

No. 685,131.

Patented Oct. 22, 1901.

W. C. GORDON.  
VALVE GEAR FOR ENGINES.

(Application filed May 25, 1901.)

(No Model.)

2 Sheets—Sheet 1.

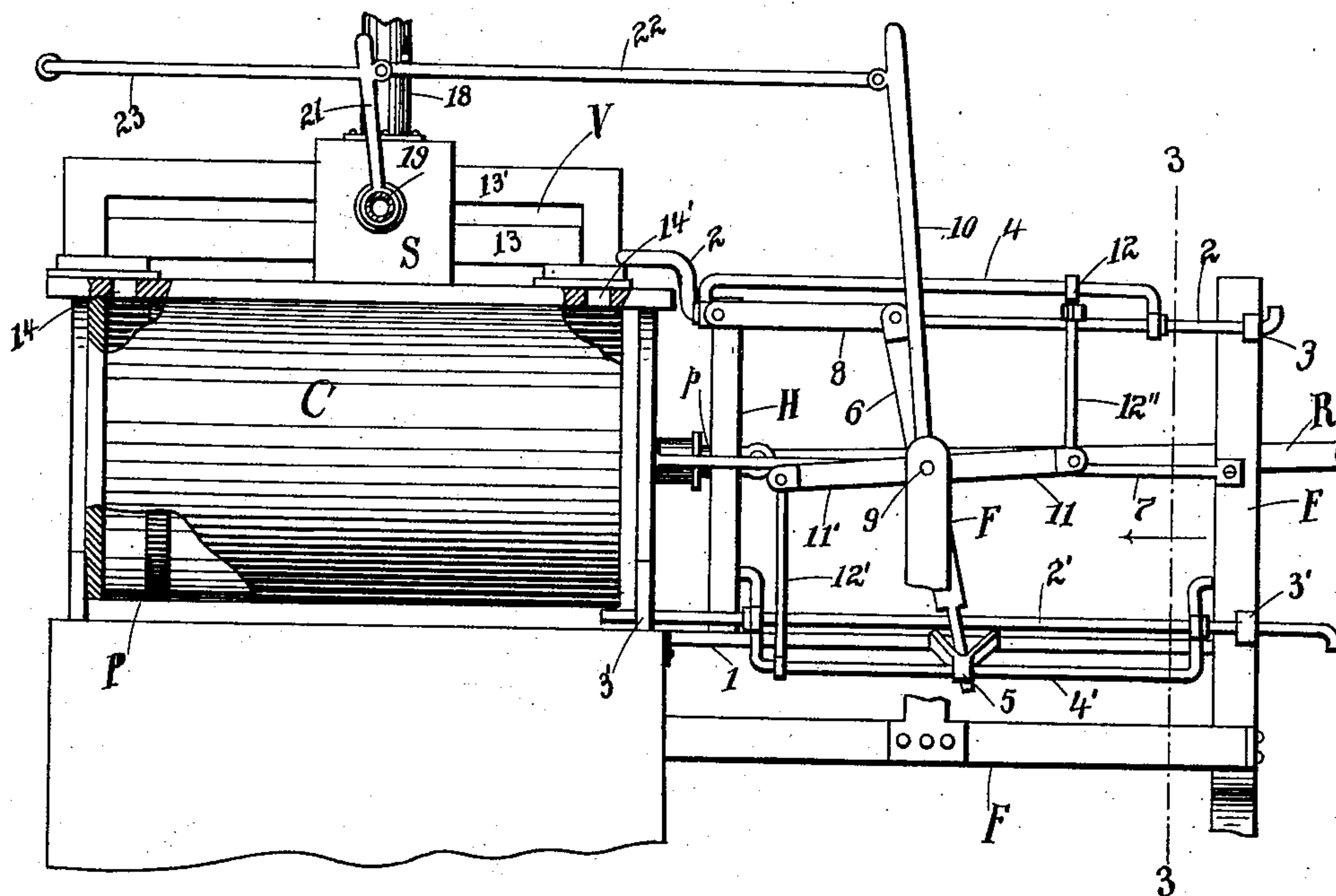


FIG. 1.

