

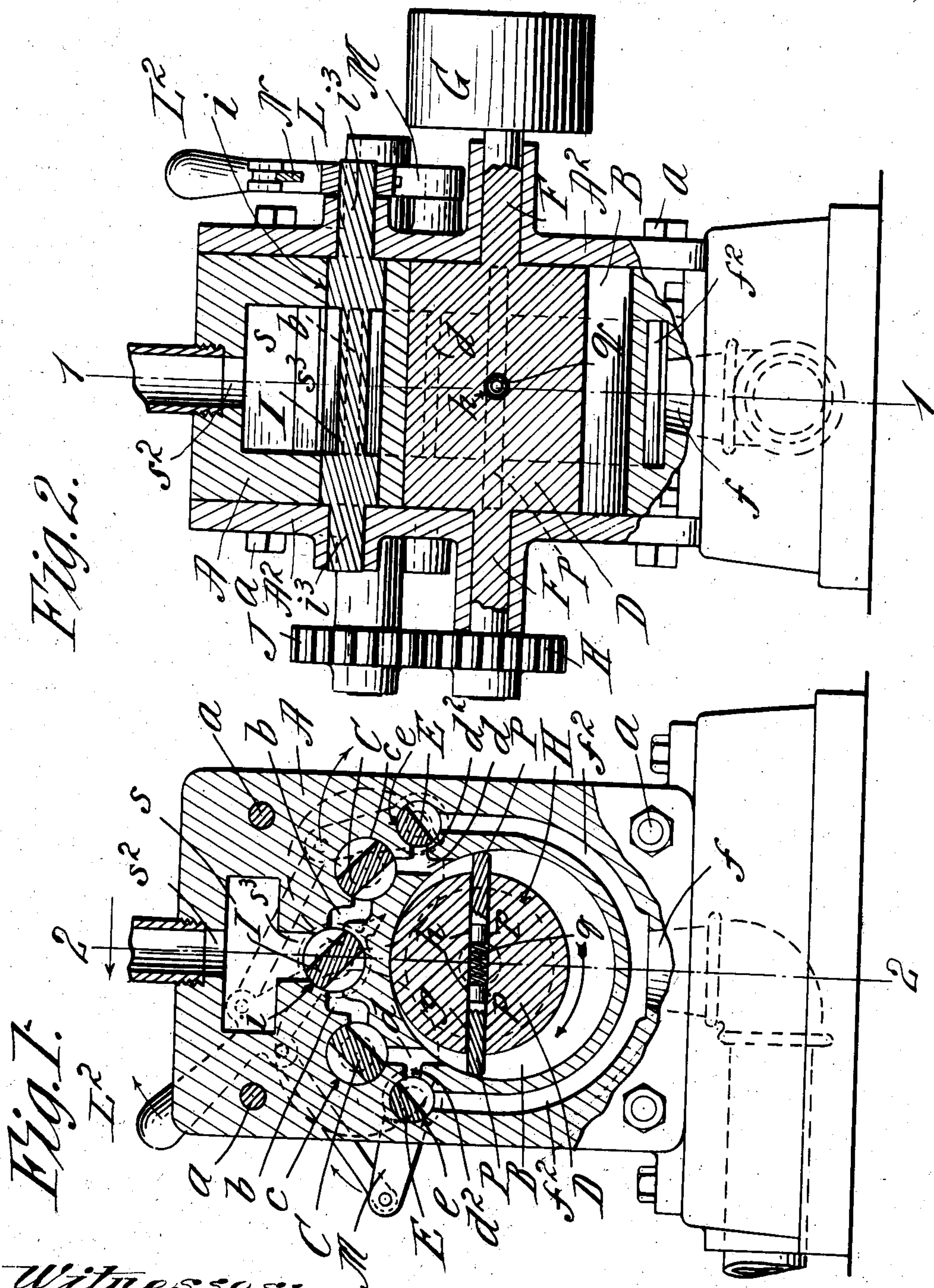
No. 834,041.

PATENTED OCT. 23, 1906.

J. H. D. BEAUCAGE.
ROTARY REVERSIBLE STEAM ENGINE.

APPLICATION FILED JULY 23, 1906.

2 SHEETS—SHEET 1.



Witnesses:
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G. R. Kriscoll.

