

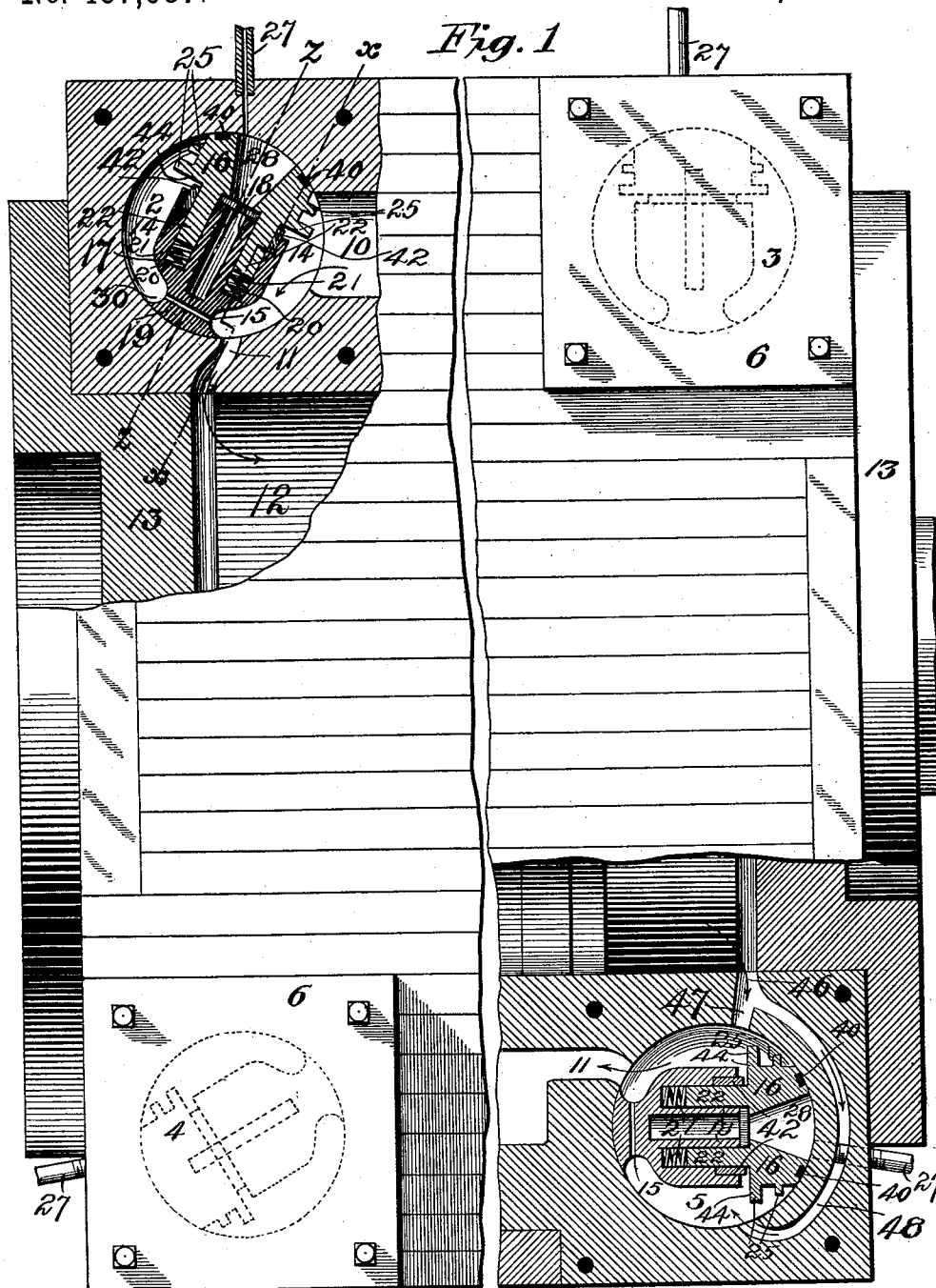
(No Model.)

2 Sheets—Sheet 1.

F. D. TOUCEY.
ROTARY VALVE.

No. 487,687.

Patented Dec. 6, 1892.



Witnesses,
C. E. Van Dorin,
O. Hawley.

