

No. 754,299.

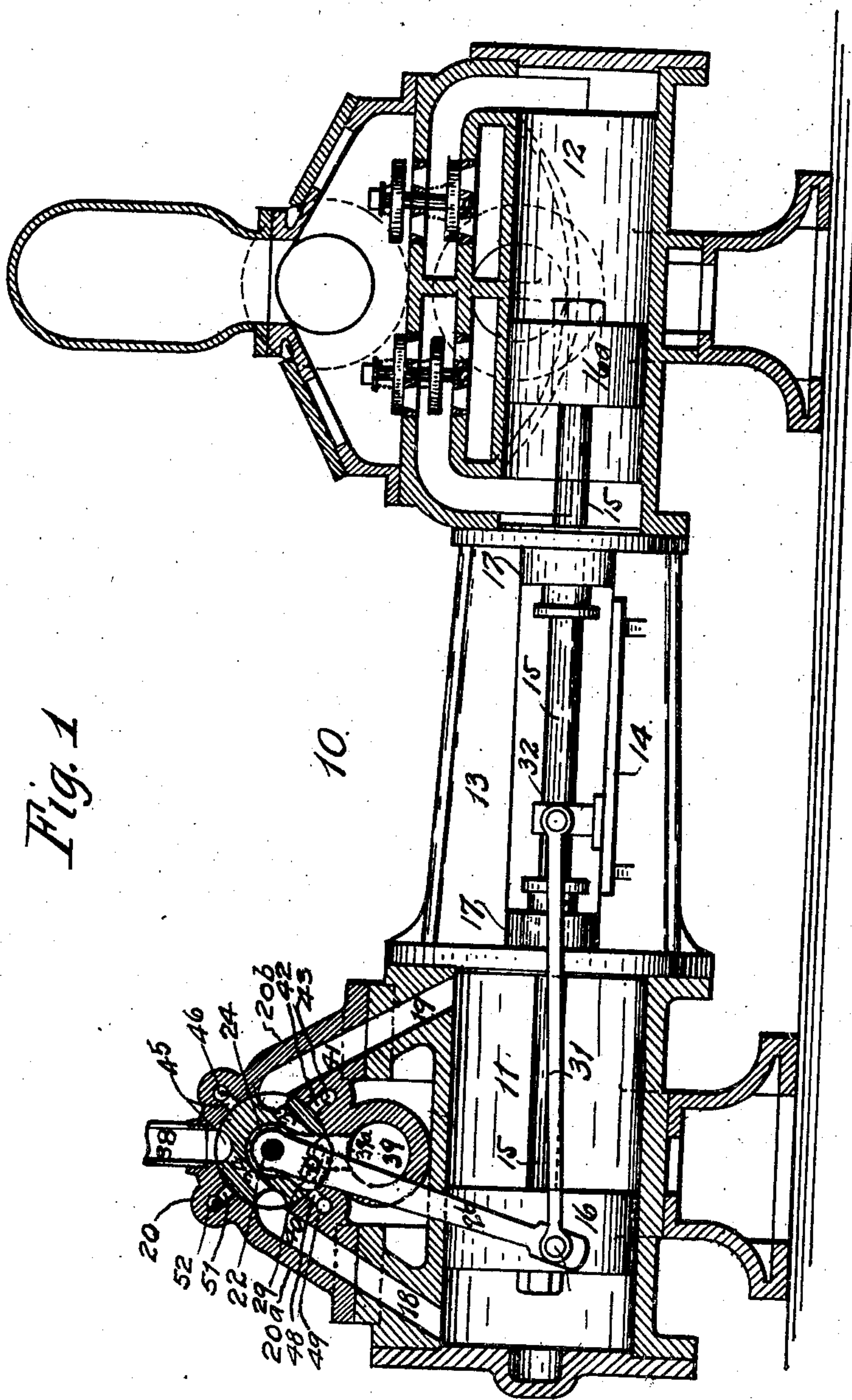
PATENTED MAR. 8, 1904.

L. L. GRIFFITHS.  
VALVE.

APPLICATION FILED APR. 1, 1903.

NO MODEL.

