No. 756,688. PATENTED APR. 5, 1904.

J. L. McJUNKIN.

STEAM VALVE.

APPLICATION FILED AUG. 28, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

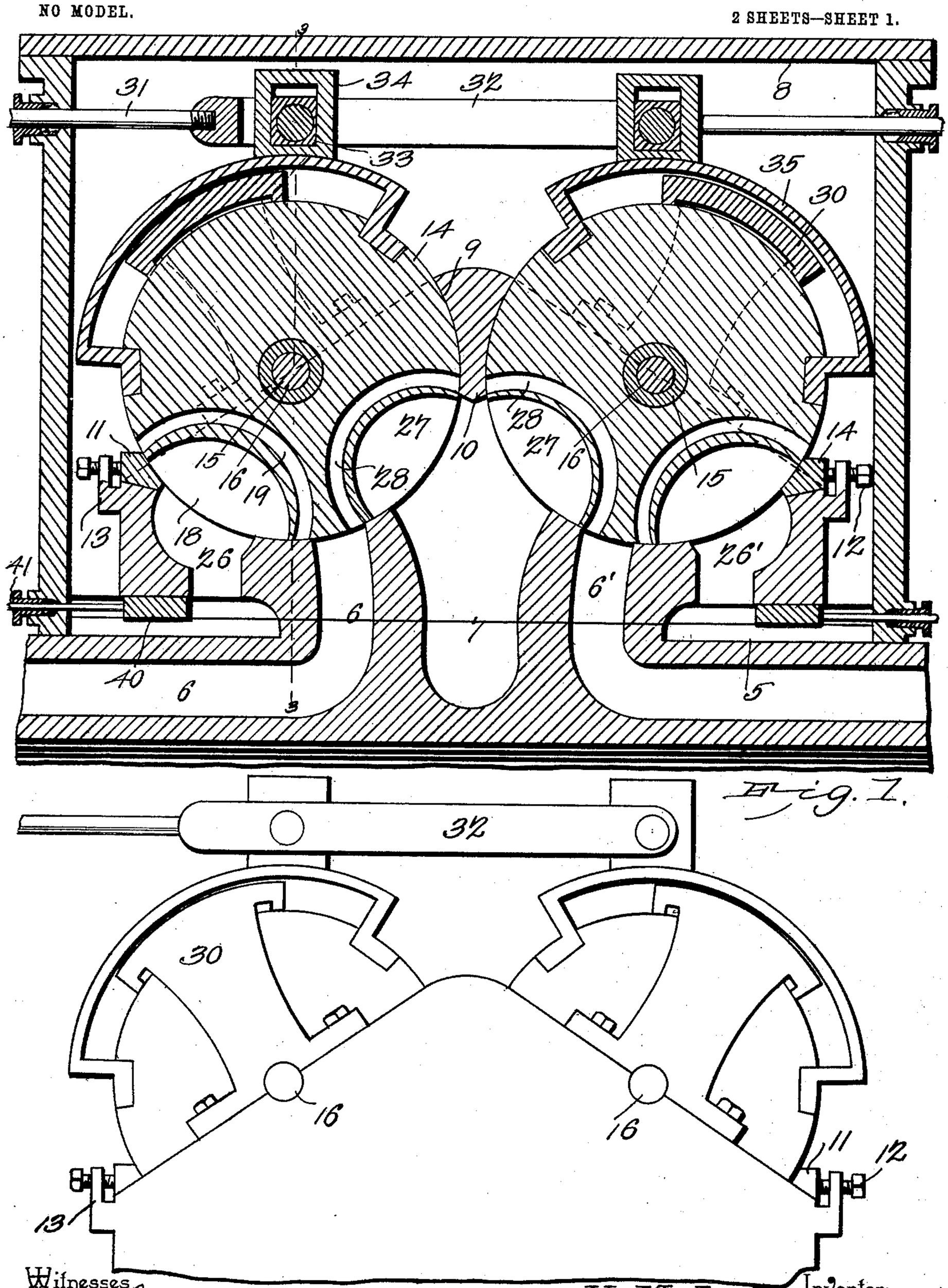

Fig. 1.

Fig. 2.

Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

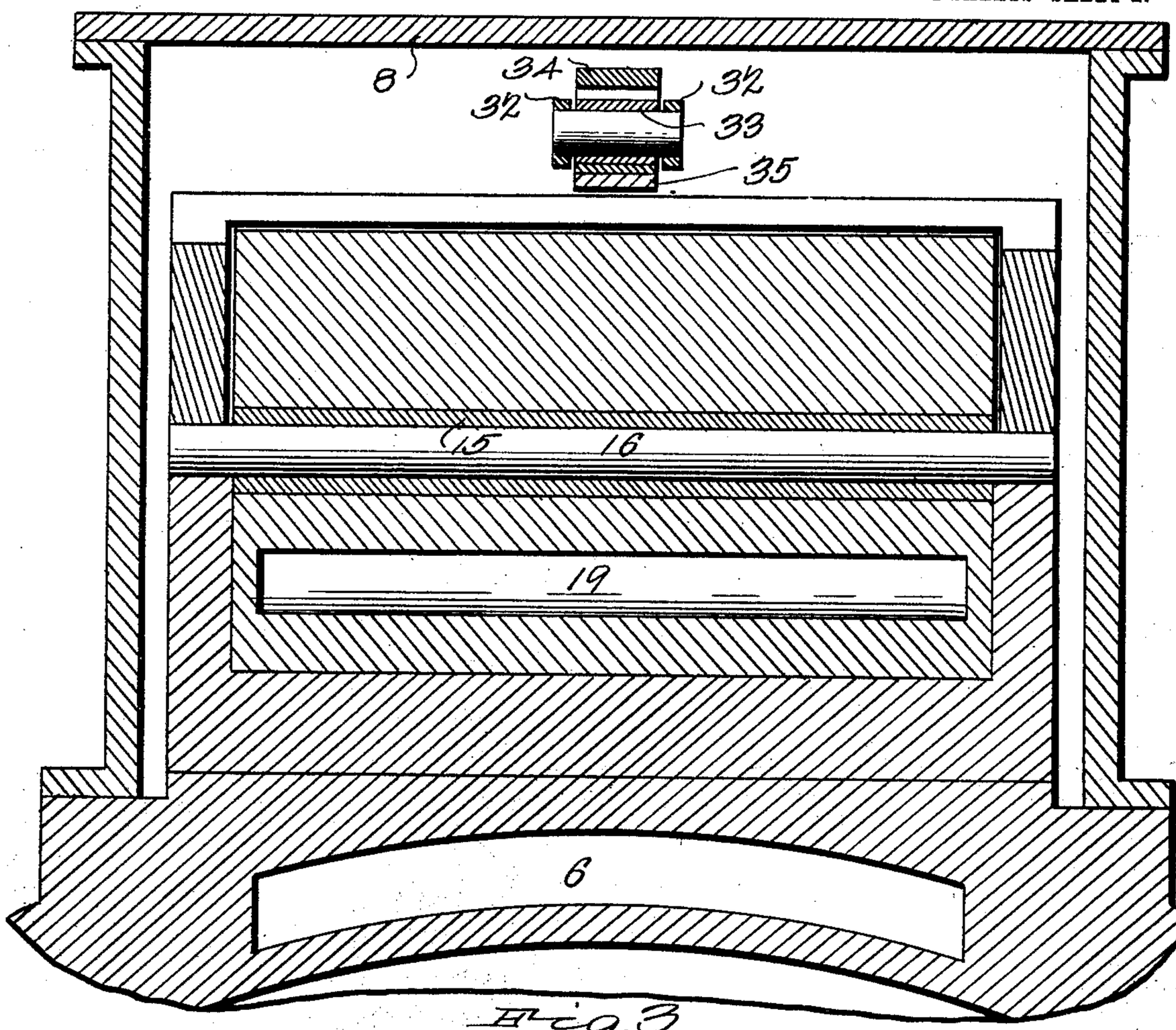

Fig. 3.

