(No Model.) 2 Sheets—Sheet 1.

J. DOUGLAS.

FLUID PRESSURE ENGINE.

No. 565,845. Patented Aug. 11, 1896.

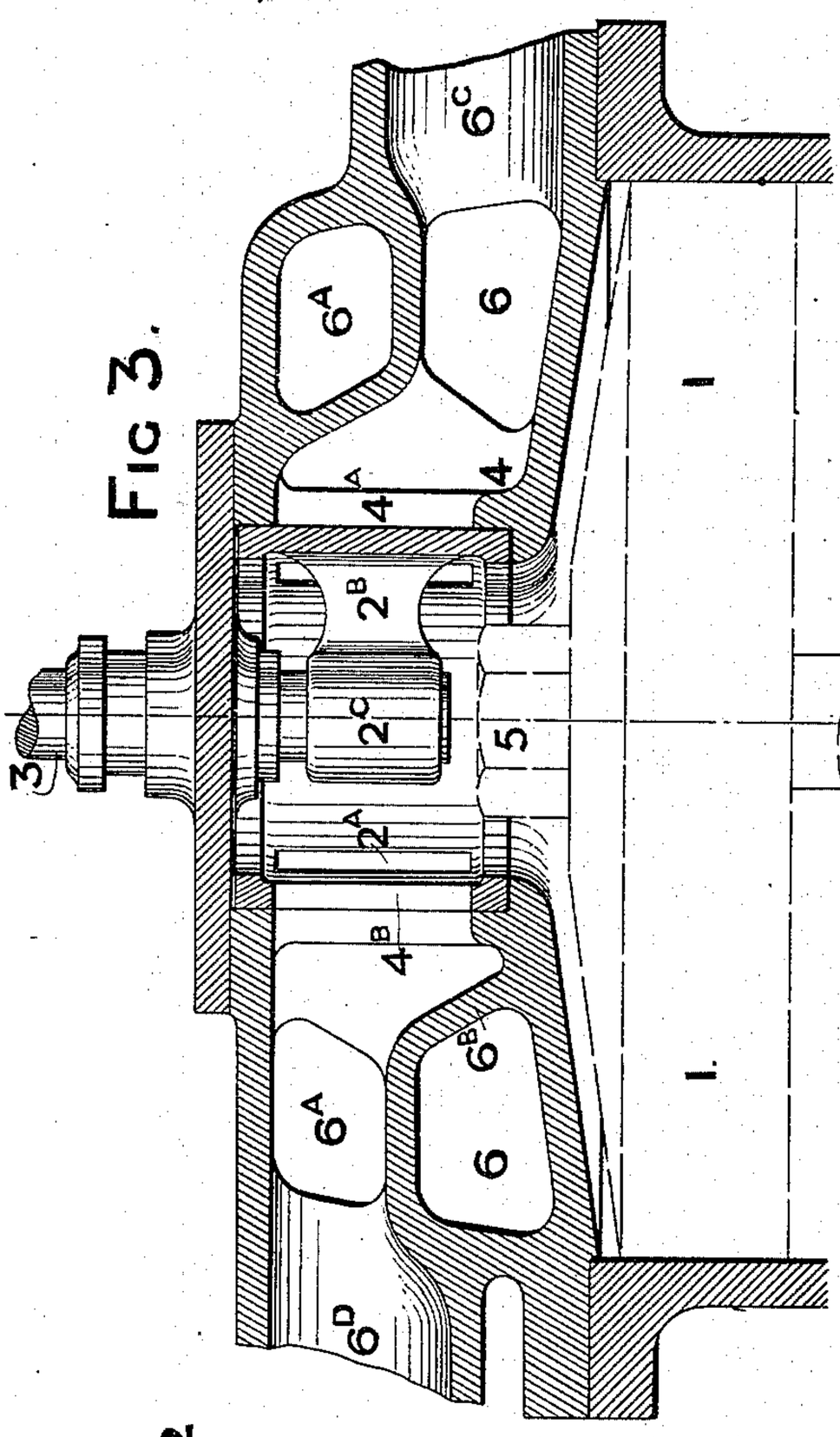

FIG 3.