6 SHEETS--SHEET 1.



**WITNESSES:**

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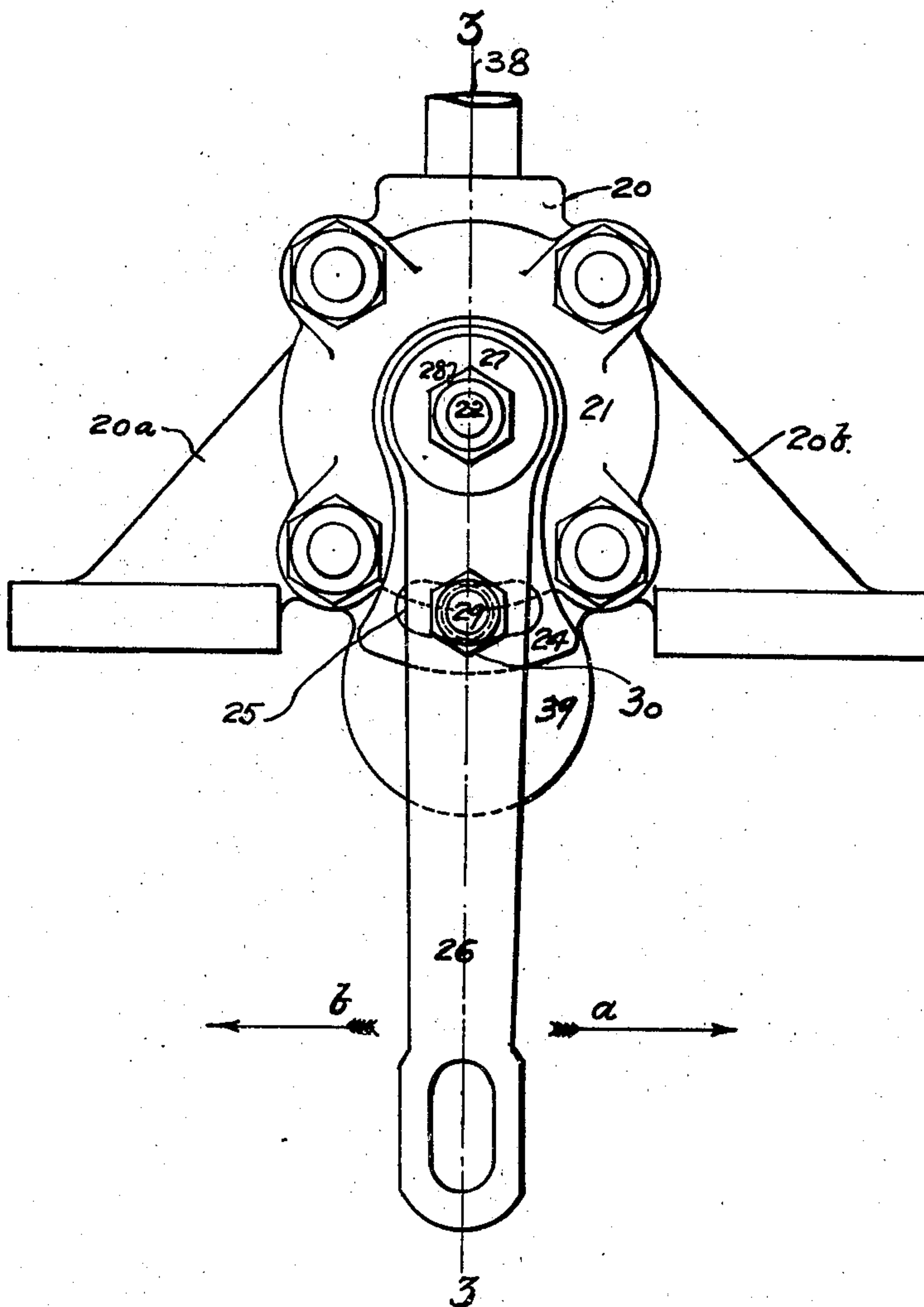
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6 SHEETS—SHEET 2.

