

No. 671,250.

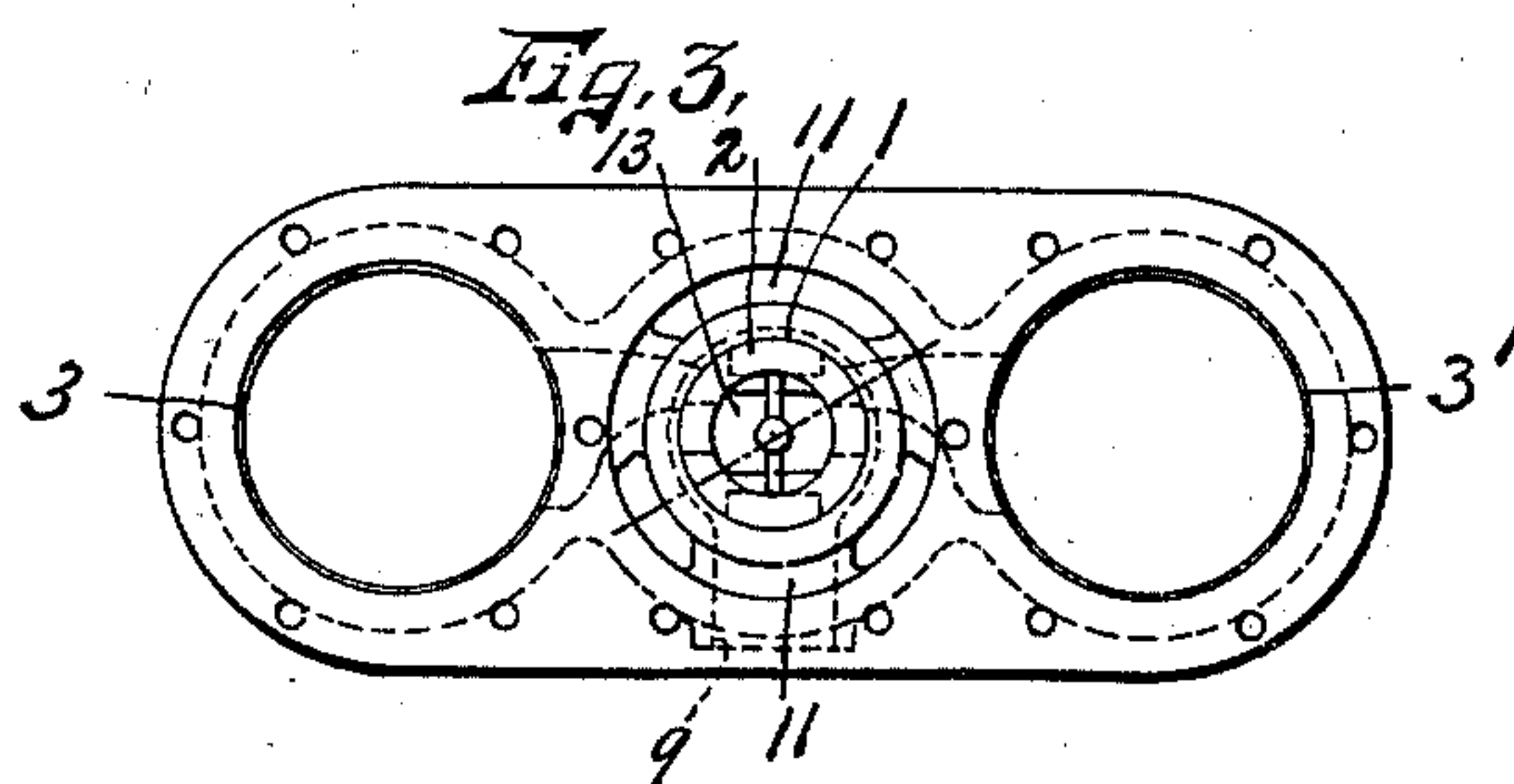
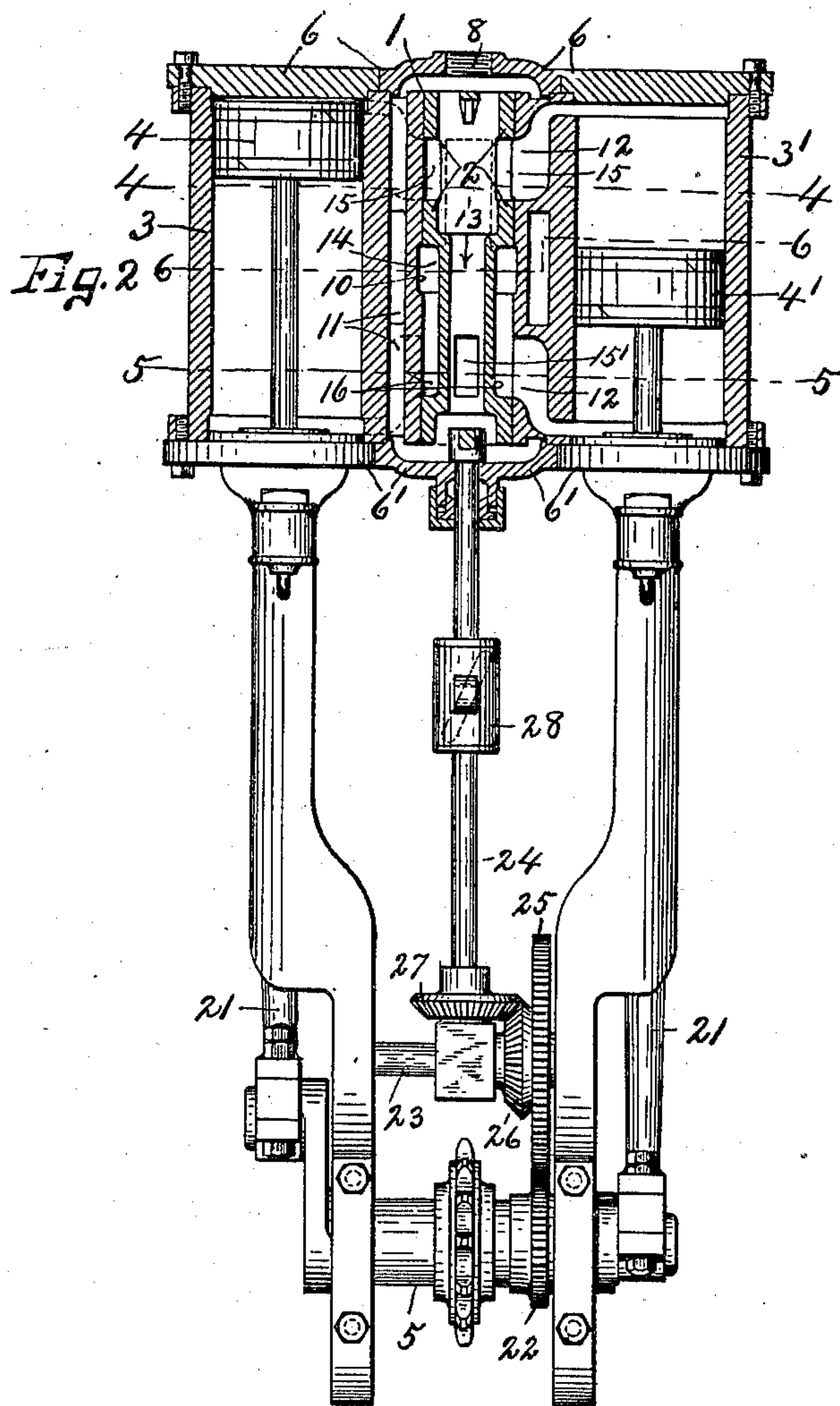
