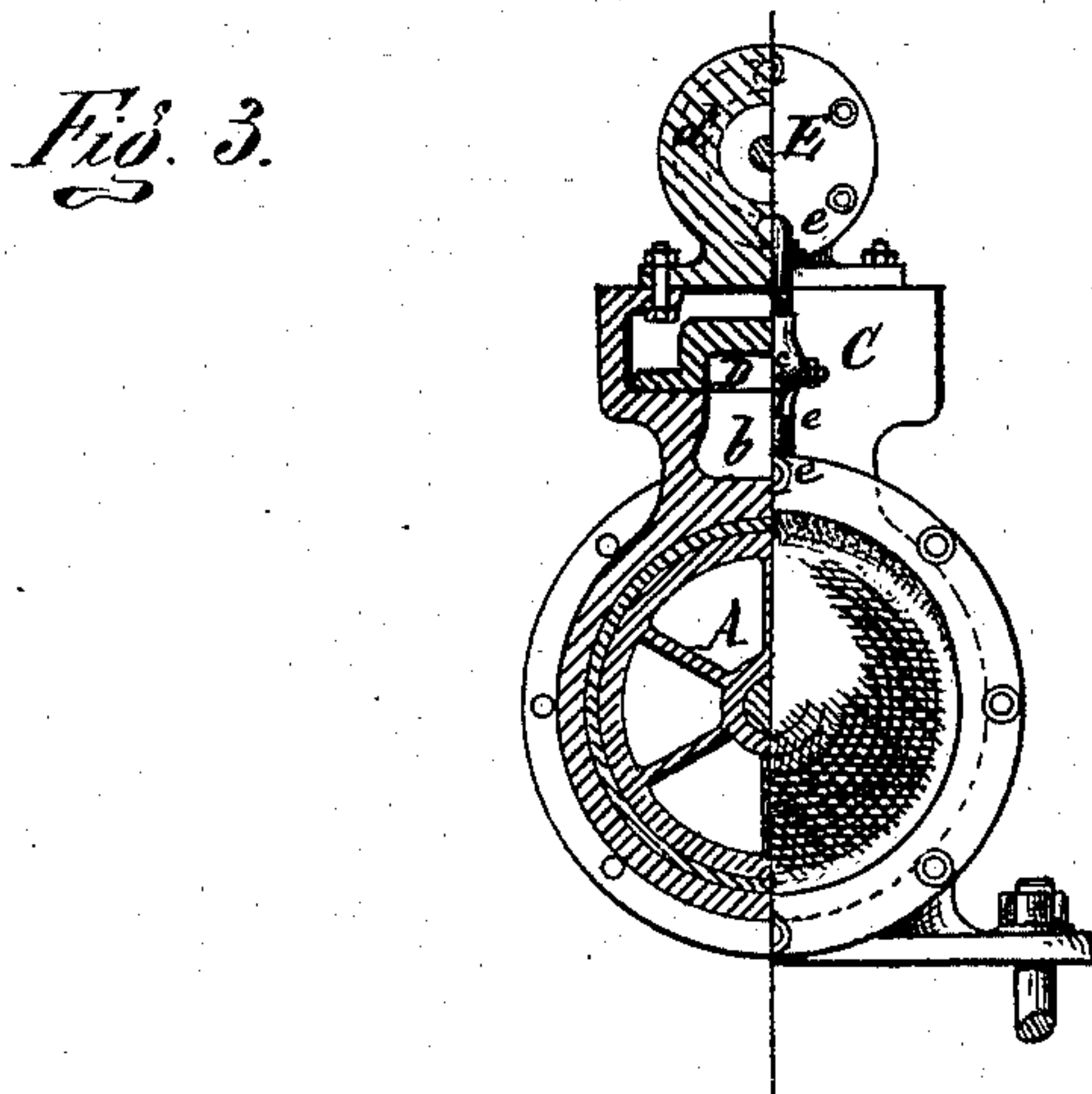
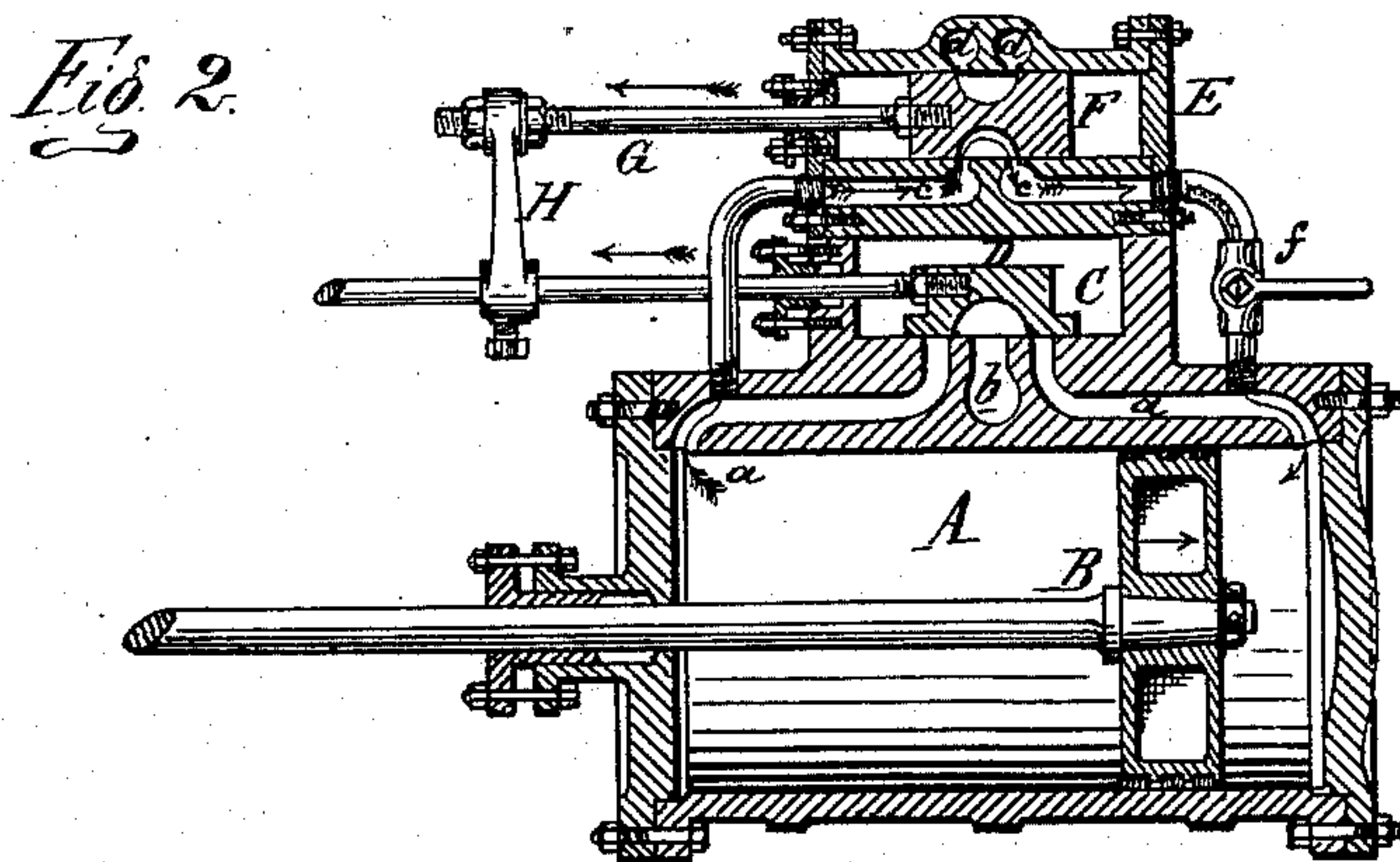