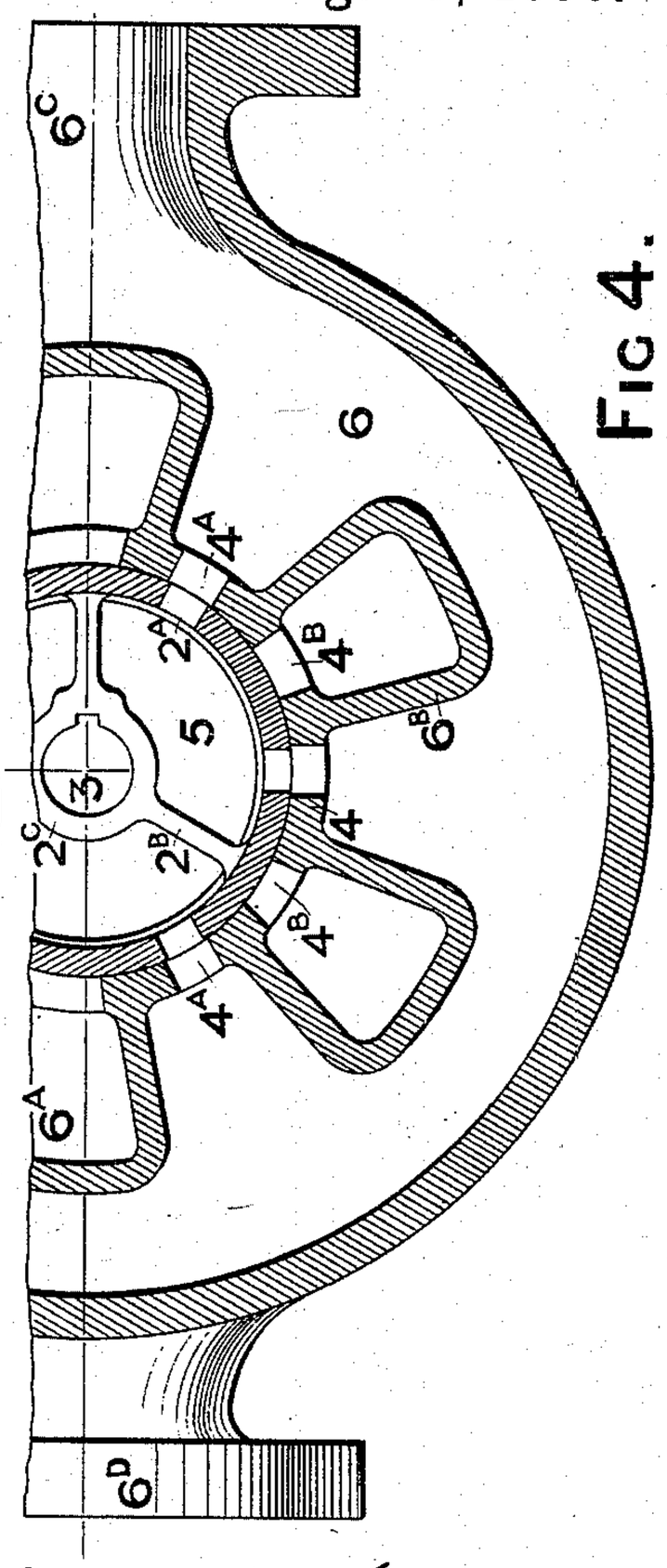

FIG 4.

