

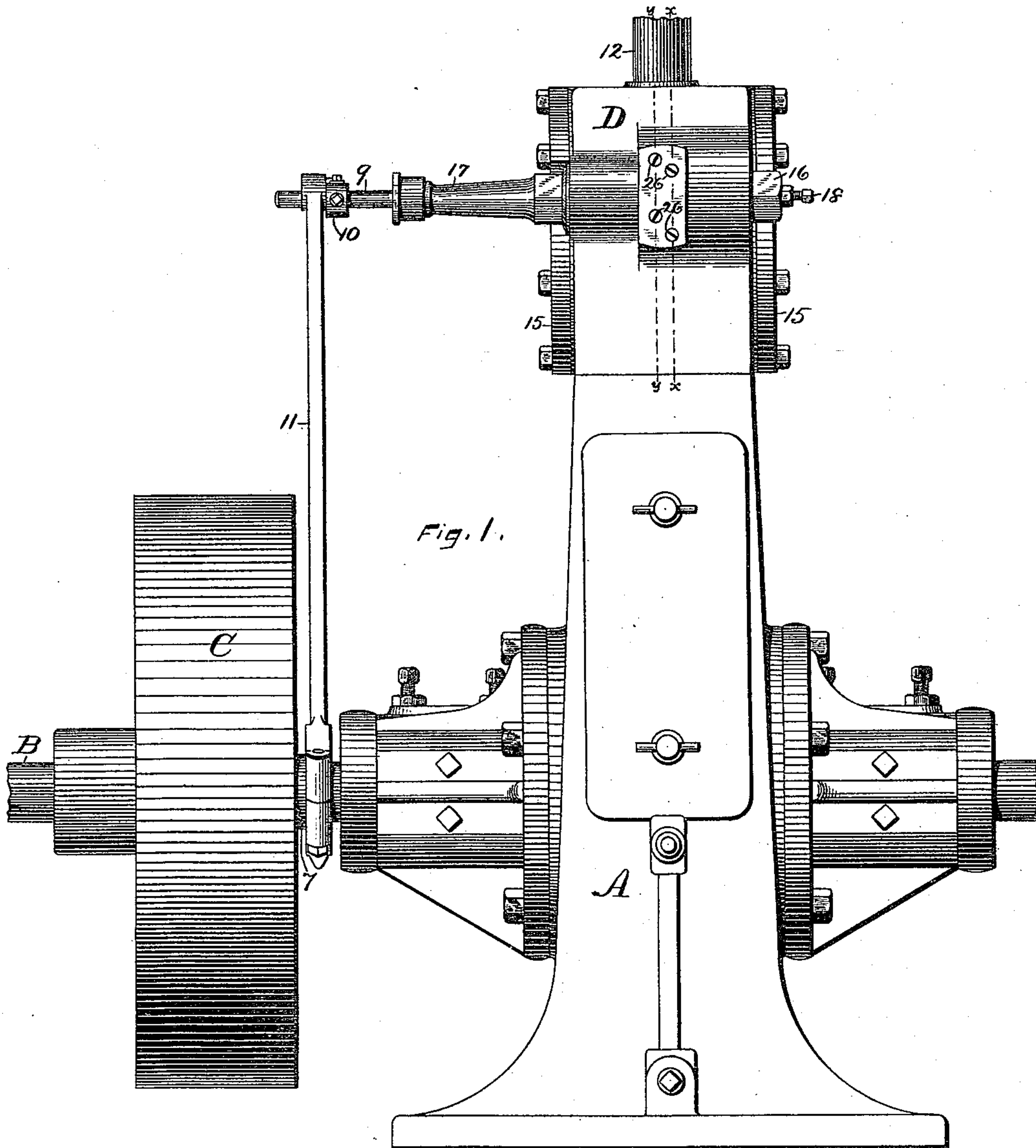
(No Model.)

4 Sheets—Sheet 1.

J. T. CASE.  
BALANCED CUT-OFF VALVE.

No. 441,092.

Patented Nov. 18, 1890.



WITNESSES.  
John Edwards Jr.  
O. E. Tracy.

INVENTOR.  
Joel T. Case.  
By James Shepard  
Att'y.