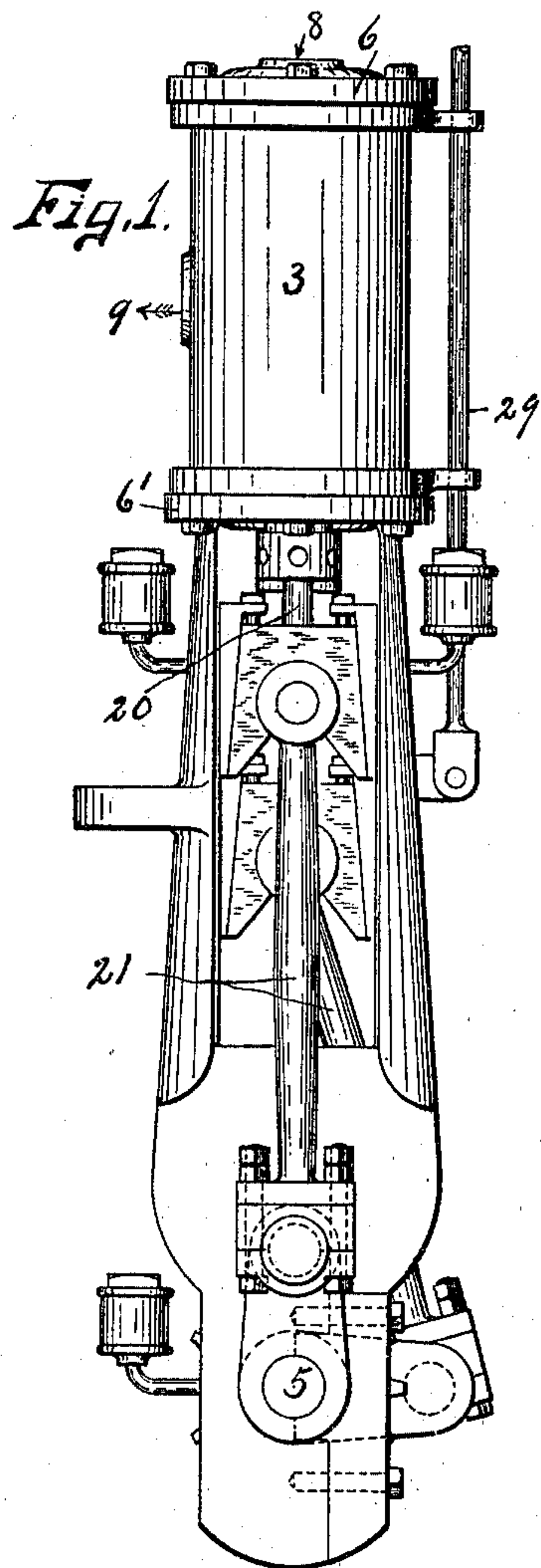
Patented Apr. 2, 1901.

