

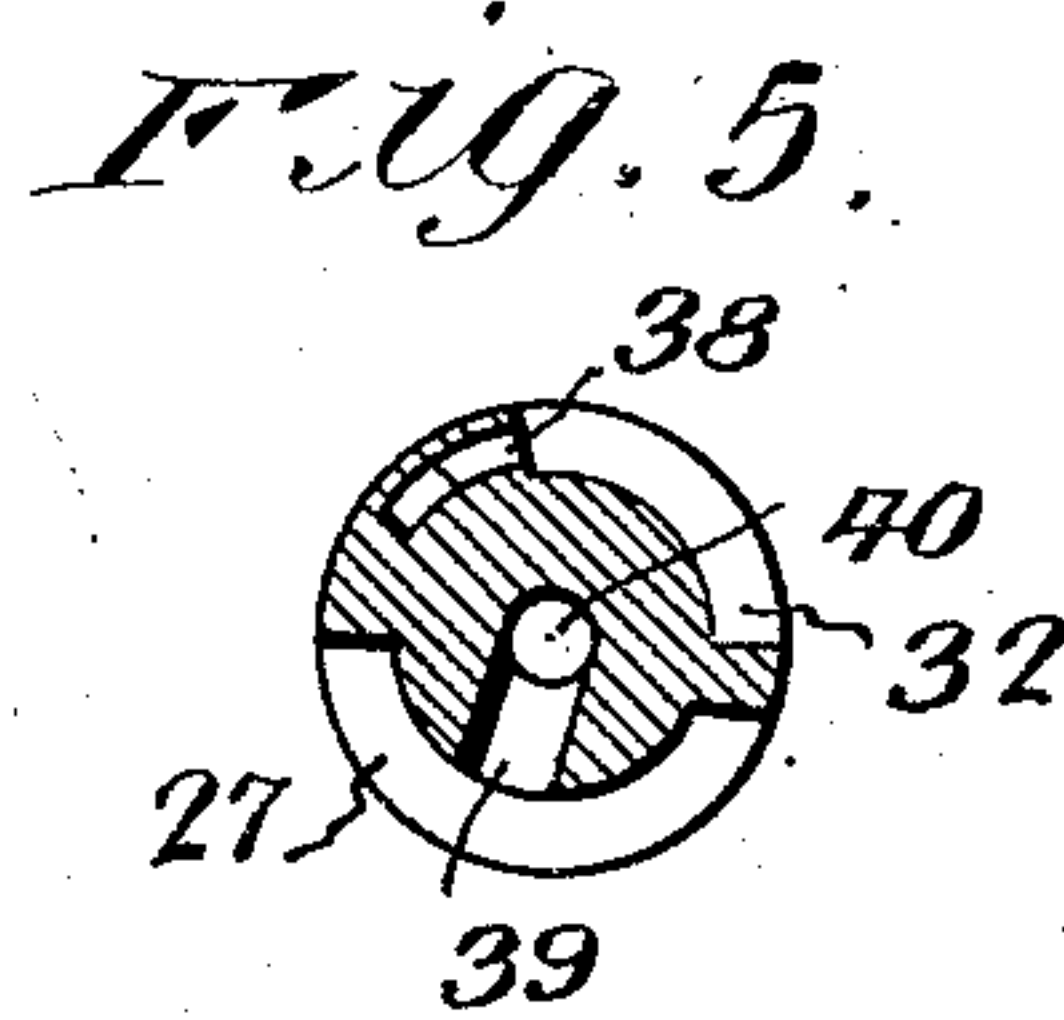
