(No Model.)

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N. H. EDGERTON.

STEAM ENGINE.

No. 409,672. Patented Aug. 27, 1889.

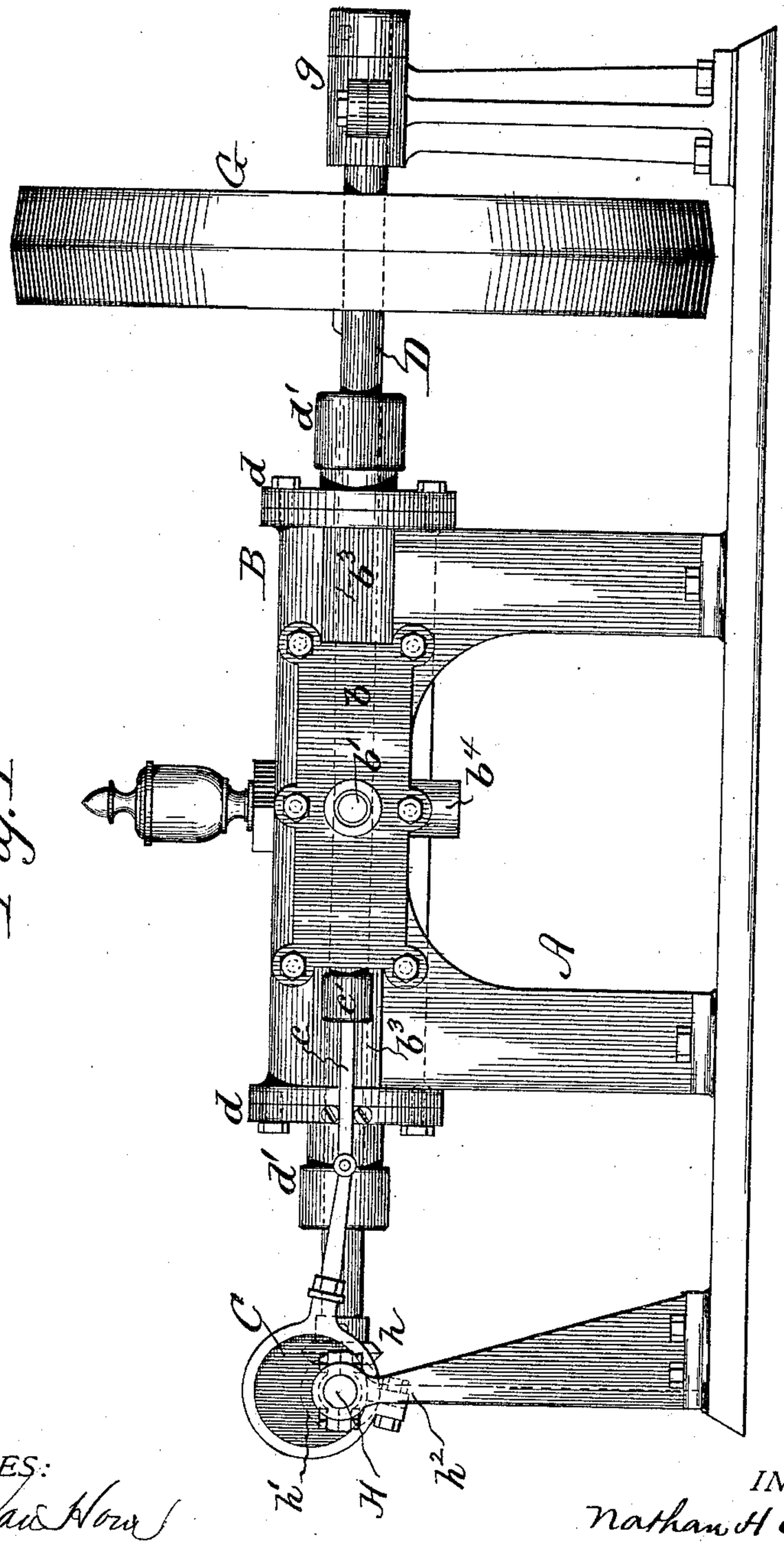

Fig. 1.