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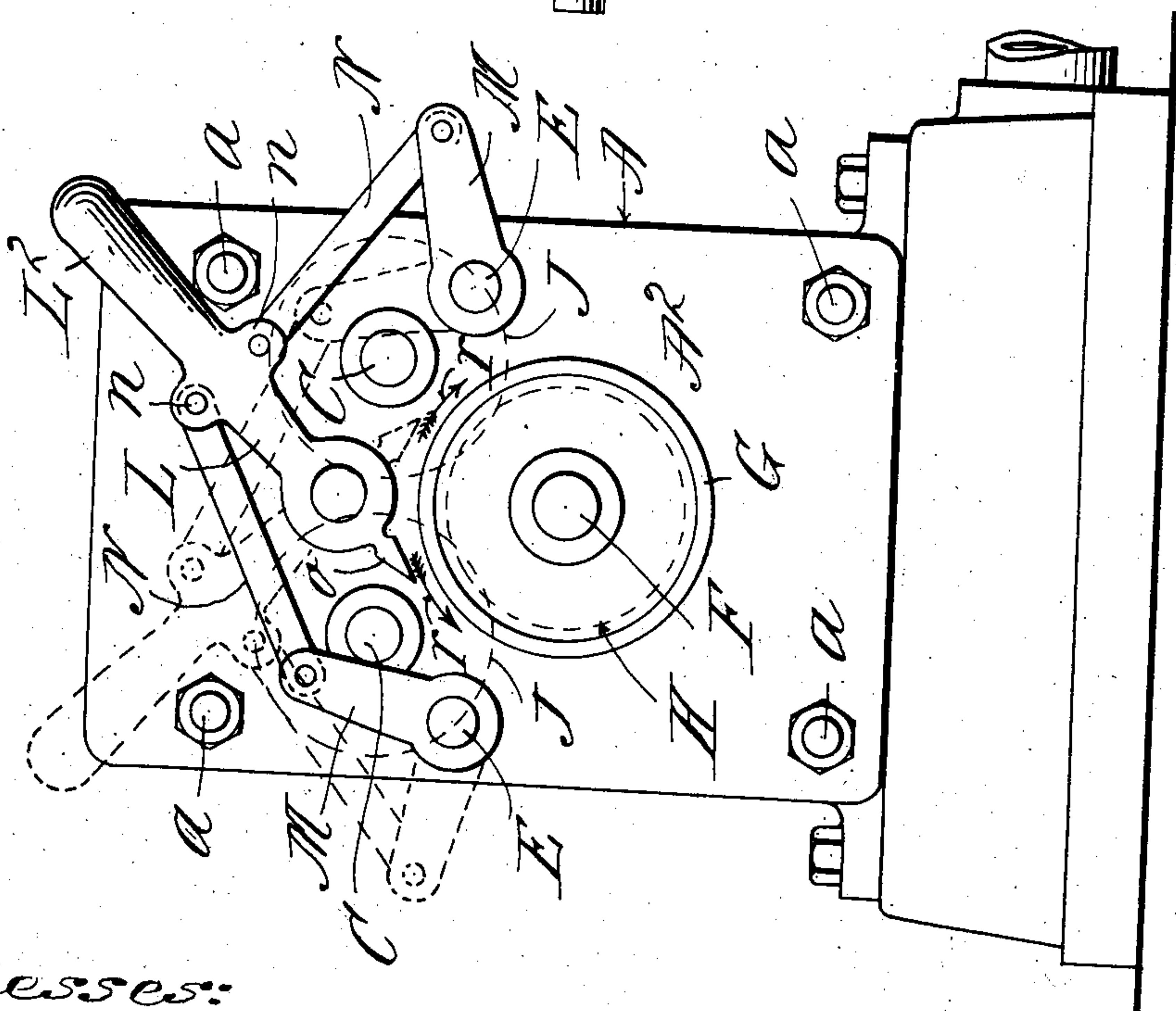
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