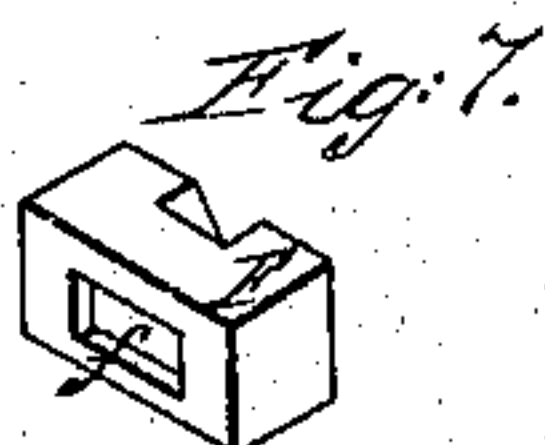
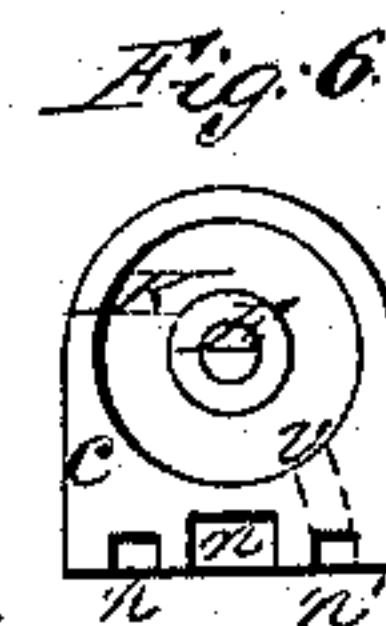