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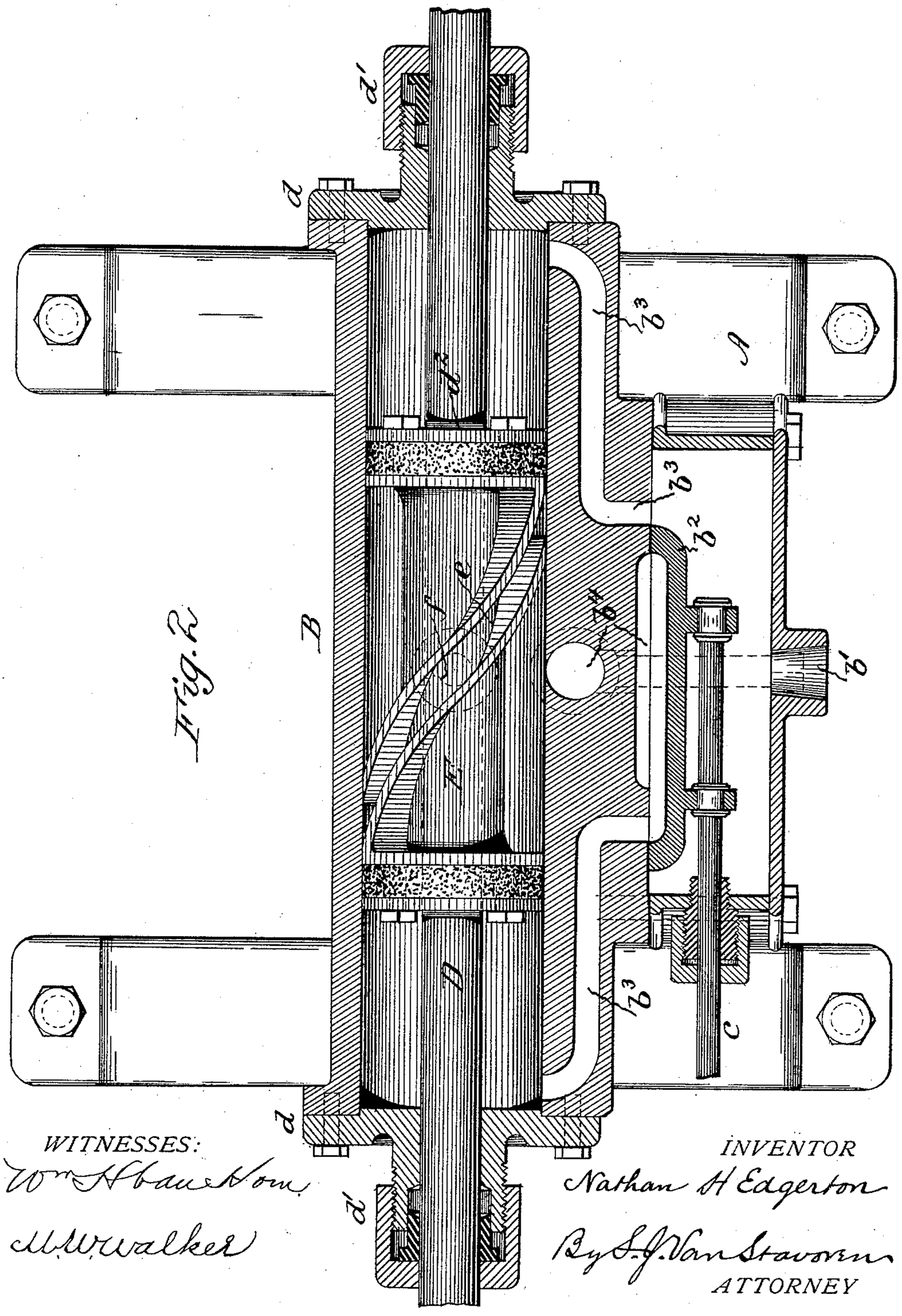

Fig. 2.

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N. H. EDGERTON.

STEAM ENGINE.

No. 409,672. Patented Aug. 27, 1889.