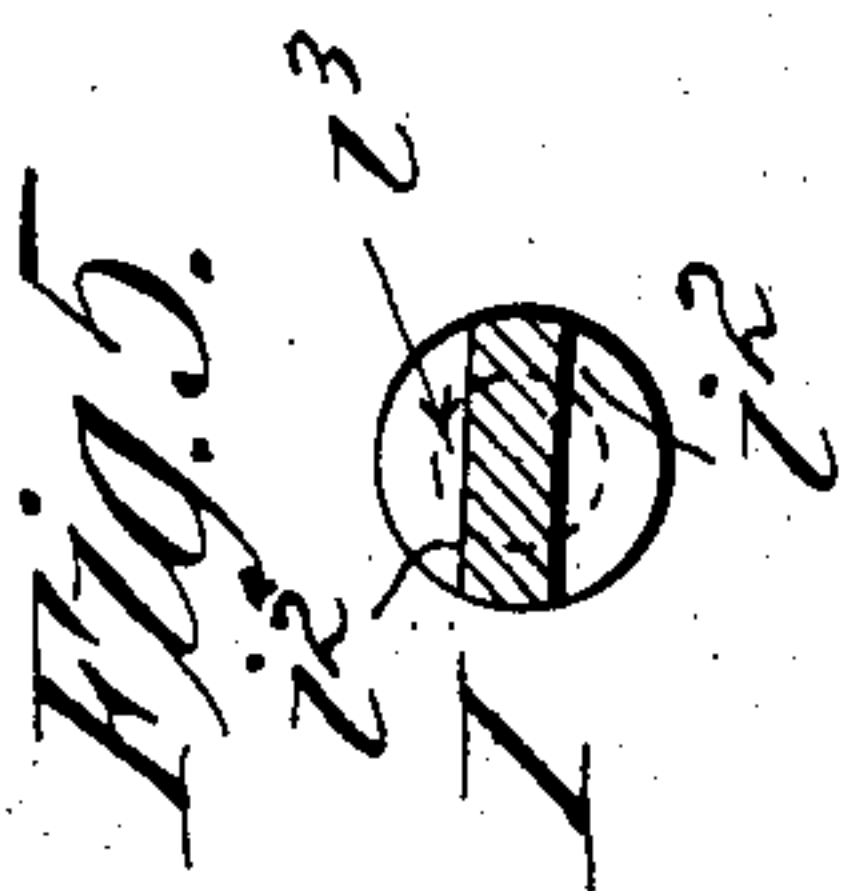
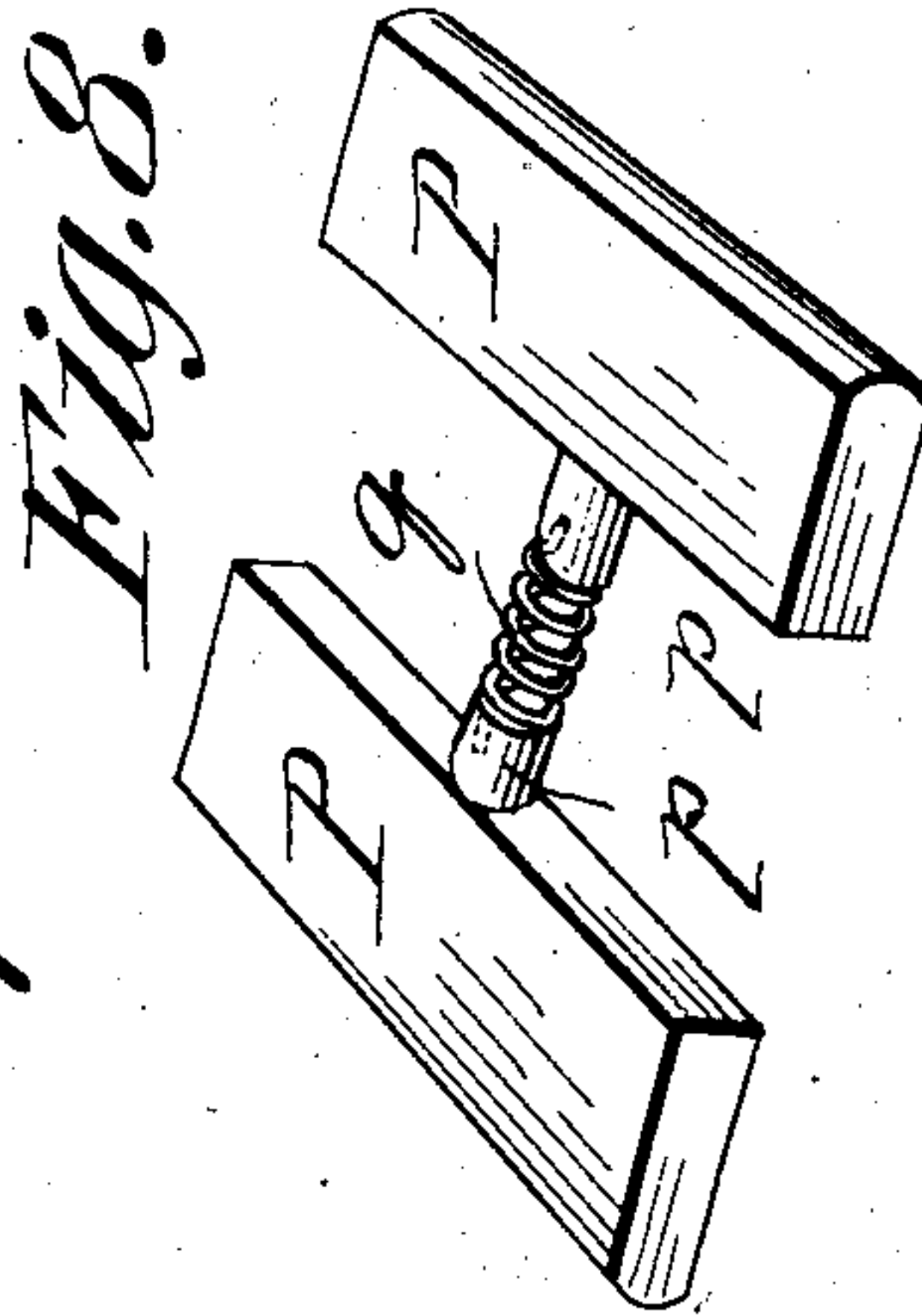
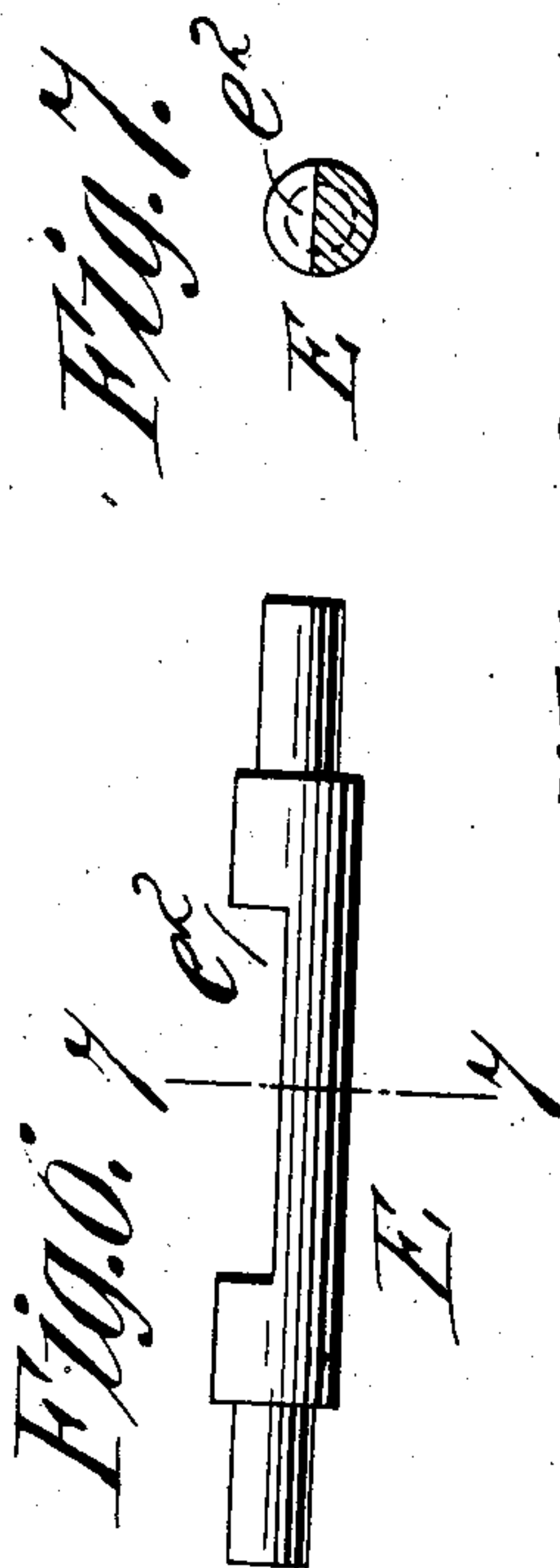