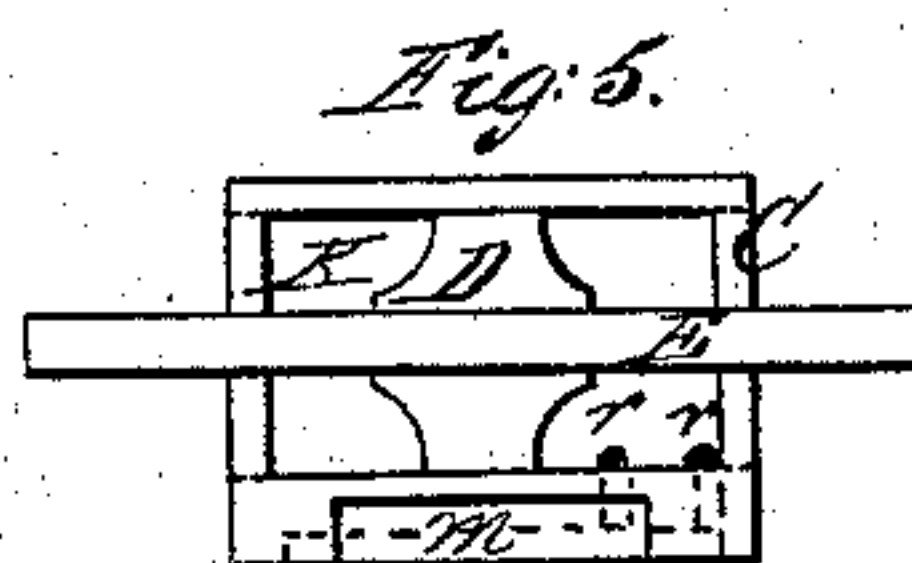
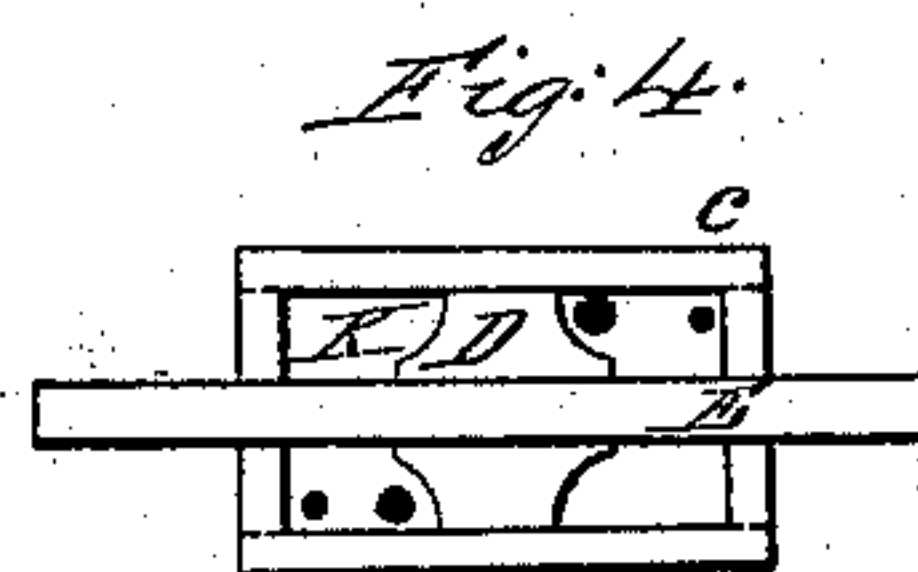