*Fig. 2.*



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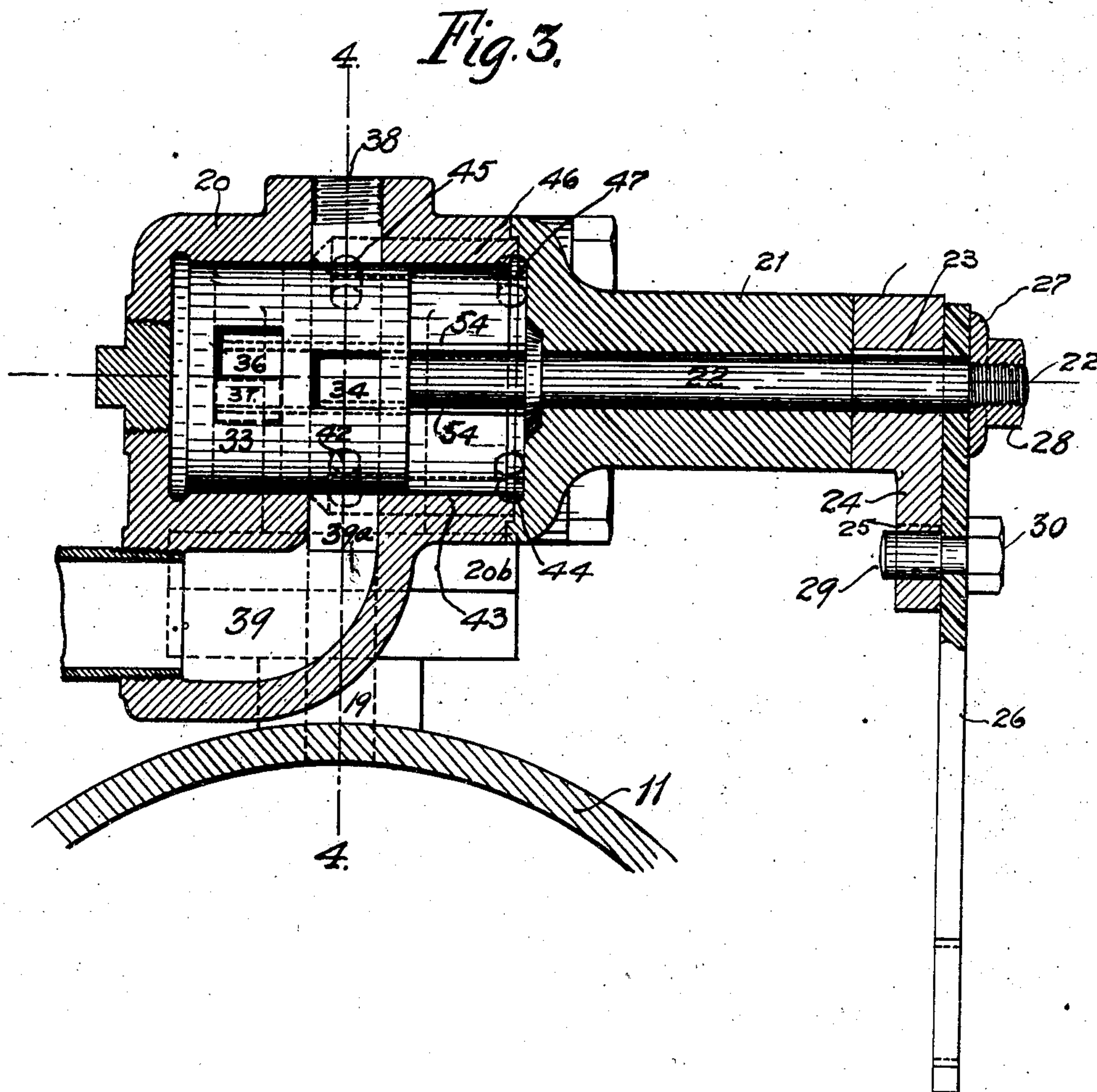
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5 SHEETS—SHEET 3.



