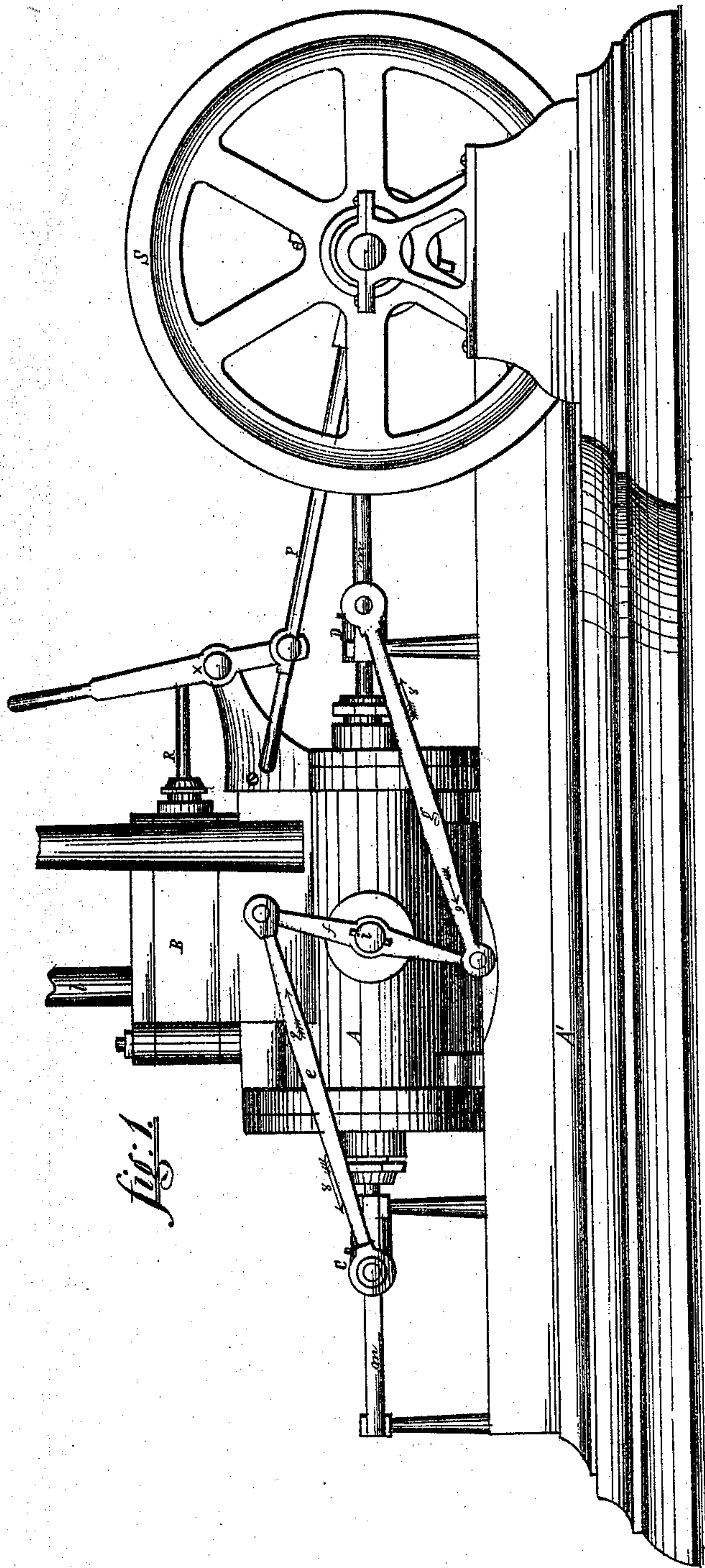


W. F. Richardson, 2. Sheets, Sheet 1.

Reciprocating Engine.

No. 107,723.

Patented Sept. 27, 1870.



Witnesses. James Johnston
A. C. Johnston.