Fig. 3

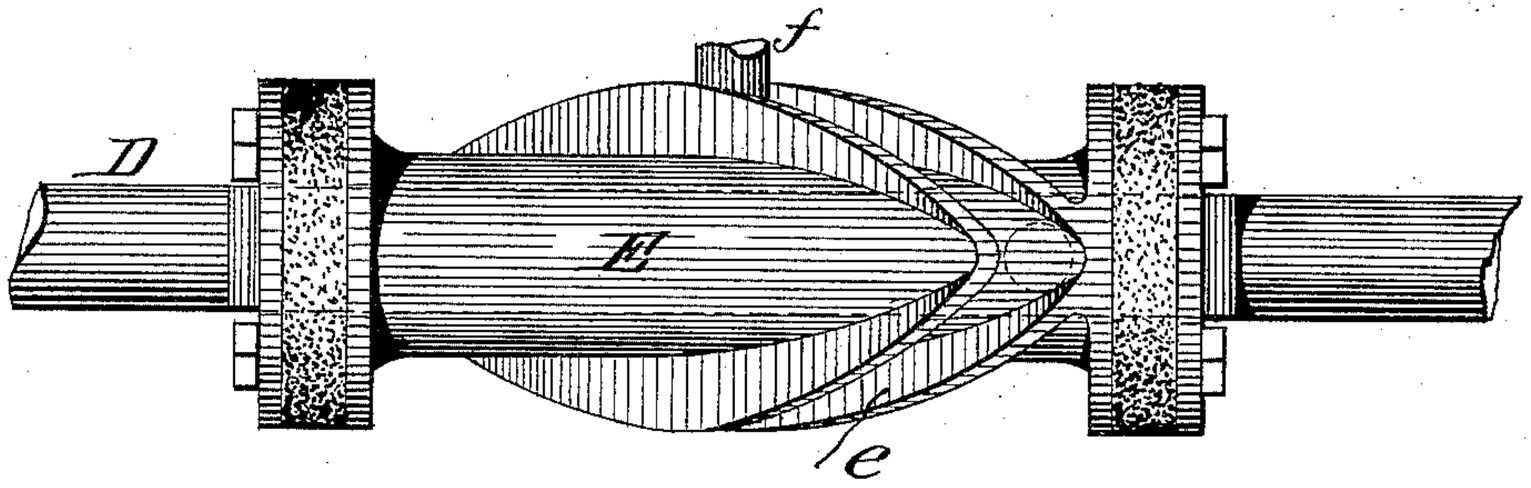


Fig. 4.

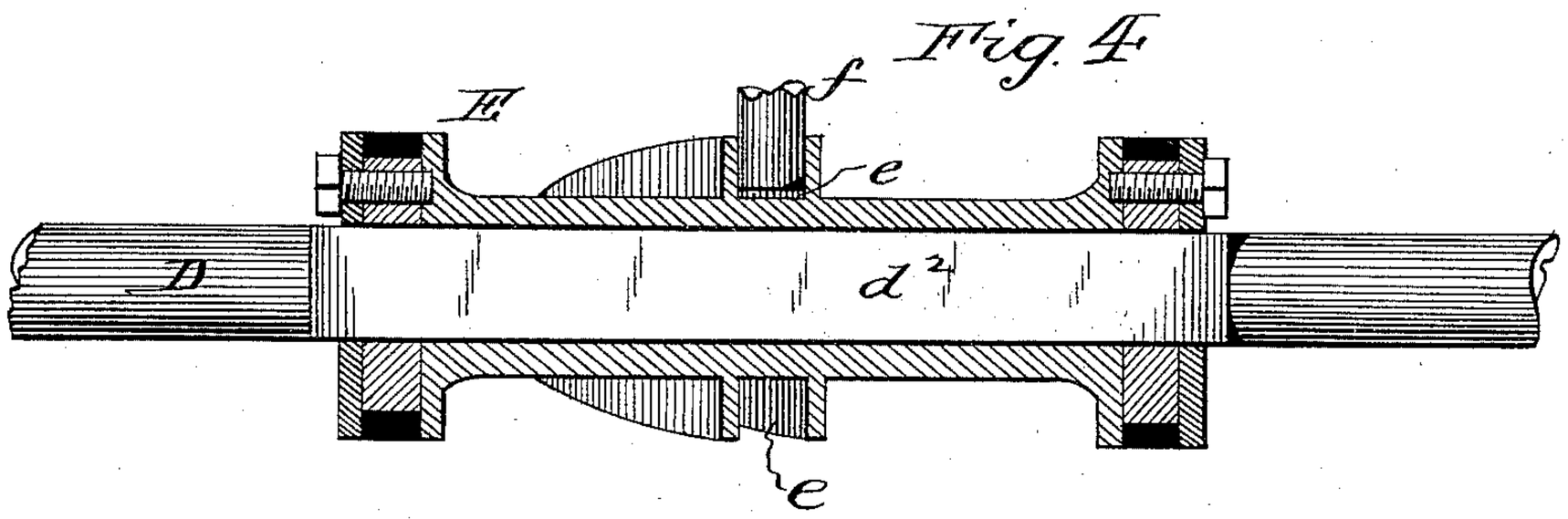
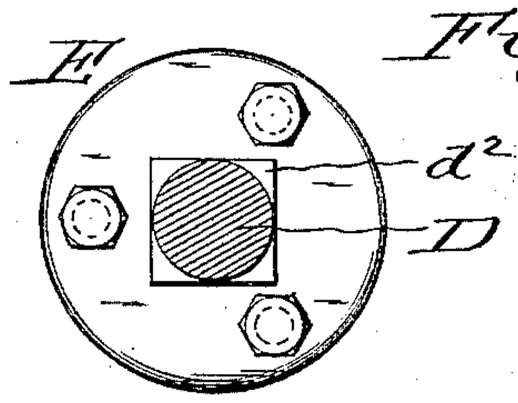