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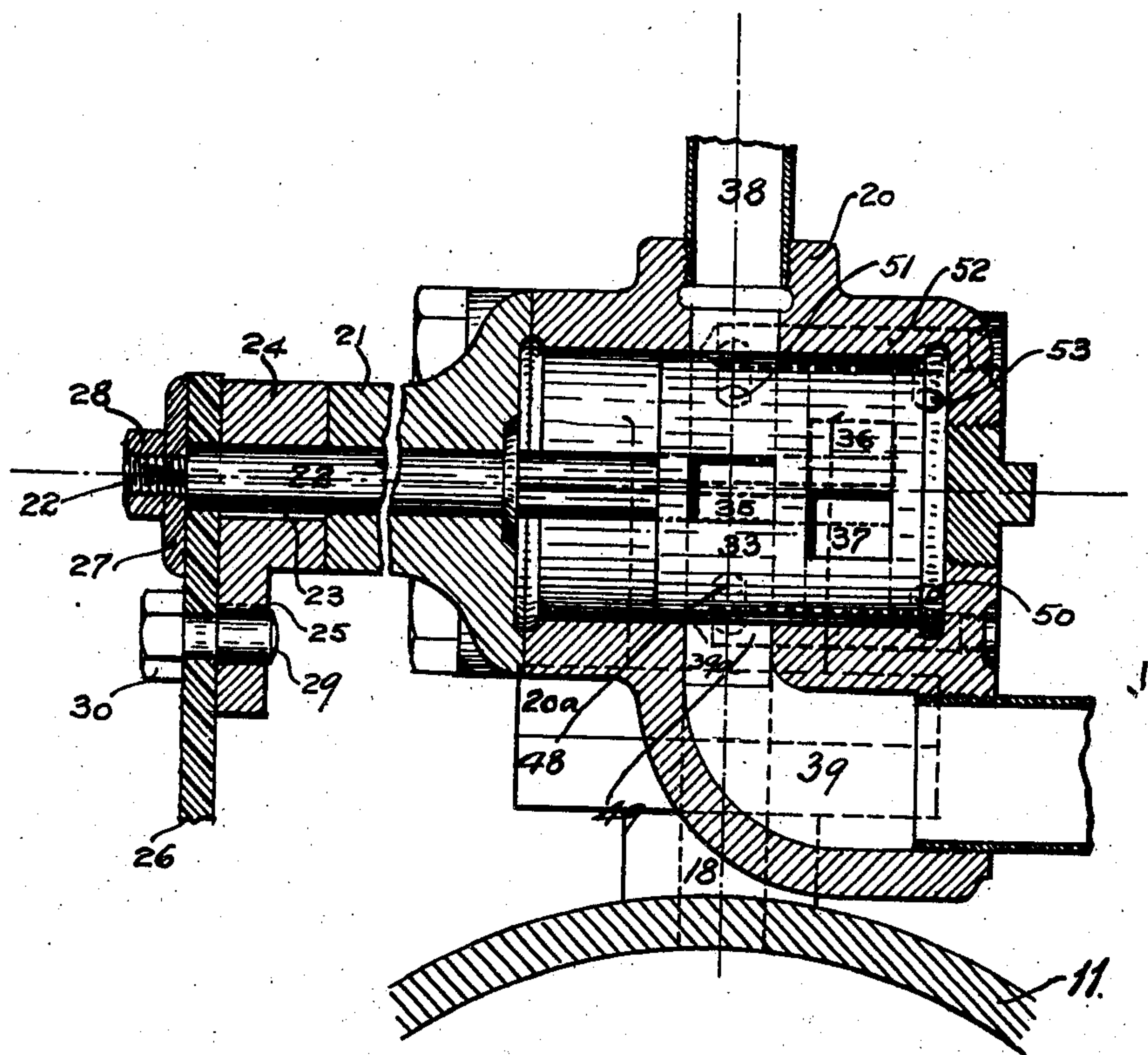
VALVE.

APPLICATION FILED APR. 1, 1903.

NO MODEL.