Inventor,
Ferris D. Toucey.
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Fig. 2.

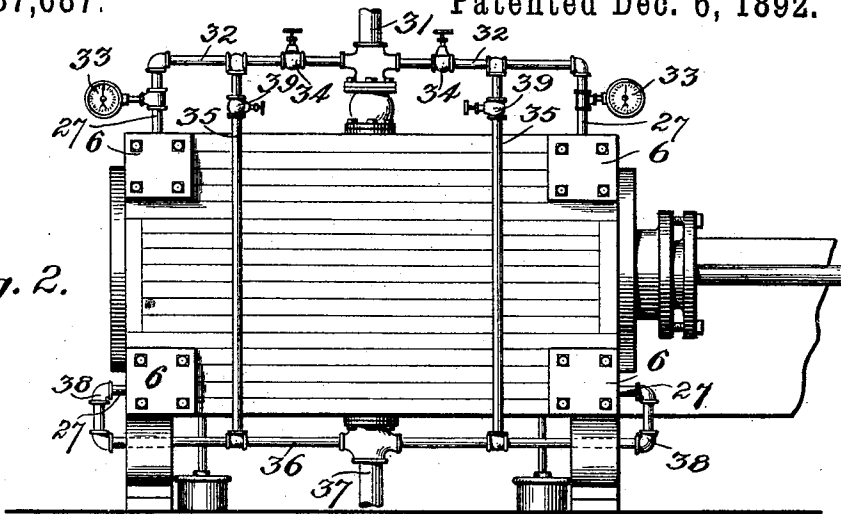


Fig. 3.

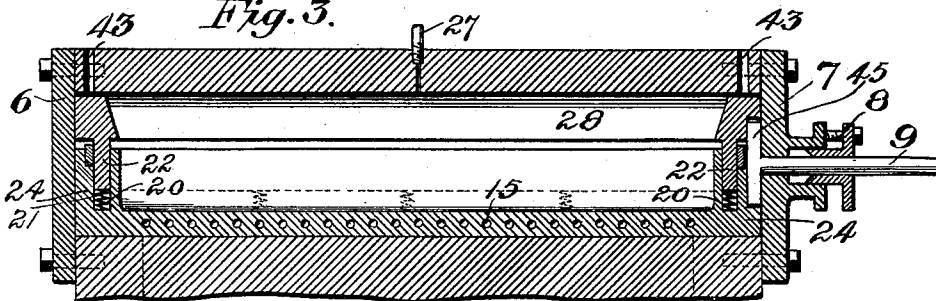


Fig. 4.

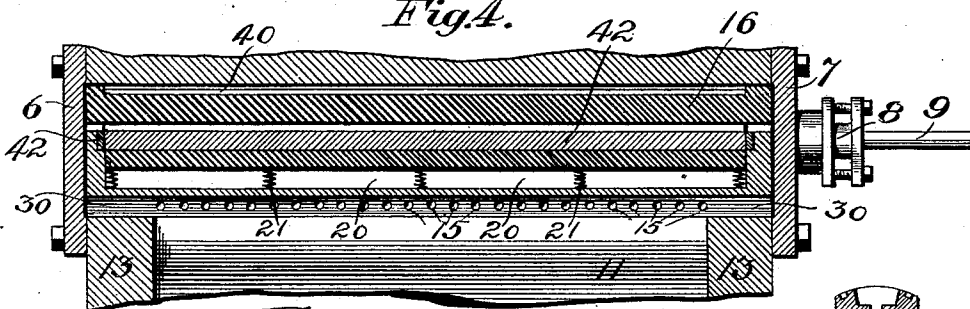


Fig. 5.

Fig. 6.

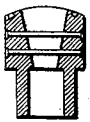


Fig. 7.

Witnesses,

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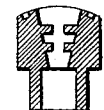
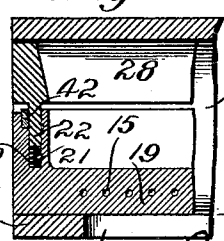
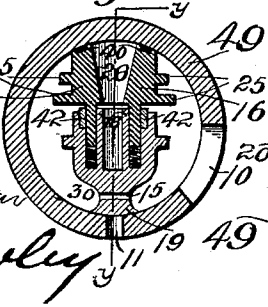


Fig. 8.