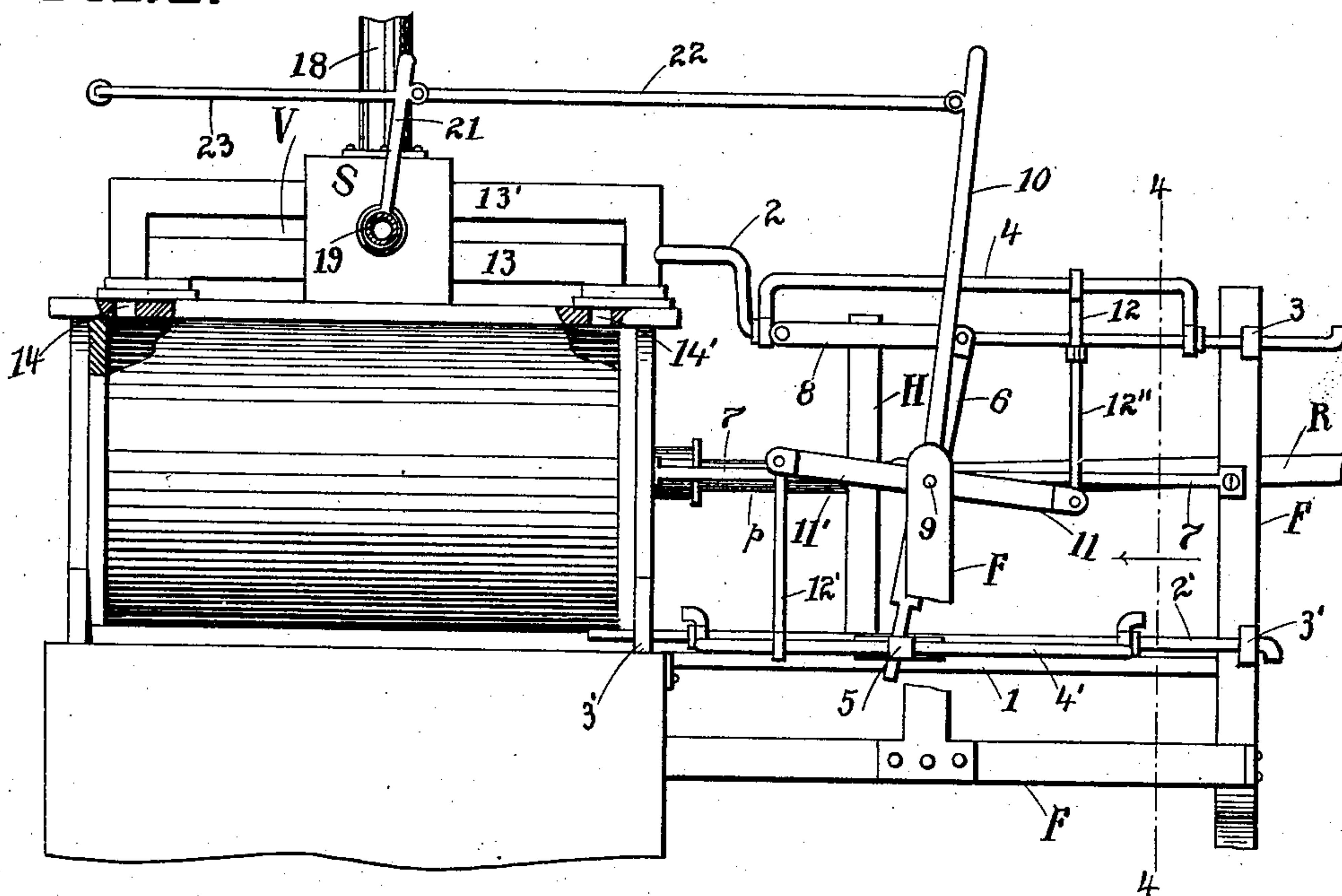


FIG. 2.

