

(No Model.)

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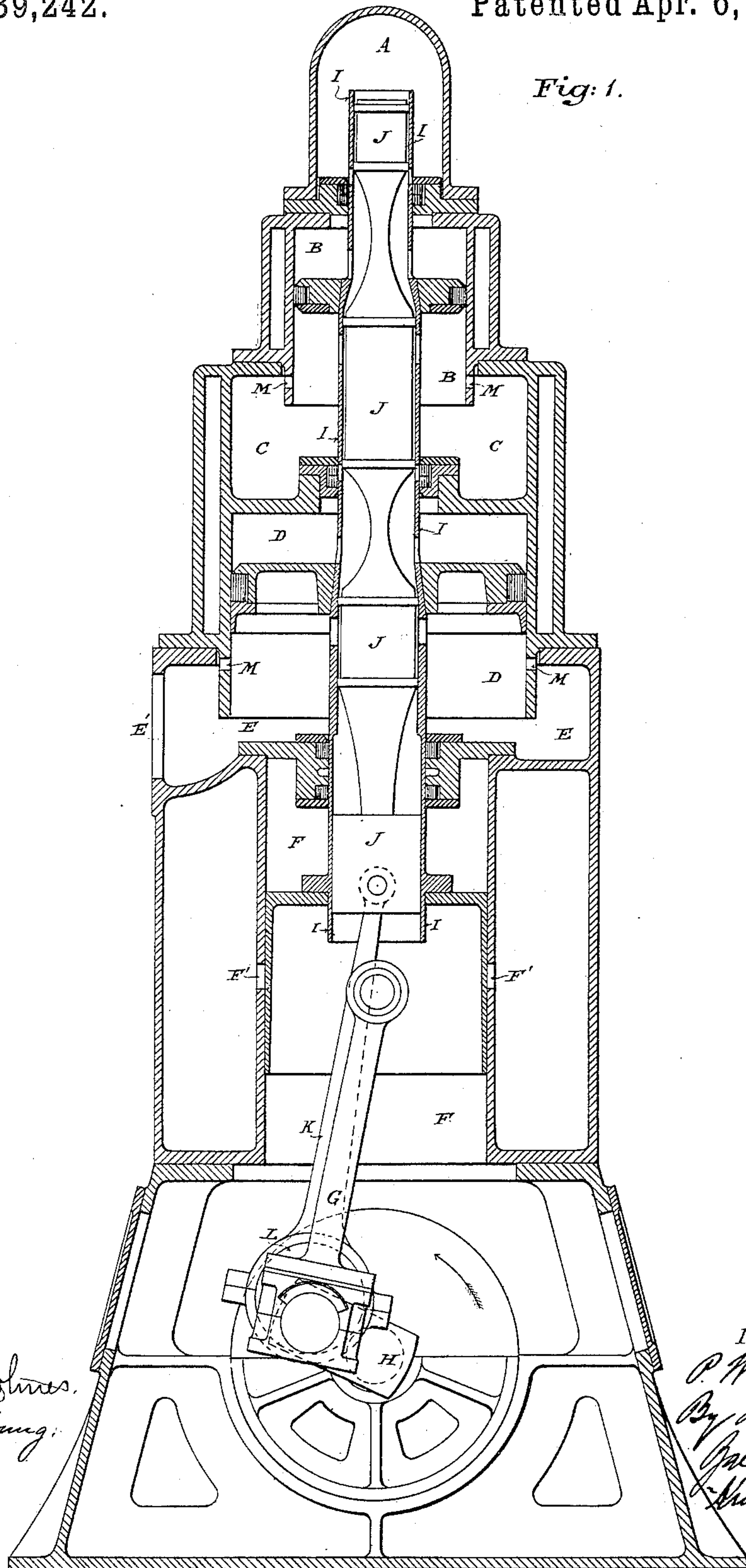
P. W. WILLANS.

FLUID PRESSURE ENGINE AND PUMP.

No. 339,242.

Patented Apr. 6, 1886.

Fig. 1.



Witnesses.
Willie Holmes.
James Young.

Inventor.
P. W. Willans
By Atty -
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(No Model.)