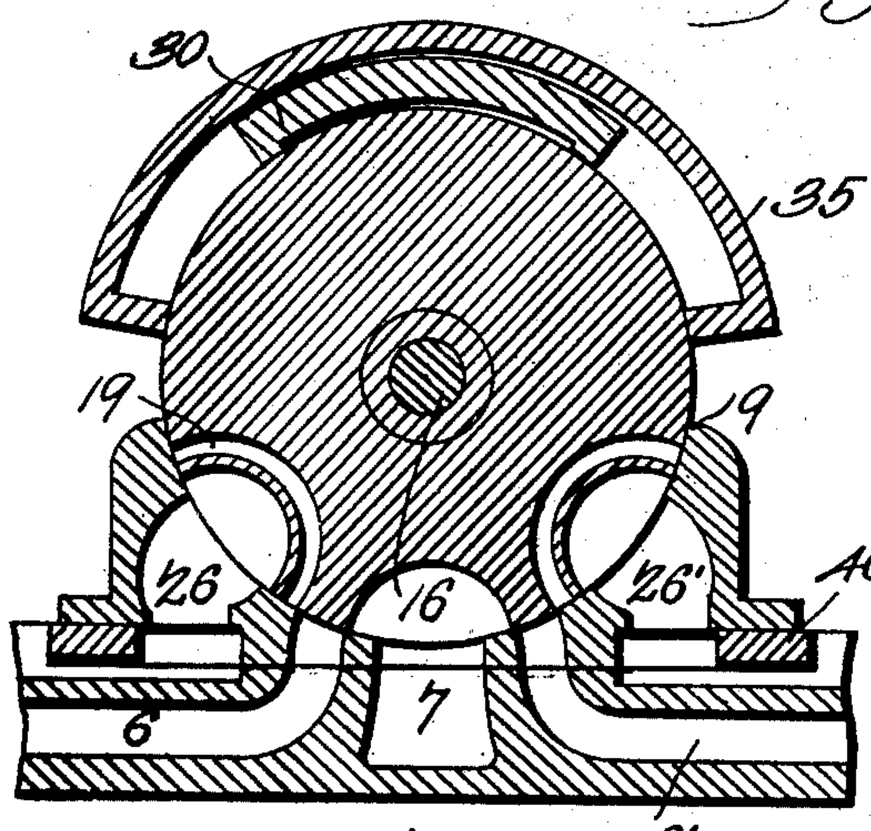

Fig. 4.

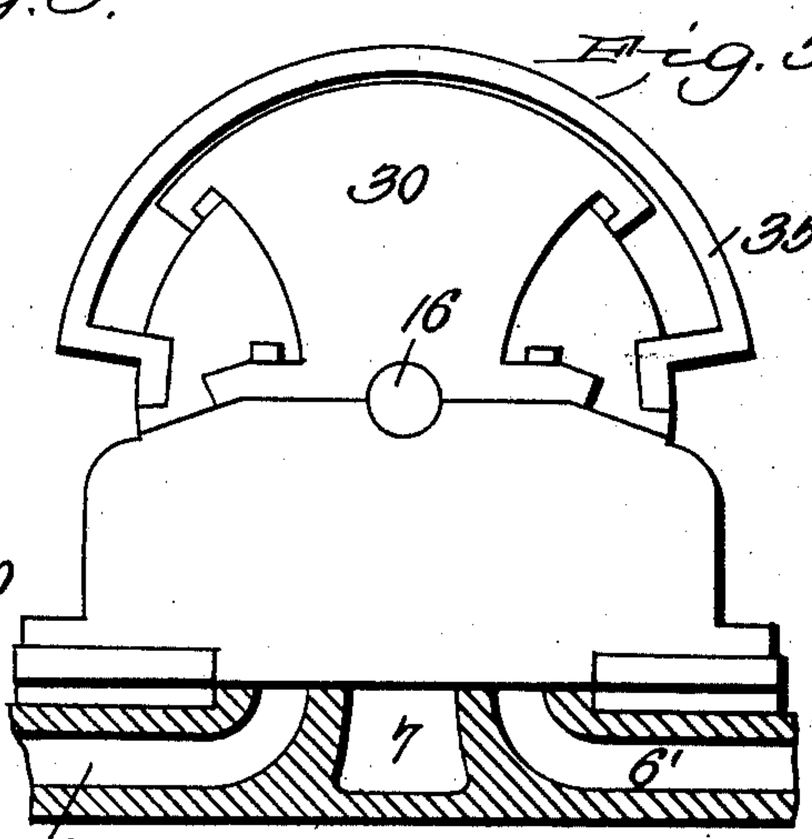

Fig. 5.

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No. 756,688. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

JOSEPH LUTHER McJUNKIN, OF BIRMINGHAM, ALABAMA.

STEAM-VALVE.

SPECIFICATION forming part of Letters Patent No. 756,688, dated April 5, 1904.

Application filed August 28, 1902. Serial No. 121,370. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH LUTHER McJUNKIN, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented a new and useful Steam-Valve, of which the following is a specification.

This invention relates to certain improvements in steam-valves for engines, and while it may be employed in connection with steam-engines of any class it is particularly adapted for use in connection with locomotives where the exhaust is employed to create the draft in the smoke-stack.

One object of the invention is to provide a rotary valve which may be subjected to substantially the same steam-pressure from a number of diametrically opposite points in order to balance the valve and prevent unnecessary friction.