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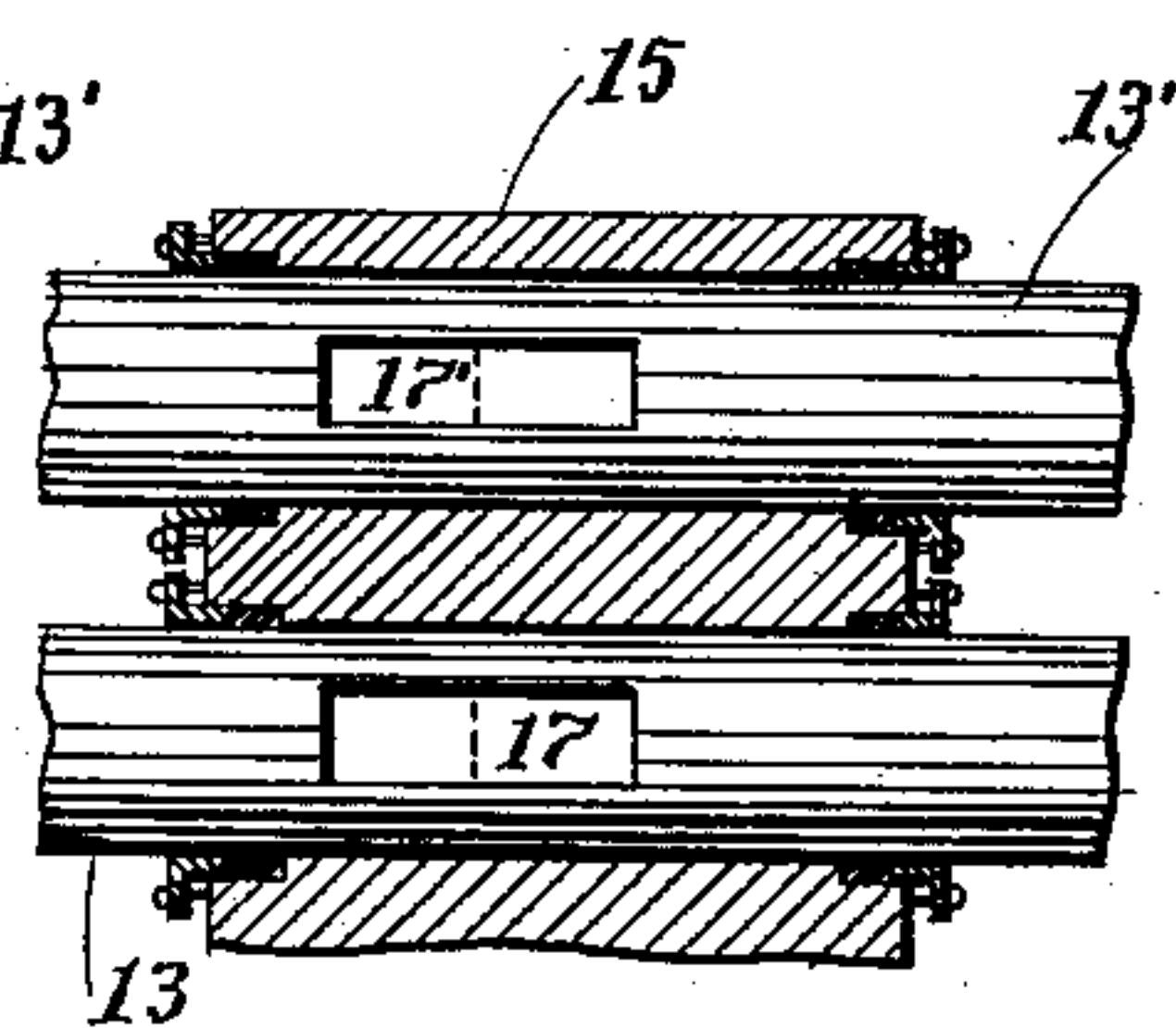