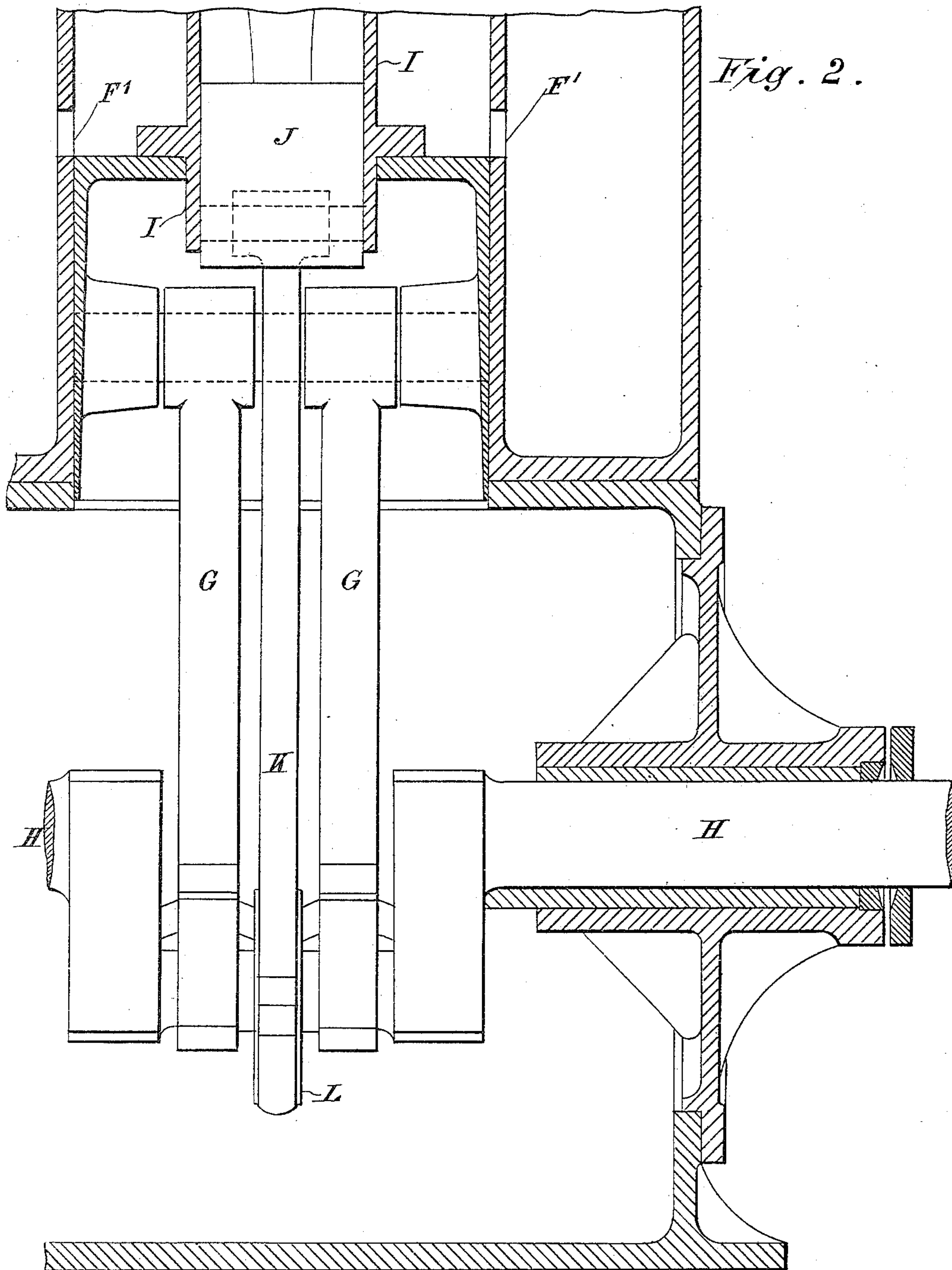
2 Sheets—Sheet 2.

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Patented Apr. 6, 1886.



Witnesses.

Lloyd B. Wright
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By Atty. P. W. Willans
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UNITED STATES PATENT OFFICE.

PETER WILLIAM WILLANS, OF THAMES DITTON, COUNTY OF SURREY,
ENGLAND.

FLUID-PRESSURE ENGINE AND PUMP.

SPECIFICATION forming part of Letters Patent No. 339,242, dated April 6, 1886.

Application filed May 11, 1885. Serial No. 165,142. (No model.)

To all whom it may concern:

Be it known that I, PETER WILLIAM WILLANS, of Thames Ditton, in the county of Surrey, England, engineer, a subject of the Queen of Great Britain, have invented certain new and useful Improvements in Fluid-Pressure Engines and Pumps, of which the following is a specification.

In United States Letters Patent No. 329,987, granted to me November 10, 1885, I described a method of constructing engines in which the pistons were mounted on tubular piston-rods, and in which the admission and discharge of the steam to and from the cylinder was effected partly by piston-valves working in the tubular piston-rod, and actuated by the rocking motion of the connecting-rod, and partly by the closing of passages in the tubular piston-rod by the direct motion of the piston-rod or piston itself. I described, also, in combination with the above valve action, the direct opening of ports or passages in the side of the cylinder by which supplementary exhaust-passages were opened before the end of the effective stroke.

The engines constructed according to my present invention are generally similar to those described in my former patent, No. 329,987; but I do not use the rocking motion of the connecting-rod to actuate the piston-valves which work in the tubular rod. I actuate the piston-valves working in the tubular rod by a crank or eccentric placed on the crank-pin.