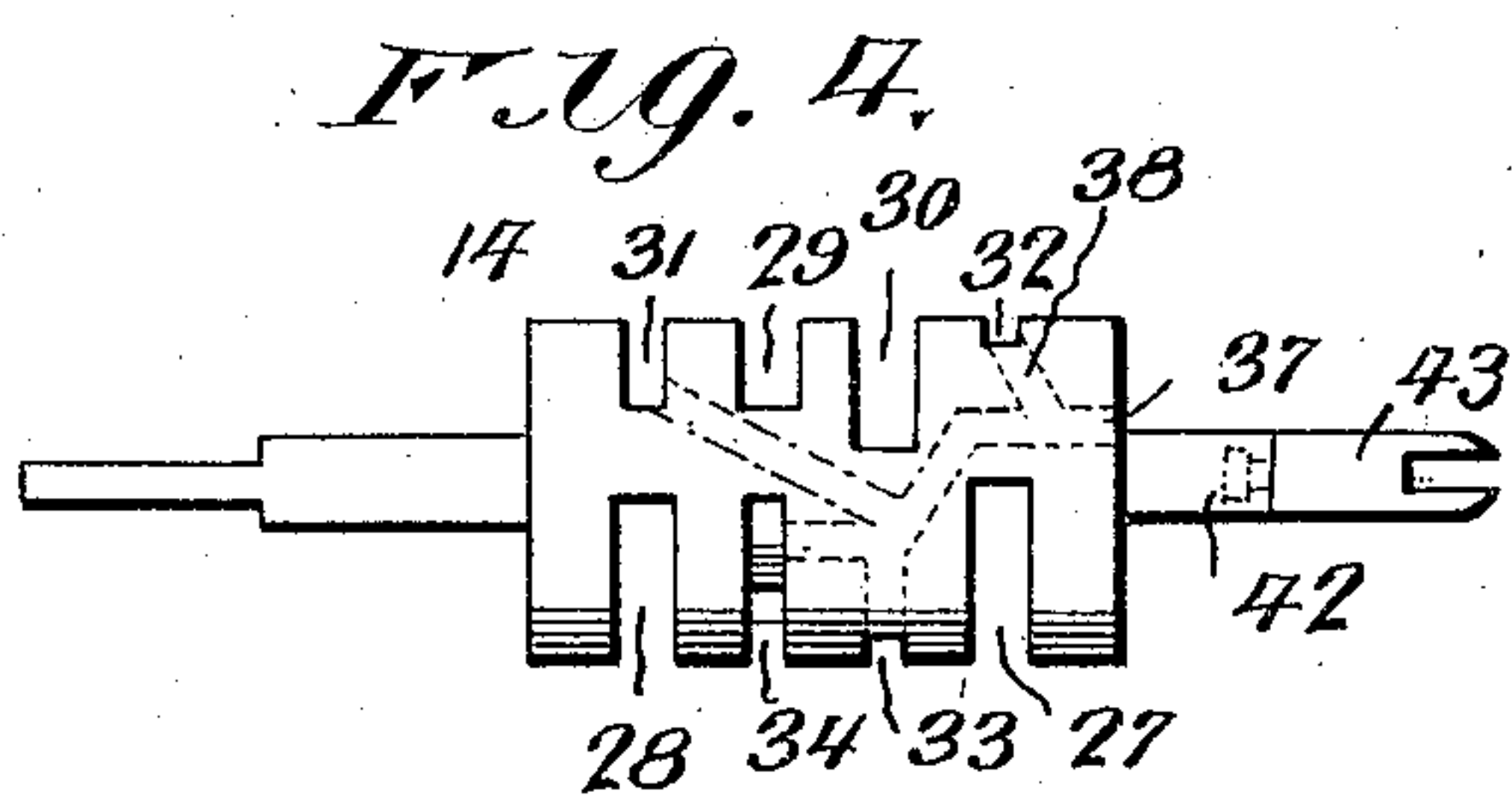
