

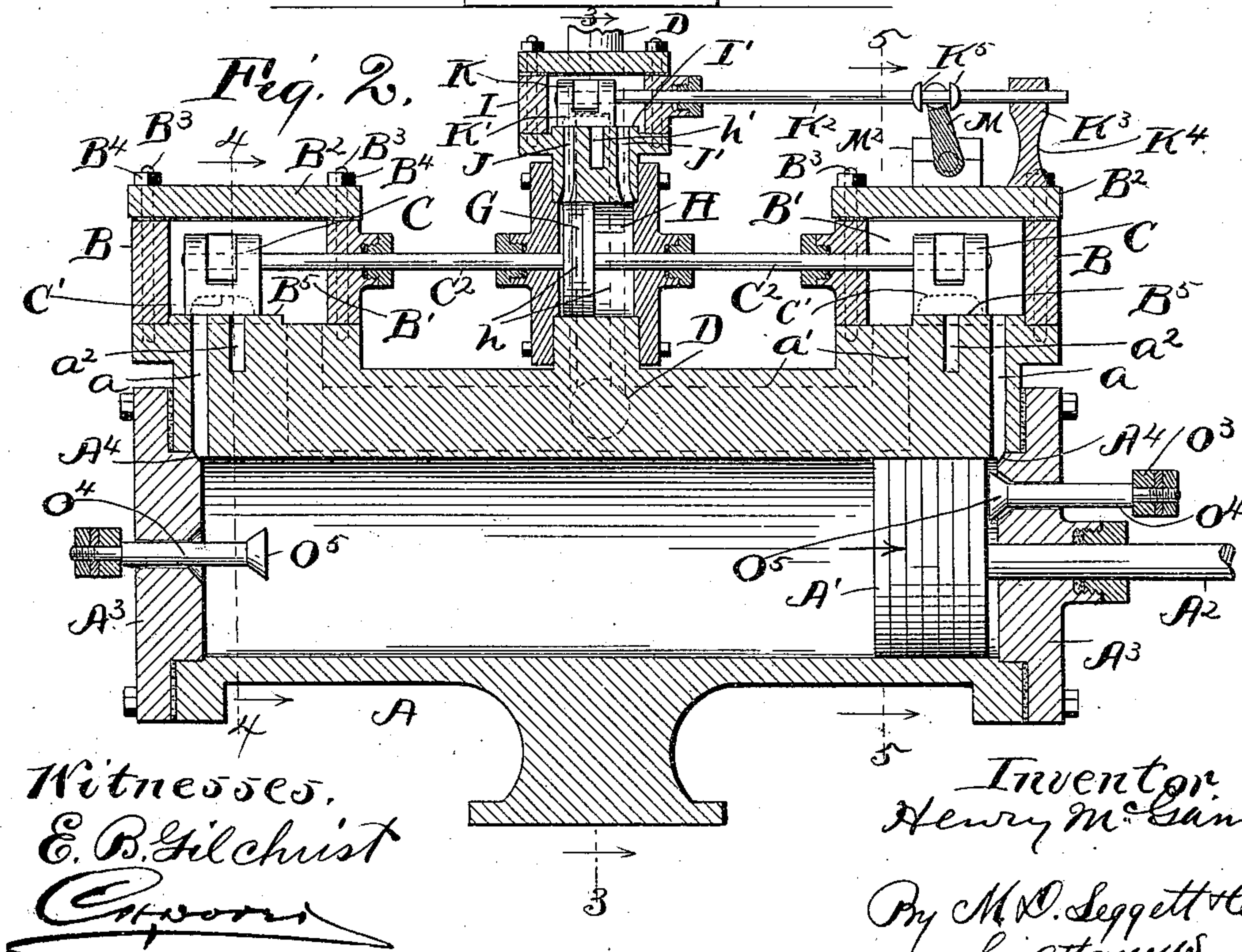