A further object of the invention is to employ a rotary valve in which the surface of the valve exposed to wear and friction will be reduced to a minimum and in which provision is made for compensating for any wear which may occur on the valve-seat or the surface of the valve in contact therewith.

A still further object of the invention is to provide a form of valve which will more readily permit the passage of steam to and from the cylinder and by quickly opening a plurality of ports permitting the ready escape of the steam from the cylinder to the stack without danger of impairing the fire on the grate by the creation of an abnormal vacuum at the stack and, further, to prevent back pressure by permitting the free escape of the steam through a double escape-port having a much larger area than the escape-ports of valves in ordinary use.

A still further object of the invention is to provide a valve of the rotary type with an improved valve-seat from which it may be readily removed when the cap or head of the steam-chest is unbolted, the valve-seat being so arranged as to receive but one-half or less than one-half of the periphery of the valve in order to permit the ready removal of the latter.

A still further object of the invention is to provide means whereby on the breakage or blowing out of a cylinder-head or other accident which would prevent the introduction of steam under pressure to one end of the cylinder the injured end may be cut off from the steam-chest, while the valve mechanism permits the introduction of steam to and its exhaust from the opposite end of said cylinder.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a portion of a steam-chest and cylinder, illustrating the application thereto of a pair of rotary valves constructed and arranged in accordance with my invention. Fig. 2 is an end elevation of the valves and the supporting devices therefor. Fig. 3 is a transverse sectional elevation of the device on the line 3 3 of Fig. 1. Fig. 4 is a sectional elevation of a modification of the invention, illustrating a single rotary valve controlling the two steam and exhaust ports of an engine. Fig. 5 is an end elevation of the modified construction of valve shown in Fig. 4.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the drawings, 5 designates a portion of the cylinder of an engine having two steam-ports 6 and 6′ and an exhaust-port 7, and above said cylinder is arranged a steam-chest 8 of ordinary construction.

The main cylinder-casting instead of terminating at the bottom of the valve-chest is continued up into the central portion of the chest and is provided with two semicircular valve-seats 9, each being substantially semicircular in form and terminating at or below a diametral line to the center of the rotary valve which it is to support. The casting is formed with an integral bridge 10 above the main exhaust-port 7, and the valve-seat is formed

partly on opposite sides of the bridge and partly on opposite sides of the steam-ports, the outer bearings for the rotary valve being in the form of substantially web-shaped blocks 11, held in position by set-screws 12, adapted to threaded openings in lugs 13, projecting from the opposite sides of the main casting, these blocks being adjustable in order to compensate for any wear which may occur on the valve-seat or the surface of the valve in contact therewith.

The rotary valves 14 are each cylindrical in form and are provided with bushings 15, of hardened metal, within which are spindles 16, having their opposite ends seated in recesses in the vertical walls of the main casting, as shown more clearly in Figs. 2 and 3, the bushings turning freely on the metallic spindles and reducing the amount of wear between each valve and its semicircular seat. Each of the rotary valves is provided with a main steam-port 18 in the form of a circular recess and an auxiliary steam-port 19 in the form of a curved channel, both of said steam-ports being movable from the position shown in Fig. 1 to such position as to place either the steam-port 6 or the port 6′ in communication with its corresponding inlet 26 26′, leading from the steam-chest, and each rotary valve is further provided with a main steam-port 27 in the form of a circular recess and an auxiliary curved port 28 immediately to the rear thereof, both of said ports being so arranged as to place either of the cylinder-ports 6 6′ in communication with the main exhaust-port 7. The ends of the ports 27 and 28 are so arranged with respect to the ports 6 and 7 that when the rotary valves are in mid-position, as illustrated in Fig. 1, the slightest movement in either direction will open communication between one of the steam-ports and the exhaust-port through both the main port 27 and the auxiliary port 28 of the rotary valve, permitting by the same extent of movement the escape of double the quantity of steam that could escape through the opening movement of a valve having but a single port. This permits of the ready reduction of steam in the cylinder and prevents all back pressure, it being unnecessary for the incoming steam at the steam side of the cylinder to exercise any appreciable force in exhausting the steam from the opposite end of the cylinder. The double steam-ports of the valve also permit the free flow of steam to the cylinder, a large port area being opened by a comparatively small movement of the valve.

The valve-spindles 16 are confined in place by the opposite ends of a yoke-shaped guard-plate 30, said end portions having semicircular recesses for the reception of the spindles and being bolted or otherwise secured to the upper face of the main casting. The arcuate guard-plate 30 is arranged at a point about diametrically opposite the division-wall between the cylinder steam and exhaust ports, and its end portions are adapted for contact with the periphery of the valve, the wearing-surface being comparatively small, but serving to prevent the pressure of steam from acting on that portion of the valve covered by the plate.