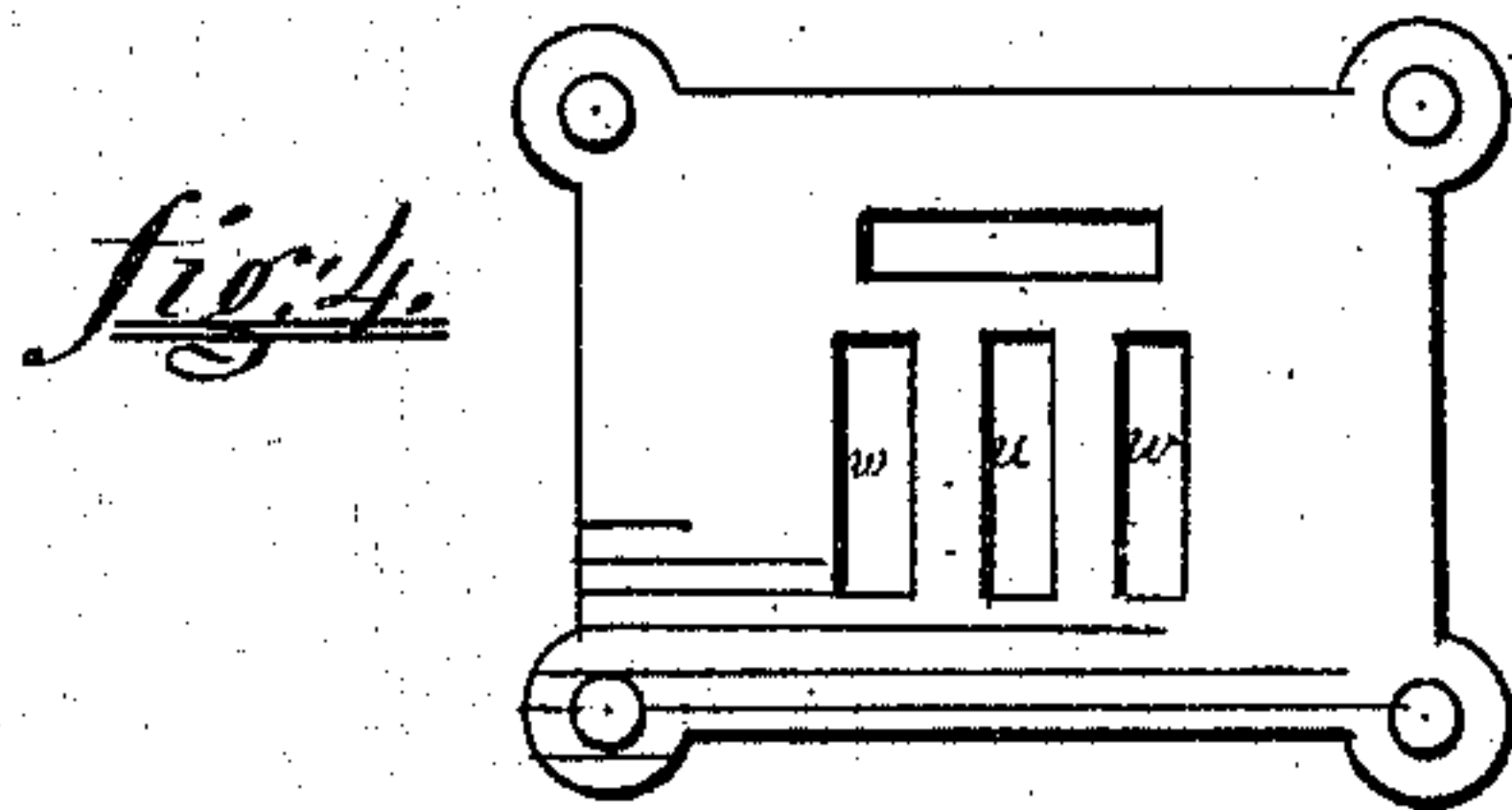