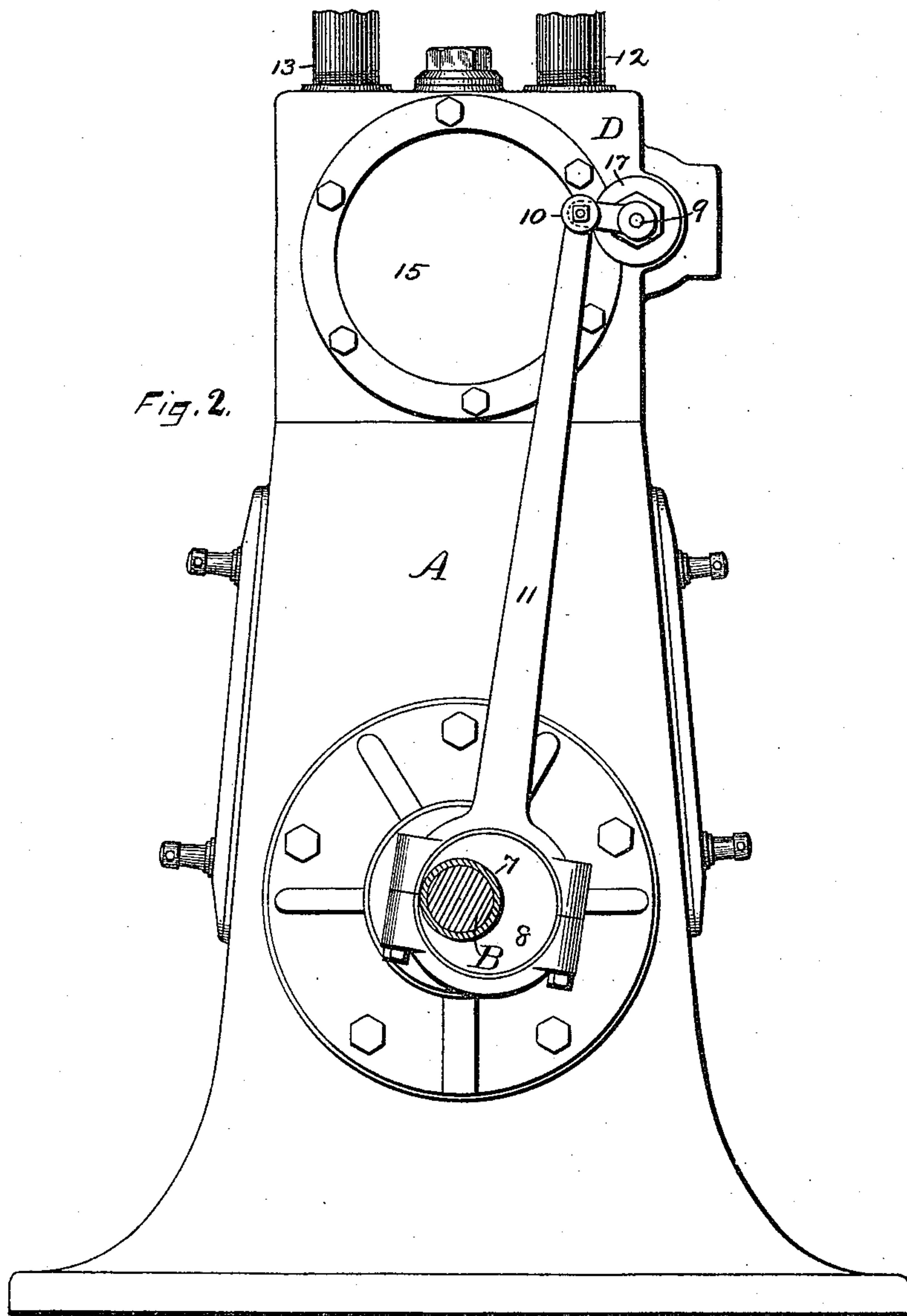
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Inventor.