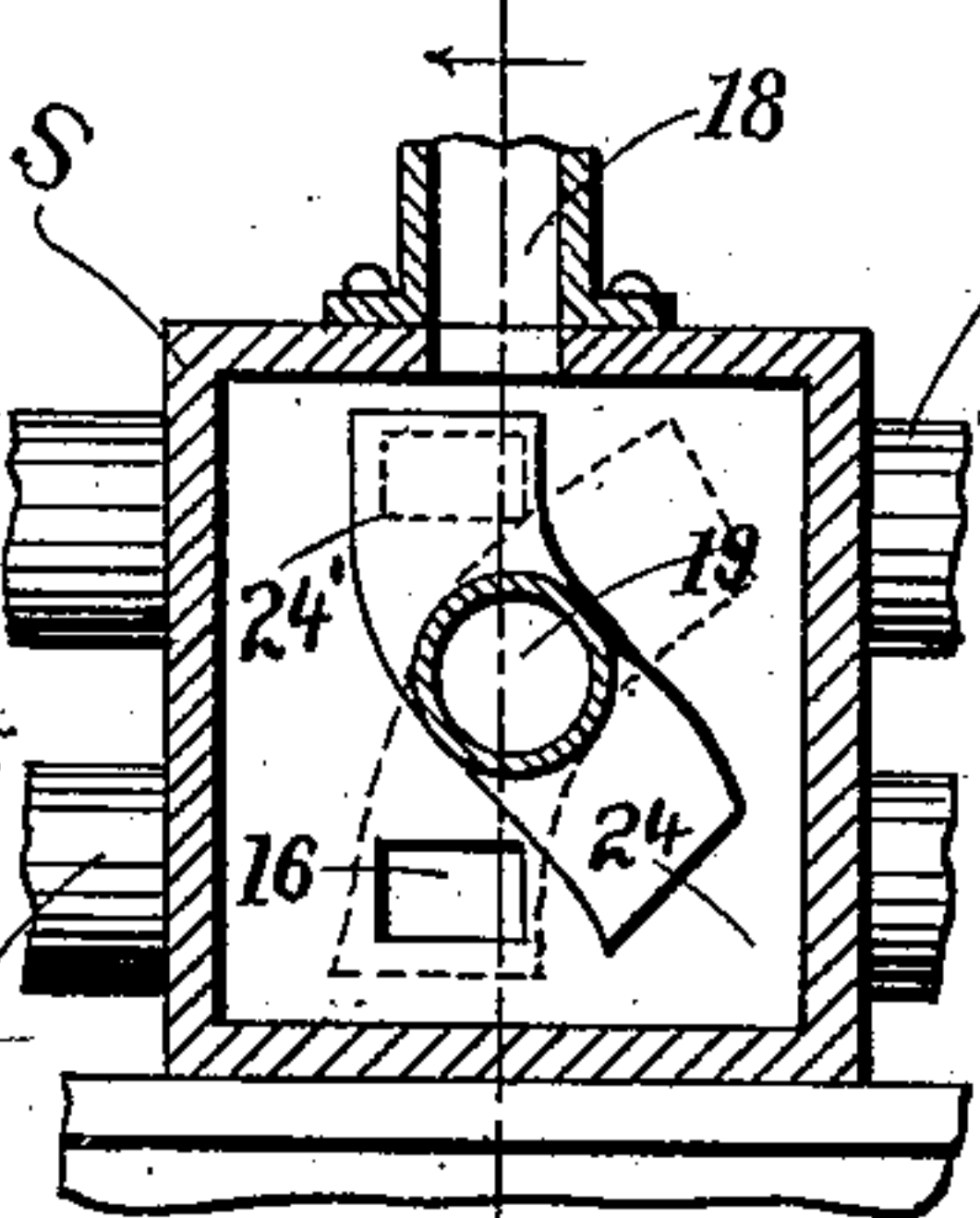
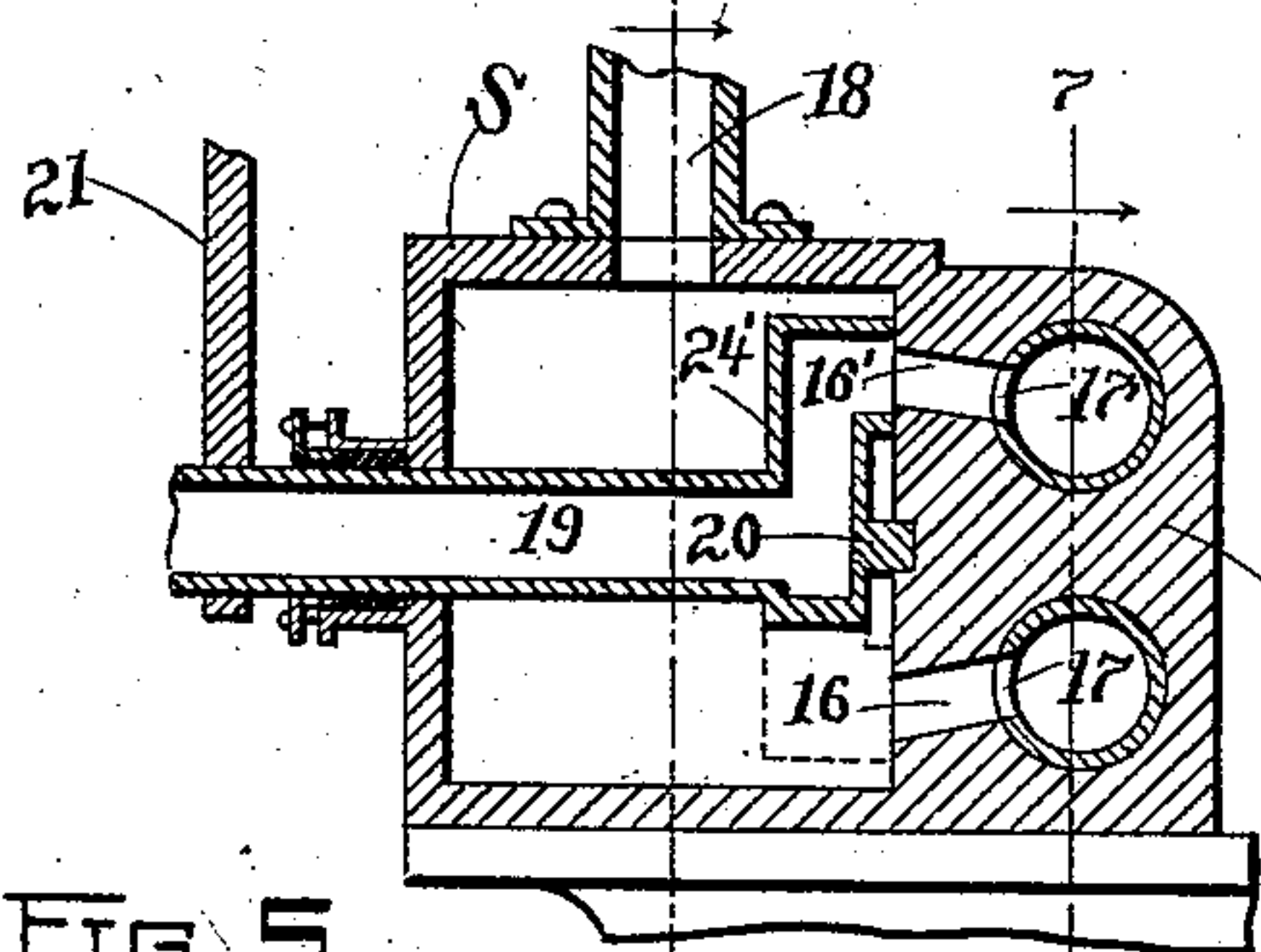