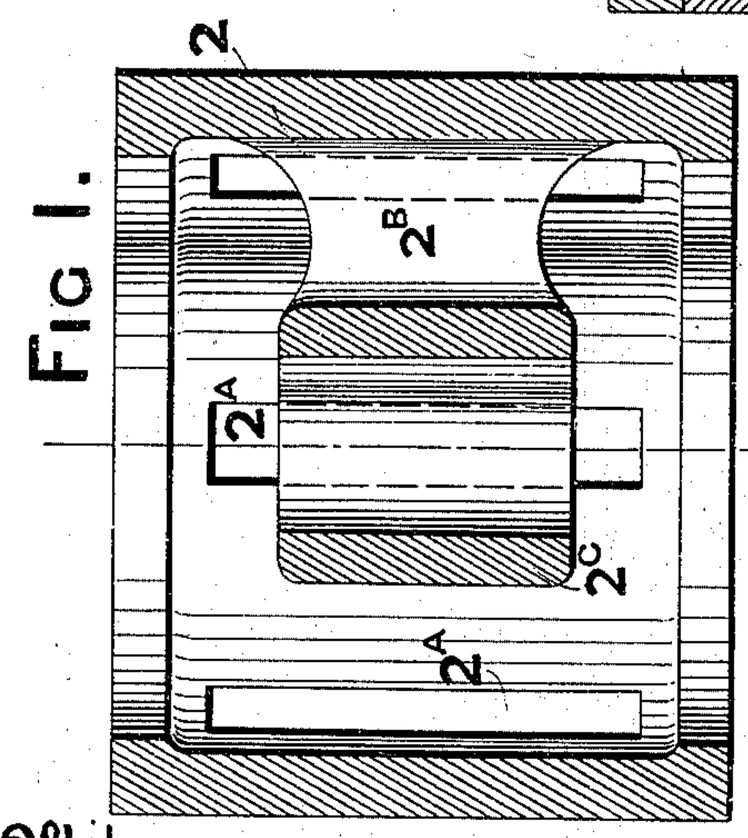

FIG 1.

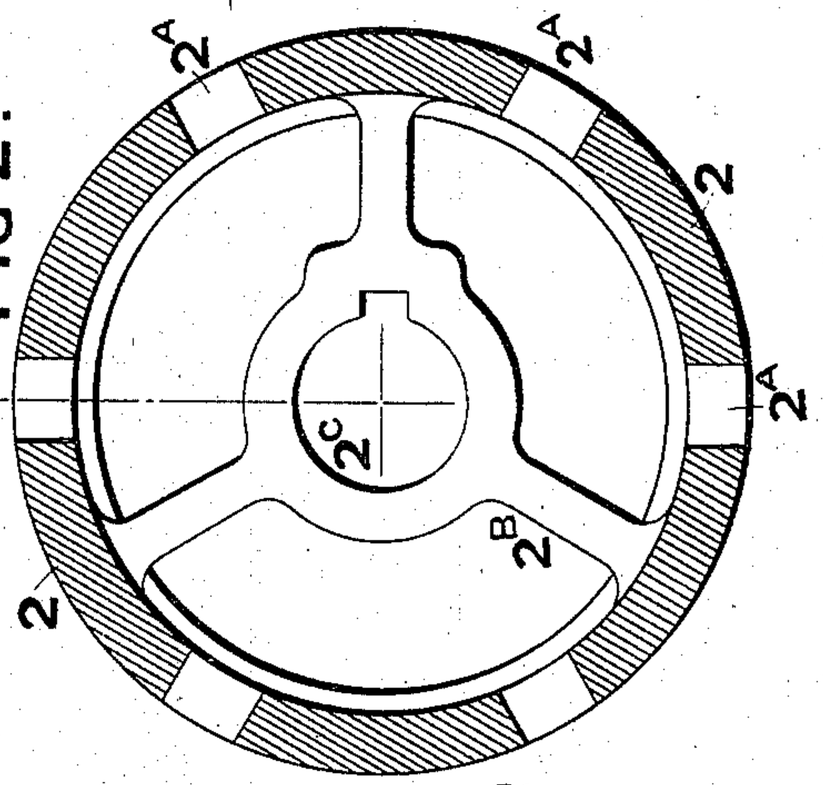

FIG 2.

