

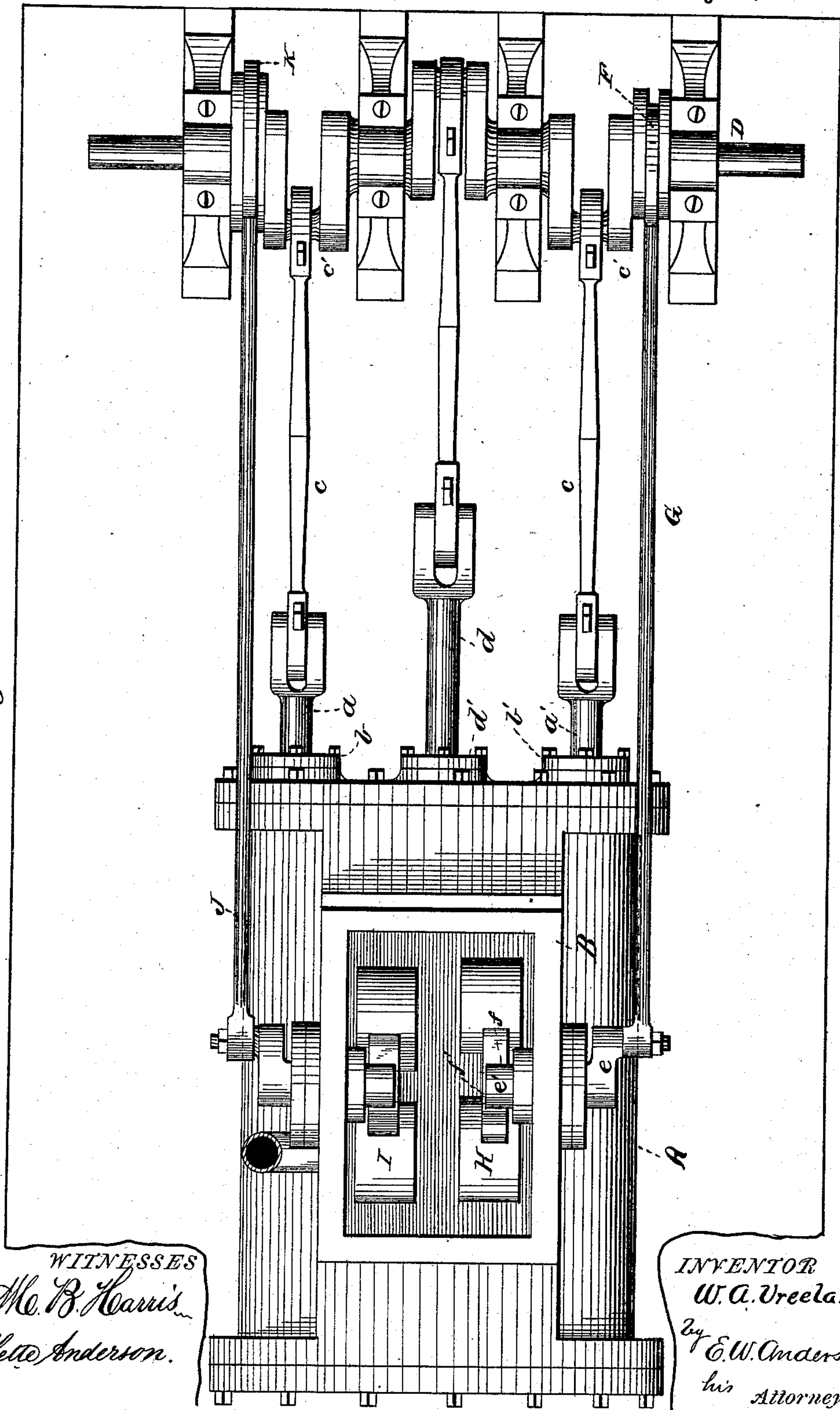
(No Model.)

3 Sheets—Sheet 1.

W. A. VREELAND.
STEAM ENGINE.

No. 406,607.

Patented July 9, 1889.