5 SHEETS—SHEET 4.

*Fig. 4.*



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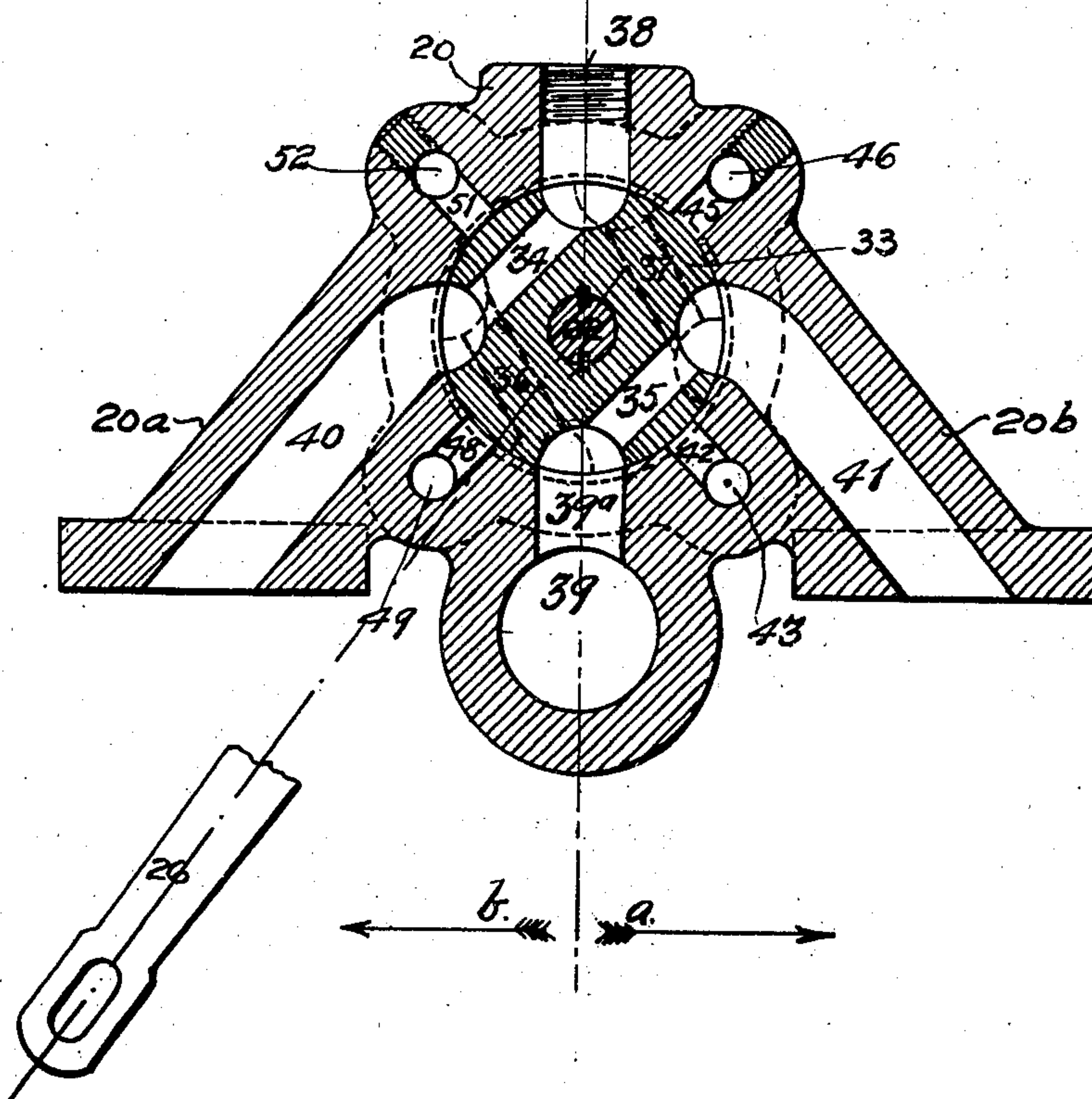
L. L. GRIFFITHS.  
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APPLICATION FILED APR. 1, 1903.

NO MODEL.

5 SHEETS—SHEET 5.

*Fig. 5*



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## UNITED STATES PATENT OFFICE.

LEONARD L. GRIFFITHS, OF NEW YORK, N. Y.

## VALVE.

SPECIFICATION forming part of Letters Patent No. 754,299, dated March 8, 1904.

Application filed April 1, 1903. Serial No. 150,533. (No model.)

*To all whom it may concern:*

Be it known that I, LEONARD L. GRIFFITHS, a citizen of the United States, residing at the city of New York, borough of Brooklyn, Kings  
 5 county, in the State of New York, have invented certain new and useful Improvements in Valves, of which the following is a full, clear, and exact specification.

My invention relates to an improvement in  
 10 valves for steam-pumps; and the same has for its object more particularly to provide a valve and mechanism for operating the same which may be applied to single or compound pumps of either horizontal or vertical type.

15 Further, the invention has for its objects to provide a valve and operating mechanism consisting of the smallest number of parts possible, be more durable and less liable to wear out or get out of order, and be more positive  
 20 in its operation than the ones in use at the present time on steam-pumps.

To these ends my invention consists of the novel details of construction and the combination, connection, and arrangement of parts  
 25 hereinafter more fully described and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, in which like numerals of reference indicate like parts, Figure 1 is  
 30 a central longitudinal sectional view of a cylinder steam-pump of usual construction provided with a valve and operating mechanism constructed according to and embodying my invention. Fig. 2 is an end view of the valve-  
 35 chest and valve mechanism removed from the pump. Fig. 3 is a central longitudinal section taken on the line 3 3 of Fig. 2 looking in the direction of the arrow *a* and illustrating the interior construction of the valve. Fig.  
 40 4 is a similar view taken on the same line 3 3 of Fig. 2 looking in the direction of the arrow *b*, and Fig. 5 is a transverse section taken on the line 4 4 of Fig. 3.

