

(No Model.)

J. PRACY.

DIRECT ACTING ENGINE.

No. 362,855.

Patented May 10, 1887.

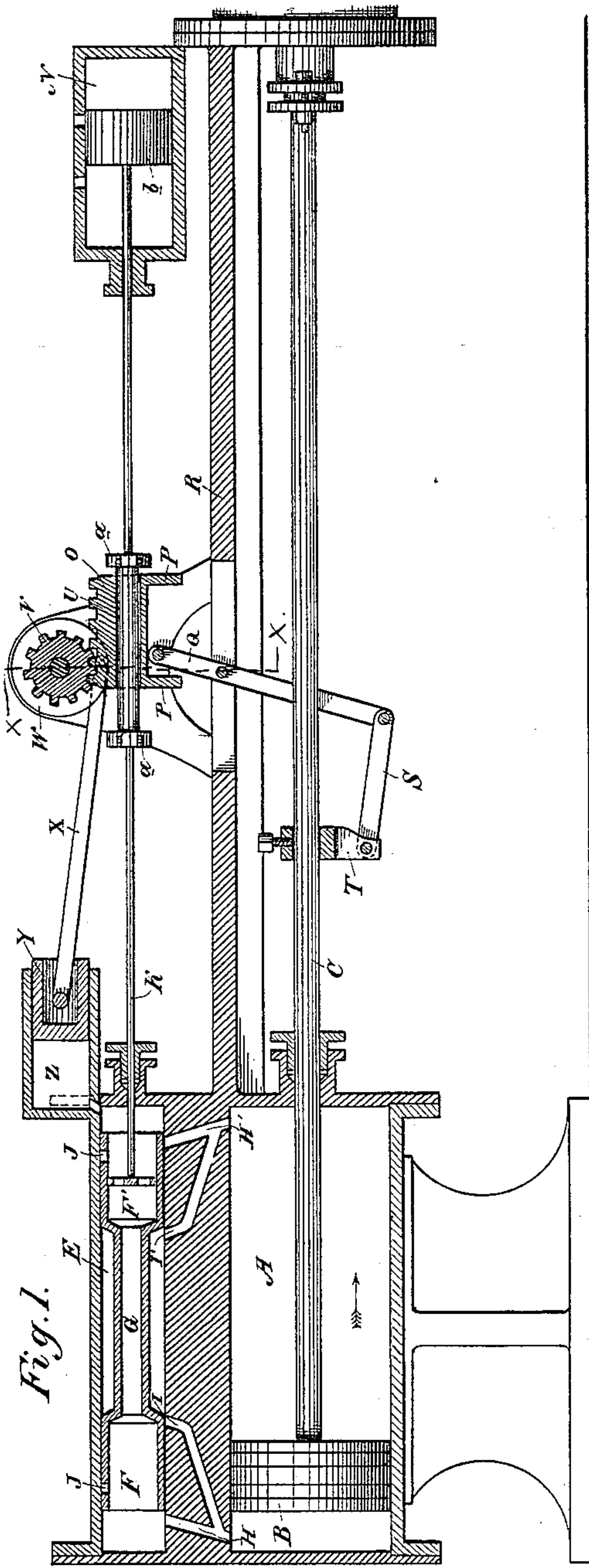


Fig. 1.