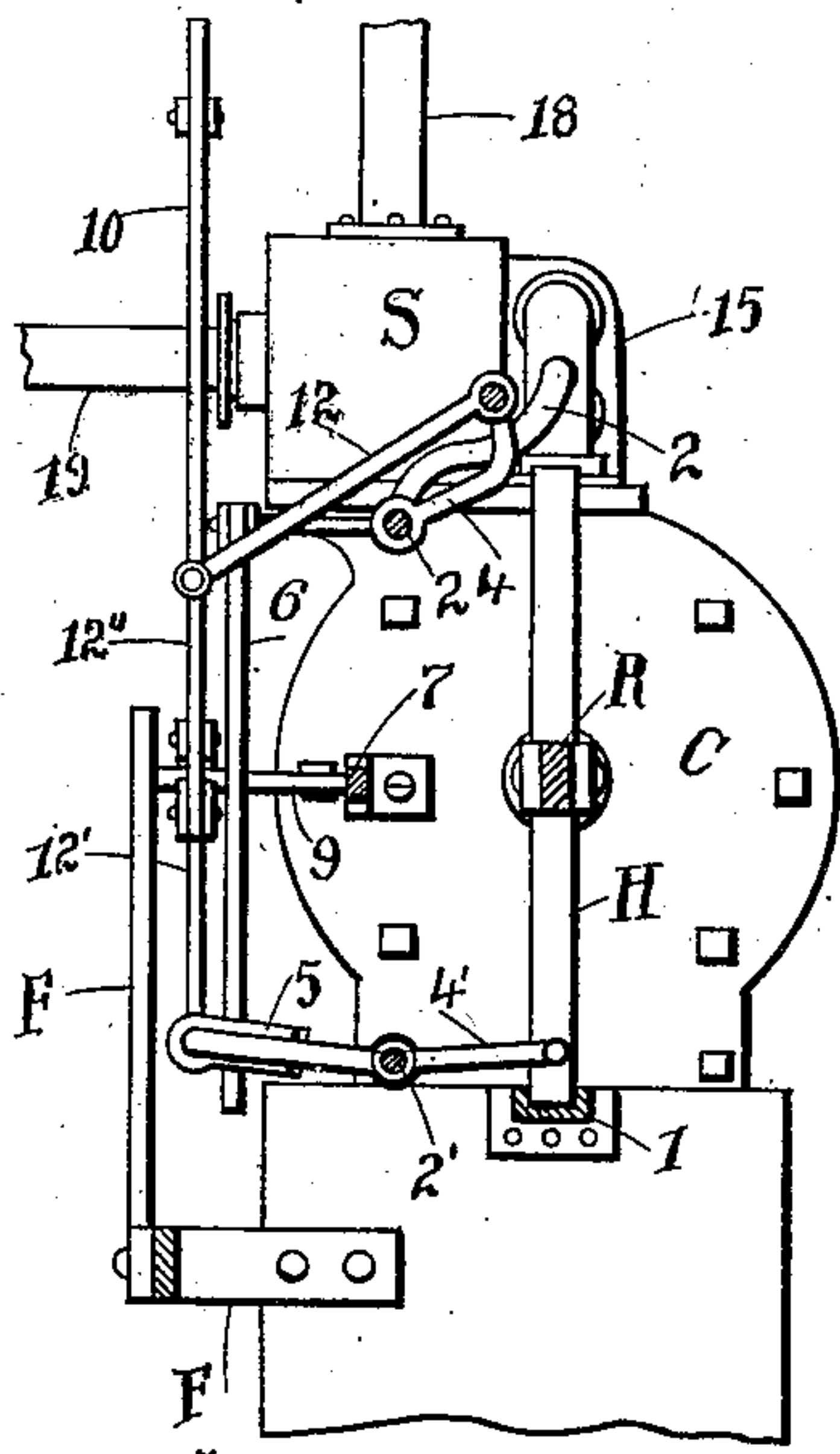
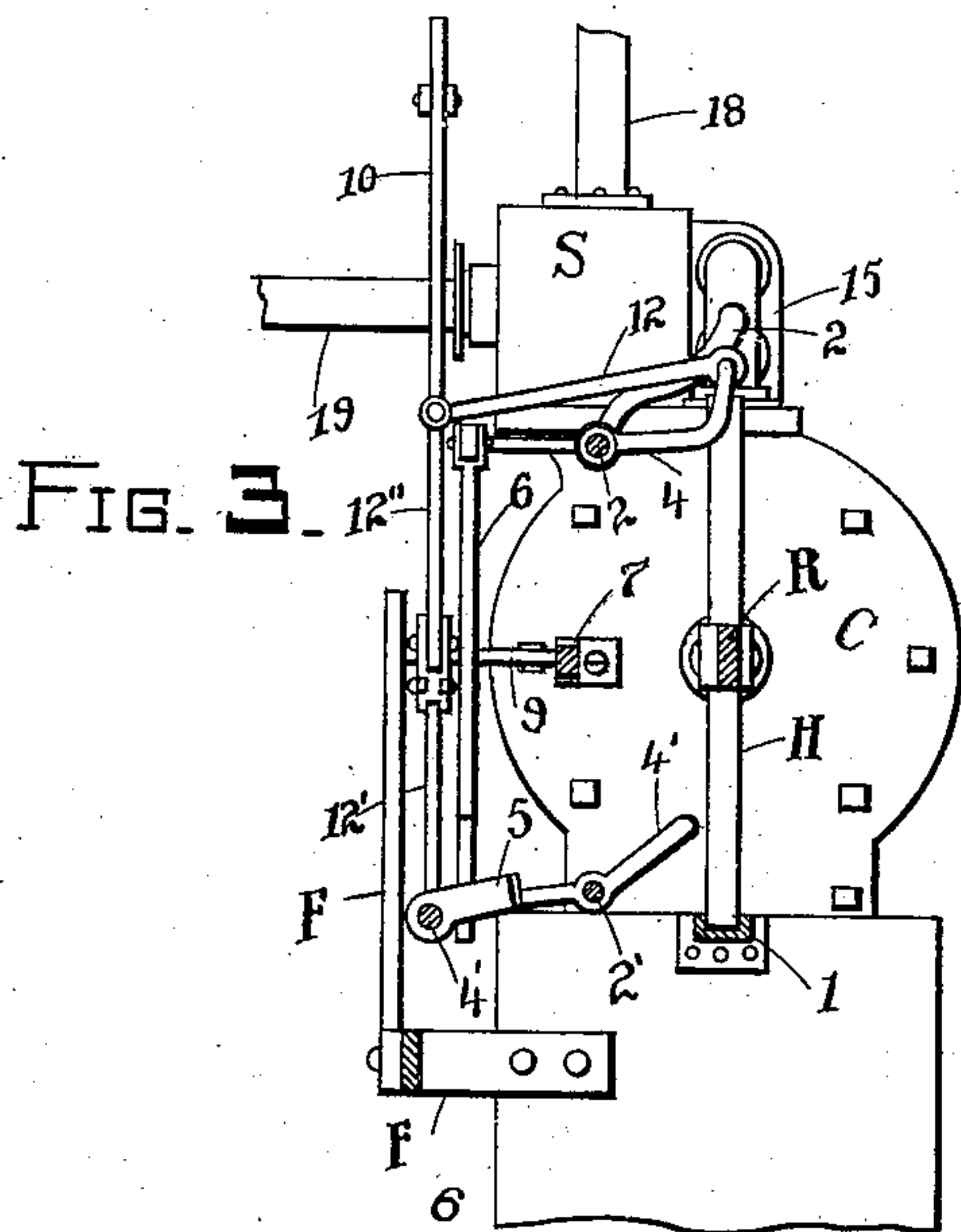