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(No Model.)

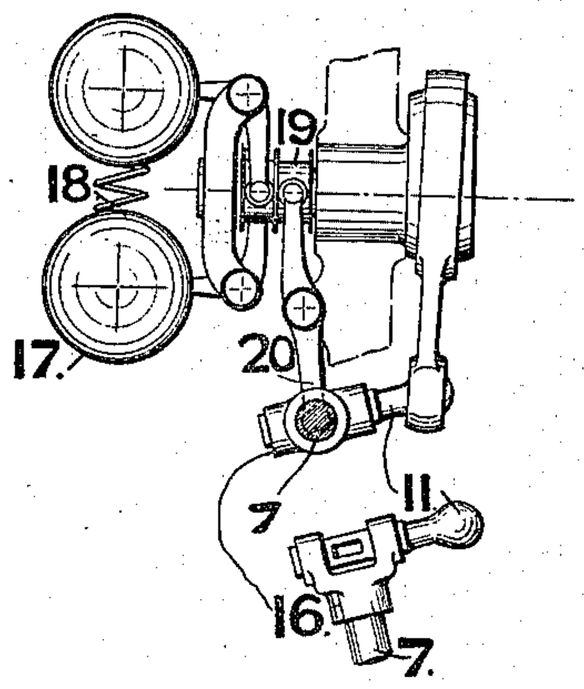
2 Sheets—Sheet 2.

J. DOUGLAS.

FLUID PRESSURE ENGINE.

No. 565,845. Patented Aug. 11, 1896.

FIG 7.



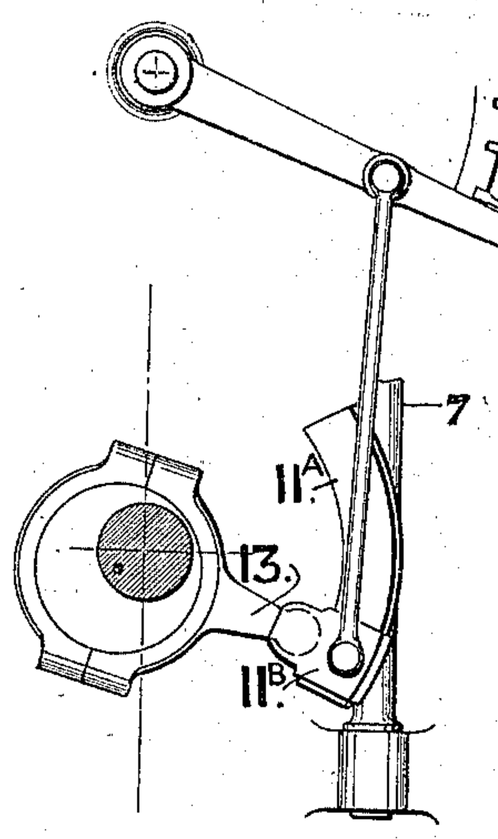


FIG 8.