WITNESSES
 Mc. B. Harris
 Villette Anderson.

INVENTOR
W. A. Vreeland,
by E. W. Anderson,
his Attorney.

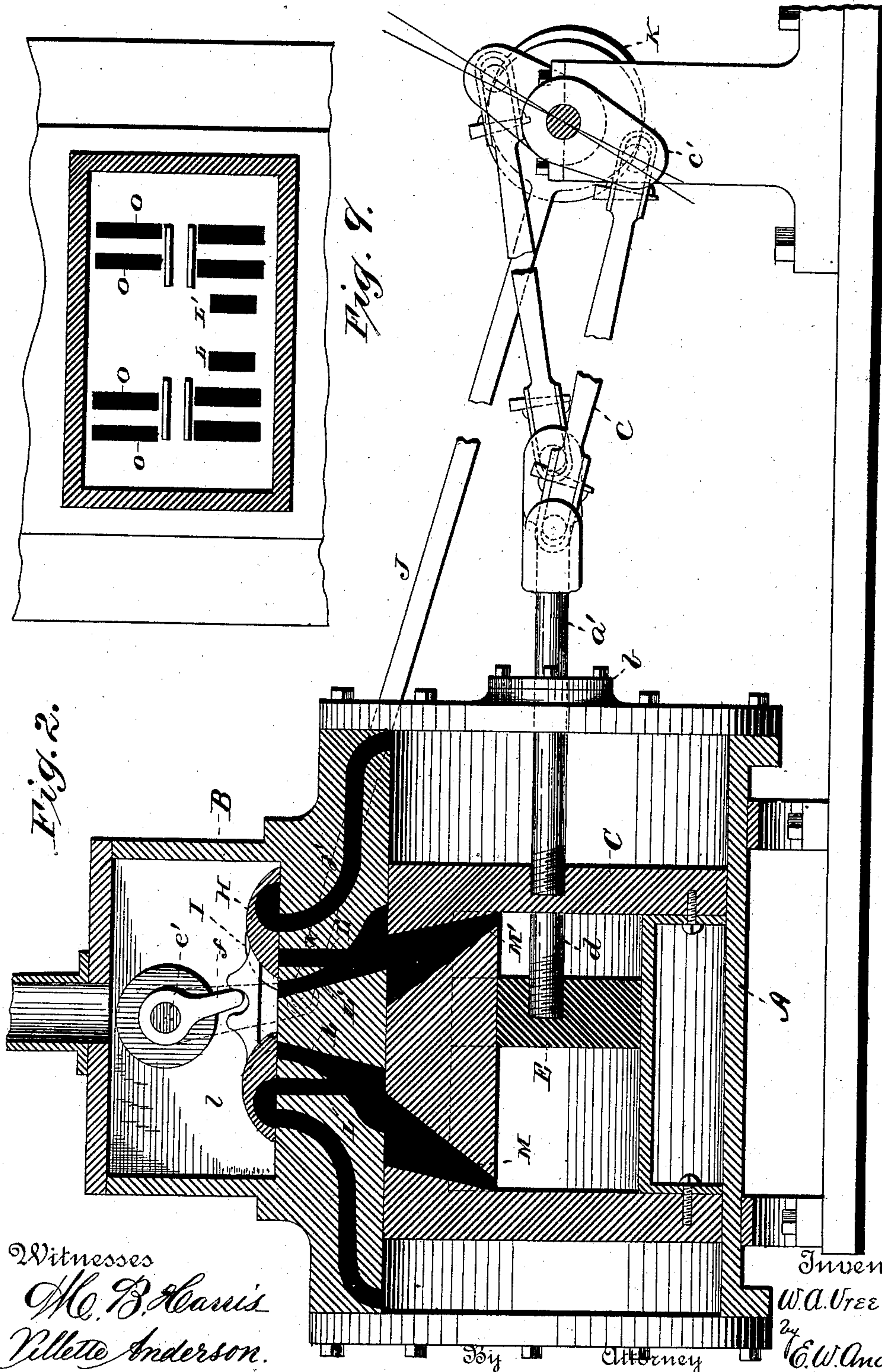