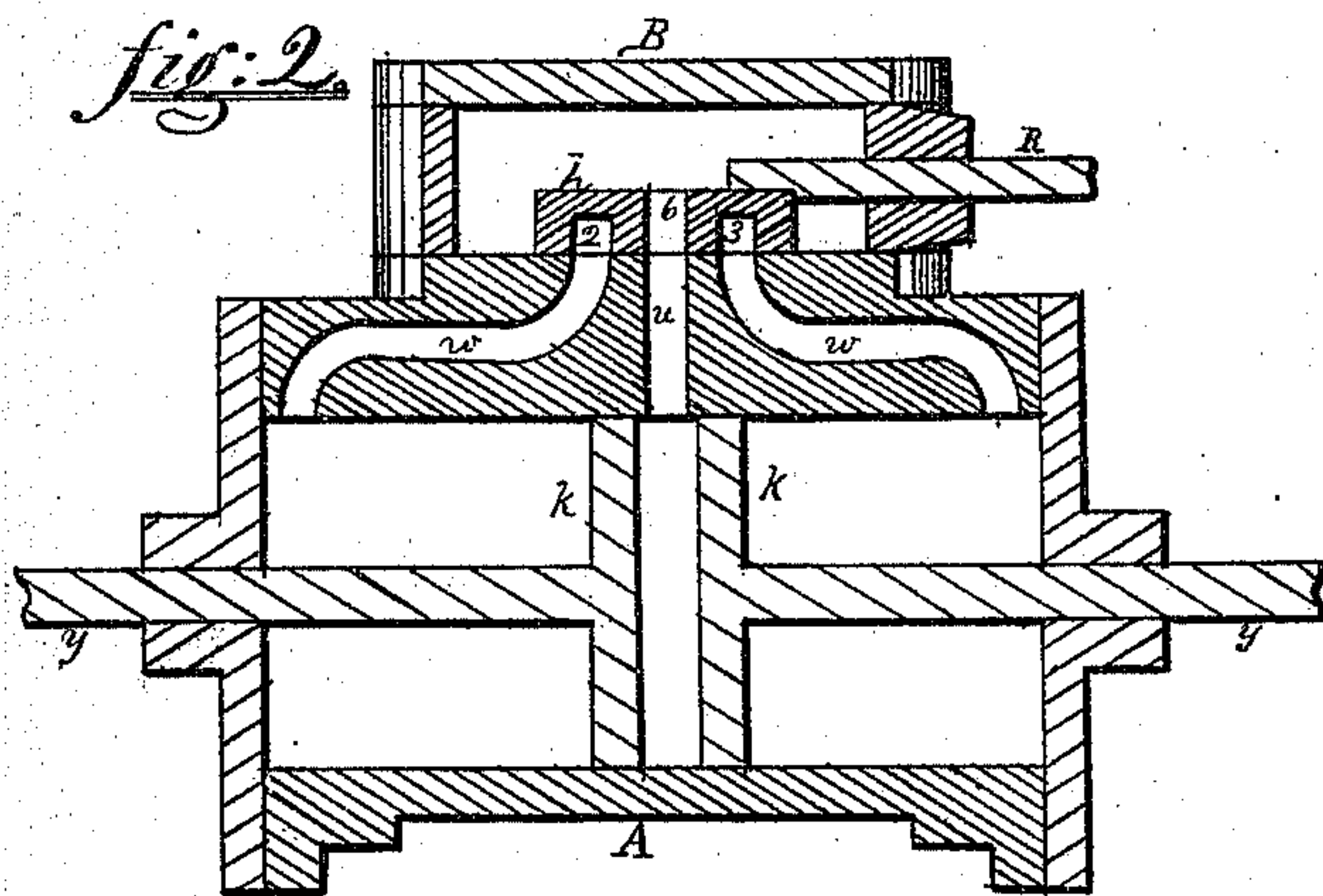
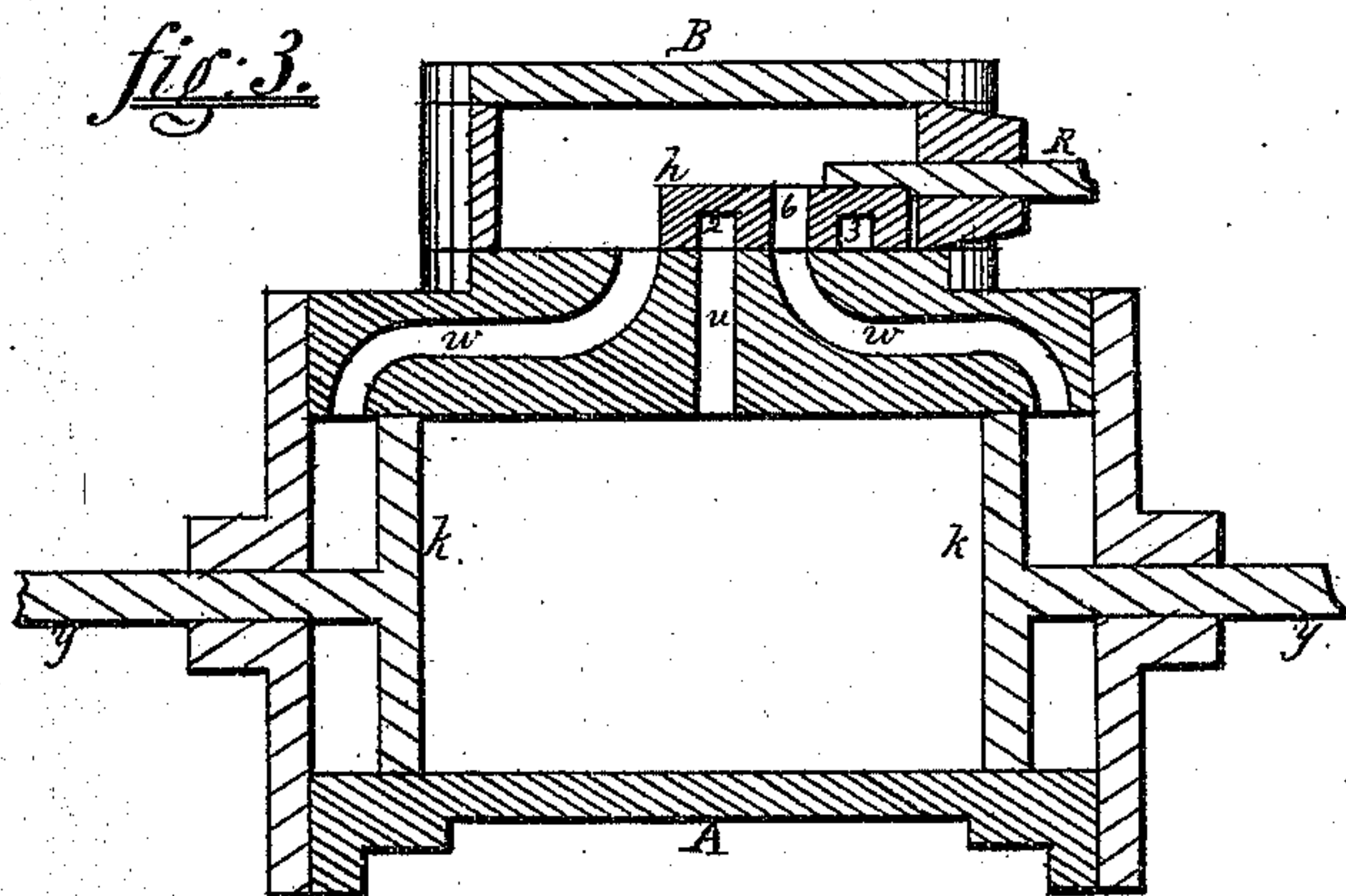
Inventor.
William F. Richardson