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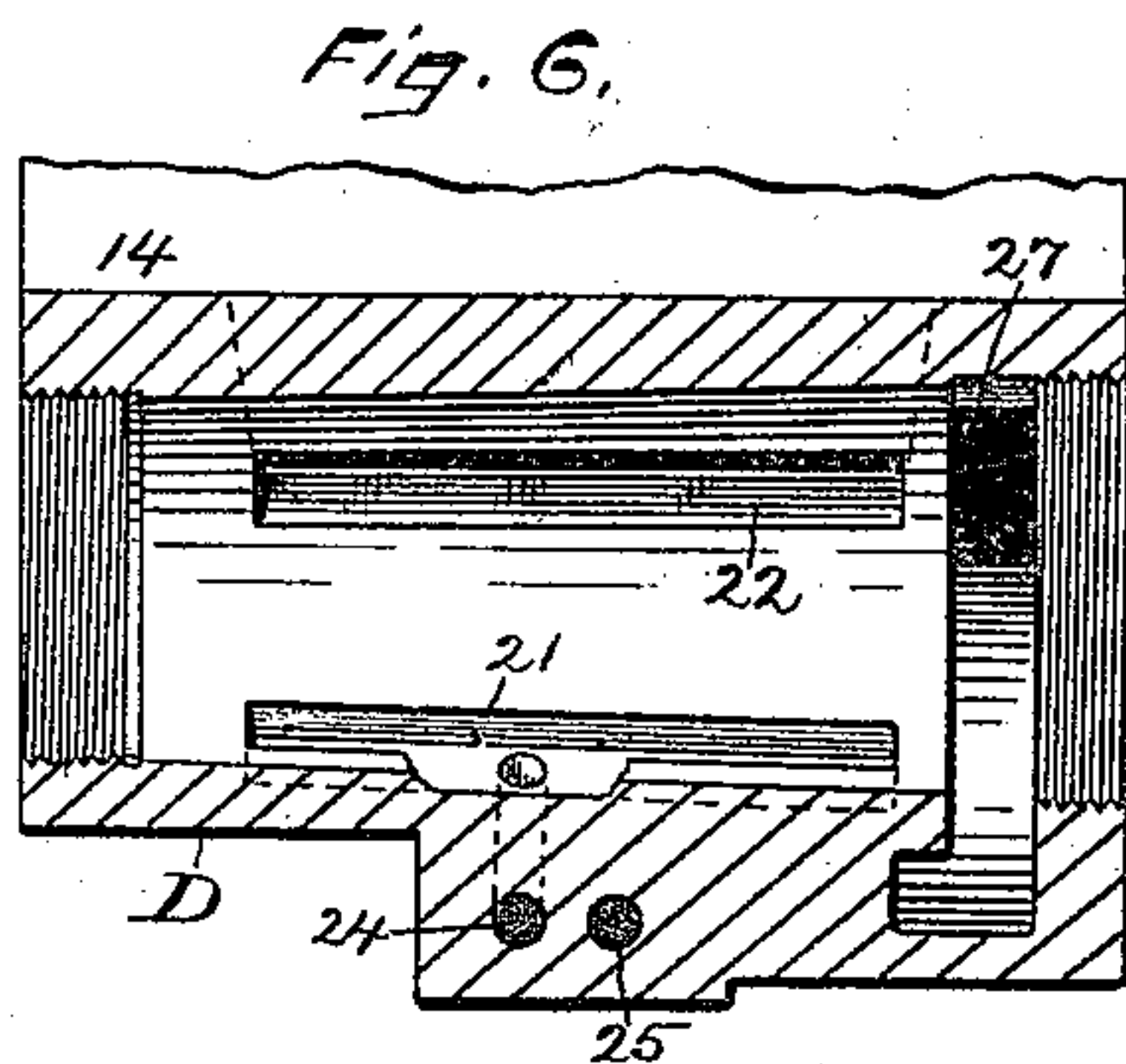