In said drawings, 10 denotes a single-cylinder pump of the usual general construction,  
 45 comprising a steam-cylinder 11 and a water-cylinder 12, rigidly connected together by an intermediate frame 13, having the slide 14 therein, and 15 denotes a piston-rod having  
 50 one end extending into the steam-cylinder 11

and provided with a piston 16 and its other end extending into the water-cylinder 12 and said latter end provided with a piston 16<sup>a</sup>, and 17 17 denote stuffing-boxes provided in the  
 55 opposing ends of the steam and water cylinders through which the piston-rod 15 extends.

The steam-cylinder 11 is provided at its rear end with a main forward steam-port 18 and at its forward end with a main backward steam-  
 60 port 19.

20 denotes a valve-casing which is arranged upon and at right angles to the cylinder 11 and supported in position thereon upon foot-  
 65 pieces 20<sup>a</sup> 20<sup>b</sup>, which are bolted to said cylinder 11, and 21 denotes a projecting sleeve or steadiment having an enlarged end or head by means of which the same is bolted to the forward end of said casing 20. Within said sleeve  
 70 or steadiment 21 is arranged a shaft 22, near the outer end of which is fixed, by means of a spline 23, a segmental arm 24, having a slot 25 provided in its end, and 26 denotes an arm  
 75 disposed upon the outer end of the shaft 22 intermediate the outer surface of the segmental arm 24 and the washer 27 and secured upon the spindle end of said shaft 22 by a lock-nut  
 80 28. The arm 26 is not rigidly fixed or keyed to the end of the shaft 22, but is held in operative connection therewith by means of the stud 29, secured to the arm 26 by a nut 30 and  
 85 projecting from its rear surface into and through the slot 25 of said segmental arm 24, and 31 denotes a link having one end pivotally secured to the lower slotted end of the arm 26  
 90 and its other end similarly secured to the cross-head 32, secured to the piston-rod 15, working upon the slide 14, whereby when the pump is in operation the arm 26 will be oscillated, and in being so oscillated cause the shaft 22 to  
 95 be partially rotated in either direction when the stud 29 contacts with the ends of the slot 25 in said segmental arm 24 upon the outer end of the shaft 22.

Within the valve-casing 20 is arranged a valve 33, which is adapted to slide longitudinally upon the inner end of said shaft 22 and  
 100 keyed thereto by splines 54, so as to turn with said shaft 22 when the same is partially rotated by the arm 26.

34 and 35 denote, respectively, the forward



steam and exhaust passages arranged parallel to each other and extending through the valve 33 to each side of the shaft 22 therein, and 36 and 37 denote, respectively, the backward exhaust and steam passages arranged in the rear part of the valve 33 at substantially right angles to the passages 34 and 35 therein.

In the upper side of the casing 20 at its middle is provided a main steam-inlet port 38, and in the bottom of said casing 20, directly below the main steam-inlet 38, is a main exhaust 39, communicating with the atmosphere or a condenser.

In the foot-piece 20<sup>a</sup> of the casing 20 is a forward steam-portway 40, communicating with the forward steam-port 18 of the cylinder 11, a backward steam-portway 41 in the foot-piece 20<sup>b</sup> communicating with the backward steam-port 19 of the cylinder 11, and 39<sup>a</sup> denotes an exhaust-port arranged in the bottom of the casing 20 intermediate the steam-portways 40 and 41 and communicating with the main exhaust 39.

At the middle of the casing 20, in the lower right-hand portion thereof, intermediate the backward steam-portway 41 and the exhaust-port 39<sup>a</sup>, is an auxiliary steam-port 42, from which extends forwardly a bore 43, communicating with the outlet 44 at the forward or right-hand end of the casing 20, and above said auxiliary steam-port 42, in the upper right-hand portion of the casing, intermediate the main steam-inlet 38 and the backward steam-portway 41, is an exhaust-port 45, having a bore 46 extending forward therefrom, terminating in an inlet 47 at the forward or right-hand end of the casing 20, and at the lower left-hand side of the casing 20, near its middle, intermediate the exhaust-port 39<sup>a</sup> and the forward steam-portway 40, is an auxiliary steam-port 48, having a bore 49 leading therefrom to the lower rear or left-hand end of the casing 20 and terminating in an outlet 50, and in the upper left-hand portion of the casing 20, intermediate the main steam-inlet 38 and the forward steam-portway 40, is an auxiliary exhaust-port 51, having a bore 52 leading therefrom to the rear or left-hand end of the casing 20 and terminating in an inlet 53.