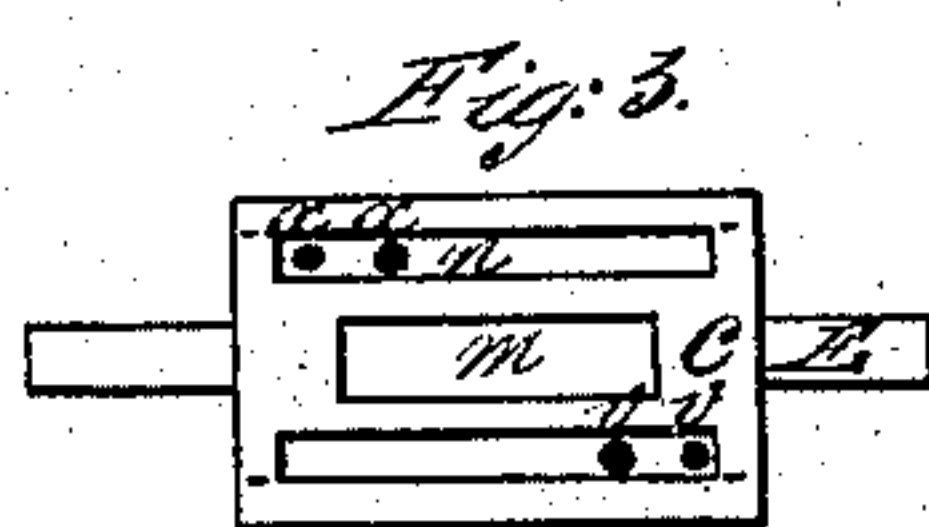