Each rotary valve is exposed to pressure between the bridge 10 and the adjacent edge of the plate 30, and between the adjustable block 11 and the opposite edge of the plate 30, while on its under side the steam passes through the passage 26 and exerts a counterbalancing force on the under side of the valve at a point about diametrically opposite that portion of the valve-surface above the bridge 9. There is also considerable pressure from the exhaust to partly counterbalance the pressure in the surface of the valve between the block 11 and the plate 30, so that the valve will be balanced or nearly balanced without rendering it necessary to employ a closely-fitting valve seat or casing entirely inclosing said valve, such devices being objectionable from a practical standpoint, owing to the friction which must be overcome in turning the valve, the rapidity of wear, and the difficulty compensating for such wear.

In order to simultaneously operate the valves, I employ a valve-rod 31, actuated from any suitable source of power and secured to a pair of spaced bars 32, carrying blocks 33, adapted to guides 34, which are mounted on links 35, secured to the lower valves, and on each block 33 is a pin serving to connect said block to the parallel bars 32.

The valves are operated in the ordinary manner, being oscillated to alternately place the steam-ports 6 6′ in communication with the steam-supply and with the exhaust.

In Figs. 4 and 5 is illustrated a slight modification of the invention, in which a single rotary valve is employed in connection with all three ports leading to and from the steam-cylinder, and in this case the double exhaust-port of the valve has been omitted, while the double inlet-valve ports are retained, the operation being otherwise the same as previously described. Where a single valve is used, it is advisable to place the protecting-plate over the vertical center of the valve and to make the same of a size proportionate to the space occupied by the ports and the valve-seat.

In locomotive engineering the forward cylinder-heads are often broken by contact with an object on the track, or the front or rear cylinder-head may blow out or an accident happen to the gland or other portion of the engine which renders it impossible or inadvisable to admit steam to the injured end of the cylinder, while the remaining end of the cylinder may still remain in condition for active service. In such cases it is usual to entirely disconnect one side of the engine-driving mechanism and proceed slowly with the

single cylinder on the opposite side. To overcome this difficulty and permit the use of the uninjured end of the cylinder, I employ auxiliary cut-off valves 40, mounted in suitable guides at each end of the steam-chest, said valves being secured to suitable stems, which may be connected to an operating lever or levers in the cab or at other convenient points. Should one end of the cylinder become disabled, the valve 40 is pushed inwardly until it entirely closes the steam-passage 26, leading from the valve-chest, and prevents the passage of any steam to that end of the cylinder, while the usual valve mechanism may be operated and steam readily admitted and exhausted at the uninjured end of the cylinder, thus enabling the engineer to proceed under at least three-quarters of the power of the engine instead of one-half or less where the cylinder at one side is entirely cut out.

Having thus described my invention, what I claim is—

1. The combination with a cylinder having steam and exhaust ports, of rotary valves seated over said ports, a plurality of steam-ports formed in each valve for the admission of steam to the cylinder-port, and main and auxiliary escape-ports formed in each of the valves and so disposed that on the movement of the valves said ports will act to place the exhaust-port in communication with one of the cylinder-ports.

2. The combination with a valve-seat having ports leading therefrom, of a rotary valve adapted to said seat and having ports or passages, a bushing carried by the rotary valve, a spindle extending through said bushing, and an arcuate plate disposed above the valve and serving to protect a portion of the periphery thereof from the pressure of steam, substantially as specified.

3. The combination in a steam-engine, of the steam-chest having curved valve-seats, steam inlet and exhaust ports terminating at the valve-seat, a pair of rotary valves adapted to said valve-seats and each provided with a plurality of steam and a plurality of exhaust ports, spindles mounted in the chest and carrying said roller-valves, and protecting-plates secured in position above and protecting a portion of the periphery of said valve from the pressure of steam within the chest.

4. The combination of the cylinder-casting having curved recesses forming valve-seats, steam and exhaust ports terminating at said valve-seats, a pair of rotary valves having ports for controlling the flow of steam, protecting-plates covering a portion of the periphery of each valve, curved yoke-bars extending over said plates and connected with the valve, slotted blocks carried by said bars, and a valve-stem having an operative connection with said slotted blocks to effect the simultaneous operation of said valves.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOSEPH LUTHER McJUNKIN.

Witnesses:
J. W. THOMPSON,
CHAS. COBB.