W. F. Richardson, 2. Sheets, Sheet 2.

Reciprocating Engine.

No. 107,723.

Patented Sept. 27, 1870.



United States Patent Office.

WILLIAM F. RICHARDSON, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 107,723, dated September 27, 1870.

IMPROVEMENT IN STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, WILLIAM F. RICHARDSON, of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters and figures of reference marked thereon.

The nature of my invention consists in so constructing a steam-engine that its cylinder shall be provided with three steam-ports, suitable exhaust-opening or openings, and two pistons, the rear one of which transmits its motion to the crank-shaft of the engine, through the medium of the side levers and rods geared to the main cross-head, as described.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

In the accompanying drawing which forms part of my specification—

Figure 1, sheet A, is a side elevation of my improvement in steam-engines.

Figures 2 and 3, sheet B, are longitudinal and vertical sections of the cylinders, pistons, slide-valve, and steam-chest.

Figure 4, sheet B, is a top view or plan of the valve-seat, representing the arrangement of steam-ports and exhaust-opening.

Figure 5, sheet B, represents the slide-valve when it is inverted.

In the accompanying drawing—

A' represents the bed-plate upon which the several parts of the engine are mounted.

A represents the cylinder, which is provided with two pistons, K K, three steam-ports, W W and U, a steam-chest, B, and slide-valve, *h*, which is provided with exhaust-chambers, 2, 3, and 5, and a supply-opening, 6.

To the end of each piston-rod *y* is attached a T-head, as indicated at C and D, which T-heads move on slides *m*.

To the T-head D is attached a pitman, which is pivoted to the crank and the end of the shaft of the fly-wheel S.

To each side of the T-head C are pivoted rods *e*, the upper ends of which are pivoted to the upper ends of levers *f*, which are pivoted one on each side of the cylinder A, at the point marked *i*.

To the lower ends of the levers *f* are pivoted rods, *g*, the upper ends of which are pivoted to the T-head D.

The slide-valve *h* is operated through the medium of cam-rod P, stem R, and rock-shaft and lever *x*, all of ordinary construction, and operating in the usual way.

l represents the steam-supply pipe, which is connected to the steam-chest B.

As the skillful mechanic will readily understand the construction and arrangement of the several parts of my improvement in steam-engines, and the relation they bear to each other, by reference to the accompanying drawing, and from the foregoing description, I will, therefore, proceed to describe the operation of the hereinbefore described engine.

The steam enters the steam-chest B through the pipe *l*, which is connected to a steam-boiler or other steam-generator.

When the slide-valve *h* is in the position shown in fig. 2, the cylinder is receiving steam through the opening 6 of the slide-valve *h* and steam-port *u* of cylinder A, and is exhausting steam through the ports W W into the exhaust-chambers 2, 3, and 5.

When the slide-valve *h* is in the position shown in fig. 3, the cylinder will be receiving steam through the ports W W, and the steam between the inner faces of the piston-heads K K will be exhausted through the port *u* of the cylinder, and the exhaust-chambers 2 and 5 of the slide-valve.

When the cylinder is receiving steam through the ports W W, the heads of the cylinder are the abutments for the steam to act against while moving the pistons K K toward the center of the cylinder.

When the cylinder is receiving steam through its port *u*, the pistons act as abutments to each other while moving the pistons K K toward each end of the cylinder.

The power or motion of the piston connected to the T-head C is transmitted to the T-head D through the medium of the rods *e* and *g* and levers *f*, and the T-head D transmits it and the power of its own piston to the crank of the engine, through the medium of the pitman.

When the pistons are moving from the center of the cylinder toward its ends, the rods *e* and *g* move in the direction indicated by the arrows, marked 8, and when the pistons are moving from the ends of the cylinder toward the center of it, then the rods *e* and *g* move in the direction indicated by the arrows marked 9.

Having thus described the nature, construction, and operation of my improvement,

What I claim as of my invention is—

1. The engine herein described, consisting of a cylinder, with two pistons moving in opposite directions, and having their rods attached to cross-heads at their outer ends, the motion from the rear cross-head communicated to the main one by means of the levers and connecting-rods, substantially as described.

2. In combination with the above, the valve with its ports and slide, constructed as herein described.

WILLIAM F. RICHARDSON.

Witnesses:

JAMES J. JOHNSTON,
ANDREW HUMBERT.