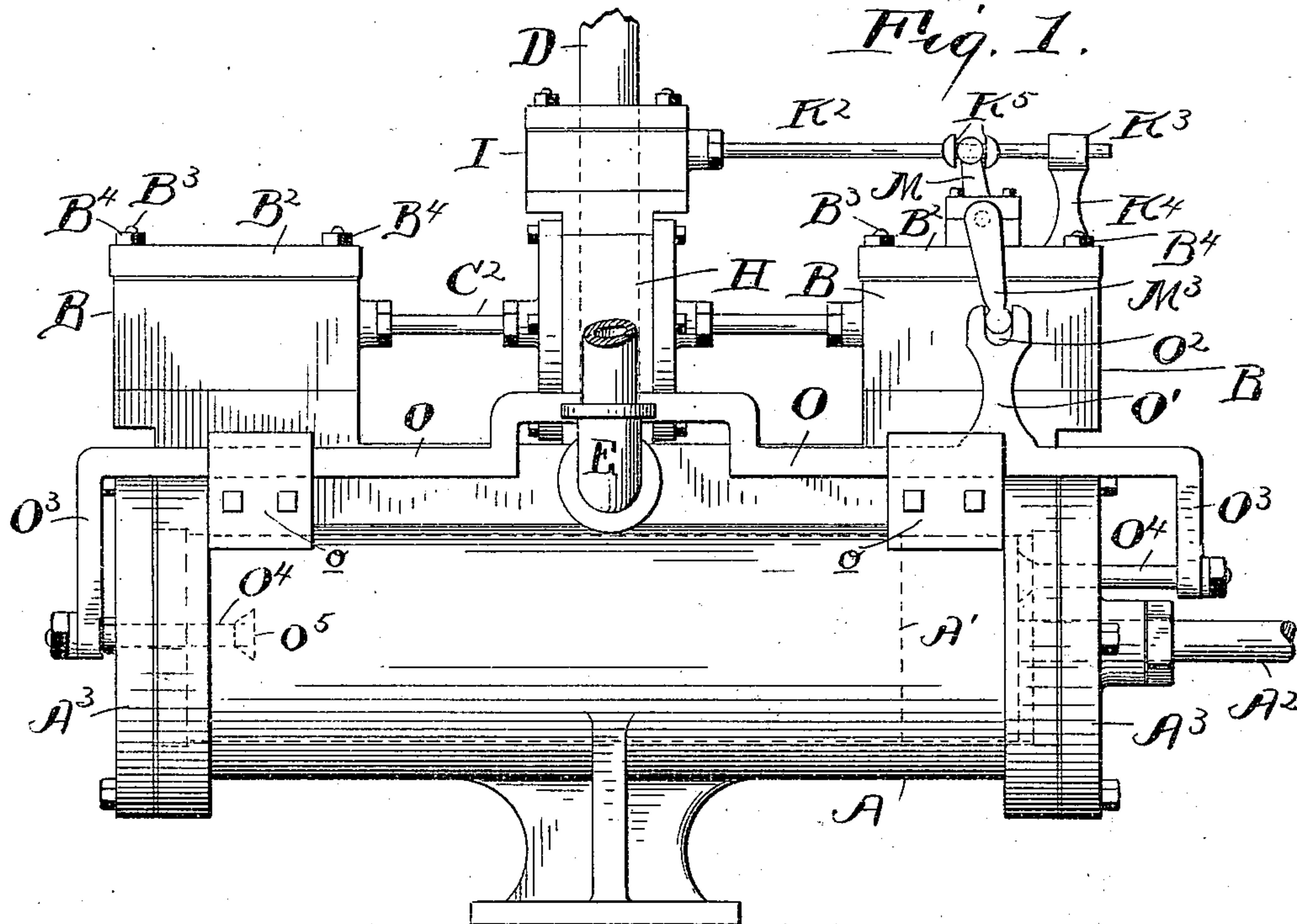
(No Model.)