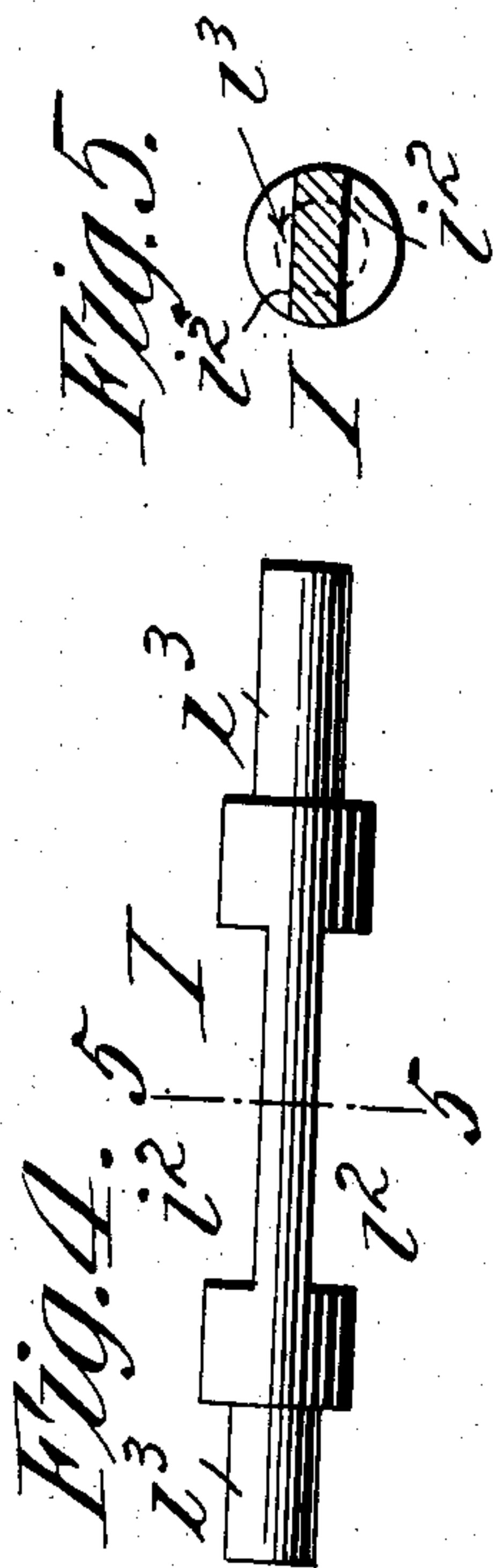
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UNITED STATES PATENT OFFICE.