W. N. WALKER.  
STEAM ENGINE.

(Application filed Nov. 14, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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INVENTOR

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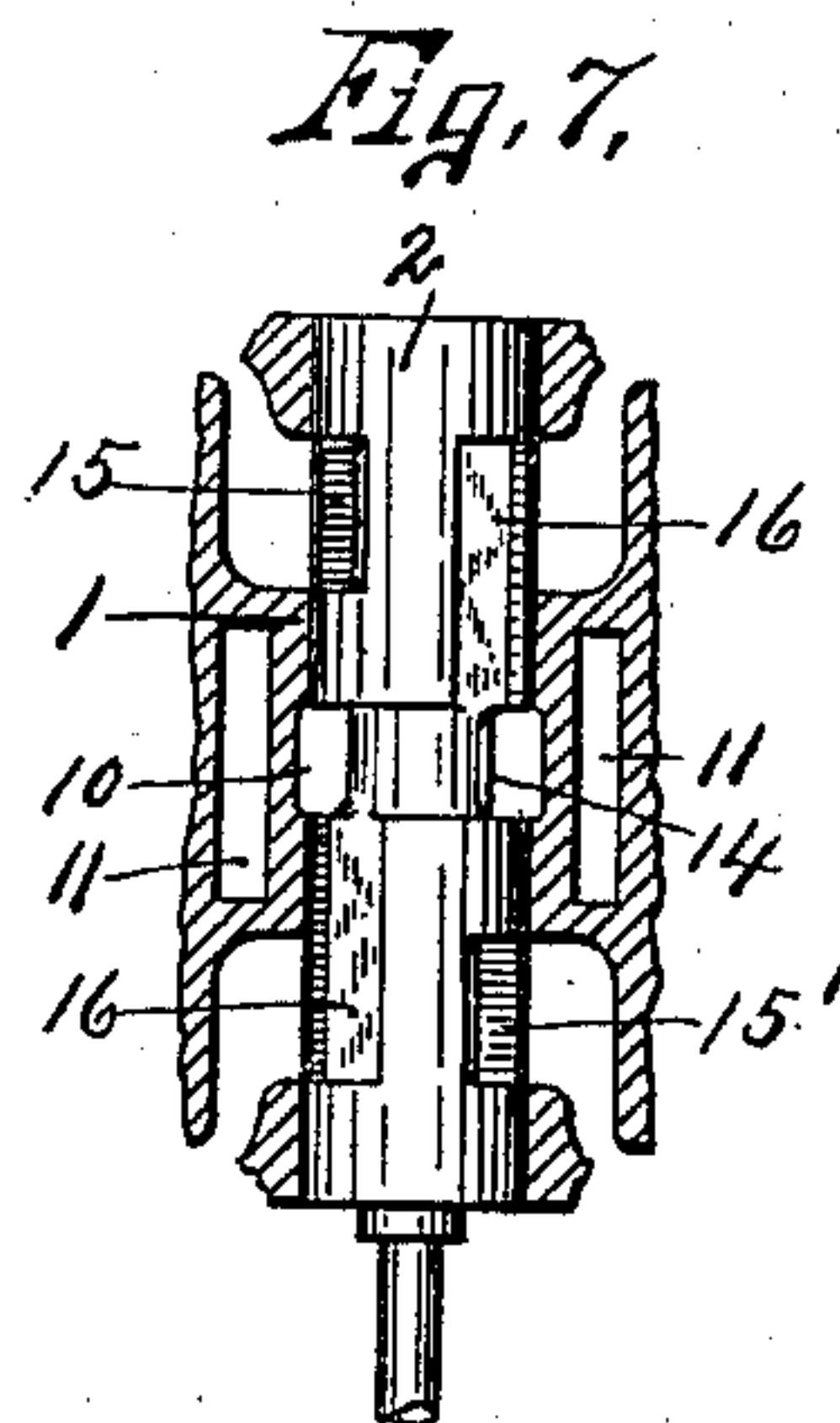