2 Sheets—Sheet 1.

H. MCGANN.  
STEAM ENGINE.

No. 549,739.

Patented Nov. 12, 1895.



Witnesses,  
E. B. Gilchrist  
*[Signature]*

Inventor,  
Henry McGann  
By M. D. Leggett & Co.  
his Attorneys.

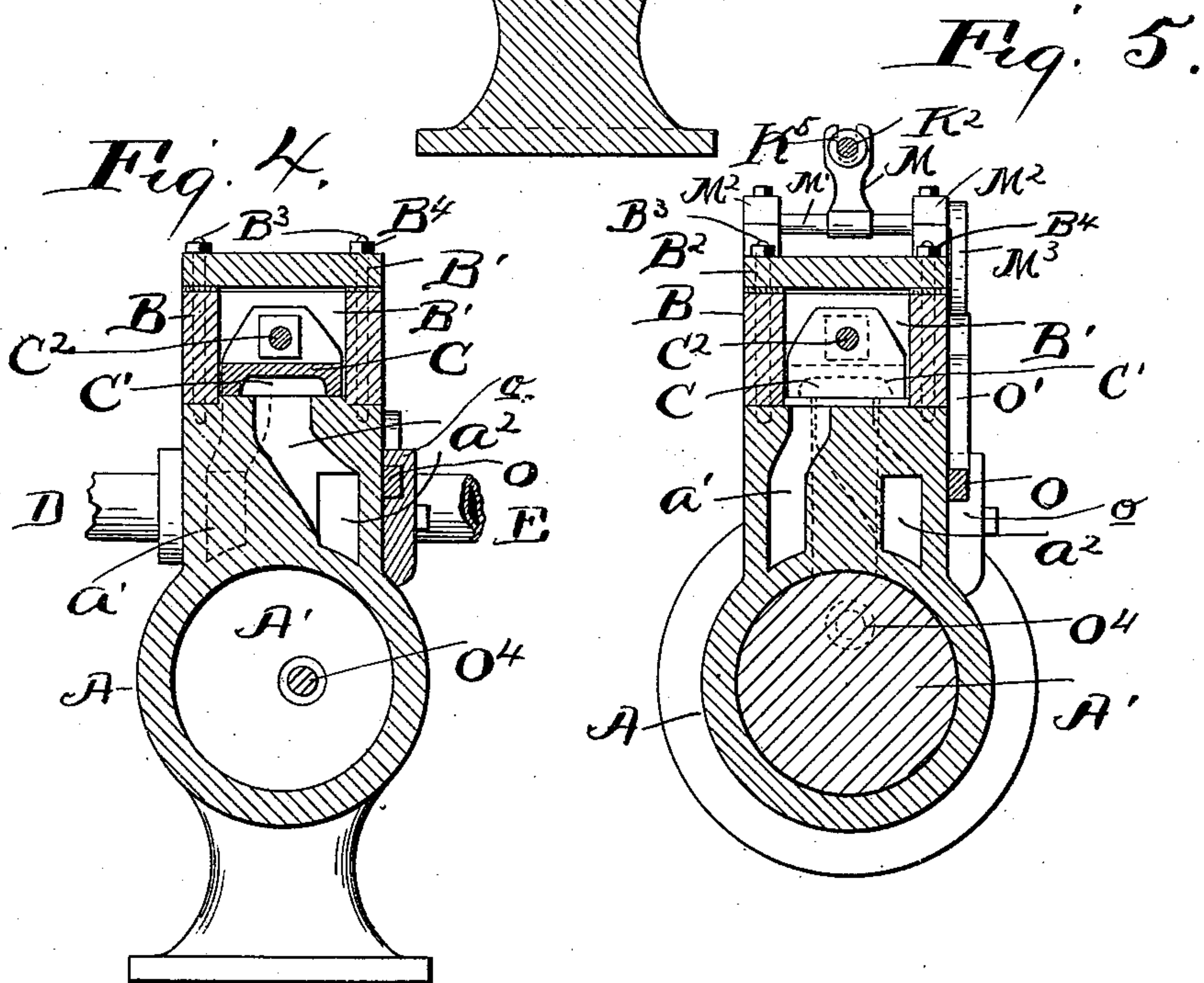
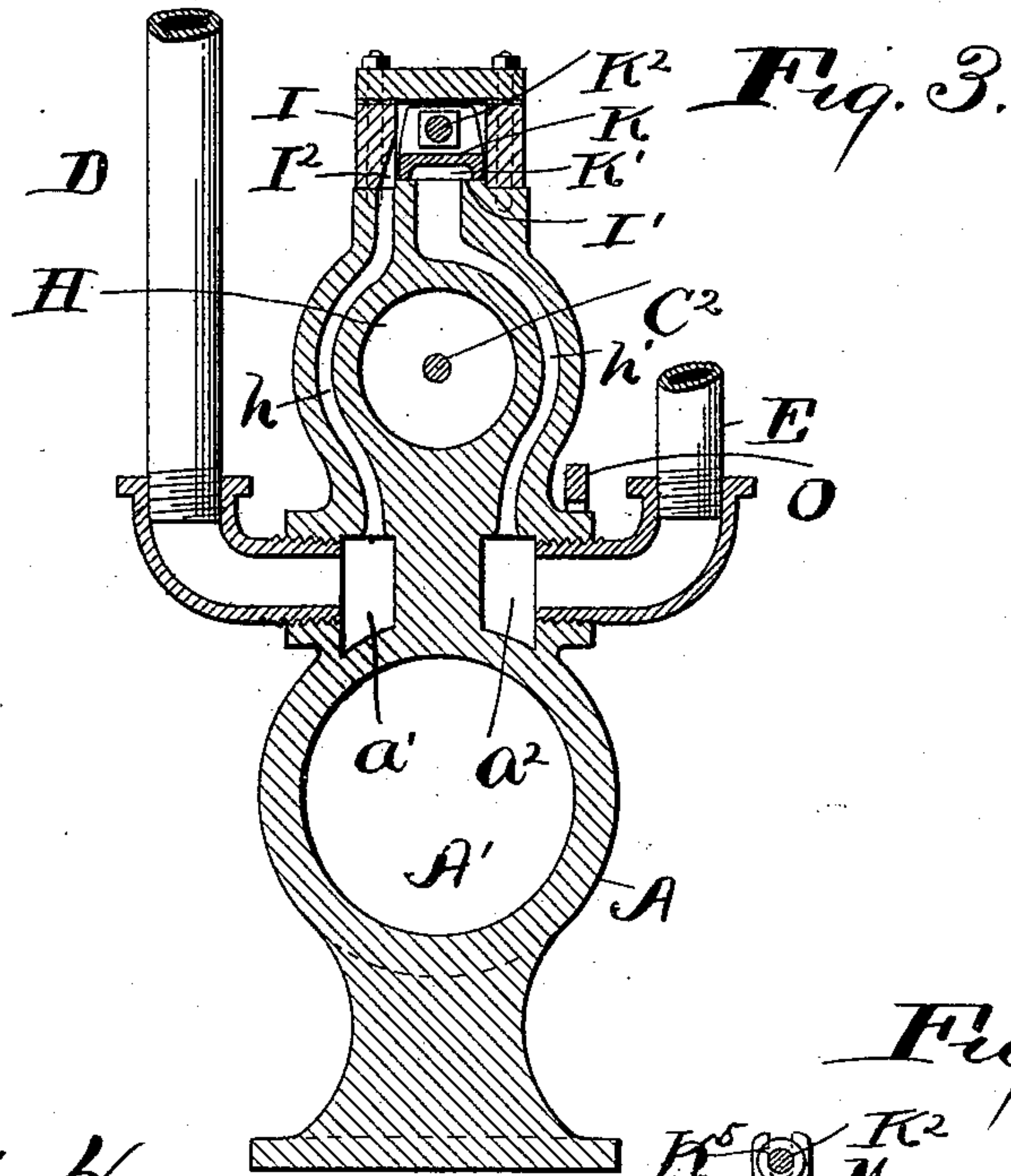
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# UNITED STATES PATENT OFFICE.