Witnesses,  
Geo. H. Strong  
J. H. Hourse

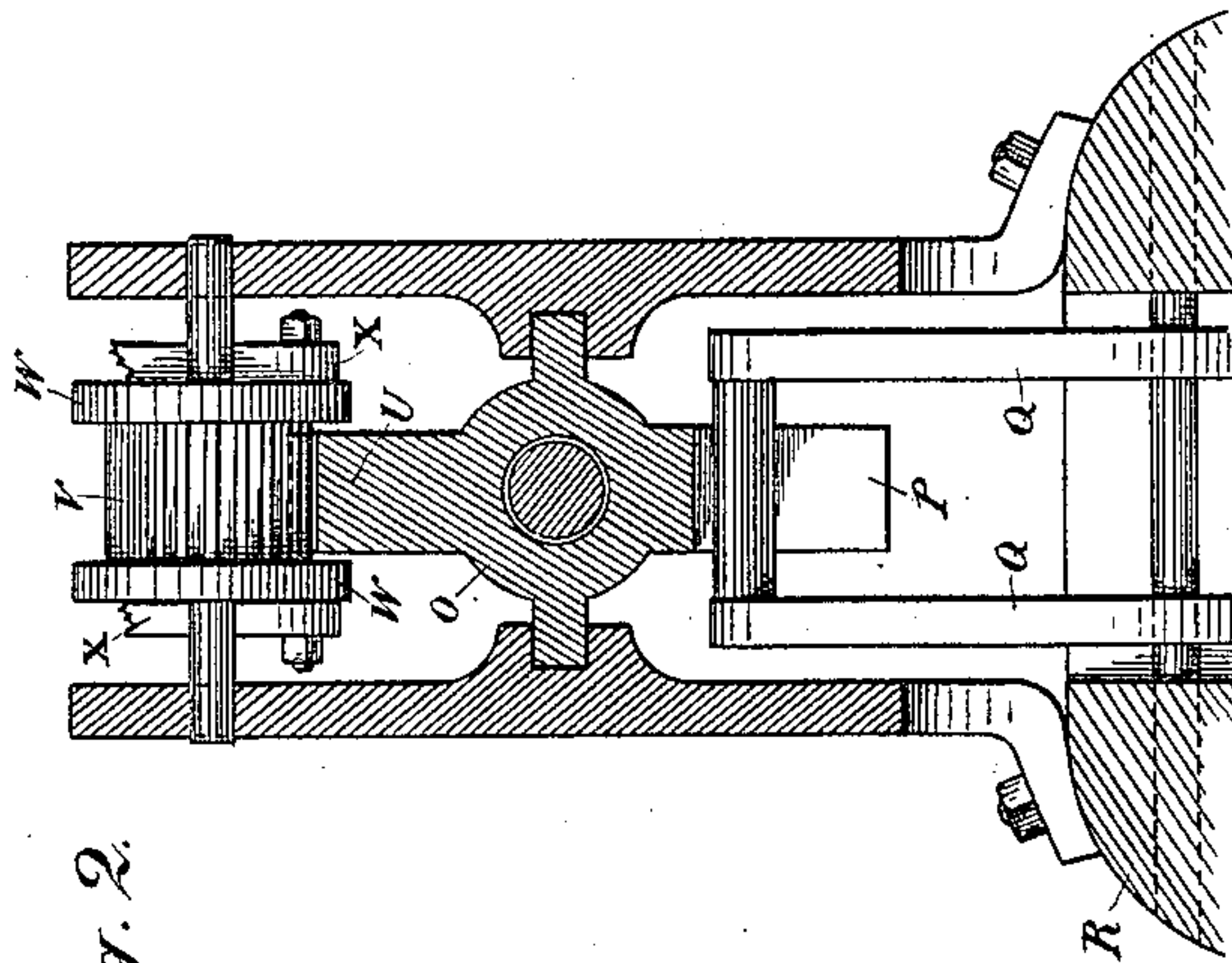


Fig. 2.

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# UNITED STATES PATENT OFFICE.

JOSEPH PRACY, OF SAN FRANCISCO, CALIFORNIA.

## DIRECT-ACTING ENGINE.

SPECIFICATION forming part of Letters Patent No. 362,855, dated May 10, 1887.

Application filed December 31, 1886. Serial No. 223,154. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH PRACY, of the city and county of San Francisco, State of California, have invented an Improvement in Direct-Acting Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in direct-acting engines, and is more especially applicable to that class of reciprocating engines which are employed to operate pumps.

It consists of a novel arrangement of a single valve with supply and exhaust ports and a mechanism by which the valve is operated, all of which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of the engine adapted to drive a pump. Fig. 2 is a cross-sectional view on the line *x x* of Fig. 1.

A is the steam-cylinder, having the piston B and the piston-rod C, which in the present case is shown extending out through a stuffing-box in one end of the cylinder and continuing into the pump-cylinder, where it connects with the pump-piston, which it actuates.

E is the valve chamber, which in the present case is made cylindrical and contains the valve, composed of two heads, F F', which fit the cylinder sufficiently tight, and are connected by an intermediate shank, G, of smaller diameter, the heads and shank being made hollow and open from end to end, as shown.

H H' are steam-ports leading from the steam-chest to the ends of the steam-cylinder A, and I I' are exhaust-ports, the lower ends of which open into the ports H H', while their upper ends open into the steam-chest or valve-chamber at points nearer to the center, so that when the valve is moved to open one steam-port, H, the other steam-port, H', will be closed, and the exhaust-port I will be closed by reason of the head F covering it, while the exhaust-port I' will be opened by the head F' having moved so far as to expose it while closing the steam-port H'. The alternate reciprocations of the valve thus open and close the steam-ports and exhaust-ports, communicating with the space around the diminished

shank G, the live-steam and exhaust connections being similar to those usually employed in this class of engines.

In order to balance the pressure through the ports from below the valve, I make openings J in the top of each of the heads, and as the steam has free access to the interior of the valve the latter will be relieved by means of these openings J, which may bear any desired proportion to the openings I I' below. In order to actuate the valve, it has a stem, K, which passes out through a stuffing-box above and parallel with the main piston-rod C, and this rod K has adjustable collars *a* fixed upon it. The end of the rod opposite to the valve enters a cushion-cylinder, N, being attached to a piston within that cylinder, as will be hereinafter described.

The collars *a* are situated about midway between the engine and pump cylinder, and a sleeve, O, traveling on guides, surrounds the rod K between the collars *a*, the opening in the sleeve being so large that the rod moves through it freely. Projecting downwardly from this sleeve are lugs P, having considerable space between them, and between these lugs the upper ends of levers Q project. These levers Q are fulcrumed in the connecting-yoke R, which extends between the engine and the pump-cylinder, or in other parts of the engine-frame, and their lower ends are connected by links S with an arm T, which is secured to the main piston-rod C, as shown.