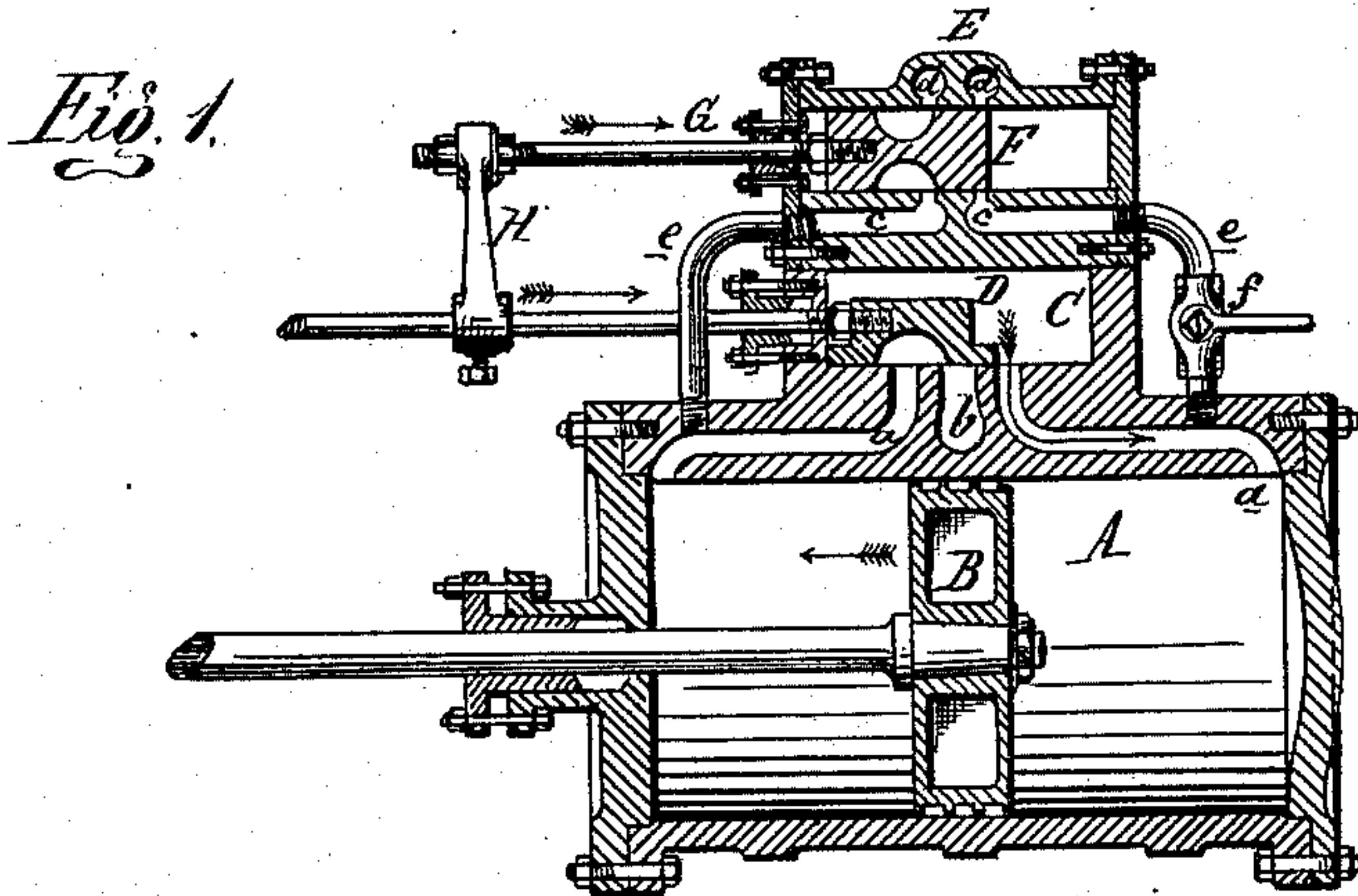