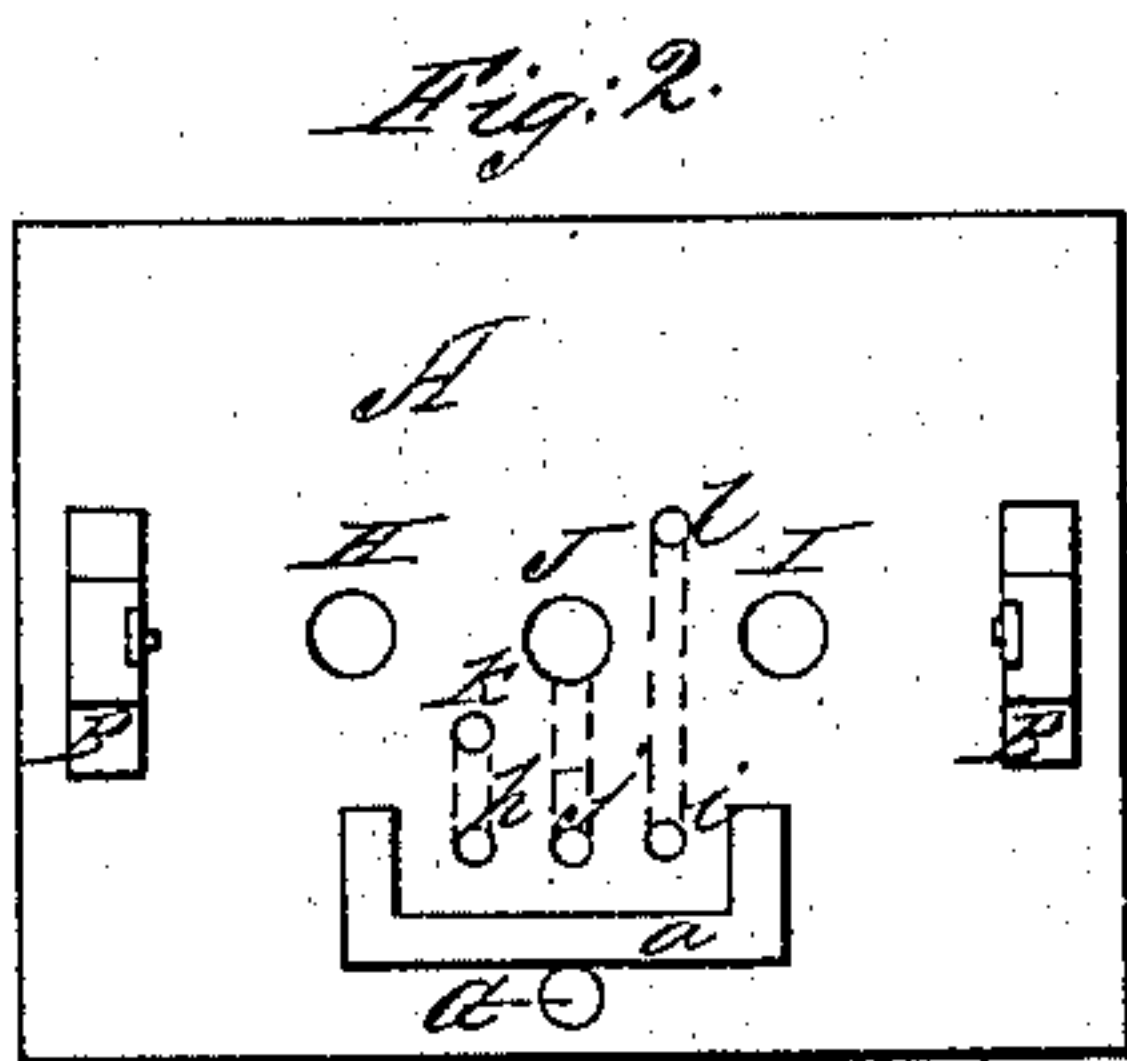
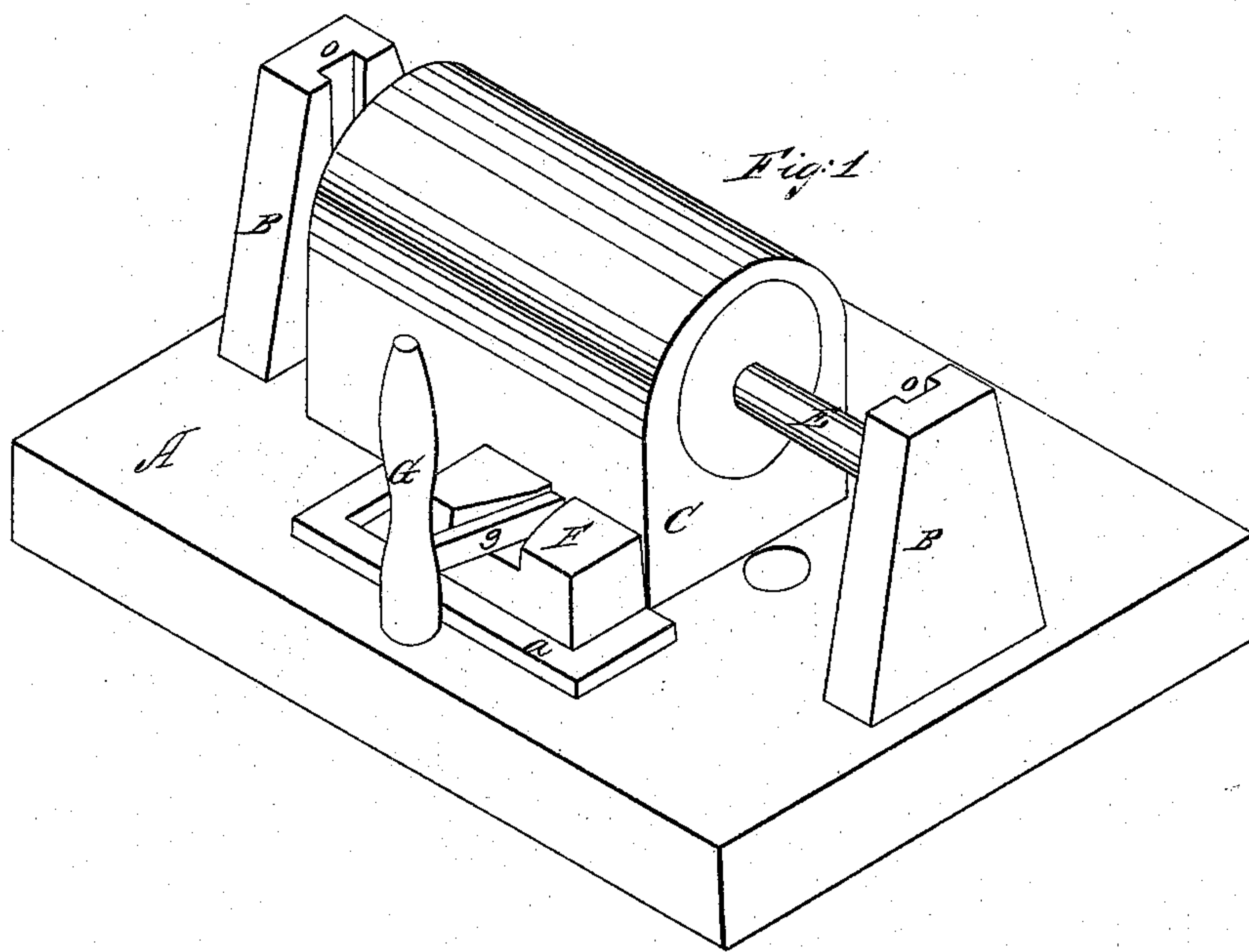