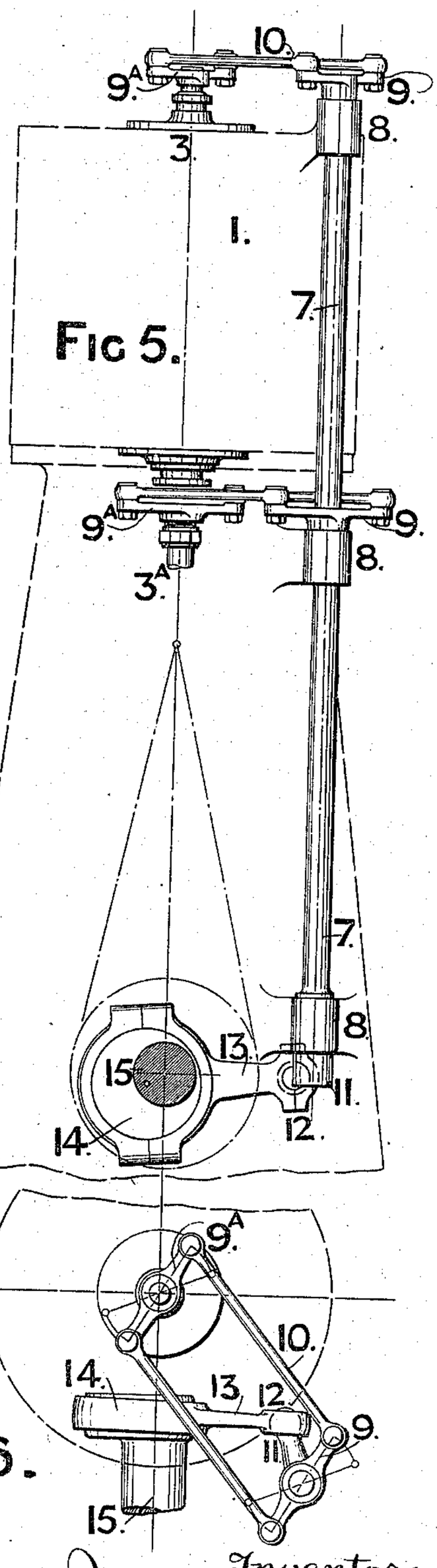


FIG 5.

FIG 6.

Witnesses
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UNITED STATES PATENT OFFICE.

JOHN DOUGLAS, OF LONDON, ENGLAND.

FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 565,845, dated August 11, 1896.

Application filed December 4, 1895. Serial No. 571,036. (No model.) Patented in England January 26, 1891, No. 1,389.

To all whom it may concern:

Be it known that I, JOHN DOUGLAS, a subject of the Queen of Great Britain and Ireland, residing at Shepherds Bush, London, in the county of Middlesex, England, have invented Improvements in Fluid-Pressure Engines, (patented in England January 26, 1891, No. 1,389,) of which the following is a specification.

This invention has reference to improvements in fluid-pressure engines, and relates more particularly to an improved construction and arrangement of valves and valve-gear for controlling the admission and emission of motive fluid (hereinafter referred to as steam) to and from the cylinders of single or double acting engines, as I will now proceed to explain by the aid of the accompanying drawings, wherein—

Figures 1 and 2 show, respectively, a vertical section and a horizontal section of my improved valve. Fig. 3 shows in vertical section the upper end of the cylinder with part of its cover and the valve therein. Fig. 4 is a horizontal section of same. Fig. 5 shows in elevation my gear for operating two valves, one at top, the other at bottom of the cylinder 1 of a vertical double-acting engine, and Fig. 6 shows a plan of same. Fig. 7 shows a modification in the means used for driving the valve-gear, and Fig. 8 shows a reversing arrangement.

Referring to Figs. 1 to 4, inclusive, it will be seen that the valve is of an open-ended hollow cylindrical grid form, consisting of a hollow cylinder 2, formed with a number of steam-ports 2^a, and provided with ribs 2^b and a boss 2^e, by which it can be fixed upon a driving-spindle 3. The valve is (in the arrangement Figs. 5 and 6) mounted to oscillate in a correspondingly-slotted cylindrical seat 4, Figs. 3 and 4, forming the wall of a central opening 5 in the cylinder-cover, such opening constituting a valve-chamber that is in direct communication with the interior of the cylinder 1. This valve-chamber may be bored out to receive the valve or it may be fitted with a removable slotted lining to form the valve-seat. The valve-seat has in it two series of ports, viz., 4^a and 4^b, that are alternately arranged, 4^a being in communication with a steam-supply chamber 6, and 4^b with an exhaust-chamber 6^a. These chambers, which are formed in the cylinder-cover and are separated from each other by a web or division 6^b, serve as steam-jackets for the cylinder end, chamber 6 being in communication with the steam-supply branch 6^c, and chamber 6^a with the exhaust-branch 6^d, which, in the case of a compound-engine, is in connection with the steam-chest of the low-pressure cylinder. In each series 4^a and 4^b in the seat the number of ports equals the number of ports 2^a in the valve, and the arrangement is such that in one position of the valve, Figs. 3 and 4, steam will pass from the steam-supply chamber 6, through the ports 4^a in the seat and ports 2^a in the valve, direct into the cylinder, and in another position to which the valve can be turned during its oscillatory movement the ports 2^a will correspond with the ports 4^b, so that the steam will exhaust from the cylinder through the ports 2^a 4^b into the exhaust-chamber 6^a and thence to any desired place.