H. P. CASE.
Steam-Engine.

No. 164,804.

Patented June 22, 1875



Attest:
Edward Benthel.
Witness

Inventor:
H. P. Case
By Atty
J. S. Sprague

UNITED STATES PATENT OFFICE.

HIRAM P. CASE, OF DETROIT, MICHIGAN.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **164,804**, dated June 22, 1875; application filed December 30, 1874.

To all whom it may concern:

Be it known that I, HIRAM P. CASE, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Steam-Engines, of which the following is a specification:

The object of my invention is to provide a steam-engine with a supplementary valve, moving in unison with the steam valve or valves, for passing a portion of the exhaust steam from the exhaust side of the piston to the steam side just before the completion of each stroke, to fill the side pipes, passage, and clearance with exhaust steam, and thereby save that volume of live steam, and at the same time to reduce the compression at the termination of each stroke. The valve may be worked by an arm on the stem of the slide-valve, if the engine be fitted with one, or by a separate eccentric.

Figure 1 is a longitudinal vertical section of a steam-engine fitted with my improvement, showing the piston at mid-stroke. Fig. 2 is a similar view, but showing the piston nearly at the end of its stroke in the reverse direction. Fig. 3 is a sectional end elevation.

In the drawing, A represents a steam-cylinder, having the usual steam-ports *a a*, and exhaust-port *b*. B is the piston. C is the steam-chest, fitted with an ordinary slide-valve, D. Above the chest I bolt on the cap thereof a cylindrical steam-chest, E, fitted with a piston-valve, F, whose stem G is connected by an arm, H, with the stem of the main valve D. Under the cylindrical bore of the chest E two passages, *c*, are cored in it, one leading to each end from a central port in the chest, each passage having its own port. To balance the valve F, a central belt, *d*, is cored around the

chest E. A pipe, *e*, is tapped into the end of each passage *c*, and its other end into the side pipe or passage *a* of the steam-cylinder. One of the pipes *e* is provided with a cock, *f*. During the time the piston is moving, the valve F covers one of the ports *c*, as seen in Fig. 1, until just as the piston is about to complete its stroke, when the valve F, moving with the main valve in a reverse direction to the piston, will uncover the ports *c*, (the main valve having covered both steam-ports *a*,) and a portion of the exhaust steam, or that which is on the exhaust side, will pass through the pipe *e* into the chest E, through the port *c*, around the valve F, thence through the other passage *c* and pipe *e* into the steam-passage *a*, filling it and the clearance with exhaust steam, saving an equal volume of live steam, and reducing the compression. At the end of the stroke the valve F will again cover the ports. The volume of steam so passing through the pipes may be regulated by the cock *f*.

On engines having other than slide-valves, the supplementary valve may be actuated by an independent eccentric.

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

The combination, with a steam-engine, of an independent valve and valve-chest and pipes, for transferring a portion of the exhaust steam to the steam side of the piston, at or near the completion of each stroke of the piston, substantially as described.

HIRAM P. CASE.

Witnesses:

H. S. SPRAGUE,
H. F. EBERTS.