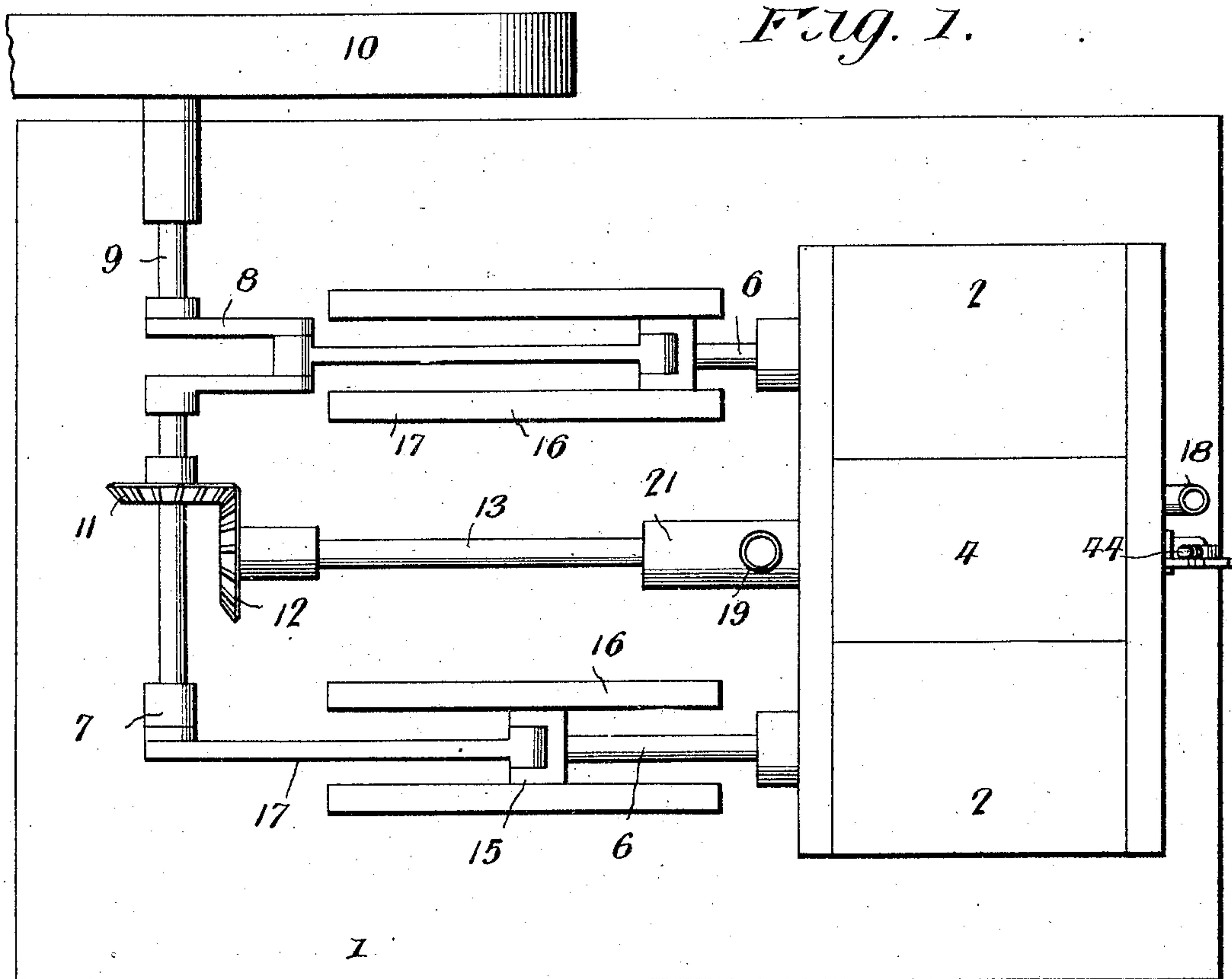
No. 785,611.