*F. Curtis.*  
*Steam Valve.*

## Steam Valve.

*N<sup>o</sup> 106,669.*

*Patented Aug. 23, 1870*



Witnesses:  
Calvin Pollard  
G W Curtis

Inventor.  
Francis Curtis



# UNITED STATES PATENT OFFICE.

FRANCIS CURTIS, OF NEWBURYPORT, MASSACHUSETTS.

## SLIDE-VALVE FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **106,669**, dated August 23, 1870.

*To all whom it may concern:*

Be it known that I, FRANCIS CURTIS, of Newburyport, in the county of Essex and State of Massachusetts, have invented a new and Improved Method of Constructing and Operating Steam-Engine Valves; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawing, making a part of this specification, in which—

Figure 1 is a perspective view of part of the steam-chest of a steam-engine, A being the cylinder-face or valve-seat; B B, portions of the sides of a steam-chest; C, a steam slide or valve, working over two steam-ports and one exhaust-port, in the manner of an ordinary three-ported valve; F, a supplementary valve, (also three-ported;) G, a rocking shaft or pin for moving the valve F by means of the arm *g* acting within the notched back *s* of the valve. Fig. 2 is a plan of the stationary parts, showing the seat A, the sides B B, with their grooves *o o*, the main steam-ports H and I, passing through the cylinder-face to opposite ends of the cylinder, (which cylinder is not shown,) the exhaust-port J, the ports *h* and *i*, and exhaust-port *j*, covered by the supplementary valve, and the three supplementary steam-passages, (in dotted lines,) which, passing within the substance of the cylinder-face, connect the port *h* with the opening *k*, the port *j* with J, and the port *i* with *l*. Fig. 3 is a view of the lower side of the valve C; Fig. 4, a horizontal section of valve C; Fig. 5, a vertical and longitudinal section of valve C; Fig. 6, a transverse section of the same, and Fig. 7 a perspective view of the supplementary valve F lying on its side.

This improvement relates to that class of engines that is without crank or connecting rod, and has no rotary motions, and is designed to secure a sure and prompt movement of the steam-valve, which movement shall be determined and timed by the main engine, yet commenced and completed independently, and also to allow the use of sliding valves with plane wearing-faces, capable of wearing down by use, and still being kept steam-tight by the pressure of steam bearing them down upon their seats. For this purpose I use the valve C, sliding over the steam-ports H and I and

the exhaust-port J, to allow the ingress of steam to alternate ends of a steam-cylinder, so as to act on alternate sides of a piston, and also to allow the steam to escape from the cylinder, when its work is done, by means of the hollow *m* in the face of valve C, connecting the ports H and I alternately with the exhaust-port J.

Within the valve C, I construct a supplementary steam-cylinder, K, containing a piston, D, with its piston-rod E passing through both cylinder-heads, and resting its ends in the grooves *o o* in the sides of the steam-chest, the steam being admitted to cylinder K alternately through ports X X on one side of piston D, and ports Y Y on the other side of the same, the valve, with the cylinder included, being free to move endwise, while the piston, being held by the two ends of its rod abutting upon the sides of the chest, remains stationary.

To the ports X X steam is conducted by the groove *n* in the valve-face, which groove slides over the opening *k*, so that when the supplementary valve F is moved by the main engine, through the means of the arm *g* of the rocking shaft G, to the position represented in Fig. 1, the steam enters, by port *h*, dotted passage *h k*, groove *n*, and ports X X, to supplementary cylinder K, and, by its elastic force, propels this cylinder to the left, uncovering main steam-port I, the steam within the supplementary cylinder K at the right side of piston D being at the same time exhausted, by the ports Y Y, groove *n'*, dotted passage *l i*, valve-recess *f*, exhaust-passage (dotted) *j*, to the main exhaust-port J.

When the main engine shall have sufficiently completed its stroke, by the steam admitted through port I, the rocker G, being by any suitable mechanical attachment (from the main piston) caused to vibrate, will move the supplementary valve F to the left extreme of its path. Thus the entire route of steam is reversed, the main valve C makes a stroke to the right, the main engine acts in a direction opposite to the previous motion, and so on, alternately and regularly. Thus the motion of C is determined and timed by the main engine moving the rocking shaft G and valve F, while the main valve C is moved and held in place alternately, from first to last, by the independ-

ent engine contained within itself; and yet the valves are both slides, with plane faces, free to wear without disarrangement resulting from such wear, and the piston-rod E, as the parts wear away, drops lower in the grooves *o o*, the whole making a simple, certain, durable, and accessible arrangement for the purpose sought. It is totally different from those in which a valve, being started in some way by the main engine, has its motion completed by the pressure of steam on a supplementary piston connected to or within the valve. Any such device I do not claim; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The grooves *n n'*, with openings X X, Y Y, *h k*, and *i l*, in combination with valves C and F, as herein set forth.

2. The cylinder-valve C, with its stationary piston D and rod E, when arranged, relatively to the respective ports and the slide F, substantially as described.

FRANCIS CURTIS.

Witnesses:

JOHN N. PIKE,

CALVIN P. MARTIN.