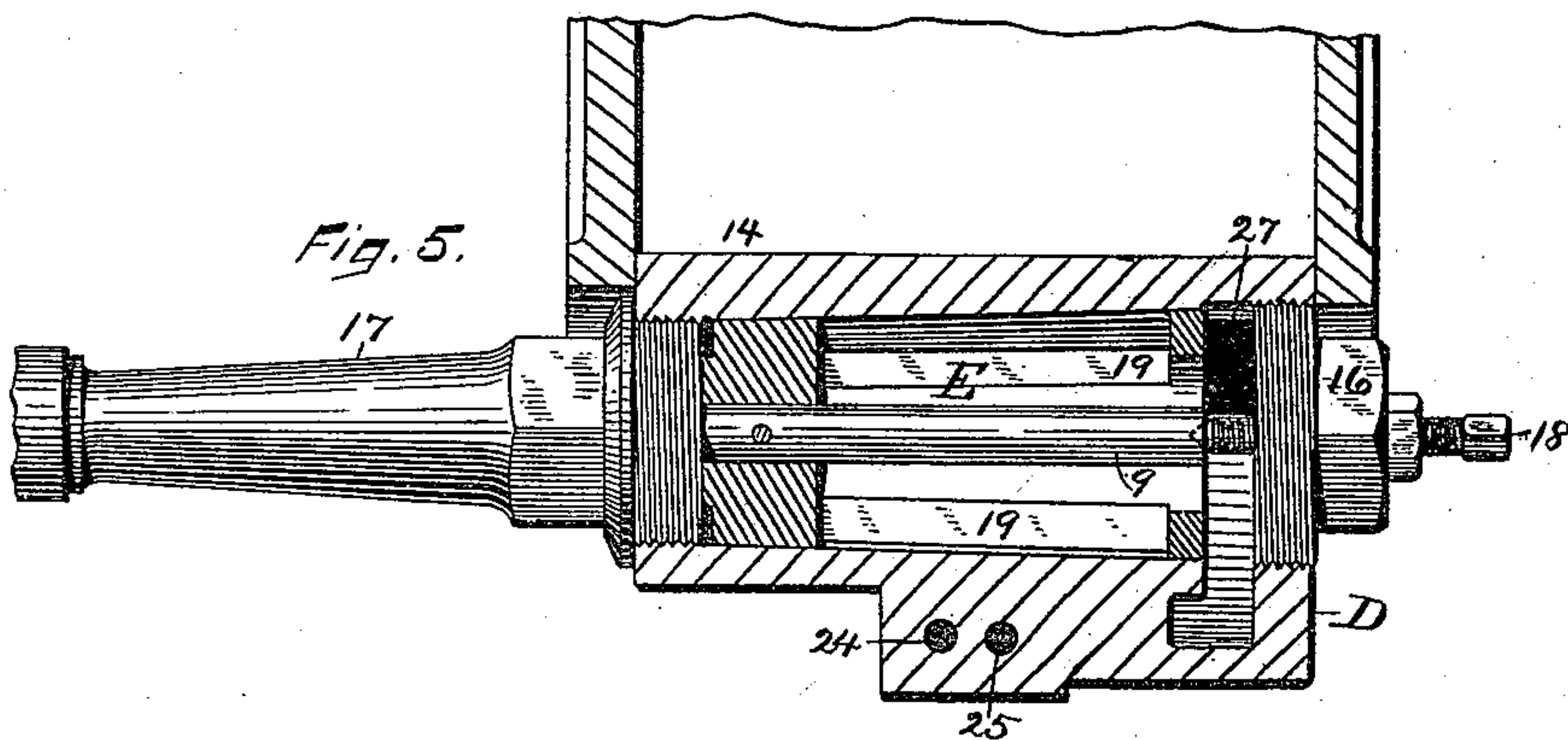
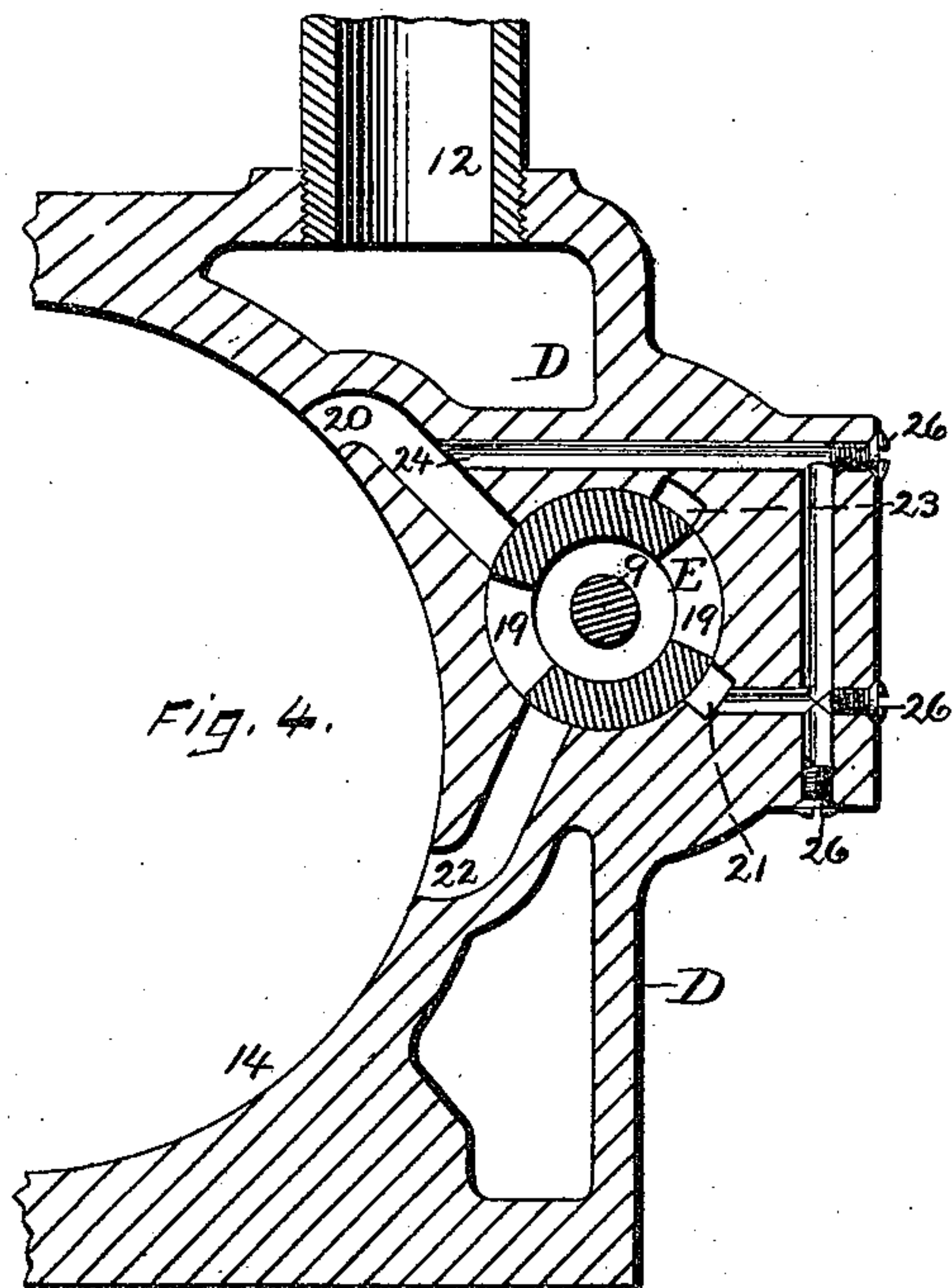
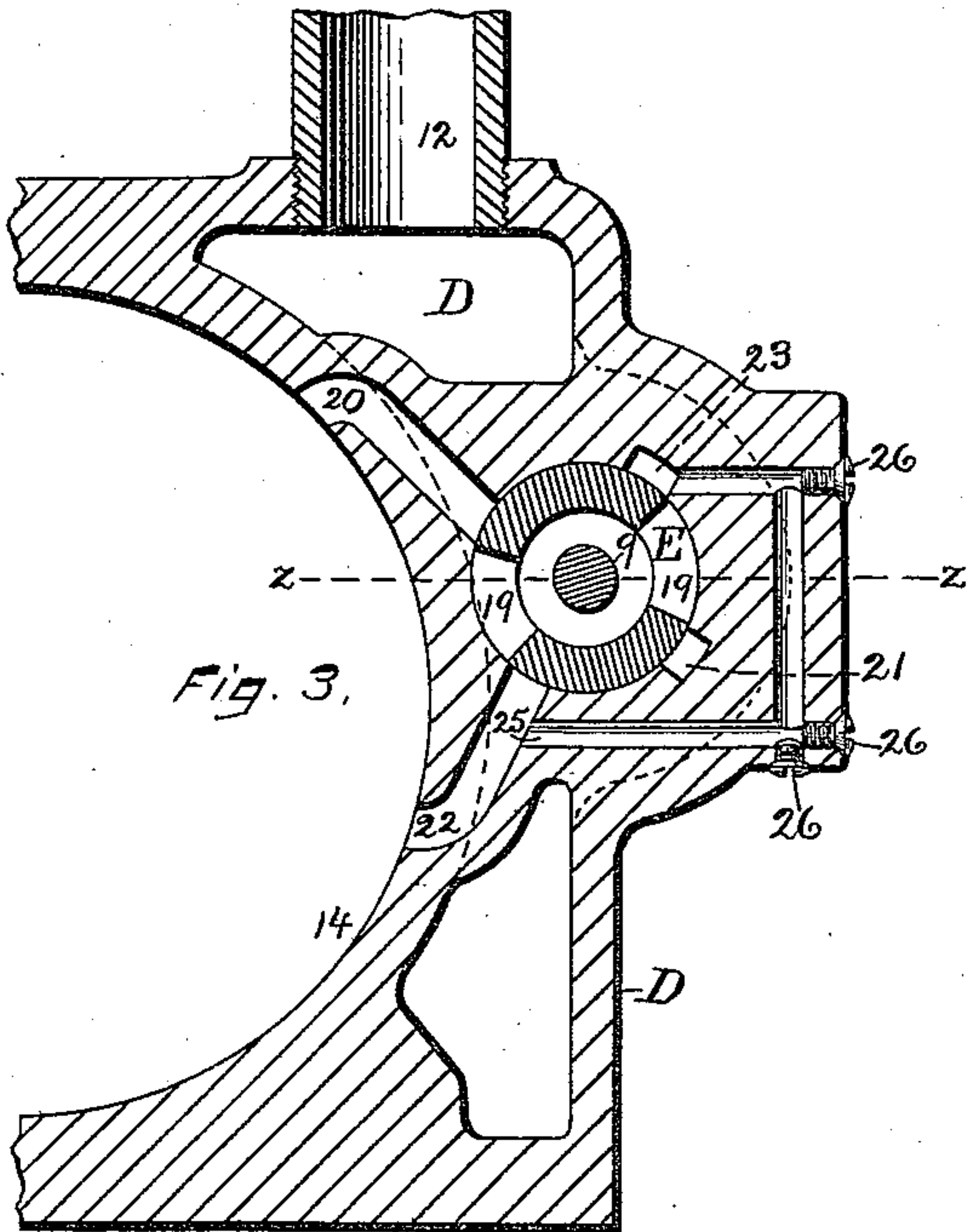
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Witnesses.  
John Edwards Jr.  
C. V. Tracy.