Inventor,

Ferris D. Toucey,

by Paul Merwin attys.

UNITED STATES PATENT OFFICE.

FERRIS D. TOUCEY, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF THREE-FOURTHS TO FRANKLIN C. JOHNSON, OF SAME PLACE.

ROTARY VALVE.

SPECIFICATION forming part of Letters Patent No. 487,687, dated December 6, 1892.

Application filed November 7, 1891. Serial No. 411,137. (No model.)

To all whom it may concern:

Be it known that I, FERRIS D. TOUCEY, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Rotary Valves, of which the following is a specification.

My invention relates to rotary valves for Corliss engines; and its object is to accurately balance such valves, and thereby greatly reduce the power required to operate the same.

To this end my invention consists in a rotary valve arranged within a cylindrical sleeve or chamber having inlet and outlet ports and consisting in two rectangular telescoping-sleeves occupying a diametrical position in said chamber and provided with ends or edges to fit the same steam-tight. In means for reseating the same in case they are forced away from the walls of the cylinder by high steam-pressure or by a vacuum from within the rotary valve itself, and in various details of construction and in combination, all as hereinafter described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 shows a steam-cylinder, partly in section and provided with valves embodying my invention, the middle part of the cylinder being broken away in order that the valve may be shown on a large scale. Fig. 2 is an elevation of a cylinder and the steam-pipe connections thereof. Fig. 3 is a section of one of the rotary valves, the section being taken on the line *z z* of Fig. 1. Fig. 4 is a similar view on the line *x x* of Fig. 1. Fig. 5 shows a valve arranged within a sleeve, adapted to be inserted into the valve-cylinder of an old Corliss engine, the ports of the same being thus made to conform to my valve. Fig. 6 shows one end of this valve in section, as seen from the line *y y* of Fig. 5. Figs. 7 and 8 show two ways of strengthening the valve.

As shown in the drawings, my valves are arranged in the upper and lower corners of the Corliss-engine cylinder-casting. The sleeves or cylinders 2, 3, 4, and 5 for containing the valves are closed at the ends by the plates 6 and 7, the latter being provided with

the stuffing-box 8 to prevent the escape of steam around the valve-rod 9. The upper left-hand corner of the cylinder is broken away to show the valve-cylinder 2, the steam-chest 10, and the admission-port 11 leading into the steam-cylinder 12, the ends of which are closed by the ordinary heads 13. The rotary valve is shown in position in this cylinder 2 and is thrown back to open the port 11. A steam-space 14 is left on each side of the valve and the steam-pressure is equalized therein through the openings 15, leading through the bottom of the valve and of sufficient number and area to allow a free passage of the steam. These openings are also shown clearly in Figs. 3 and 4. Without these openings the pressure on the steam-chest side of the valve would spring the valve, so as to bind the surfaces thereof against the walls of the transverse cylinder, thereby rendering the movement of the valve difficult or entirely preventing the two halves of the valve from having free telescopic movement occasioned by the compression under the lower half of the valve.

My valve bridges the cylinder and is composed of two parts telescoping into one another and ordinarily made of a single piece, as shown, each pipe being of a substantially-rectangular cross-section. The upper part of the valve telescopes into the lower part 17, having the inner walls 18, which in turn telescope into the upper part. In transverse section the lower part of the valve presents the form of a thick cup having a flaring bottom 19 to be thrown across the port 11 and provided with the deep rectangular groove 20, wherein the springs 21 are arranged and into which the lower edges or flanges 22 of the upper part 16 extend. In the longitudinal section, however, it will be seen that this lower part extends the full length of the rotary-valve cylinder or steam-chest. The ends 24, as shown, are carried out to make nice joints with the inner surfaces of the end or head plates 6 and 7. The upper part is provided, also, with the flanges 22 at its end, the grooves 20 being extended around in the ends of the lower part of the valve to receive the same and springs being arranged therein just as on the sides. The upper part of the valve is