By the construction described it will be seen that the valve is perfectly balanced and of comparatively small weight, so that it can be easily operated, the friction being small; also, in consequence of the simplicity and shape of the valve, its cost of manufacture will be small, and being, as aforesaid, perfectly balanced, and requiring only a short range of movement to open and close the steam and exhaust ports, it will need little, if any, repair. The valve being in the cylinder-cover, there need be no projection on the side of the cylinder, so that in the case of two or more cylinders fitted with my improved valve such cylinders can be arranged close together with their axes at a minimum distance apart. Furthermore, by arranging the valve in the cylinder-cover so as to be in close proximity to the interior of the cylinder end, the clearance is reduced to a very small amount and loss of steam, such as occurs with large clearance spaces, is avoided, while by providing separate steam and exhaust chambers and passages to and from the cylinder all loss of heat, such as obtains where the same ports and passages serve alternately as steam and exhaust ports and passages, is obviated.

7, Figs. 5 and 6, is a vertical rock-shaft and mounted in bearings 8 and connected to the

spindle of each valve through a pair of levers 9 9^a and a pair of links 10, the levers 9 being fixed to the rock-shaft and the levers 9^a to to the valve-spindles 3 3^a. To the lower end of the shaft 7 is fixed a lever-arm 11, that is connected by a ball-and-socket joint 12 to the rod 13 of an eccentric 14, fixed to the driving-shaft 15 of the engine, the arrangement being such that when the engine is running there will be imparted to the shaft 7 a rocking motion which will be transmitted to each of the oscillating distributing-valves in the cylinder covers.

Instead of making each pair of levers 9 9^a double-ended, as shown, they may be made single-ended, in which case only a single connecting-link 10 will be necessary, but it is preferred to adopt the construction shown. The spindle 3^a of the lower valve is in the arrangement shown made tubular, and the piston-rod of the engine is arranged to pass through it, but the valve might be located on one side so as to clear the piston-rod, though it is preferred to arrange it concentric with the cylinder, as shown.

To govern the engine by means of a shaft-governor, the lever-arm 11 on the lower end of the rock-shaft may be suitably made to shorten or lengthen under the action of the governing mechanism, so as to give a greater or less amplitude of vibration to the rock-shaft 7, and consequently to the valves.

Fig. 7 shows a suitable arrangement for this purpose, wherein the lever-arm 11 is made to shorten or lengthen as required by sliding in the fork 16, attached to or made in one with the rock-shaft 7, the position being controlled by the governor-balls 17 and spring 18 acting through the sleeve 19 and double-ended lever 20.

For reversing the direction of running of the engine, the lever-arm 11 may, as shown in Fig. 8, be replaced by a link 11^a provided with a sliding block 11^b, to which the eccentric-rod 13 is jointed, suitable mechanism, such as the lever mechanism shown, operated by a hand-lever 21, being provided to move the said block in the reversing-link 11^a in the desired manner for changing the direction of running of the engine.

As will be obvious, valves and valve-gear constructed and arranged as described can be applied to motive-fluid engines of various kinds, whether single or double acting, and whether having one or more cylinders.