PATENTED MAR. 21, 1905.

C. E. HASTINGS.  
ENGINE.

APPLICATION FILED MAY 7, 1904.

2 SHEETS—SHEET 1.



Witnesses

*J. W. Clegg*  
*M. M. Decker*

Inventor  
*Charles E. Hastings.*

By

*Victor J. Evans*

Attorney

No. 785,611.

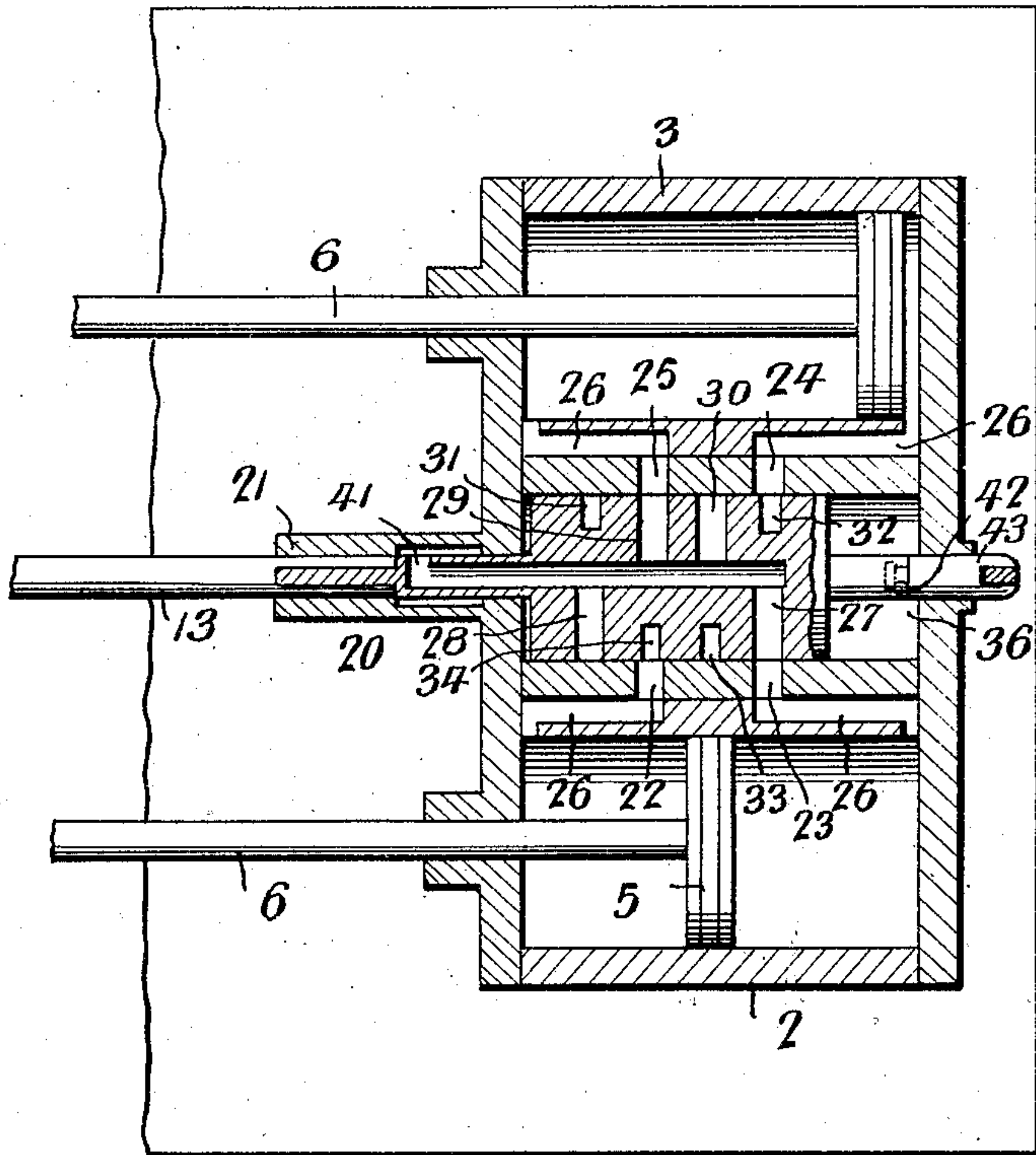
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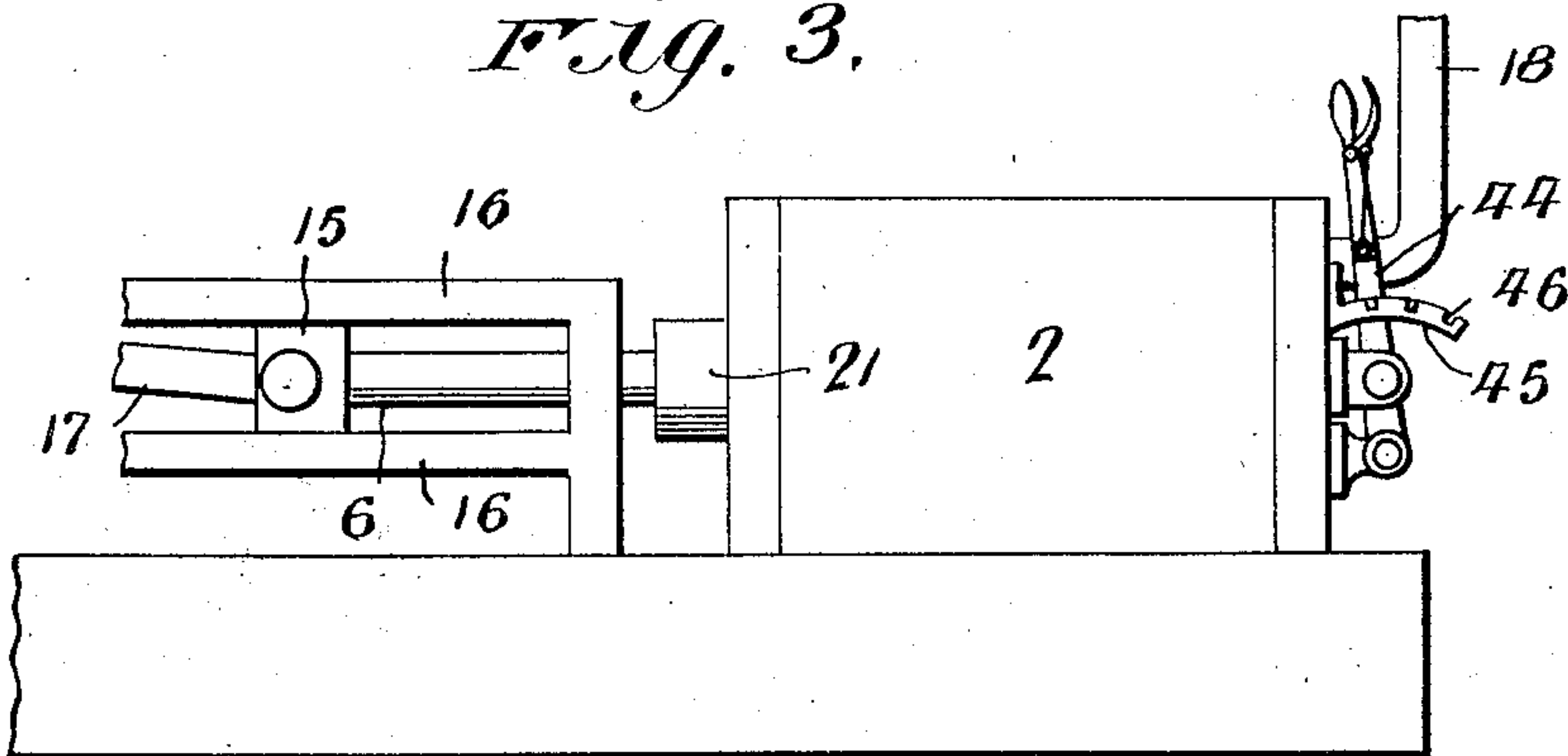
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2 SHEETS—SHEET 2.