JOSEPH H. D. BEAUCAGE, OF PITTSFIELD, MASSACHUSETTS.

ROTARY REVERSIBLE STEAM-ENGINE.

No. 834,041.

Specification of Letters Patent.

Patented Oct. 23, 1906.

Application filed July 23, 1906. Serial No. 327,315.

To all whom it may concern:

Be it known that I, JOSEPH H. D. BEAUCAGE, a citizen of the United States of America, and a resident of Pittsfield, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Rotary Reversible Steam-Engines, of which the following is a full, clear, and exact description.

This invention relates to improvements in steam-engines of the rotary-piston type, and more particularly to a rotary-piston steam-engine in which the steam may be employed expansively with high efficiency, and said engine being, moreover, capable of reversal.

The object of the invention is to produce a steam-engine in which the components and arrangements are of a comparatively few and very simple character, susceptible of production by inexpensive mechanical operations.

The invention consists in an engine comprising chambers, valve sockets or bores, steamways, inlet, cut-off, and exhaust valves, a rotary blade or wing carrying body, and other appliances in form and arrangement as hereinafter particularly described, and set forth in the claims.

The improved engine is illustrated in the accompanying drawings, in which—

Figure 1 is substantially a central sectional view through the engine as taken on a plane at right angles to the engine-shaft. Fig. 2 is a vertical sectional view through the engine as taken on a plane at right angles thereto indicated by lines 2 2, Fig. 1. Line 1 1, Fig. 2, indicates the plane of section of Fig. 1. Fig. 3 is a front elevation of the engine. Fig. 4 is a side view of the steam-inlet valve, which is identical in form to the cut-off valves, Fig. 5 being a cross-section of the same as taken on the line 5 5, Fig. 4. Fig. 6 is a side view of one of the duplicated exhaust-valves, Fig. 7 being a cross-section of the same on the line 7 7, Fig. 6; and Fig. 8 is a perspective view showing the oppositely-located piston blades or wings which are fitted within and carried by the rotatable body in the working chamber of the engine.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the engine-body, having parallel cylindrical cross bores or openings extending through from side to side thereof, but closed by the opposite side plates a^2 a^2 , which by the bolts a a are

tightly secured to the opposite sides of the central portion A of the engine-body.