Inventor,  
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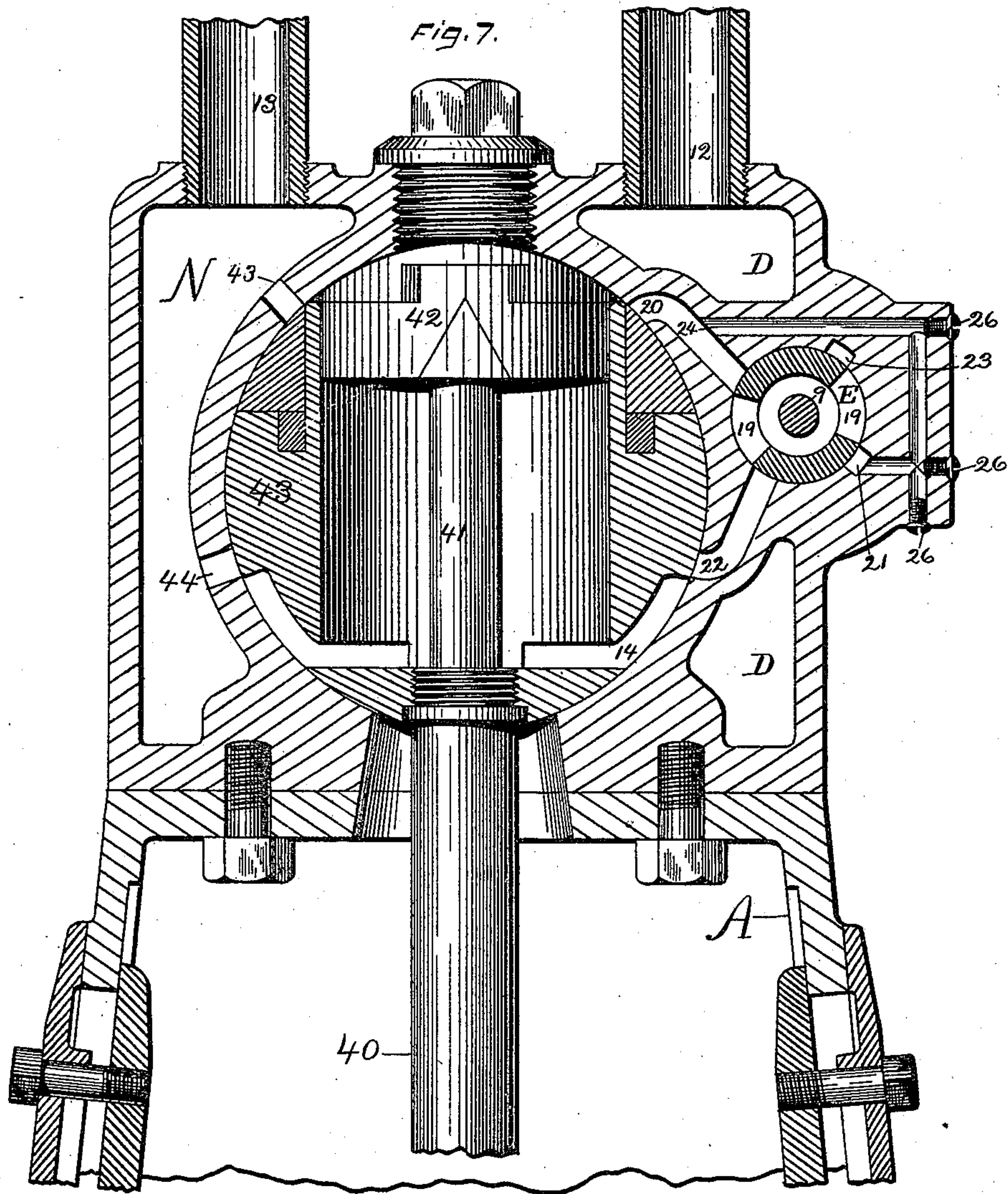
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4 Sheets—Sheet 4.