FIG. 5.

FIG. 6.

FIG. 7.

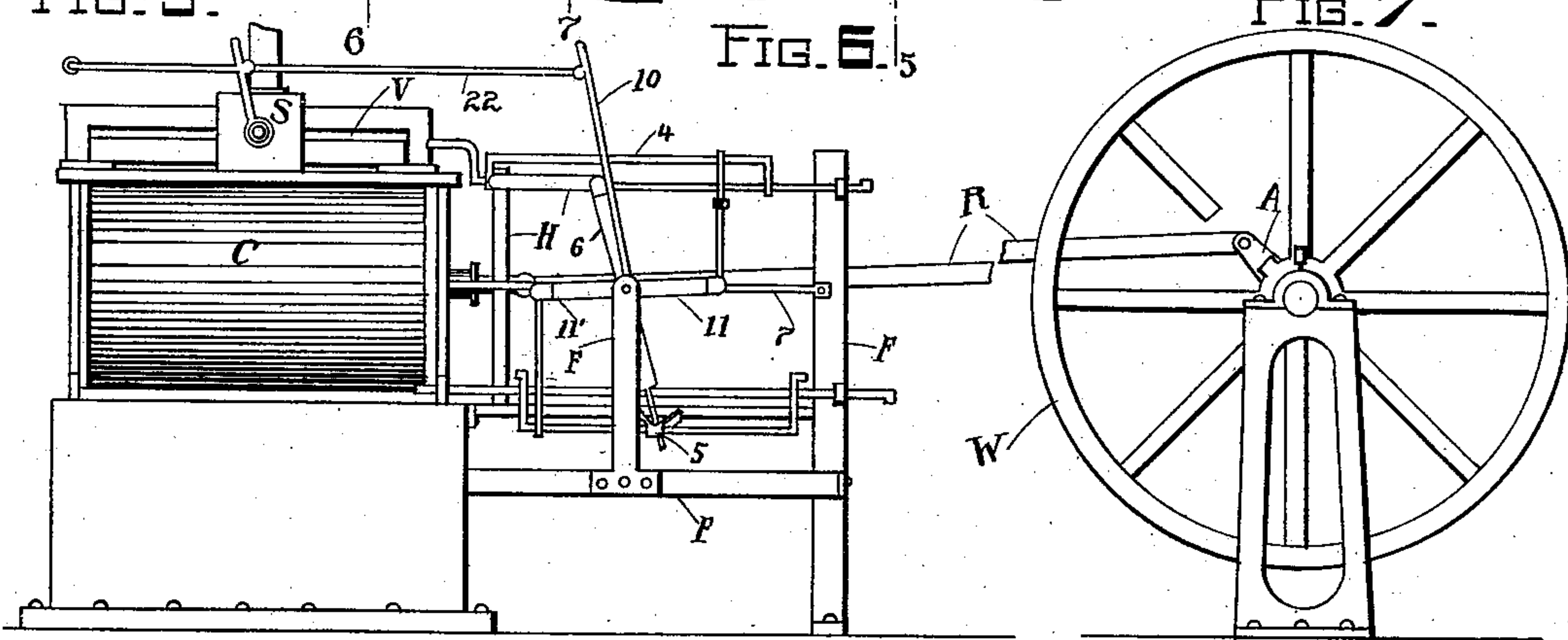


FIG. 8.

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# UNITED STATES PATENT OFFICE.

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## VALVE-GEAR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 685,131, dated October 22, 1901.

Application filed May 25, 1901. Serial No. 61,943. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM C. GORDON, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Valve-Gear for Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in steam-engines; and it consists in the novel construction of engine more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the cylinder and valve-gear with reversing-lever in one of its extreme positions. Fig. 2 is a similar view with reversing-lever in the other extreme position. Fig. 3 is a vertical section on line 3 3 of Fig. 1, showing the upper tappet-yoke in position to be struck by the cross-head. Fig. 4 is a vertical section on line 4 4 of Fig. 2, showing the lower tappet-yoke in position to be struck by the cross-head, the upper tappet-yoke being tilted out of engagement. Fig. 5 is a longitudinal vertical section through the steam-chest, taken on line 5 5 of Fig. 6. Fig. 6 is a transverse vertical section on line 6 6 of Fig. 5. Fig. 7 is a longitudinal section taken through the steam-valve stuffing-box on line 7 7 of Fig. 5, and Fig. 8 is a side elevation of the engine complete.

The present invention has relation to that class of engines known as the "tappet" type, or that form in which the steam-valve is operated without an eccentric.