Fig. 5



WITNESSES:

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UNITED STATES PATENT OFFICE.

NATHAN H. EDGERTON, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 409,672, dated August 27, 1889.

Application filed June 25, 1888. Serial No. 278,167. (No model.)

To all whom it may concern:

Be it known that I, NATHAN H. EDGERTON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention has relation generally to that form of steam or analogous engines in which the reciprocating motion of the piston is converted into a rotary motion without the employment of a crank and pitman, and particularly to that form of the same wherein the rotary motion is imparted to the piston through the instrumentalities of a spirally-formed groove and a pin or trunnion-head engaging with or working in said groove; and it has for its objects simplicity of construction, to render the engine more compact, to increase its efficiency, and to avoid uncovering the spirally-formed grooves to the steam or other motive power in the cylinder, whereby such steam is prevented racing from one side or end of the cylinder to the other, resulting in an appreciable loss of power.

My invention accordingly consists of the combinations, constructions, and arrangement of parts, as hereinafter described and claimed.

Reference being had to the accompanying drawings, Figure 1 is a side elevation of a steam-engine embodying my improvements. Fig. 2 is a horizontal section, partly in plan, drawn to an enlarged scale, through the cylinder and steam-chest, showing the reciprocating and rotary piston and driving-shaft. Fig. 3 is a plan of the piston and part of the driving-shaft detached from the cylinder. Fig. 4 is a sectional plan of same, and Fig. 5 is a sectional end view of said parts.

A represents the engine bed-plate, and B the cylinder, which may be of any suitable design or construction, as desired. The cylinder B may be provided with the usual form of steam-chest b, with inlet-pipe b', slide-valve b^2, and inlet-ports b^3 and exhaust-ports b^4; or any other form of valve or valves and arrangement of ports may be used, as desired, as the kind of valve or valves b^2 and disposition of the ports b^3 b^4 in themselves form no essential part of my improvements. Thus, for instance, a rotary instead of a slide valve b^2 may be employed. The valve or valves b^2 may be arranged to admit of using the steam expansively or otherwise, as desired. The valve-rod c passes through a stuffing-box c' on one side or end of the steam-chest and connects with an eccentric C, arranged as hereinafter described. The cylinder-heads d d are each provided with a stuffing-box d', through which passes a shaft D. Upon the latter, within the cylinder, the piston E is loosely placed or mounted upon shaft D, so that as the piston is reciprocated it is also rotated to drive said shaft, as hereinafter set forth.

To provide a loose connection between the shaft D and piston E, to impart the above-described rotary motion to the shaft D, I prefer to make a portion of the length of the shaft, or a part of it located within the cylinder, angular in cross-section, as shown at d^2, and give to the bore of the piston a corresponding configuration in cross-section, (see more plainly Fig. 4;) but, if desired, a key and groove or other suitable construction may be substituted.

Upon or in the periphery of the piston is formed a continuous or reverse cam or spiral groove e, the length or pitch of which is proportionate to the travel or extent of movement or stroke of the piston, and from the bore of the cylinder projects a pin or stud f, having a roller thereon to form a trundle-head which enters the spiral groove e on piston E. The trundle-head f may be inserted in position as desired, as the manner of doing so is immaterial.

At one end of shaft D is mounted a driving-wheel G, and, if desired, an additional bearing g may be provided for said shaft end, as shown in Fig. 1. At the opposite end of said shaft is shown a bevel-gear h, which meshes with a like gear h' on a shaft H, having suitable bearings h^2, and upon shaft H is located the eccentric C.