Particularly pointing out the above-referred-to transversely-extending bores or chambers, the engine-body is seen to comprise the cylindrical chamber B, which is the "working chamber" of the engine, above which in the median line of the body is the inlet-valve bore i , cylindrical cut-off-valve bores c c , separated from and at opposite sides of the inlet-valve bore and oppositely-located exhaust-valve bores e e , separated from the cut-off-valve bores, and farther from and lower than the inlet-valve bore, all such bores being in parallelism with the axis of the working cylindrical chamber B.

Within the engine-body above the inlet-valve bore is a steam chest or chamber s , leading vertically to which from above is the steam-inlet passage s^2 , and leading from which to the inlet-valve bore i is the steam-inlet passage or continuation s^3 . The engine-body is, moreover, constructed with the pair of oppositely-located steamways b b , leading from the inlet-valve bore to the oppositely-located cut-off-valve bores c , and with oppositely-located T-shaped ways d d , connecting the latter bores with the working chamber at opposite sides and near the top thereof, while the upwardly-extending branches d^2 d^2 have connections between the working chamber and the exhaust-valve bores e e . The engine-body is, furthermore, constructed at its lower central portion below the working chamber B with an exhaust-way f and with curved exhaust-outlets f^2 f^2 , leading within the thickness of the engine-body from the exhaust-valve bores e downwardly and toward each other and connecting with the said exhaust-way f .

D represents a cylindrical rotatable body mounted within the working chamber axially eccentrically thereof, its top being peripherally in contact with the upper wall of the working chamber centrally between the steamways d d and constituting, in conjunction with the wall of the working chamber, the crescent-shaped space, as shown in Fig. 1. The said rotatable body, which is as long as the working chamber B, has formed as one therewith and is supported by the engine-shaft F, having at one end a pulley G and at the other end a spur gear-wheel H. The said rotatable cylindrical body D has opposite radial outwardly-opening recesses or piston-blade pockets g extending from end to end thereof,

the inner walls or bases of such pockets being connected by one or more circular holes *h*.

P P represent a pair of piston blades or wings of exactly the same length as the cylindrical body D and the working chamber B, the same being fitted and slidable inwardly and outwardly in the said recesses or pockets *g* and have at their inner edges stems *p*, which are fitted in the aforementioned hole *h*, which connects the opposite blade-pockets *g g*, and a helical spring *q* lies in the center of the hole *h* in compression between the stems and exerts an outwardly-forcing action to maintain the blades always with their outer edges in yielding contact against the circular wall of the working chamber B.

I represents the inlet-valve of a general cylindrical shape closely to fit and to have reversing rotative movements within the inlet-valve bore *i*, and, as clearly shown in the drawings, this valve has the opposite sides of its body portion recessed or slabbed off, as indicated at *i² i²*, the length of such recessed portions being understood as of the same length as the ways *b b*. The cylindrical inlet-valve has the turned-down end portions *i³ i³* to constitute journals therefor in circular journal-holes therefor and to be fitted in and through circular journal-holes in the opposite end-closing plates *a²* of the engine-body. The cut-off valves C C are, or may be, of the identical form and dimensions as the inlet-valve I, and on the extended journals at one end of each is affixed a spur gear-wheel J, the spur-gears of both cut-off valves running in mesh with the aforementioned spur-gear on the engine-shaft. Both of the exhaust-valves E are of a similar cylindrical shape to the inlet and cut-off valves, with the exception that each has a recessed or slabbed-off portion *e²* only at one side thereof. On one of the journal extensions *i³* of the inlet-valve is rigidly affixed a lever L, having a handle extension *L²*, and to end journal extensions of the exhaust-valves are affixed radially-extending levers M M, to the extremities of which are pivoted links N N, which are pivoted to oppositely-extended ear-pieces *n n* of the aforesaid handle-lever. These provisions, in conjunction with the inlet and exhaust valves, having the constructions stated, constitute the entire reversing means necessary for this engine.