My invention is specially adapted to a double-acting steam-engine, and has for its object to produce an engine which may be readily reversible, one under ready control of the operator, one particularly applicable to stationary engines, one which is simple in construction and perfect in operation, and one possessing further and other advantages better apparent from a detailed description thereof, which is as follows.

Referring to the drawings, C represents the cylinder, and F a frame located in front thereof.

W is the fly-wheel, the crank-arm A of

whose shaft is connected, by means of connecting-rod R, to the cross-head H. The latter is connected to the piston-rod *p*, to which the piston P is secured. The cross-head is guided in its travel on the track or way 1, forming a part of the frame F. The cross-head at the end of each stroke shifts the position of the steam-valve V to secure the necessary admission of the steam on opposite sides of the piston and permit its exhaust at the proper moment.

The mechanism by which the shifting of the steam-valve is effected is as follows: Connected to one end of the steam-valve is the upper curved end of a reciprocating rod 2, the opposite end being loosely mounted in a bearing 3 on the frame F. Below the rod 2 is a similar reciprocating rod 2', mounted in bearings 3' 3'. Mounted on the rod 2 and adapted to reciprocate with it is a tappet yoke or frame 4, which, while it is freely rotatable about the rod 2, is not movable longitudinally along the same. Mounted on the rod 2' and adapted to reciprocate with it is a similar tappet-yoke 4', which likewise is freely rotatable about the rod 2', but not movable longitudinally along the rod. The medial portion of the yoke 4' has formed thereon a V-shaped fork 5, the base of which is always in engagement with the lower end of a lever 6, medially pivoted on a rod 9, whose inner end is secured to a bar 7, forming a part of the frame F, the upper end of the lever 6 being pivotally secured to a connecting-link 8, which couples said lever to the yoke 4. From the connections described it is apparent that as one yoke and its supporting-rod reciprocate in one direction the adjacent yoke and its supporting-rod will travel in the opposite direction, the one being operated from the other through the lever 6 and link 8.

Pivotally mounted on the horizontal rod 9, carried by the frame F, is the reversing-lever 10, the base of which carries the arms 11 11', the arm 11 being connected to the yoke 4 by a swinging link 12, loosely embracing the basal portion of the same, the link 12 being coupled to a rigid link 12'', and the arm 11' being connected to the yoke 4' by a similar link 12'. By rocking the reversing-lever to the position indicated in Fig. 1 the tappet-



yoke 4 will be rocked to a position to permit the reciprocating cross-head to impact there-with (see Fig. 3) at the end of each strike thereof, thus shifting the steam-valve to the positions necessary to allow for the proper admission of live steam into the cylinder and the simultaneous exhaust therefrom of the steam on the exhaust side of the piston. When the reversing-lever is rocked to the position indicated in Fig. 2, the yoke 4 will be rocked out of engagement with the cross-head and the yoke 4' rocked into engaging or impacting position, this action reversing the direction of the reciprocations of the yokes and that of the steam-valve and reversing the direction of rotation of the engine, as will presently more fully appear.

The steam-valve in the present instance comprises two parallel pipes 13 13', whose opposite ends are adapted to communicate with the cylinder-ports 14 14', through which the steam enters into and escapes out of the cylinder. The pipes 13 13' operate in a stuffing-box 15, provided with transverse passages or ports 16 16', opening, respectively, into the steam-chest S and into the steam-valve through elongated openings 17 17' of the component pipes thereof. The steam is fed to the steam-chest through steam-pipe 18, there being mounted rotatably within the steam-chest the exhaust-pipe 19, (having a bearing or spindle 20 in the wall of the stuffing-box,) the outer projecting end of the said exhaust-pipe having secured thereto an arm 21, which is connected to the reversing-lever by a connecting-rod 22, the arm 21 being provided on the opposite side with a handle-bar 23. The inner end of the exhaust-pipe 19 is provided with two branches 24 24', one of the branches 24' being adapted to cover the port 16' when the parts occupy the position in Figs. 1 and 3 and the branch 24' covering the port 16' when the reversing-lever is shifted to the position indicated in Figs. 2 and 4. It will be observed that the reversing-lever is shifted by pushing the handle-bar 23 in one direction or the other, and in this act the exhaust-pipe is rotated, so that for one position of the branches 24 24' of the latter the port 16 becomes the live-steam port and for the other position the port 16' becomes the live-steam port, the exhaust escaping through port 16. (See Fig. 6.)

The full position indicated in Figs. 5 and 6 corresponds to the positions of the parts in Figs. 1 and 3, and with these before us the operation of the engine is readily explained.