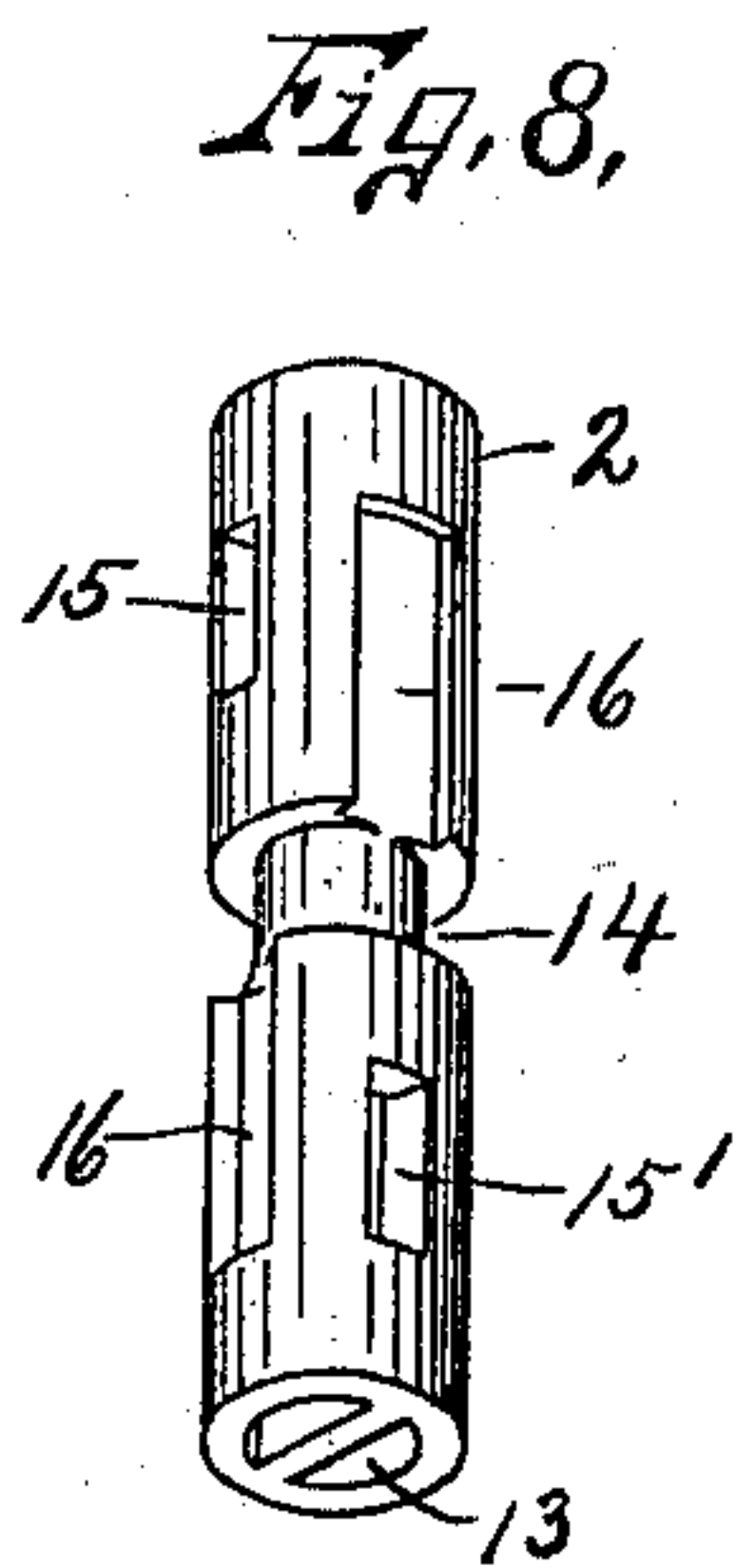
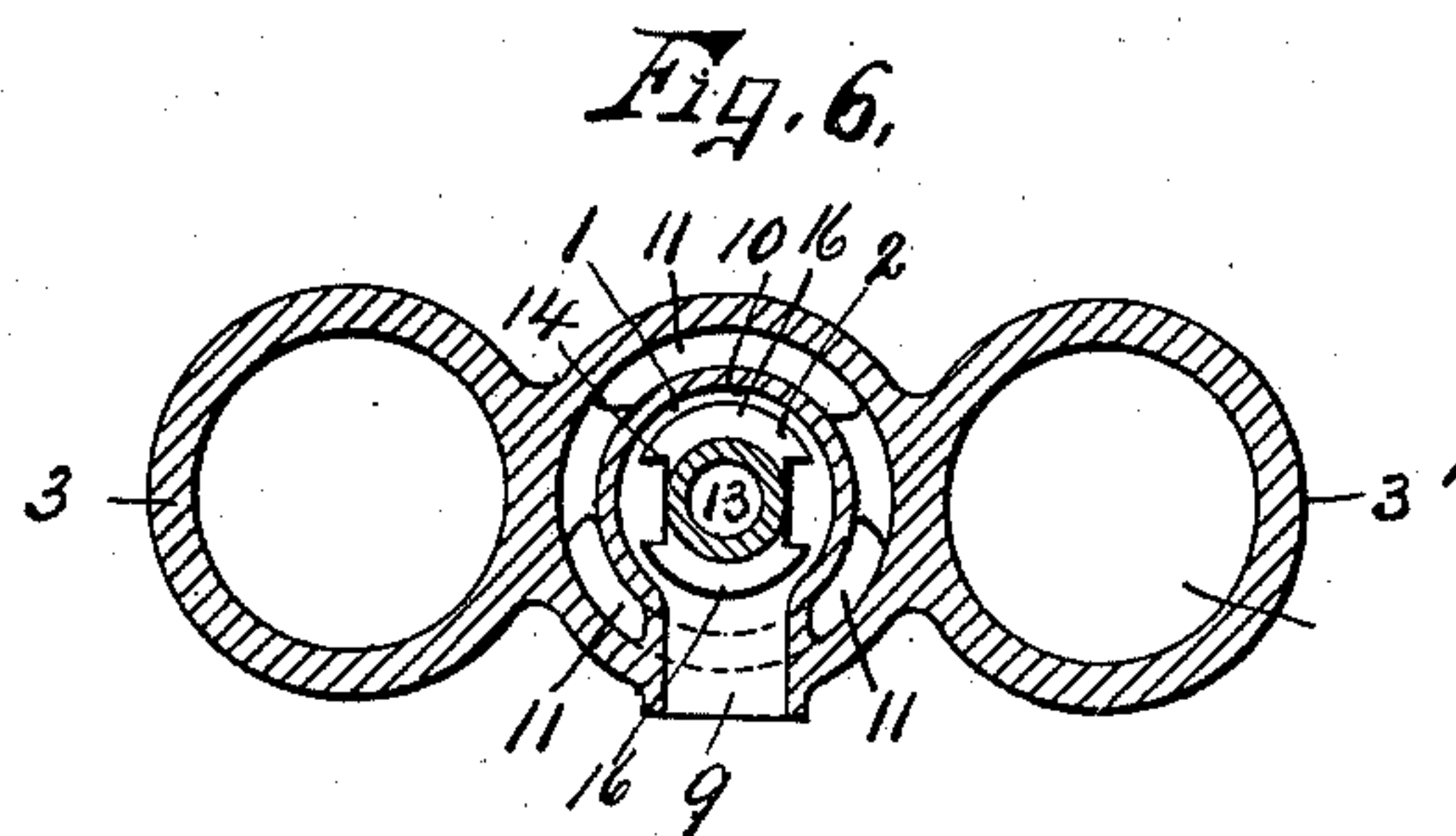
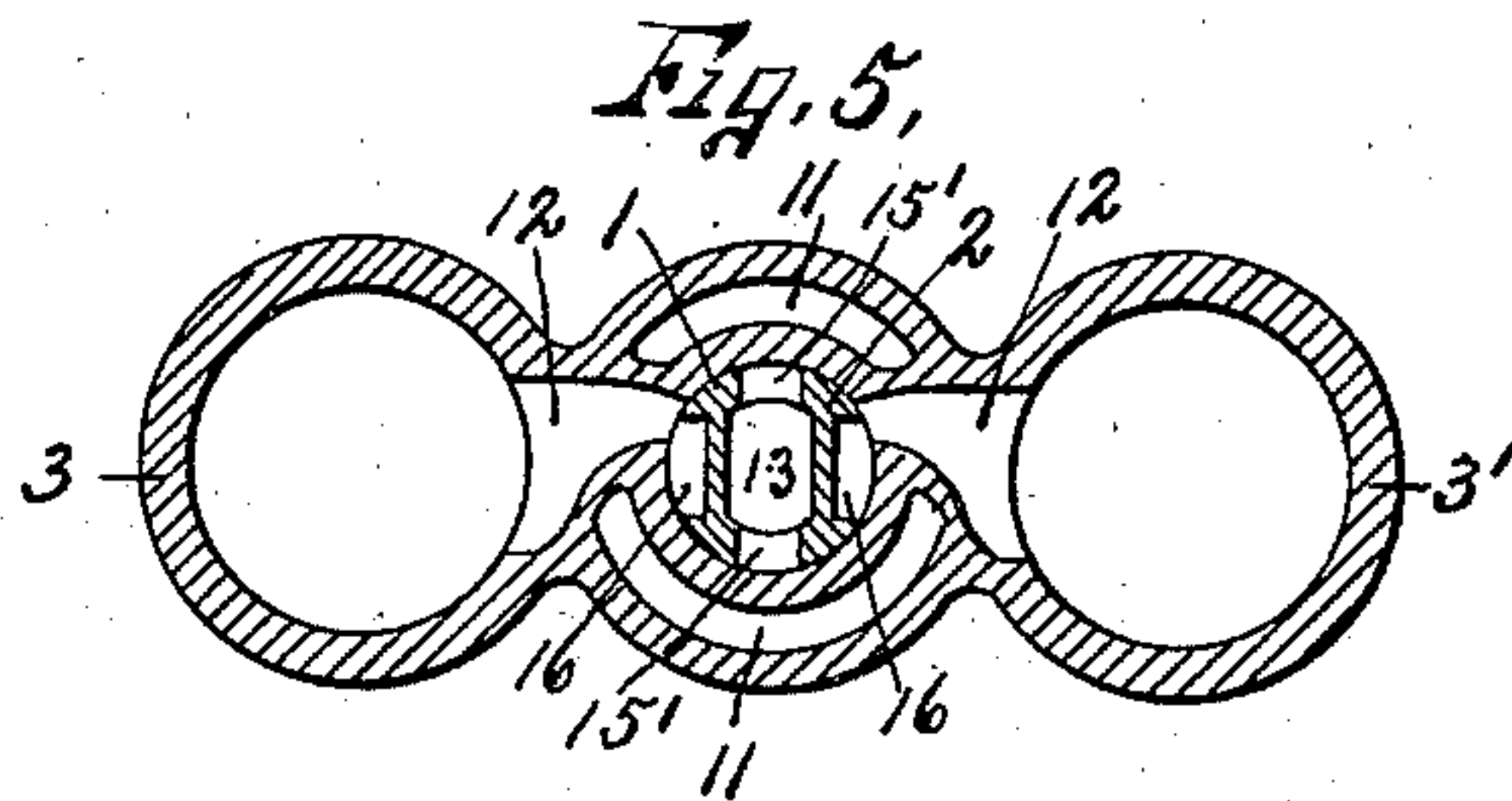