As represented in Fig. 3, the handle-lever L is shown as provided with an index-finger or pointer *o*, and on the face of the adjacent end wall of the engine oppositely-pointing arrows *r r* are cast or engraved, the pointer, in conjunction with the arrow next to which it may be positioned, indicating the direction in which the engine is to have its running rotation as insured by positions of the valves controlled by the handle-lever.

Now as to the operation: It will be apparent that when the inlet and exhaust valves

are set as shown in Fig. 1 (in positions reversed from those established when the handle-lever is in the position shown in Fig. 3) the rotatable body and engine-shaft will have the direction of rotation as indicated by the arrow in Fig. 1, it being apparent that when the unrecessed central portion of the inlet-valve downwardly inclined to the rightward the steam from the chamber or steam-chest will pass downwardly to the rightward through the right-hand steamway *b* and while the right-hand cut-off valve is momentarily in the position of Fig. 1 will pass to the steamway *d*, being obstructed from thence passing to the exhaust-way by the solid portion of the exhaust-valve positioned against the branchway *d³*, and the steam will enter the contracted space at the right upper portion of the working chamber B, behind the right-hand piston-plate P, and will be effective by direct pressure and also by expansion after the cut-off valve shall have been closed against such plate to force it fully or more than half-way around, and when the opposite piston-plate has come around past the right-hand steamway *d* the first plate will pass the left-hand steamway *d*, permitting the exhaust of the engine through the branch *d²* of the left-hand way *d* through the rightward recessed portion of the left-hand exhaust-valve and through the left-hand exhaust-passage *f* for exhaust through the exhaust-opening *f*. It may be mentioned that when the engine-valves are set as in Fig. 1 the left-hand cut-off valve C, while continuously rotating, performs no function, as, of course, is the case with the right-hand cut-off valve when the engine is reversed, and it is easy to be perceived that when the handle-lever is thrown to the reversed position indicated in Fig. 3 the solid middle portion of the inlet-valve will be inclined downwardly and to the left, opening steamway from the inlet into the working chamber at the upper left-hand instead of the upper right-hand portion, and the exhaust-valves will be so turned that the solid portion of the left one cuts off connection from the left-hand steamway to the left-hand exhaust-passage *f²*, while the recessed portion of the right-hand exhaust-valve will establish communication from the working chamber through the right-hand exhaust-passage *f²*.

This engine as viewed from the standpoint of a machinist or engine-builder exhibits attractiveness because of the very few, simple, easily-formed, and machine-finished pieces which are comprised in the engine.

I claim—

1. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, and having outwardly therefrom, and within such body, an intermediately-located cylindrical inlet-valve bore, cylindrical cut-off valve bores separated from

and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off-valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said engine-body having an inlet-opening leading to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, and ways leading from the latter bores into the working chamber at opposite sides of its median line, such ways having branched passages leading to the exhaust-valve bores, and exhaust-outlets leading from the exhaust-valve bores, a cylindrical rotatable body mounted within the working chamber and having a main shaft as part thereof, wings or blades carried by, and radially extended from, said body and edgewise bearing against the working-chamber wall, a reversible cylindrical inlet-valve, rotary cut-off valves, and reversible exhaust-valves fitted for their movements in the respective bores therefor, and means for imparting continuous rotary motions to said cut-off valves.

2. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, and having outwardly therefrom an intermediately-located cylindrical inlet-valve bore, cylindrical cut-off-valve bores separated from and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off-valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said engine-body having an inlet-opening leading to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, ways leading from the latter bores into the working chamber at opposite sides of its median line, such ways having branched passages leading to the exhaust-valve bores, and exhaust-outlets leading from the exhaust-valve bores, a cylindrical rotatable body eccentrically mounted within the working chamber, peripherally in contact with one side of the chamber-wall, having outwardly-opening blade-pockets, and having a main shaft as part thereof, blades carried by said body inwardly and outwardly movable in the pockets therein, and springs having outwardly-forcing actions against said blades, a rotatively-reversible cylindrical inlet-valve, rotary cut-off valves, and rotatively-reversible exhaust-valves, fitted for their movements in the respective bores therefor, and means for imparting rotary motions to said cut-off valves.

3. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, and having outwardly therefrom an intermediately-located cylindrical inlet-

valve bore, cylindrical cut-off-valve bores separated from and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off-valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said engine-body having an inlet-opening leading to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, ways leading from the latter bores into the working chamber at opposite sides of its median line, such ways having branched passages leading to the exhaust-valve bores, and exhaust-passages leading from the exhaust-valve bores, a cylindrical rotatable body mounted within the working chamber and having the engine-shaft as part thereof, wings or blades carried by, and radially extended from, said body and edgewise bearing against the working-chamber wall, a reversible cylindrical inlet-valve, rotary cut-off valves, and reversible exhaust-valves fitted for their movements in the respective bores therefor, said inlet and cut-off valves having reversed or slabbed formations at their opposite sides, and said exhaust-valves recessed or slabbed formations at one side only, a gear-wheel on the engine-shaft, and gear-wheels on the cut-off valves with which the first-named gear is in mesh.

4. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, and having outwardly therefrom an intermediately-located cylindrical inlet-valve bore, cylindrical cut-off-valve bores separated from and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off-valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said engine-body having an inlet-opening leading to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, and ways leading from the latter bores into the working chamber at opposite sides of its median line, such ways having branched passages leading to the exhaust-valve bores, and exhaust-outlets leading from the exhaust-valve bores, a cylindrical rotatable body mounted within the working chamber and having a main shaft as part thereof, wings or blades carried by, and radially extended from, said body and edgewise bearing against the working-chamber wall, a reversible cylindrical inlet-valve, rotary cut-off valves, and reversible exhaust-valves fitted for their movements in the respective bores therefor, a lever having a handle, connected to the inlet-valve, levers connected to the exhaust-valves, links connecting said exhaust-valve levers with the inlet-valve lever, and means

for imparting continuous rotary movements to the cut-off valves.

5. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, and having outwardly therefrom an intermediately-located cylindrical inlet-valve bore, cylindrical cut-off-valve bores separated from and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off-valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said engine-body having an inlet-opening leading to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, and ways leading from the latter bores into the working chamber at opposite sides of its median line, such ways having branched passages leading to the exhaust-valve bores, and exhaust-outlets leading from the exhaust-valve bores, a cylindrical rotatable body mounted within the working chamber and having a main shaft as part thereof, wings or blades carried by, and radially extended from, said body and edgewise bearing against the working-chamber wall, a reversible cylindrical inlet-valve, rotary cut-off valves, and reversible exhaust-valves fitted for their movements in the respective bores therefor, a lever having a handle, connected to the inlet-valve, levers connected to the exhaust-valves having a pointer, links connecting said exhaust-valve levers with the inlet-valve lever, reversely-pointing motion-indicating arrows on the face of the engine-body adjacent the inlet-valve and in relation to either of which said pointer may be positioned, and means for imparting continuous rotary movements to the cut-off valves.

6. In a reversible rotary steam-engine, an engine-body having a cylindrical working chamber, having thereabove a steam-chamber and therebelow an exhaust-way, a pas-

sage leading from the top of the body to said steam-chamber, an intermediately-located cylindrical inlet-valve bore, below the steam-chamber, cylindrical cut-off-valve bores separated from and at opposite sides of the inlet-valve bore, and oppositely-located exhaust-valve bores separated from the cut-off valve bores, and farther from the inlet-valve bore, all said bores being in axial parallelism with the working cylindrical chamber, and said body having an opening leading vertically from the steam-chamber to the inlet-valve bore, a pair of oppositely-located steamways leading from such bore to the cut-off-valve bores, and T-shaped ways connecting the latter bores with the working chamber and connecting the latter chamber with the exhaust-valve bores, and having curved exhaust-outlets leading within the engine-body from the exhaust-valve bores, downwardly and toward each other and connecting with said exhaust-way, a cylindrical rotatable body mounted within the working chamber and having a main shaft as part thereof, wings or blades carried by, and radially extended from, said body and edgewise bearing against the working-chamber wall, a reversible cylindrical inlet-valve, rotary cut-off valves, and reversible exhaust-valves fitted for their movements in the respective bores therefor, a gear-wheel on the engine-shaft and gear-wheels, in mesh therewith, on the cut-off valves, a lever connected to the inlet-valve, levers connected to the oppositely-located exhaust-valves, and links connecting said exhaust-valve levers with the inlet-valves.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

JOSEPH H. D. BEAUCAGE.

Witnesses:

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G. R. DRISCOLL.