Steam enters the steam-chest S through steam-pipe 18, thence passing through port 16, opening 17, pipe 13, and port 14 into the cylinder, forcing the piston to the right, (see Fig. 1,) the exhaust escaping through port 14', pipe 13', opening 17', port 16', branch 24', and out through exhaust-pipe 19. When the piston has about reached the limit of its right-hand stroke, the cross-head strikes the tappet-yoke 4 and shoves the latter and the valve V to the right, (see Fig. 2,) the live steam

now passing into the cylinder on the opposite side of the piston and driving the same in the opposite direction, the action of the pipes 13, 13', 24', and 19 remaining the same. Suppose, however, that the operator by the time the piston is half-way on such return stroke suddenly reverses the lever 10. (see Fig. 2.) Then from the connections above set forth the tappet-yoke 4 will be rocked out of engagement and yoke 4' be brought into the path of the cross-head H and the latter be now in a position to operate the steam-valves through said yoke 4', lever 6, and link 8; but with this change in the position of the reversing-lever there has also been rotated about its axis the exhaust-pipe 19 and its branches 24 24', the branch 24 now covering the port 16 (see dotted position, Fig. 6) and branch 24' uncovering the port 16'. The live steam now passes from the steam-chest through the port 16', opening 17', pipe 13', and port 14 into the cylinder, suddenly driving the piston (advancing toward the left in Fig. 2) in the reverse direction and reversing the engine, the exhaust being forced through port 14', pipe 13, opening 17, Fig. 7, port 16, branch 24, and out through exhaust-pipe 19, so that when the engine is running in one direction the pipe 13 and port 16 conduct live steam and pipe 13' and port 16' exhaust-steam, and when running in the opposite direction the reverse of these conditions is the rule.

In Figs. 2 and 4 the tappet-yoke 4' is in position to be struck by the cross-head at the end of each stroke thereof, the valve V being operated through the lever 6 and link 8, as already explained. Of course if the reversing-lever is swung back to its original position the engine will again run as before the first reversal.

It is apparent, of course, that the details herein may in a measure be departed from without affecting the nature or spirit of my invention.

Having described my invention, I claim—

1. In an engine, a cylinder, a reciprocating piston therefor, a piston-rod, a steam-valve controlling the admission of steam into, and exhaust from the cylinder, tappets located on opposite sides of the path of the piston-rod, one of said tappets being connected to the steam-valve, devices for causing either one tappet or the other to be struck during the reciprocations of the piston, and suitable connections between the tappets for producing a simultaneous reciprocation thereof in opposite directions, substantially as set forth.

2. In an engine, a cylinder and steam-valve therefor, a piston, a pair of rotatable and reciprocating tappets, devices carried by the piston-rod adapted to contact with one of the tappets at a time and intermediate connections between the tappets for producing a simultaneous reciprocation thereof in opposite directions, substantially as set forth.

3. In an engine a cylinder, a steam-valve therefor, a piston and piston-rod, a cross-



head, suitable rotatable reciprocating tappet frames or yokes adapted to be struck one at a time by the cross-head, intermediate connections between the tappets for producing  
5 a simultaneous reciprocation thereof in opposite directions, and devices under the control of the operator for alternately bringing one or the other tappet-frame into position to be struck by the cross-head when near the  
10 end of its stroke, substantially as set forth.

4. In an engine, a cylinder, a steam-valve therefor, a piston and piston-rod, a cross-head, a rotatable reciprocating tappet yoke or frame disposed on each side of the cross-head, one of the tappet-yokes being connected  
15 to the steam-valve, a lever pivoted between the yokes, a link connecting one end of the lever to the yoke having direct connection with the steam-valve, the opposite end of the  
20 lever being in coöperative engagement with the opposite yoke, a swinging reversing-lever pivoted in the line of the axis of the aforesaid lever, and suitable linked connections between the reversing-lever and the yokes,  
25 whereby upon swinging the reversing-lever in one direction, one of the yokes shall be rocked in the path of the cross-head, and when swung in the opposite direction, the other yoke shall be brought into like relation  
30 while the first yoke is disengaged, the parts operating substantially as and for the purpose set forth.

5. In an engine a suitable steam-chest, a reciprocating steam-valve, a stuffing-box for  
35 said valve, the latter having two passages or pipes whose opposite ends are adapted to establish communication with the corresponding ends of the cylinder, ports leading from the stuffing-box to the steam-chest, elongated  
40 openings formed in the component pipes or passages of the steam-valve and in communication with the said ports, a rotatable exhaust-pipe extending from the steam-chest and having inner branches adapted each to  
45 cover or uncover one of the aforesaid ports

according to the degree of rotation imparted to the exhaust-pipe, the parts operating substantially as and for the purpose set forth.

6. In an engine, a steam-chest reciprocating steam-valve coöperatively connected there-  
50 with and establishing communication with the opposite ends of the cylinder, tappets actuated by the reciprocations of the piston, intermediate connections between one of the  
55 tappets and the steam-valve, a rotatable exhaust-pipe leading from the steam-chest, a reversing-lever, intermediate connections between the reversing-lever and the rotatable exhaust-pipe, whereby the swinging of the  
60 reversing-lever in either direction will cause a corresponding rotation of the exhaust-pipe, branches carried by the exhaust-pipe for permitting the live steam to enter either end of  
the cylinder through the steam-valve and exhaust from the opposite end through a separate  
65 passage of said valve, according to the direction in which the reversing-lever is swung, substantially as set forth.

7. In an engine, a steam-chest, a rotatable exhaust-pipe, a slide-valve, a reversing-le-  
70 ver, and intermediate connections between the exhaust-pipe and reversing-lever, whereby upon the rotation of the said pipe, an oscillating movement will be imparted to the reversing-lever substantially as set forth.  
75

8. In an engine a slide-valve having two component pipes or sections adapted to establish communication with opposite ends of the  
cylinder, and means under the control of the operator for directing the live steam through  
80 one pipe or the other, depending on the direction in which the engine is to run, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM C. GORDON.

Witnesses:

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G. L. BELFRY.