*Fig. 2.*



*Fig. 3.*



Witnesses

*J. W. Carey.*

*M. M. Becker.*

Inventor  
*Charles E. Hastings.*

By *Victor J. Evans*

Attorney



# UNITED STATES PATENT OFFICE.

CHARLES E. HASTINGS, OF GRIFFIN, CALIFORNIA.

## ENGINE.

SPECIFICATION forming part of Letters Patent No. 785,611, dated March 21, 1905.

Application filed May 7, 1904. Serial No. 206,915.

*To all whom it may concern:*

Be it known that I, CHARLES E. HASTINGS, a citizen of the United States, residing at Griffin, in the county of Ventura and State of California, have invented new and useful Improvements in Engines, of which the following is a specification.

This invention relates to engines, and especially to that type of engine in which a plurality of cylinders is employed in connection with a steam chest and valve common to both cylinders, whereby the steam is fed alternately to and exhausted from the cylinders and the pistons thereof properly timed to cooperate with the main engine-shaft to which they are coupled.

One object of the present invention is to provide means whereby the valve, which is rotary, may be adjusted accurately, so as to supply more or less steam to the cylinders, and thereby regulate the speed and power of the engine to a nicety; also, to provide a double set of inlet and exhaust ports in the valve in connection with means for shifting the valve, so as to bring either set of ports into use for reversing the engine; also, to arrange steam inlet and exhaust chambers beyond the ends of the valve and provide for cushioning the strokes of the pistons, thereby avoiding to a considerable extent jar and vibration.

With the above and other objects in view, the nature of which will more fully appear as the description proceeds, the invention consists in the novel construction, combination, and arrangement of parts, as herein fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a plan view of an engine embodying the present invention. Fig. 2 is a sectional plan view of the same. Fig. 3 is a side elevation of the engine, showing the reversing or valve-shifting means. Fig. 4 is a plan view of the steam-valve, and Fig. 5 is a cross-section through the same.

Like reference-numerals designate corresponding parts in all the figures of the drawings.

Referring to the drawings, 1 designates a suitable bed or base upon which the parts of the engine are mounted.

2 and 3 represent a pair of cylinders between which is interposed a steam-chest 4. Mounted within the cylinders are pistons 5, mounted on piston-rods 6, which connect with cranks 7 and 8 on the main engine-shaft 9, the said cranks being set at a quarter of a revolution apart, as shown in Fig. 1.

10 designates a fly or belt wheel on the engine-shaft 9, and 11 designates one of a pair of miter-gears, the gear 11 being fast on the shaft 9 and meshing with a corresponding gear 12, fast on a rotary stem 13 of the steam-valve 14, which is mounted in the steam-chest 4 and by means of which the steam is alternately fed to and exhausted from the cylinders 2 and 3.

Each piston-rod 6 carries at its outer end a slide 15, which moves between parallel guides 16 and has connected thereto one end of a pitman 17, the opposite end of which connects with one of the cranks 7 or 8.

18 designates the steam-supply pipe, and 19 designates the steam-exhaust pipe, which communicates with a steam-exhaust chamber 20, formed within a tubular extension or boss 21, extending longitudinally from one end of the steam-chest, as shown in Figs. 1 and 2, and also forming a bearing for the rotary stem 13.

By reference to Fig. 2 it will be seen that the cylinder 2 embodies combined inlet and exhaust ports 22 and 23, while the cylinder 3 comprises correspondingly - combined inlet and exhaust ports 24 and 25, the said ports being connected, by means of longitudinal passages 26, with the opposite ends of their respective cylinders.

The valve, which is illustrated in detail in Figs. 2 and 4, is cylindrical in form and is cut away at portions of its periphery to form exhaust-ports 27, 28, 29, and 30 and relatively smaller inlet-ports 31, 32, 33, and 34, two complete sets of inlet and exhaust ports being thus provided for in the valve. The steam-chest is made of greater length than the valve, as shown in Fig. 2, in order to allow of the