J. T. CASE.  
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No. 441,092.

Patented Nov. 18, 1890.



WITNESSES.  
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# UNITED STATES PATENT OFFICE.

JOEL T. CASE, OF BRISTOL, CONNECTICUT.

## BALANCED CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 441,092, dated November 18, 1890.

Application filed October 30, 1889. Serial No. 328,627. (No model.)

*To all whom it may concern:*

Be it known that I, JOEL T. CASE, a citizen of the United States, residing at Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Balanced Cut-Off Valves for Steam-Engines, of which the following is a specification.

My invention relates to improvements in balanced cut-off valves for steam-engines; and the objects of my improvement are simplicity and economy in construction and efficiency in operation.

In the accompanying drawings, Figure 1 is a front elevation of an engine having my balanced cut-off valve. Fig. 2 is a side elevation of the same with the shaft and eccentric-sleeve in section. Fig. 3 is a vertical section of parts on the line  $xx$  of Fig. 1. Fig. 4 is a like view on the line  $yy$  of Fig. 1. Fig. 5 is a horizontal section, partly in plan view, on line  $zz$  of Fig. 3. Fig. 6 is a like section on the same line, showing the valve-chamber with the valve removed; and Fig. 7 is a vertical section of the upper part of my engine on the line  $xx$  of Fig. 1.

The general form of the engine is the same as that patented to me December 18, 1888, No. 394,675. It is shown most clearly in Fig. 7, in which 40 designates a sleeve through which the piston-rod 41 works in operating the piston 42 and its oscillating cylinder 43. The live-steam port 20 22 and exhaust-steam ports 43 44 are on opposite sides of the cylinder and are opened and closed by the oscillating movement of said cylinder, as in my aforesaid patent, so that when live steam enters the upper end of the cylinder through the port 20 it exhausts at the lower end through the port 44, and when live steam enters the lower end of the cylinder through the port 22 it exhausts at the upper end through the port 43.

A designates the case or frame, B the crank-shaft, and C the governor mounted on said shaft. This governor may be of any ordinary construction and provided with a sleeve 7 and eccentric 8, the same as in other governors. The live-steam chest D at the upper part of the engine is enlarged on one side to make room for the rotary cut-off valve E. This valve is provided with a projecting spindle 9,

to the outer end of which I attach a crank 10, and I connect said crank with the eccentric of the governor by the pitman 11, whereby said eccentric will partially rotate the cut-off valve a given distance at each revolution of the shaft B, the time of which movement of said valve relatively to the opening and closing of the valves at the ends of the cylinder will be varied by the governor according to the variation in speed of the crank-shaft.

The live-steam chest D is supplied through the pipe 12, and the exhaust-steam passes out from the exhaust-steam chest N on the opposite side through the pipe 13. Between the live and exhaust steam chests is the cylinder-chamber, one side of which is shown in Figs. 3 and 4 at 14 and the whole chamber in Fig. 7, the flat sides of said chamber being covered by the caps 15.