made strong in any case; but to additionally strengthen the sides of the same against springing inwardly I provide the ribs 25, extending along the sides thereof, as shown plainly in Figs. 1 and 5. The inner part is also hollow, the opening passing clear through the same, so that any steam collecting in this inner chamber of the valve may be exhausted through the small pipe 27, the gap 28 in the top of the part 16 of the valve being wide enough to always leave the end of the pipe 27 open. Another use for this pipe is to reseat the lower part of the valve when from any cause it becomes stuck or cocked in the cylinder, thereby allowing a continuous passage of steam directly from the steam-chest into the cylinder. In such a case the live steam is let into the cavity of the valve through the pipe 27, and pressure being exerted on the bottom of the recess or chamber 30 in the lower part the lower part is forced back over the port. The pipe connections for thus turning on the steam or exhausting the steam are shown in Fig. 2, where it will be seen that the live-steam pipe 31, extending into the steam-chest, has two branches 32, which are connected with the pipes 27, the steam-gages 33 and the globe-valves being included in the pipes 27 and 32, respectively. Hence by opening the valves 34 steam is allowed to pass into the inner chambers of the rotary valves. From points between the valves 34 and the rotary-valve pipes 35 extend down to pipes 36, connecting directly with the main exhaust-pipes 37. The pipes 36 also have branches 38, connecting with the pipes 27 of the lower or exhaust valves of the Corliss engine. By closing the valves 34 and opening the valves 39 a direct collecting is made with the exhaust, whereby it will be seen that all steam connecting in the rotary valves is immediately exhausted, thereby leaving the parts thereof to be influenced only by the springs and steam-pressure on their exterior surfaces. The upper edges of the part 16 are provided with the channels 40, thereby making two steam-surfaces instead of one on each edge. The joints between the two parts of the valve are made steam-tight by means of the packing-blades 42, arranged in grooves provided in the edges of the lower parts. The upper edges of these blades do not touch the shoulder of the upper part, so that either part is free to move with respect to the walls of the containing-cylinder. The springs 21, arranged beneath the edges or flanges of the upper part, or, in other words, arranged between the upper and lower parts of the valve, hold each part well in contact with its seat.

In addition to or taking the place of the spring I sometimes provide the air-ports 43 just above the ends of the upper part, these ports being at all times closed by said surfaces, except when the upper part drops away either from lack of steam-pressure or breakage of springs. These ports or openings 43 allow the immediate and constant exhaust of

all steam collecting between the upper ends of the valve and the walls of the cylinder, and as a consequence there is no pressure above the valve to equalize the pressure on the lower edges or cylinders 44. Hence the upper part of the valve is held continuously with its seat. The valve is operated by the valve-rod 9 engaging the same by means of the key-head 45, for which a recess is provided in the forward end of the valve.

The lower or exhaust valves of the engine are of the same construction as the high-pressure valves, with the exception that for each I arrange the divided port 46, having the two branches 47 and 48, leading into the two sides of the valve-cylinder, whereby the pressure of the exhaust-steam upon the valve is perfectly equalized. The sides of the valve-top may be strengthened, also, by inside ribs or by stay-bolts, as shown in Figs. 7 and 8.

Where an old Corliss engine is to be fitted with my valves, I insert a sleeve 49 into each of the original rotary-valve cylinders, thereby securing without trouble or delay proper seats and ports for the valve.

I thus provide valves which elastically engage the walls of the valve-cylinders and which are practically balanced, so that they may be operated by the least possible power, thereby saving both the power otherwise consumed in the engine, rendering the valve more durable, accomplishing a saving of fuel to a given amount of work done, and greatly lessening the liability of engines breaking down, and, further, making a saving in lubricants, owing to the lessening of friction between the valves and the seats therefor.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A rotary valve consisting of two main telescoping parts, one of said parts having an edge adapted to close the port, means for oscillating the valve, one of said parts provided with holes or ducts 15, wherethrough steam may pass to equalize the pressure upon both sides of the valve, and means provided for holding both edges of the valve firmly against the seats provided therefor and for preventing the passage of steam between said parts, substantially as described.

2. The combination, with an engine-cylinder, of a rotary-valve cylinder or sleeves arranged therein, a port 11, connecting the two, means for leading the live steam into said valve-cylinder and a rotary valve arranged in said cylinder, means for operating the same, said valve consisting of telescoping parts and being provided with a normally-closed internal cavity, one of said parts adapted to close said port 11, means for holding both parts in contact with the walls of said cylinder, and means for the exhaust or inlet of steam from or to the cavity of said valve, whereby the valve may be collapsed or resealed, as desired, substantially as described.