Upon the sleeve O is secured a short rack, U, and above this is a pinion, V, which is fixed to a shaft between the disks W. These disks have crank-pins upon them, and they are connected by means of a rod or rods, X, with a piston, Y, moving within a pressure-cylinder, Z.

The operation of this device will then be as follows: The piston B in the main cylinder A being in the position shown in the drawings, and the valve in such position that the steam-port H will be open, the head F of the valve will close the exhaust-port I, and steam which has been admitted into the valve-chamber will pass through the port H into the space behind the piston B, and, driving the piston in the direction shown by the arrow toward the right-hand end of the cylinder, will move the pis-



ton-rod C, the arm T, and through the connecting-link the levers Q. The upper ends of the levers are united by a cross-bar, and this acts against the downwardly-projecting lug P at the left end of the sleeve O, thus moving it in a contrary direction from that of the piston B. This carries the toothed rack U, which, acting upon the pinion V, turns it and the disks W, the crank-pins of which act through the connecting-rods X to press the piston Y into the cylinder Z until the crank-pin has reached a point above the horizontal line of the axis, or above the dead-center. The pressure from within the cylinder Y will then complete the semi-rotation of the disks and the gear-wheel V, which, acting upon the rack, will through it carry the sleeve O into contact with the collar a, which is adjustable upon the rod K, and through it will force the valve F' to the opposite end of its stroke, the space between the lugs P allowing the sleeve to move independent of the lever Q. The reverse movement then takes place, the lever-arm Q acting to start the sleeve O in the same manner as before described, until the connecting-rods X of the piston Y are below the horizontal line taken through the axis of the crank-disks, when the piston Y will again complete the stroke in the opposite direction and return the valve.

The movement of the crank-disks W is one-half of a revolution, (more or less,) the points of rest being above and below the plane of the axis about which they revolve, so that when the piston Y has been forced out of the cylinder Z to its point of rest the crank-pin of the disk will be either below or above the shaft. The sleeve O and rack U are carried by the lever Q to such a point that the piston Y can complete the movement in each direction, the lugs P being so far apart as to allow a movement of the sleeve independent of the lever Q, as before described.

The pressure which is applied to move the piston Y may be that of a column of water, compressed air, or steam from within the engine itself.

In the present case I have shown a small connecting-passage, through which steam is admitted into the cylinder Z from the valve-chamber E; but various sources of pressure may be employed to actuate the piston Y, or to complete the rotation of the disks W, without altering the character of my invention.

Within the cylinder N is a piston, b, which is connected with the rod K, and as the valve moves from one end to the other of its stroke the piston b acts to cushion against the air contained in each end of the cylinder N, and thus prevent the valve from moving too far or striking against the ends of the valve-chamber.

Openings are made in the the cylinder N, through which the body of air within the cylinder may be maintained at its proper pressure.

Although I have here shown the pressure-cylinder Z situated near the upper part of the valve-chamber, it will be manifest that its position may be changed, and that various well-known mechanical equivalents may be employed to apply its power to the movement of the valve, as above described.

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

1. In a direct-acting engine, a reciprocating piston and piston-rod and the single reciprocating valve moving within the valve-chamber and controlling the supply and exhaust ports of the cylinder, in combination with a reciprocating sleeve, by which the valve is moved, a lever connected with the main piston-rod, by which the movement of the sleeve is commenced, and crank or eccentric arms connected with the sleeve, and a pressure apparatus by which the motion of the crank is completed after passing a dead center, substantially as herein described.

2. A sleeve moving over or with the valve-stem or its connections exterior to the valve-chamber, collars upon the valve-stem, and a rack and pinion or intermediate mechanism between the sleeve and cranks, secured to a horizontal shaft connected with a piston moving in a pressure-cylinder, substantially as herein described.

3. A sleeve moving over or with the valve-rod or its connections exterior to the valve-chamber, stops secured to the valve-rod, against which the sleeve may act, a toothed rack and pinion connecting the sleeve with cranks fixed to a shaft, and connected with a piston moving in a pressure-cylinder, as shown, in combination with a lever one end of which acts upon lugs projecting from the sleeve, so as to start the valve in either direction, while the other is connected with the main reciprocating piston-rod, substantially as herein described.

4. In a direct-acting engine, the main cylinder, piston, piston-rod, and single reciprocating valve and connected supply and exhaust ports, and the intermediate mechanism by which the movement of the valve is commenced and completed, as shown, in combination with the cushion-cylinder N and piston b, moving within said cylinder and connected with the valve-stem, substantially as herein described.

In witness whereof I have hereunto set my hand.

JOSEPH PRACY.

Witnesses:

S. H. NOURSE,  
J. H. BLOOD.