The operation of the apparatus is as follows, if we assume the valve 33 to be in the position shown at Figs. 1 and 3 and steam entering at 38 and passing through the passage 34 in the valve 33 and through the main forward steam-portway 40 and port 18 to the rear end of the steam-cylinder 11 and causing the piston 16 therein to move forward or toward the right-hand end of said steam-cylinder 11 and the exhaust-steam being permitted at the same time to pass from the forward end of said steam-cylinder 11 through the main forward exhaust-portway 19 and port 41 through the passage 35 in the valve 33, exhaust-port 39<sup>a</sup>, and into the main exhaust 39. As the piston

16 and rod 15 continue to move forward toward the water-cylinder 12 they carry therewith the lower end of the arm 26 by means of the link 31, attached to the cross-head 32, and as said arm 26 moves forward the stud 29 thereon is caused to contact with the right-hand end of the slot in the free end of the segmental arm 24, splined to the shaft 22, and partially rotate (about forty-five degrees) said shaft 22 and valve 33 upon the rear end thereof, and as soon as the lower end of the arm 26 has almost reached the limit of its forward movement the valve 33 will have partially rotated and assumed the position to permit steam to pass from the main inlet 38 through the passage 34 of the valve 33, thence into the auxiliary steam-inlet 48, auxiliary steam-bore 49, and outlet 50 and into the rear end of the casing 20 and throw the valve 33 forward, the exhaust passing at the same time from the forward end of the casing 20 through the auxiliary exhaust-inlet 47, auxiliary exhaust-bore 46, and exhaust-port 45 into and through the passage 35 of the valve 33 and exhaust-port 39<sup>a</sup> to the main exhaust 39. Hereupon steam from the main inlet 38 will pass through the passage 37 of the valve 33 through the main backward portway 41 and port 19 into the forward end of the steam-cylinder 11 and cause the piston 16 to move backward toward the rear end of said cylinder 11 and the exhaust-steam pass from the rear end of the cylinder 11 through the port 18 and portway 40, passage 36 of the valve 33, and into the exhaust-port 39<sup>a</sup> and into the main exhaust 39. As soon as the piston 16 reaches almost the extreme limit of its rearward movement the lower end of the arm 26, which is caused to move backward therewith through the link 31 and piston-rod 15, will partially rotate the valve 33 and cause the same to assume the position to permit steam to pass from the main inlet 38 through the passage 37 of the valve 33, thence into the auxiliary steam-inlet 42, auxiliary steam-bore 43, and outlet 44 and into the front end of casing 20 and throw the valve 33 rearward, the exhaust passing at the same time from the rear end of the casing 20 through the auxiliary exhaust-inlet 53, auxiliary exhaust-bore 52, and outlet exhaust-port 51 into and through the passage 36 of the valve 33 and the exhaust-port 39<sup>a</sup> to the main exhaust 39. With the completion of the operation just described the parts will be restored to their initial positions, and the operation first above described repeated, and so on as long as steam is admitted to the main steam-inlet 38 and exhaust permitted to escape at 39.

It will be observed that my improved valve mechanism is applicable not only to steam-pumps, but to direct-acting fluid-pressure motors of all kinds, no matter for what purposes the same may be employed, and as the valve



is arranged at right angles to the main piston and positively operated at or near the end of each stroke of the piston all possibility of the parts becoming set at a dead-point is obviated.

Without limiting myself to the details of construction, which may be varied within the scope of the invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-motor, the valve-casing having main steam and exhaust ports therein communicating with the motor, and auxiliary steam and exhaust ports communicating with the interior of the casing adjacent to its ends, an oscillatory valve arranged within said casing and adapted to move longitudinally therein under the impulse of the operating fluid, a set of steam and exhaust passages arranged in said valve adjacent to one end thereof, and a set of steam and exhaust passages arranged therein adjacent to its opposite end, adapted to alternately communicate with the main and auxiliary steam and exhaust ports, and means connected to the motor for reversing the passage of the steam and exhaust from the main and auxiliary steam and exhaust ports, through the passages in said valve, substantially as specified.

