the area

of steam-pressure is equal to or greater on the upper than on the lower end of the plug, substantially as described.

6. A valve comprising a casing having a chamber provided with an admission-port and an exhaust-port, a plug adapted to open and close said admission-port, said plug having a hole therethrough whereby the space above said plug is in open communication with the space below it, and said plug having a stem extending through the lower end of the casing whereby the area of steam-pressure is equal to or greater on the upper than on the lower end of the plug, substantially as described.

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