HENRY MCGANN, OF CLEVELAND, OHIO.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 549,739, dated November 12, 1895.

Application filed November 20, 1894. Serial No. 529,361. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY MCGANN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Engines; and I do hereby 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 pertains to make and use the same.

My invention relates to improvements in steam-engines, the primary object being to cushion the piston operating within the main steam-cylinder of the engine at the end of each stroke and to effect greater economy in the use of steam.

With this object in view and to the end of rendering the operating parts simple, durable, and reliable my invention consists in certain features of construction and in combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a steam-engine embodying my invention. Fig. 2 is a side elevation, mostly in central longitudinal section. Figs. 3, 4, and 5 are end elevations in section on lines 3 3, 4 4, and 5 5, respectively, Fig. 2 looking in the direction of the arrows.

Referring to the drawings, A designates the main steam-cylinder of the engine; A' A<sup>2</sup>, the piston and piston-rod, respectively, operating in said cylinder, and A<sup>3</sup> A<sup>3</sup> represent the heads of the cylinder.

B B represent the main valve-chests of the engine, said chests being provided above and at opposite ends, respectively, of cylinder A. Said chests are rigid with the cylinder.

B' represents the chambers of chests B, said chambers being closed at the top by lids or covers B<sup>2</sup>, that are removably secured to the surrounding walls of chambers B' by means of studs B<sup>3</sup>, that extend into cylinder A through the surrounding walls of chambers B', and nuts B<sup>4</sup>, mounted upon said studs and engaging the upper sides of lids or covers B<sup>2</sup>. Within the chamber of each chest B is located a slide-valve C, that engages and is adapted to operate upon a seat B<sup>5</sup>, formed upon the bottom of the respective chamber, and a port a leads from the outer end of each valve-seat B<sup>5</sup> downwardly to and communicates with

the adjacent end of the chamber of cylinder A, cylinder-heads A<sup>3</sup> being preferably cut away more or less upon the inner side, as at A<sup>4</sup>, to form those portions of ports a that communicate with the chamber of cylinder A.

D and E designate the steam-pipe and exhaust-pipe, respectively, of the engine, and a' and a<sup>2</sup> represent the main steam-port and main exhaust-port, respectively, said ports being formed within and extending longitudinally of the upper portion of the shell of cylinder A and being located at opposite sides, respectively, of the cylinder. (See Figs. 2 to 5, inclusive.)

Steam-pipe D communicates with the central portion of port a', and exhaust-pipe E communicates with the central portion of port a<sup>2</sup>. Ports a' a<sup>2</sup> at each end extend upwardly, as shown in Figs. 2, 4, and 5, and communicate with the chambers of chests B, steam-port a' communicating with the inner ends of the chambers at the inner ends of valve-seats B<sup>5</sup> and exhaust-port a<sup>2</sup> communicating with the central portion of said chambers at valve-seats B<sup>5</sup>.

Each valve C is provided with a recess or port C', that is adapted to establish and interrupt communication between ports a' and a<sup>2</sup>, which lead from the seat upon which said valve operates. Each valve C is operatively connected, by means of a rod or stem C<sup>2</sup>, with a piston G, located within and adapted to operate endwise of the chamber of a smaller or secondary steam-cylinder H, provided at the top and central portion of cylinder A.

A secondary valve-chest I is provided above cylinder H, K designating the slide-valve that is located within the chamber of said chest and that rests upon a seat I', formed upon the bottom of said chamber.

A steam-port h (see Fig. 3) leads from the central portion of port a' through the adjacent side of the shell of cylinder H into the central portion and at one side of the chamber of chest I, the respective side wall of said chamber being preferably cut away, as at I<sup>2</sup>, to form that portion of port h that communicates with said chamber. Another port h' (see Fig. 3) leads from the central portion of exhaust-port a<sup>2</sup> upwardly through the adjacent portion of the shell of cylinder H into



the central portion of the chamber of chest I, centrally of valve-seat I'. The wall between the chamber of chest I and the chamber of cylinder II is provided with two ports J J', that are adapted to communicate with opposite ends, respectively, of the chamber of cylinder I, as shown in Fig. 2, the one port J leading from one end of valve-seat I' into one end of cylinder II and the other port J' leading from the other end of said valve-seat into the other end of cylinder II.

Valve K is provided with a recess or port K', adapted to establish communication between port h' and the one or the other of ports J J', according as the valve is moved in the one direction or the other. Valve K is provided with a stem K<sup>2</sup>, that extends laterally (see Figs. 1 and 2) through valve-chest I and has bearing in a box K<sup>3</sup>, rigid with a standard K<sup>4</sup> upon chest B. Stem K<sup>2</sup> at any suitable point intermediately between box K<sup>3</sup> and chest I is provided with two collars or shoulders K<sup>5</sup>, located a suitable distance apart, and between said shoulders or collars stem K<sup>2</sup> is straddled by the free or forked end of an arm or lever M, that is operatively mounted upon a shaft M', arranged transversely of and having bearing in boxes M<sup>2</sup>, rigid with the lid or cover of the adjacent valve-chest B. A depending arm or lever M<sup>3</sup> is operatively mounted upon one end of shaft M', and the free end of said arm or lever M<sup>3</sup> engages a slot O<sup>2</sup> in an upwardly-projecting arm or member O' of a tappet-rod O, that is located at one side of and extends longitudinally of the steam-engine and has bearing in boxes o, rigid with the adjacent side of the shell of cylinder A. Tappet-rod O at each end is provided with a depending arm O<sup>3</sup>, to and at or near the free end of which is suitably secured a tappet O<sup>4</sup>, that extends inwardly through the adjacent head A<sup>3</sup> of cylinder A and terminates at its inner extremity in a head O<sup>5</sup>, adapted to be engaged by the piston A'. Heads A<sup>3</sup> of cylinder A are, of course, bored to accommodate the location and operation of tappets O<sup>4</sup> and their heads O<sup>5</sup>.