3. The combination, with the containing-

cylinder provided with a port or ports, of a valve arranged longitudinally in the same and diametrically bridging said cylinder, said valve constituted by a lower part adapted to cover the admission-port and provided with longitudinal slots or channels, springs arranged in said channels, and an upper part having bearings on the opposite walls of the cylinder and telescoping into said lower part and elastically forced upon said walls by said springs in said channels, a chamber being arranged within said valve, and means provided for exhausting the leakage steam therefrom or applying steam to force the lower part of the valve upon its seat, and openings through the bottom of said lower part for supplying steam to the back of the valve to equalize the pressure thereon, substantially as described.

4. The engine-cylinder having in its walls transverse valve-cylinders and admission and exhaust ports, in combination with a two-part valve arranged in each valve-cylinder and having a lower part provided with holes 15, extending through from side to side and having the walls provided with slots 20, springs arranged in said slots, and an upper telescoping part engaging said springs and provided with strengthening-ribs, said valve provided with an internal chamber, and an opening in the upper part extending to the cylinder-wall, means for exhausting steam from said chamber, and means for rotating or oscillating said valve, substantially as described.

5. The combination, with a valve-cylinder, of a two-part rotary valve arranged therein, segmental chambers being left on each side of said valve when in the cylinder, openings wherethrough the steam passes equally to both sides of the valve, an internal chamber arranged within said two-part valve, a packing being provided between the two parts whereby leakage of steam into said chamber is substantially avoided, while said parts are left independently movable, an opening for the exhaust of steam from said chamber, and an opening or openings 43, arranged in the walls of the cylinder above each end of the valve and closed thereby, whereby the pressure thereon is diminished and the valve seated by the force of the steam on its walls, substantially as described.

6. The combination, with a steam-cylinder having the valve-cylinder, of the steam-chest inlet thereto and the admission-port leading therefrom, the two-part valve having its parts independently movable and the lower edge of which is adapted to be rotated to close said admission-port, the other end or edge of the valve to seat against the opposite wall of the cylinder, and the wall of the cylinder provided

with openings or ports 43, arranged to be normally covered thereby, and that part of the valve being provided with surfaces to receive steam-pressure, whereby said part is held in contact with its seat, pressure being thereby relieved from the lower or other part of the valve, substantially as described.

7. The combination, with a steam-cylinder having the valve-cylinder, of the steam-chest inlet thereto and the admission-port leading therefrom, the two-part valve having its parts independently movable and held apart by springs arranged between them, packing being arranged to prevent passage of steam between the parts of the valve, one part of the valve provided with transverse holes or ducts for the equalization of steam-pressure on the sides of the valve, one edge of the valve adapted to close over the admission-port, and air or pressure relief openings or ports arranged at opposite points in the walls of the cylinder and to be at all times closed by the other part of the valve, substantially as and for the purpose specified.

8. The combination, in a rotary valve, of the lower part provided with the grooves or channels 20, springs 21, arranged in said channels, said part provided with openings 15 for the free passage of steam to both sides of the valve, the upper part having the flange 22, adapted to engage said spring, packing-blades arranged between the upper and lower parts, said upper part having the ribs 25, respectively, and an internal opening arranged in the lower part, and the exhaust-pipe 27, connecting with the internal chamber of the valve, substantially as and for the purposes specified.

9. The combination, with the cylinder, of valve-cylinders arranged therein, two-part valves provided in each cylinder, the two parts of each being independently movable, means for holding each part in contact with the wall of the valve-cylinder adapted to receive the same, and an internal chamber arranged within each valve, exhaust-pipes 27, connected with the main exhaust of the engine-cylinder, valves arranged in said pipes, and live-steam connections with said pipes 27, said connections provided, also, with valves whereby the chambers of said valves may be completely exhausted or filled with steam, substantially as described.

In testimony whereof I have hereunto set my hand this 4th day of November, 1891.

FERRIS D. TOUCEY.

In presence of—

C. G. HAWLEY,
F. S. LYON.