2. In a steam-motor, the valve-casing having main steam and exhaust ports communicating with the motor, auxiliary steam and exhaust ports communicating with a part of said casing and auxiliary steam and exhaust ports communicating with the opposite part of said casing, an oscillatory valve arranged in said casing and adapted to move longitudinally therein under the impulse of the motive fluid, a set of steam and exhaust passages in said valve adjacent to its forward end, and a set of steam-exhaust passages in said valve adjacent to its rear end adapted to alternately communicate with the main and auxiliary steam and exhaust ports in said casing, and means for actuating said valve connected to the motor and operated thereby, substantially as specified.

3. In a steam-motor, the valve-casing having main steam and exhaust ports therein communicating with the motor, auxiliary steam and exhaust ports communicating with the forward and rear ends of said casing, a shaft supported partly within and partly without said casing, a valve slidably arranged upon the inner end of said shaft and adapted to rotate therewith, a set of steam and exhaust passages extending through said valve, a similar set of exhaust and steam passages arranged at an angle to and to the rear of the first-named set, and mechanism intermediate the outer end of the valve-shaft and piston-rod of the motor for actuating said valve, substantially as specified.

4. In a steam-motor, the cylindrical valve-casing having main steam and exhaust ports therein communicating with the motor, aux-

iliary steam and exhaust ports communicating with the forward end of said casing, auxiliary steam and exhaust ports communicating with the rear end of said casing, a shaft supported partly within and partly without said casing, a cylindrical valve arranged upon the inner end of said shaft within said casing adapted to move longitudinally thereon and rotate therewith, steam and exhaust passages arranged parallel to each other and extending through said valve, similar steam and exhaust passages arranged in said valve to the rear of said first-named passages therein, and operating mechanism connected to and arranged intermediate the projecting end of the valve-shaft and the piston-rod of the motor whereby to reverse the valve at or near the completion of the stroke of the motor-piston in each direction, substantially as specified.

5. In a steam-motor, the cylindrical valve-casing having main steam and exhaust ports therein communicating with the motor, auxiliary steam and exhaust ports communicating with the forward and rear ends of said casing, a shaft supported partly within and partly without said casing, a valve arranged upon its inner end within the casing and provided with steam and exhaust passages adapted to communicate with the main and auxiliary steam and exhaust ports therein, an arm fixed to the outer end of said shaft, a segmental slot therein, an arm loosely carried by the outer end of said shaft, a stud on said last-named arm extending into the segmental slot in the fixed arm, and a link having one end pivotally connected to the lower end of the loose arm, and its other end pivotally connected to the piston-rod of the motor whereby to actuate the fixed arm, the shaft and valve mounted thereon, at or near the end of the stroke of the motor-piston in each direction, substantially as specified.

6. In a steam-motor, the cylindrical valve-casing arranged at right angles to the motor-cylinder and piston therein, main steam and exhaust ports arranged midway of said casing ends, main steam and exhaust portways in line with the main steam and exhaust ports and communicating with the motor, auxiliary steam and exhaust ports in the valve-casing intermediate one main portway and the main steam inlet and exhaust and communicating with the forward end of said valve-casing, auxiliary steam and exhaust ports arranged intermediate the other of said main portways and the main steam inlet and exhaust and communicating with the rear end of said valve-casing, a shaft arranged partly within and partly without said valve-casing, splines at its inner and outer ends, a cylindrical slide-valve arranged upon the inner splined end of said shaft, steam and exhaust passages arranged parallel to each other and extending through said valve, a second steam and exhaust passage also extending



through said valve to the rear of and at an angle to the passages first named, a segmental arm keyed to the outer splined end of the valve-shaft having a segmental slot therein, an arm  
5 loosely carried upon the outer end of said valve-shaft having a stud upon its rear surface extending into the slot in the keyed segmental arm, and a link having one end pivotally connected to the outer end of the loose  
10 arm, and its other end pivotally connected to

the piston-rod of the motor, substantially as specified.

Signed at the city of New York, in the county and State of New York, this 28th day of March, 1903.

LEONARD L. GRIFFITHS.

Witnesses:

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GUSTAVE DIETERICH.