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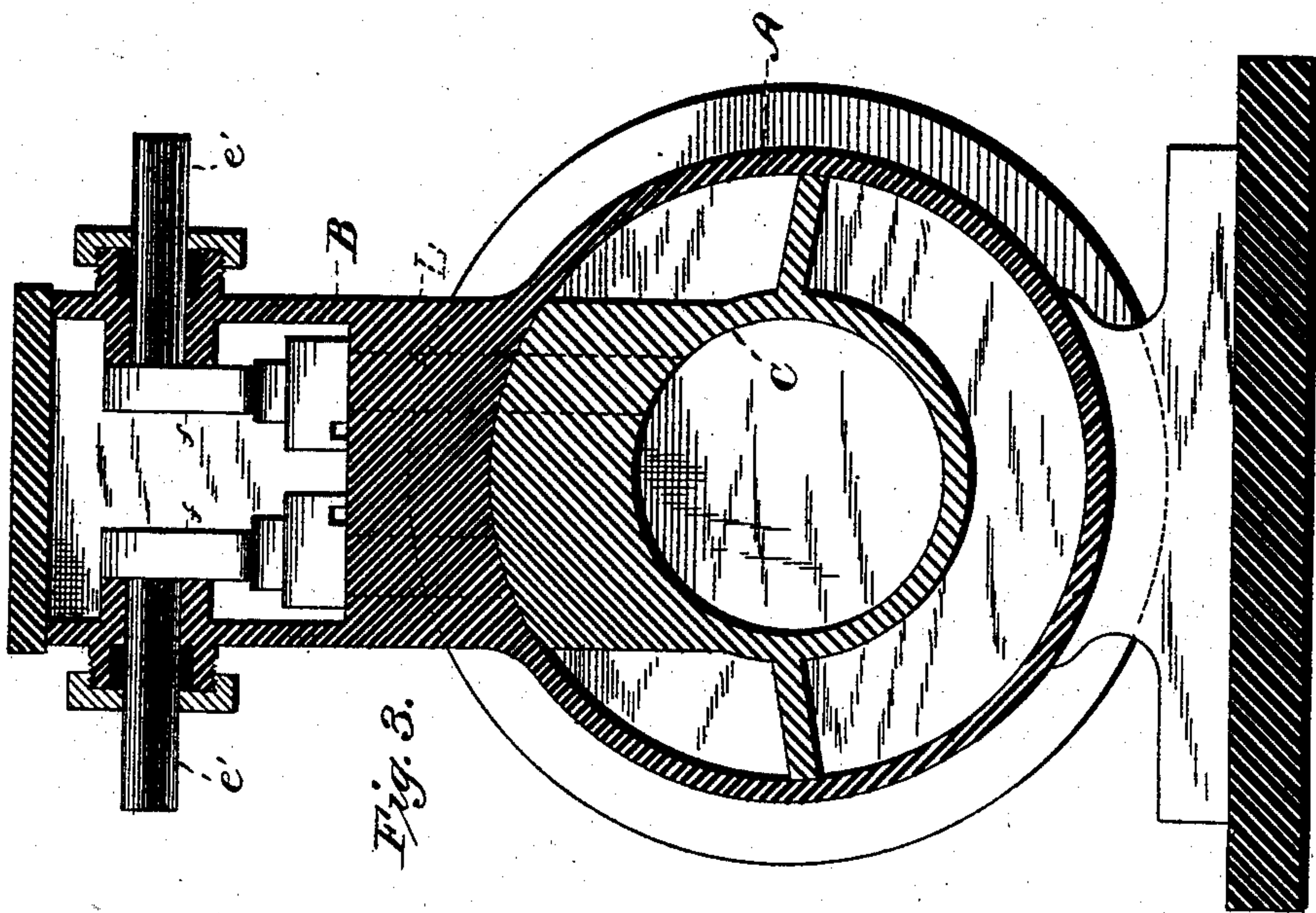
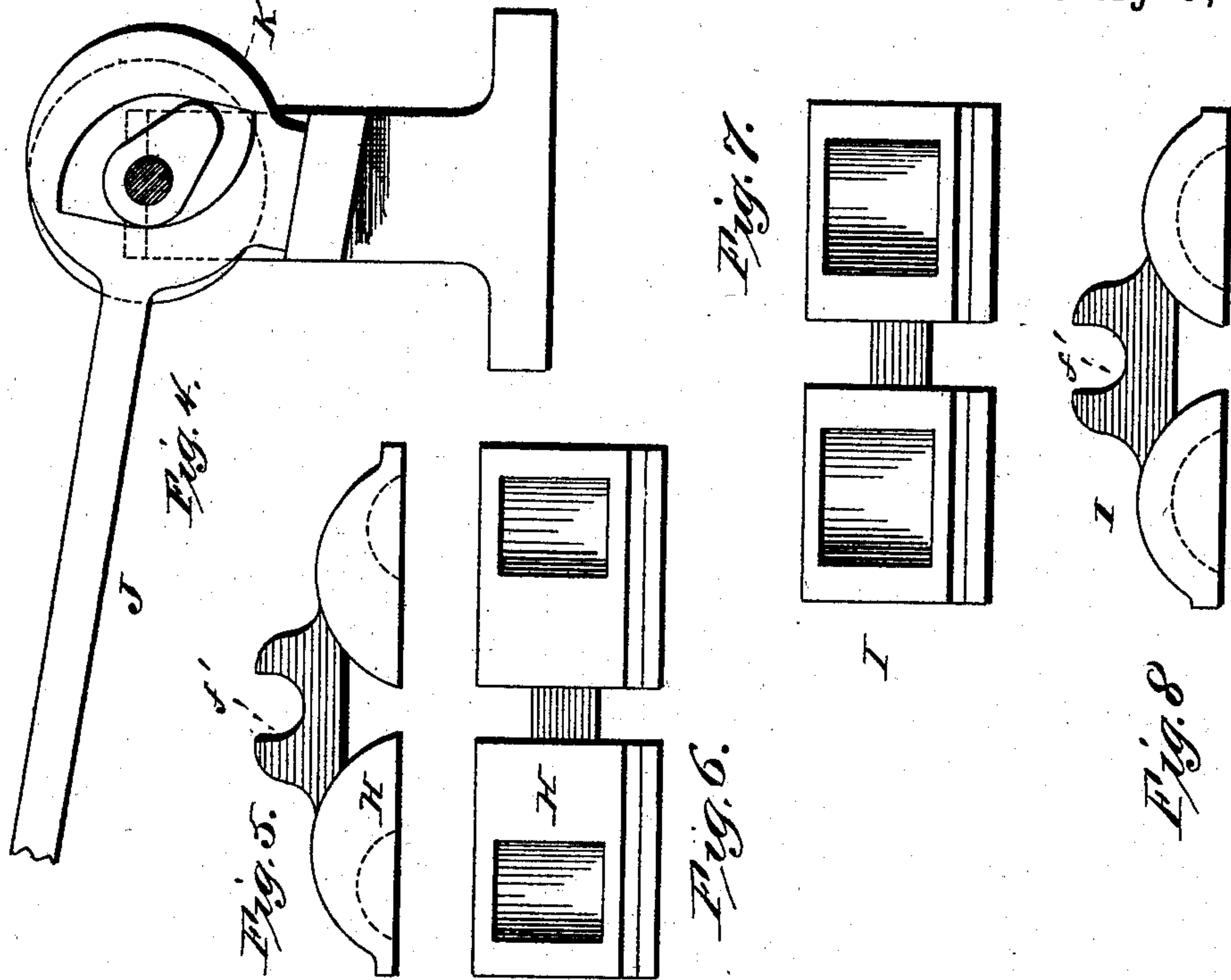
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W. A. VREELAND.
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UNITED STATES PATENT OFFICE.