In the wall of the steam-chest D, I bore a tapering hole, as a valve-chamber, for the cut-off valve E, and close the ends of this hole by screw-plugs 16 and 17. The plug 16 is provided with a pointed screw 18 for centering the inner end of the valve-spindle 9 and for adjusting the valve, while the body of said spindle passes outwardly through a central hole in the plug 17. The valve E is a hollow tubular valve open at one end and has its periphery fitted to the bore of the chamber that receives it. Two openings 19 are made through its shell on opposite sides, as shown. The ports 20 22, which open into the cylinder-chamber 14, for the opposite ends of the cylinder lead to and open into the valve-chamber, and no steam can enter them except that which passes through the cut-off valve. I form two balancing-chambers or depressions 21 23 in the wall of the valve-chamber at points nearly opposite that end of the ports 20 22 that open into said valve-chamber, as shown. These balancing-chambers are closed at each end; but I make a passage 24, that leads from the port 20 to its opposite balancing-chamber 21, and a passage 25, that leads from the port 22 to its opposite balancing-chamber 23. A convenient way to form the passages 24 and 25 is to drill two parallel horizontal holes into the desired port and chamber to be connected and then connect said horizontal holes by drilling a vertical



hole running into both of the horizontal holes, as clearly shown in Figs. 3 and 4, and then stop the outer ends of said drilled holes by plugs 26. That end of the valve-chamber in which the open end of the valve E is located is provided with a passage-way 27, that opens into the interior of the steam-chest D.

Steam entering the live-steam chest D through the pipe 12 comes into the open end of the cut-off valve E through the passage-way 27. As the valve partially rotates it presents one of its side openings 19 successively to the ports 20 and 22, so that the steam passes through them first to one end of the cylinder and then to the other. The steam is cut off from both ports when the valve is in the position shown in Figs. 3, 4, and 5, the solid portions of the valve-periphery covering said ports. When the eccentric operates the valve to bring one of the openings 19 in front of the port 20 and the opposite opening 19 in front of the balancing-chamber 21, the steam can pass from said valve in both directions—that is to say, directly into the port 20 on one side and indirectly into the port 20 through the balancing-chamber and passage 25. At the same time the solid portions of the valve E will be in front of the port 22 and its opposite balancing-chamber 23, so as to close them, which port and chamber are connected by the passage 25, as shown in Fig. 3, whereby all the pressure of the steam under its expansive force within said port and balancing-chamber will be exerted equally upon both sides and perfectly balance the valve, so that it may partially rotate without much friction. In like manner, when the valve opens to the port 22 and its opposite balancing-chamber 23, the solid portions of the wall are in front of and cut off communication between the interior of the valve and the port 20 and balancing-chamber 21, which port and chamber are connected by the passage 24, so that the pressure upon opposite sides of the valve is balanced.

In a prior application filed by me February 14, 1888, Serial No. 263,973, I have shown, described, and claimed an engine having a piston and oscillating cylinder with valves consisting of a movable part, which rocks with the oscillating movement of the cylinder and is provided with radial ports, and a stationary part having radial ports, in combination with a cut-off in a steam-passage leading to said ports and a governor connected with said cut-off for varying the time of operating it relatively to the opening and closing of the valves proper, and therefore I do not claim

the same in this application, although the present engine, cut-off, and governor constitute the same combination.

My improved cut-off valve is of a different construction and is balanced, and the engine proper, although of the same class as that referred to in said prior application, is of the improved form shown and described in my prior patent hereinbefore named.

I claim as my invention—

1. In an engine, the combination of the steam-chest having a valve-chamber and passage 27 leading from the interior of said steam-chest to one end of said chamber, the ports 20 and 22, opposing balancing-chambers 21 23 and connecting-passages, and the valve E, of a tubular form, open at the end and provided with side openings of less breadth than the distance between the ports 20 and 22, and two solid portions, each of a breadth sufficient to cover one of said ports and the space between the two, substantially as described, and for the purpose specified.

2. In an engine having a rotary cut-off valve, the steam-chest having the valve-chamber, the ports 20 22, balancing-chambers 21 23, and the passages 24 25, extending in an angular form from each port to its opposing chamber, whereby said passages may be formed by drilling and plugging the outer open ends, substantially as described, and for the purpose specified.

3. In an engine, the combination of a steam-chest, a valve-chamber having ports leading to the respective ends of the cylinder, a balanced cut-off valve fitted within said valve-chamber, an eccentric for oscillating said cut-off valve to alternately cut off and open said ports, and a governor connected with said cut-off valve to vary its time of action, substantially as described, and for the purpose specified.

4. In an engine, the combination of the steam-chest having a valve-chamber and passage 27 leading from the interior of said steam-chest to one end of said chamber, the ports, opposing balancing-chambers, and connecting-passages, the valve E, of a tubular form, open at the end and provided with side openings, the spindle 9, on which said valve is mounted, and the screw 18, bearing on the end of said spindle, substantially as described, and for the purpose specified.

JOEL T. CASE.

Witnesses:

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JOHN EDWARDS, Jr.