Figure 1 shows a vertical section of a single-acting engine, the piston-rod of which is tubular, and has a piston-valve working to and fro within it, as described in my former patent, but in which this piston-valve in place of being moved endwise to and fro within the tubular piston-valve by the rocking of the connecting-rod is moved endwise, according to my present invention by an eccentric on the crank-pin of the crank-shaft of the engine. Fig. 2 shows, in vertical section at a right angle with Fig. 1, portions of the lower part of the engine on an enlarged scale.

The drawing shows an engine in which steam is first admitted to a high-pressure cyl-

inder, is then exhausted therefrom into a receiving-chamber, from which it is admitted to a second and larger cylinder, wherein it is allowed to expand, and is then exhausted therefrom; but the same arrangement may be used for moving the piston-valve of other engines of a like kind—such, for example, as the various engines described in my former patent or other engines in which a piston-valve working within the interior of a tubular piston-rod is employed for controlling the admission and escape of steam from the cylinder or cylinders of the engine.

A is the steam-chest, to which steam is admitted continuously.

B is the high-pressure cylinder, to which steam is admitted from the steam-chest A.

C is a receiving-chamber, into which steam is exhausted from the cylinder B.

D is the low-pressure cylinder, to which steam is admitted from the receiver C.

E is an annular exhaust-chamber, into which steam is exhausted from the low-pressure cylinder D, and from which the steam can be conducted away through an outlet, E'.

F is a cylinder in which works a piston fixed on the lower end of the piston-rod. It serves as a guide for the lower end of this rod, and also to form a cushion of compressed air on the upstroke, which maintains at all times downward pressure upon the connecting-rod and insures the connecting-rod being always kept in compression during the upstroke. Air is for this purpose admitted to the cylinder through ports F' at the end of each downstroke.

G are main connecting-rods coupling the piston on the lower end of the piston-rod with the crank of the crank-shaft H of the engine. In the arrangement shown in the drawings two such connecting-rods are used jointed to opposite sides of the piston; but a single central connecting-rod may be used, in which case the connecting rod or link employed for moving the piston-valve would be bent or forked, so as not to come into contact with the main connecting-rod.

I is the tubular piston-rod, having fixed to it the pistons which work in the several cyl-

inders. It has ports formed through its sides for controlling the admission and escape of steam from the cylinders and the intermediate receiver between them, as described in my former patent.

J is the piston-valve, which travels to and fro with the piston-rod, but to which an endwise to-and-fro motion within this rod is also imparted to open and close the ports in the piston-rod. Its lower end has jointed to it a connecting rod or link, K, at the lower end of which is a strap embracing an eccentric, L, fixed on the center of the crank-pin of the crank-shaft H.

As before mentioned, in lieu of the eccentric and strap connection between the link and crank-shaft a crank on the pin may be employed.

M M are ports in the sides of the lower ends of the cylinders B and D, past which the pistons of these cylinders travel at the end of their downward stroke to allow steam to then exhaust from the cylinder, as described in my before-mentioned patent.

The crank-shaft of the engine revolves in the direction shown by the arrow. The parts of the engine are shown in the positions they are in when the piston-valve is at the top of its slight endwise motion within the tubular piston-rod, a line drawn through the center of the eccentric and the center of the crank-pin being then vertical. When the crank-pin has been carried round to a corresponding position on the opposite side of the crank-shaft, the piston-valve would be at the lower end of its travel within the piston-rod, this line being then again in a vertical position.

By varying the position in which the eccentric is set upon the crank-pin the times at which the piston-valve is caused to make its endwise movements within the piston-rod can be varied, and in this way a power of adjusting

the times at which the piston-valve is caused to make its to-and-fro endwise movements is obtained, which was not the case in the arrangement described in my former patent.

In the drawings I have shown the engine as a vertical engine; but it is evident that it might be set horizontally or in other convenient position. I have also described the engine as it is used for obtaining motive power; but it is also evident that if the crank-shaft were driven by suitably-applied power in a direction the reverse of that indicated by the arrow, the engine could be worked as a pump for compressing air or other elastic fluid.

It will be obvious during operation as an air-pump that air will be drawn from the exhaust-chamber E and will be compressed into the chamber A, (which before was the steam-chest,) and from A the compressed air may be passed into any suitable receiver in connection therewith. The passage for the air through the engine will be in all respects similar to that of the steam, but in the reverse direction.

Having now described my invention and the manner of performing the same, I declare that what I claim is—

The combination of the piston or pistons, the cylinder or cylinders, the tubular piston-rod to which the piston or pistons are fixed, the piston-valve capable of being moved endwise in the tubular piston-rod, the crank-shaft, the main connecting rods or rod, the eccentric or crank on the crank-pin, and the link connecting the eccentric or crank and the piston-valve, substantially as and for the purpose set forth.

PETER WILLIAM WILLANS.

Witnesses:

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