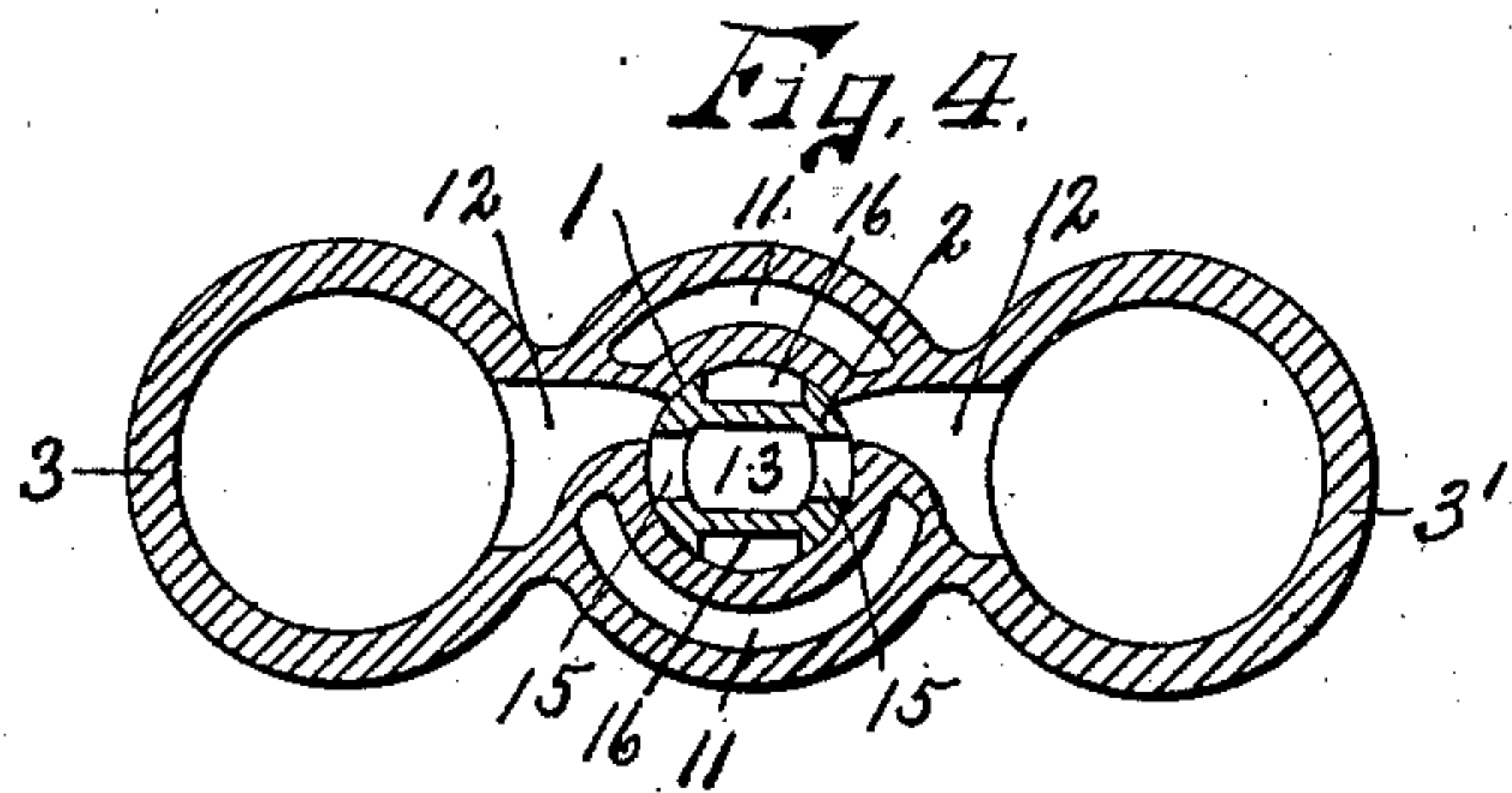
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WITNESSES:

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# UNITED STATES PATENT OFFICE.

WILLIAM N. WALKER, OF ROME, NEW YORK.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 671,250, dated April 2, 1901.

Application filed November 14, 1900. Serial No. 36,442. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM N. WALKER, of Rome, in the county of Oneida, in the State of New York, have invented new and useful  
5 Improvements in Steam-Engines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

10 This invention relates to improvements in steam-engines, and particularly to the class used in the propulsion of automobiles.

The primary object of my invention is to provide a valve-chamber and a rotary valve seated therein which are so constructed and  
15 arranged with relation to each other that the steam-pressure upon the valve is substantially equal on all sides, thereby producing a substantially balanced valve, the walls of the valve-chamber being substantially surrounded  
20 by a steam-jacket for equalizing the expansion and contraction of the valve-seat and valve, and thereby preventing the valve from binding or causing undue friction between the valve and the valve-seat.

25 The further object of this invention is to provide means for rotating the valve at a less rate of speed than the driving-shaft actuated by the pistons.

30 To these ends the invention consists in the combination, construction, and arrangement of the parts of a steam-engine, as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figures 1 and 2  
35 are face views, taken at right angles to each other, of my improved engine, the cylinders and valve being shown in section in Fig. 2. Fig. 3 is a plan view of the cylinders and valve-chamber, the end walls of said cylinders and  
40 chamber being removed. Figs. 4, 5, and 6 are sectional views taken, respectively, on lines 4 4, 5 5, and 6 6, Fig. 2. Fig. 7 is an elevation of a detached valve and portions of the adjacent walls of the valve-chamber. Fig. 8  
45 is an isometric view of the detached valve.

Similar reference characters indicate corresponding parts in all the views.

50 As seen in the drawings, my improved engine comprises a valve-chamber 1, a rotary valve 2, seated in the chamber, cylinders 3 3', arranged at opposite sides of the valve-cham-

ber and communicating therewith, pistons 4 4', reciprocally movable in the cylinders, and a driving-shaft 5, actuated by the pistons and connected to rotate the valve 2. 55

The valve-chamber 1 and cylinders 3 3' are preferably arranged side by side in close proximity to each other, their peripheral inclosing walls being usually formed integral with each other and their opposite ends being  
60 closed by suitable heads 6 6' and 7 7'.

The valve-chamber 1 is preferably cylindrical in form, is provided with inlet and exhaust openings 8 and 9, and is also formed with an inner annular enlargement 10, intermediate its opposite ends and communicating with said exhaust-opening. The opposite ends of the valve-chamber 1 are connected by suitable  
65 steam-passages 11, which are independent of the valve-chamber and substantially parallel therewith and are of sufficient lateral width to form a steam-jacket surrounding the greater portion of the valve-chamber for causing the walls of said valve-chamber to expand and contract equally with the expansion and con-  
70 traction of the valve, thereby reducing to a minimum the friction and incidental wear of the valve and preventing the valve from binding or becoming set in its seat and at the same time insuring a close fit of the valve  
75 within said seat. 80

The heads 6 6' of the valve-chamber 1 are generally formed with recesses in their inner faces for facilitating the distribution of the steam admitted through the inlet-opening 8  
85 as uniformly as possible through the passages 11 and to the interior of the valve 2, presently described.

The inlet-opening 8 is preferably formed in the central portion of the head 6 in alinement  
90 with the central valve-chamber 1 and may be connected to any desired form of steam-generator for admitting steam to the valve-chamber. The exhaust-opening 9 extends through one of the outer peripheral walls of said valve-  
95 chamber at substantially its intermediate portion and may, if desired, be connected to a suitable muffler or condenser, (not illustrated; but for a purpose well known to those skilled in the art.) The opposite ends of the  
100 valve-chamber 1 are connected to the corresponding ends of the cylinders 3 3' by suit-



able ports 12, the inner ends of which are usually elongated to correspond with similar cooperating ports in the valve 2, the ports 12 at each end being alined and arranged diametrically opposite to each other.

The valve 2 forms one of the most essential features of my invention, and consists of a hollow cylindrical shell of substantially the same length and diameter as the valve-chamber 1, is suitably seated in the walls of said chamber, and is formed with a lengthwise central passage 13, extending therethrough from end to end and communicating with the inlet-opening 8, and is provided with an annular peripheral recess 14, alined with the enlargement 10 and exhaust-opening 9 for facilitating the discharge of the steam from the chamber 1. The peripheral walls of the opposite ends of the valve 2 are provided with diametrically opposite ports 15 15', the ports at one end of the valve being disposed in a plane at substantially right angles to the ports at the opposite end and are each movable successively into and out of registration with the corresponding ports 12 of the cylinders 3 3' as said valve is rotated. It is thus apparent that the ports 15 at one end of the valve are simultaneously registered with the corresponding ports of the cylinders 3 3' at each half-revolution of the valve for admitting steam to the corresponding ends of the cylinders and that the ports at the opposite end of the valve are at this time closed for cutting off the entrance of steam to the opposite ends of said cylinders. In order to permit the steam to exhaust from the cylinders in advance of the pistons, I provide the valve 2 with lengthwise peripheral recesses or pockets 16, arranged in pairs and extending in opposite directions from the annular recess 14, the pockets of each pair being diametrically opposite each other and disposed at substantially right angles to the ports 15 at the same side of the annular recess 14, the ports 15 and pockets 16 at each end of the valve 2 thus alternating with each other and are movable successively into and out of registration with the corresponding ports of the cylinders. It is evident, therefore, that when the pockets at one end of the valve are alined with the ports 12 of the cylinder the ports 15 15' at the opposite end of the valve are simultaneously registered with the corresponding ports 12 of the cylinders and that the pockets 16 at either end of the valve serve to connect the corresponding ends of the cylinders to the exhaust-opening at each half-revolution of the valve. The cylinders 3 3' are preferably formed of substantially the same diameter, and the pistons 4 4' are movable in said cylinders and are connected by suitable rods 20 and pitmen 21 to the driving-shaft 5, previously mentioned. In order to obviate any liability of dead-centers and to permit the engine to be operated in either direction at any time, I usually connect one of the pistons to the crank-shaft a quarter of a turn in advance of

the similar connection for the other piston. This arrangement of pistons being well understood, it is unnecessary to further illustrate or describe the same.