Furthermore, my improved valve might have imparted to it an oscillatory motion by any other suitable gear, or an intermittent rotary motion might be imparted to it.

What I claim is—

1. The combination with a cover of an engine-cylinder, of a hollow rotary distributing-valve located within a chamber that is formed in said cover, is in direct communication with the interior of said cylinder, and the wall of which has ports in it and is adapted to form a circular grid-like seat for said valve, and means for operating said valve, substantially as described.

2. In a motive-fluid engine, a cylinder having a cover formed with a valve-chamber, and with independent steam and exhaust chambers that are separated from said valve-chamber by a perforated valve-seat, a valve located within said valve-chamber and controlling the direct connection between said steam and exhaust chambers and the engine-cylinder, and means for operating said valve, substantially as described.

3. In a motive-fluid engine, a cylinder having a cover formed with a centrally-arranged cylindrical valve-chamber in direct communication with the interior of said cylinder and the wall of which serves as a valve-seat and is provided with alternately-arranged steam and exhaust ports, separate steam and exhaust chambers in communication with said steam and exhaust ports respectively, a grid-valve of hollow cylindrical form mounted to turn in said valve-chamber, and means for operating said valve substantially as herein described.

4. In a fluid-pressure engine, the combination with an engine-cylinder and driving-shaft, of a rotary distributing valve or valves mounted to oscillate in the cover or covers of the engine-cylinder, a rock-shaft arranged parallel to the engine-cylinder, mechanism for rocking said rock-shaft from said driving-shaft, and mechanism for transmitting the rocking motion of said rock-shaft to said valve or valves, substantially as described.

5. In a fluid-pressure engine, the combination with the engine-cylinder and driving-shaft, of a rotary distributing valve or valves mounted to oscillate in the cover or covers of said cylinder and arranged with its or their axis or axes in line with said cylinder, a rock-shaft arranged parallel to said cylinder and provided with one or more levers, a lever fixed to the spindle of said valve or to each valve one or more links connecting the lever on each valve-spindle to the corresponding lever on the rock-shaft, and means for operating said rock-shaft from said driving-shaft, substantially as described.

6. In a fluid-pressure engine, the combination with the engine-cylinder and driving-shaft, of a rotary distributing-valve mounted to oscillate in the cover of said cylinder, a rock-shaft arranged parallel to said engine-cylinder, mechanism connecting said valve and rock-shaft so that oscillatory motion of the one will be transmitted to the other, a lever-arm fixed to said rock-shaft, and an eccentric driven from said driving-shaft and having its rod connected by a ball-and-socket joint to said lever, substantially as described.

7. In a fluid-pressure engine, the combination with a motive-fluid distributing-valve, located within the engine-cylinder cover and a rotary driving-shaft, of a rock-shaft connected with said valve a lever fixed to said rock-shaft and adjustable in length, an ec-

centric arranged to transmit motion from said driving-shaft to said lever, an adjusting device adapted to alter the length of said lever and a governor adapted to control said adjusting device, substantially as described.

8. In a fluid-pressure engine, the combination with a motive-fluid distributing-valve located within the cover of the engine-cylinder, and a rotary driving-shaft, of a rock-shaft connected with said valve and provided with an operating-lever in the form of a link, a block arranged to slide in said link, an eccentric actuated by said driving-shaft and having its rod jointed to said block, and mechanism for adjusting said block in said link, substantially as described.

9. In a fluid-pressure engine, the combination with a motor-cylinder having an oscillatory valve located in each of its covers, the axis of each valve being in line with the cylinder-axis, and the engine crank-shaft, of a rock-shaft arranged parallel with said cylinder, levers 9, 9ª and links 10 connecting said rock-shaft to the stem of each valve, a lever-arm fixed to said rock-shaft, and an eccentric 14 having its rod 13 connected with said lever-arm substantially as herein described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN DOUGLAS.

Witnesses:
EDMUND S. SNEWIN,
PERCY E. MATTOCKS.