The operation is obvious. As the piston reciprocates, the fixed trundle-head f, in engagement with the piston-groove e, as is well known, also causes the piston to rotate to impart a rotary motion to shaft D for transmitting power, and also to actuate the cylinder-

valve mechanism for controlling the admission of steam to the cylinder.

Instead of using the valve-actuating mechanism shown and described, any other suitable valve-actuating gearing may be interposed between shaft D and the valve-rods. As the shaft D has fixed bearings in the cylinder and the piston E slides and rotates thereon, the piston does not drag upon the lower side of the cylinder, and consequently undue friction and wear of said parts are avoided. The piston may be of a skeleton form—that is, have the packed ends or heads e^2 e^2 with depressed intermediate part, as shown, or it may be of a solid form or of the same diameter throughout, as desired. The latter may in some cases be a preferable form, as leakage of steam between the packed ends e^2 e^2 of the piston is avoided.

Steam, air, or other motive power may be used for operating my improved engine.

From the foregoing it will be noted that the periphery of the piston is packed at its ends to form a steam-tight joint at each end of the piston, and between these joints or ends is located the spiral groove *e*, into which projects the pin or trundle-head *f*, passing through the side of the cylinder at or near its transverse center. The advantages of such-described construction are, first, only one cylinder or piston-chamber need be used and the employment of expensive and bulky auxiliary cylinders and pistons is dispensed with; second, the spiral groove *e*, being on the periphery of the piston, provides the required leverage for the pin *f* to easily rotate the piston, and also prevents said groove being at any time uncovered to the steam in the cylinder; consequently such steam cannot escape or race through the spiral groove from one side to the other of the cylinder, and its full efficiency or power is exerted in doing work, and a more economical use of the same is obtained, and, third, the pin *f*, projecting through the side of the cylinder, provides for easy access to said pin for adjustment or renewal of the same without dismounting or dismantling any other parts of the engine.

What I claim is—

1. The combination, with a steam-cylinder B, of a shaft D, having bearings in the ends or heads of the cylinder, the reciprocating piston E on and engaging with shaft D, a spirally-formed groove in the periphery of said piston, said groove being located between the packed or steam-tight ends for said piston, and a pin or trundle-head *f*, projecting from one of the cylinder sides into said groove, substantially as set forth.

2. In a steam or other engine, a cylinder, a shaft having bearings in the cylinder heads or ends, a sliding or reciprocating piston on said shaft, a spirally-formed groove on the periphery of the piston and between its ends, and a pin or trundle-head on the cylinder engaging with said piston-groove for imparting a rotary motion to the piston and shaft as the piston reciprocates on the shaft, substantially as set forth.

3. In combination with an engine-cylinder B, having closed ends *b*, the shaft D, passing through and having bearings in said ends, a reciprocating piston E, having steam-tight or packed ends mounted on said shaft, a spirally-formed groove in the periphery of said piston between its ends, and a pin or trundle-head *f*, passing through the side of the cylinder at or near its transverse center, and valves actuated by said shaft, substantially as set forth.

4. In combination with an engine-cylinder having closed ends *b*, shaft D, having bearings in said ends *b*, sliding piston E on and engaging with said shaft, a spirally-formed groove in the periphery of said piston between its ends, a pin or trundle-head *f*, passing through the side of the cylinder and engaging with said piston-groove, cut-off valves for said cylinder, and actuating mechanism interposed between the valves and said shaft, substantially as set forth.

5. In combination with an engine-cylinder B, a shaft D, having bearings in the cylinder heads or ends, and having an angular cross-section between its said bearings, a reciprocating piston E on said shaft having a corresponding angular bore and exterior or outer packed or steam-tight ends, a spirally-formed groove on the periphery of said piston between its ends, and cylinder-pin *f*, engaging with said piston-groove, substantially as and for the purpose set forth.

6. The combination, with an engine-cylinder shaft, of a reciprocating piston E on said shaft having packed or steam-tight joints, with the cylinder and peripheral spiral groove between said ends, a cylinder-pin *f*, for engagement with said piston-groove, and valves for the cylinder actuated by said shaft, substantially as set forth.

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

NATHAN H. EDGERTON.

Witnesses:
JOHN RODGERS,
S. J. VAN STAVOREN.