The arrangement of parts is such that steam is admitted to and exhausted from opposite sides of piston A' within cylinder A through ports a a in the shell of said cylinder.

We will suppose that piston A' had just completed its stroke in the direction of the arrow marked upon said piston in Fig. 2. Tappets O<sup>5</sup> in their normal position project into the chamber of cylinder A, and the arrangement of parts is such that the piston upon reaching the end of its stroke in either direction shall not clash against the respective cylinder-head A<sup>3</sup>, but shall engage the head of the tappet extending through the respective cylinder-head before reaching the terminus of its stroke, and thereupon actuate said tappet, and consequently the mechanism operatively connecting the tappet with the valve in chest I in the direction required to establish communication between the chamber of

said chest and one of the ports leading from said chamber into one end of the chamber of cylinder II, resulting in the actuation of piston G in the direction required to actuate valves C, so as to admit steam into that end of cylinder A toward which piston A' is moving, and thereby actuate said piston A' in the opposite direction. The two tappets O<sup>5</sup> are operatively connected with each other, as hereinbefore described, and the arrangement of parts is such that as the one tappet is actuated to effect the movement of valve K, piston G, and valves C in the one direction the other tappet is brought into its normal position, said valves and piston being actuated in the one direction or the other, according as piston A' operates upon the one or the other of said tappets.

What I claim is—

1. In a steam-cylinder, the combination with the main or primary cylinder A; piston and piston-rod A', A<sup>2</sup>, respectively; main valve-chests B B located at opposite ends, respectively, of the aforesaid cylinder; slide-valves C within said chests and recessed or ported, as at C'; steam-pipe D; exhaust-pipe E; ports a a; main steam-port a'; main exhaust-port a<sup>2</sup>; secondary steam-cylinder II; piston G within said secondary cylinder and operatively connected with the aforesaid valves; secondary valve chest I; steam-port h; exhaust-port h'; ports J J'; slide-valve K within the secondary valve-chest and ported at K' and provided with a stem K<sup>2</sup> extending laterally through the valve-chest, all arranged substantially as indicated; of the tappet-rod O arranged externally and longitudinally of the main or primary-cylinder; bearings for said rod, which bearings are rigid with said cylinder, said tappet-rod, at each end of the primary cylinder, being provided with an inwardly-extending arm O<sup>3</sup> that overlaps the outer face of the adjacent cylinder-head, and is provided with a tappet that extends through said head inwardly, and mechanism operatively connecting the tappet-rod with the aforesaid valve-stem in a manner substantially as shown, for the purpose specified.

2. In a steam-cylinder, the combination with the main or primary cylinder A; piston and piston-rod A' A<sup>2</sup>, respectively; main valve-chests B B located at opposite ends, respectively, of the aforesaid cylinder; slide-valves C within said chests and recessed or ported, as at C'; steam-pipe D; exhaust-pipe E; ports a a; main steam-port a'; main exhaust-port a<sup>2</sup>; secondary steam-cylinder II; piston G within said secondary cylinder and operatively connected with the aforesaid valves; secondary valve-chest I; steam-port h; exhaust-port h'; ports J J'; slide valve K within the secondary valve-chest and ported, as at K', and provided with a stem K<sup>2</sup> extending laterally through the valve-chest, all arranged substantially as indicated; of a tappet-rod O provided with two tappets extending into opposite ends, respectively, of the



main cylinder and provided with an arm O' having the slot O<sup>2</sup>, the shaft M' having an arm M<sup>3</sup> engaging the aforesaid slot and provided with the arm M operatively connected  
5 with the aforesaid valve-stem, all arranged and operating substantially as shown, for the purpose specified.

In testimony whereof I sign this specification, in the presence of two witnesses, this 17th day of October, 1894.

HENRY MCGANN.

Witnesses:

C. H. DORER,  
ELLA E. TILDEN.