WILLIAM A. VREELAND, OF CHICAGO, ILLINOIS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 406,607, dated July 9, 1889.

Application filed November 27, 1888. Serial No. 291,993. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. VREELAND, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-
10 pertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a representation
15 of a top view of the engine. Fig. 2 is a longitudinal vertical section. Fig. 3 is a transverse section. Figs. 4, 5, 6, 7, 8, and 9 are detail views.

This invention relates to improvements in
20 steam-engines; and it consists in the construction and novel combination of parts, as hereinafter set forth.

This invention relates more particularly to combined low and high pressure engines, in
25 which one steam-cylinder is inclosed within the other, and the steam-ports so arranged that the exhaust-steam from the inner cylinder will enter the outer cylinder and operate the piston therein before its final exhaust.

Referring to the drawings, A designates a
30 steam-cylinder, and B is a steam-chest thereon, with which the steam-pipe from the boiler may be connected at any convenient point.

C is a cylinder-piston within the cylinder
35 A, having the two piston-rods *a a'* extended through the stuffing-boxes *b b'* in the cylinder-head, as shown, and connected by pivoted extension-rods *c* to the cranks *c'* of the crank-shaft D, which is provided with suitable bearings. The piston C is made hollow, and has
40 the piston E therein, which has its rod *d* extended through the central stuffing-box *d'* of the cylinder A and connected by a pitman to the central crank of the crank-shaft D.

F is an eccentric on the shaft D, having
45 the adjustable eccentric-rod G, connecting pivotally with a crank *e*, which is secured to the shaft *e'*, having a bearing through the steam-chest, and provided on its inner end
50 with a depending arm *f*, engaging in the re-

cess *f'* of the sliding valve H within the steam-chest.

I is a sliding-valve similar to the valve H, and having similar connections to an eccentric-rod J, which is adjustable and has an in-
55 termittent motion imparted to it by the eccentric K on the crank-shaft.

L L' are the steam-ports opening through the cylinder A, and both adapted to register simultaneously with the ports M M' through
60 the cylinder C, one of said ports, however, being closed by the sliding valve while the other is open—that is, when steam is entering the inner cylinder through the port L, to drive the piston, the mouth of the port L' is closed by
65 its valve; but the exhaust from the inner cylinder is forced through the port M', a portion of the port L', and into the outer cylinder by way of the branch port *j'* and the port *k*, both
70 of which are in connection with the chamber *l* in the valve. At the end of the entrance the exhaust is transferred by the sliding valve. In this construction it will be seen that the exhaust from the inner or higher
75 pressure-cylinder is conveyed to the outer or low pressure-cylinder to operate the cylinder-piston therein.

O shows the final exhaust-ports leading from opposite ends of the cylinder A, and alternately registering with the valve I and
80 escaping through the ports *m*.

It is obvious that the cylinder-piston and the piston therein move in opposite directions, and that the live steam has an operative pressure against two surfaces.
85

The valve I is made intermittent in its movement, as described, so that it will be at rest long enough to allow the steam to exhaust. The exhaust is cut off by the valve,
90 however, before the piston reaches the end of its movement, so that the small amount of steam remaining in the cylinder will mix with the incoming steam and assist in operating the piston.

Having described my invention, what I
95 claim is—

1. A steam-engine having a high-pressure cylinder operating as a piston in a low-pressure cylinder, the low-pressure cylinder having steam-passages communicating with ports or
100

passages in the inner high-pressure cylinder and controlled by separate valves, the final exhaust-ports also being controlled by separate valves, said high-pressure cylinder also
5 having a piston, substantially as set forth.

2. A steam-engine having a high-pressure cylinder operating as a piston in a low-pressure cylinder, the low-pressure cylinder having steam-passages communicating with ports or
10 passages in the high-pressure cylinder and controlled by separate valves, the final ex-

haust-ports also being controlled by separate valves, said high-pressure cylinder also having a piston and the low-pressure cylinder having a plurality of piston-rods, substantially as specified. 15

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

WM. A. VREELAND.

Witnesses:

A. STARK,
JAMES TINDILL.