As previously stated, the valve 2 is rotated at a less rate of speed than the driving-shaft, and I have arranged the ports of said valve and valve-chamber in such manner as to require the valve to be rotated at one-half the rate of speed of the driving-shaft. The means for rotating this valve 2 consists of a pinion 22, secured to the shaft 5, and supplemental shafts 23 and 24, actuated by the pinion 22. The shaft 23 is arranged substantially parallel with the shaft 5 and is provided with gears 25 and 26, the gear 25 meshing with the pinion 22 and is formed of substantially twice the diameter of said pinion. The shaft 24 is arranged at substantially right angles with the shaft 23, one end being provided with a gear 27, meshing with the gear 26, and its other end being secured to the valve 2 for rotating the same. The intermediate portion of the shaft 24 is preferably provided with a longitudinal movable reversing member 28, connected to a reversing-link 29, for shifting the position of the valve, and thereby reversing the movement of the pistons and driving-shaft.

In the operation of my invention steam is admitted through the inlet-opening 8, expands into the central passage of the valve, and the passages 11, forming the steam-jacket, and then passes into the cylinders through the ports of the valve registering with the corresponding ports of the cylinder, thereby actuating the pistons in one direction. During this movement of the pistons the pockets 16 at the opposite ends of the cylinders are registered with the cylinder-ports at the opposite sides of the piston and permit the steam to exhaust in advance of the piston through said pockets to the exhaust-opening. The ports at each end of the valve are registered with the corresponding ports of the cylinders for admitting steam to the corresponding ends of said cylinders at each half-revolution of the valve, and inasmuch as the valve rotates only one-half as fast as the driving-shaft it is evident that steam is admitted to the corresponding ends of the cylinders at each return stroke of the pistons and that owing to the fact that the exhaust-pockets at one end of the valve are in longitudinal alinement with the ports at the opposite end of the valve the steam in advance of the pistons is free to pass out through the cylinder-ports alined with the pockets and through the exhaust-opening at the same time that steam is admitted at the opposite ends of the pistons.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that considerable change may be made in the detail construction and arrangement of the various parts of my improved engine without depart-



ing from the spirit thereof. Therefore I do not limit myself to the precise construction and arrangement herein shown and described.

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

1. In a steam-engine, a shell having parallel pistons and valve-chambers and a steam-passage surrounding the valve-chamber for forming a steam-jacket between the valve-chamber and piston-chambers having connecting-ports, and a rotary valve seated in the valve-chamber and provided with ports and a central lengthwise passage connecting the opposite ends of the steam-passage for the purpose set forth, said shell having steam inlet and exhaust openings, the inlet discharging into one end of the central passage of the valve.

2. A steam-engine comprising a shell having piston-chambers and a valve-chamber between and parallel with the piston-chambers provided with inlet and exhaust openings and a steam-passage surrounding the valve-chamber the steam-passage having no connection with the exhaust-opening, said valve-chamber having its opposite ends each provided with a pair of diametrically opposite ports leading to the adjacent ends of the piston-chambers, and a rotary valve seated in the valve-chamber and having its opposite ends each provided with a pair of diametrically opposite ports and exhaust-pockets arranged in the periphery of the valve between the ports and communicating with the exhaust-opening.

3. A steam-engine comprising a shell having piston-chambers and a valve-chamber interposed between the piston-chambers and provided with an inlet-opening in one of its end walls and an exhaust-opening in its peripheral wall, said valve-chamber having its opposite ends each provided with diametrically opposite ports communicating with the corresponding ends of the cylinders and a rotary valve seated in the valve-chamber and having its opposite ends open and each provided with diametrically opposite steam-inlet ports the ports at one end being arranged in planes at right angles to the other ports,

said valve being provided with an annular peripheral recess communicating with the exhaust-opening, and exhaust-pockets extending in opposite directions from said recess between the ports of the valve and having their outer ends closed, a driving-shaft actuated by the pistons, and means actuated by the driving-shaft for rotating the valve at substantially half the rate of speed of the driving-shaft.

4. The herein-described valve for steam-engines comprising a tubular shell provided with a peripheral annular recess for the exhaust-steam and having its opposite ends each provided with a pair of diametrically opposite steam-inlet ports extending through the walls of the shell in planes at substantially right angles to each other, said opposite ends of the shell being each provided with a pair of diametrically opposite lengthwise steam-exhaust pockets between the inlet-ports at corresponding ends of the shell and having their outer ends closed and their adjacent ends communicating with the annular recess.

5. In a steam-engine, a shell having parallel piston and valve chambers and a steam-jacket between the walls of the piston-chambers and the valve-chamber, said shell having inlet and exhaust openings and provided with ports connecting the opposite ends of the valve-chamber with the corresponding ends of the piston-chambers, a rotary valve seated in the valve-chamber and provided with a lengthwise central passage communicating at its opposite ends with the opposite ends of the steam-jacket, said valve having each of its opposite ends formed with a pair of diametrically opposite exhaust pockets or recesses, the inlet-ports of the valve extending from the central passage through the walls of the valve, and the exhaust pockets or recesses consisting of depressions in the periphery of the valve.

In witness whereof I have hereunto set my hand this 12th day of November, 1900.

WILLIAM N. WALKER.

Witnesses:

H. E. CHASE,  
MILDRED M. NOTT.