valve being shifted longitudinally and also to provide a steam-inlet chamber 36, with which the inlet-pipe 18 communicates. The steam admitted to the chamber 36 enters the valve at the point 37, being in that end of the valve which is in direct communication with the steam-chamber 36. From the entrance-point 37 a branched steam-passage leads to all four of the steam-inlet ports 31, 32, 33, and 34, said passage, with its several branches, being illustrated by dotted lines in Fig. 4 and a portion of such passage being indicated in full lines in Fig. 5 and designated as 38, the steam in this way being supplied to all of the valve inlet-ports. All of the exhaust-ports 27, 28, 29, and 30 of the valve communicate, by means of radial extensions or passages 39, with a central passage 40, extending lengthwise of and centrally within the valve, as shown in Figs. 2 and 5, the passage 40 extending part way along the rotary stem 13, as shown in Fig. 2, and being provided at its extremity with a lateral vent 41, which opens into the steam-exhaust chamber 20, the internal diameter of which is greater than the diameter of the stem 13, so that the steam may exhaust readily at all points in the revolution of the stem, the exhaust-steam being finally carried out by the exhaust-pipe 19 and delivered at any suitable point. The valve is also provided with a stem 42, projecting from its opposite end and provided with a swiveled extension 43, which is slotted to receive pivotally a shifting or reversing lever 44, preferably of the thumb-latch type, as shown in Fig. 3, the latch thereof being engaged with a segmental rack 45, provided with notches 46, three of such notches being shown for the purpose of providing for three adjustments of the lever 44, and consequently the valve 14. By throwing the lever in one direction one set of inlet and exhaust ports is presented to the cylinder-ports, while by throwing the lever in the opposite direction the other set of inlet and exhaust ports is presented to the cylinder-ports, thus providing for reversing the engine. By adjusting the lever to the central position the valve inlet-ports are thrown out of line with the corresponding ports of the cylinder, thus stopping the engine. In such central position, however, the exhaust-ports slightly overlap each other, so as to provide for the escape of any surplus steam. By manipulating the shifting or reversing lever 44 to intermediate points the steam-inlet ports may be thrown open to a greater or less extent, thus providing for running the engine at any required speed—a feature which will be found of importance in various hoisting operations.

Under the relation of parts shown in Fig. 2 it will be observed that the steam is entering the valve inlet-port 32 and cylinder-port 34,

while the exhaust-steam is passing outward through the ports 25 and 29. With respect to the other cylinder the steam is entering through the ports 34 and 32, while it is exhausting through the ports 23 and 27. As the valve 13 rotates the valve inlet and exhaust ports are shifted so as to supply steam to the opposite ends of the cylinders and correspondingly exhaust the same. During this operation only one set of valve inlet and exhaust ports is used. Now when it is desired to reverse the engine the lever 44 is thrown in the opposite direction, thereby bringing the other set of inlet and exhaust ports into alinement with the cylinder-ports, as will be readily understood by an inspection of Figs. 2 and 4. When the lever is adjusted to the central position, the valve inlet-ports are thrown out of communication with all of the cylinder-ports, thus cutting off the steam and stopping the engine.

It will of course be understood that the valve may be packed in any suitable manner to prevent the steam from jumping across from one port to another, the packing being preferably in the form of rings extending around the outer surface of the valve and diverted at suitable points to prevent the passage of steam from one port to another. By making the valve in the form of a true cylinder it may be moved endwise within the steam-chest for the purposes above stated. The valve-ports are so arranged by preference that the exhaust begins either at the same instant or a fraction ahead of the steam-supply, and the exhaust also cuts off just before the piston reaches the end of its movement, said arrangement serving to cushion the piston-rod at the opposite ends of its stroke.

Having thus described the invention, what is claimed as new, is—

1. An engine comprising a steam-chest, steam-cylinders arranged on opposite sides thereof and communicating therewith, a longitudinally-shiftable and rotary valve-stem extending into the steam-chest and having a longitudinal passage formed with a lateral vent, a steam-chamber surrounding the stem and communicating with the lateral vent, said chamber being elongated to maintain connection with the lateral vent, under any longitudinal adjustment of the stem, and the rotary valve shiftable in the steam-chest and mounted on the valve-stem, said valve having a plurality of inlet-ports communicating with the end of the steam-chest and a plurality of exhaust-ports communicating with the longitudinal passage in the valve-stem.

2. An engine comprising a steam-chest, steam-cylinders arranged at opposite sides thereof and communicating therewith, a rotary valve working in the steam-chest and shiftable endwise therein, a valve-stem pro

vided with a steam-exhaust passage leading  
from the valve outward and provided with a  
lateral vent, and a steam-chamber surrounding  
the stem and communicating with the lateral  
5 vent, said chamber being elongated to main-  
tain communication with the exhaust-passage  
under any adjustment of the valve.

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

CHAS. E. HASTINGS.

Witnesses:

J. E. HASTINGS,  
CHAS. PALMER.