

No. 680,635.

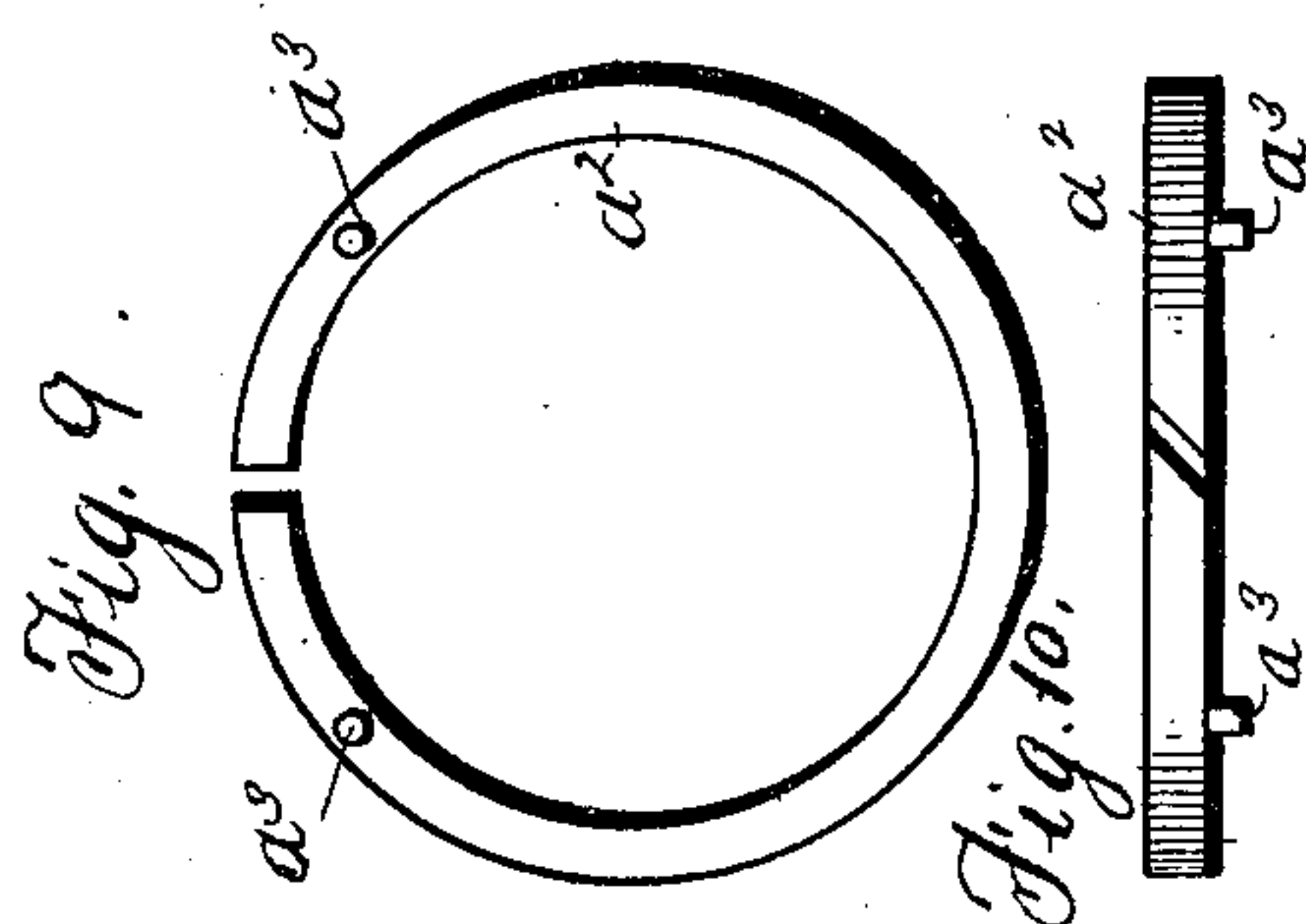
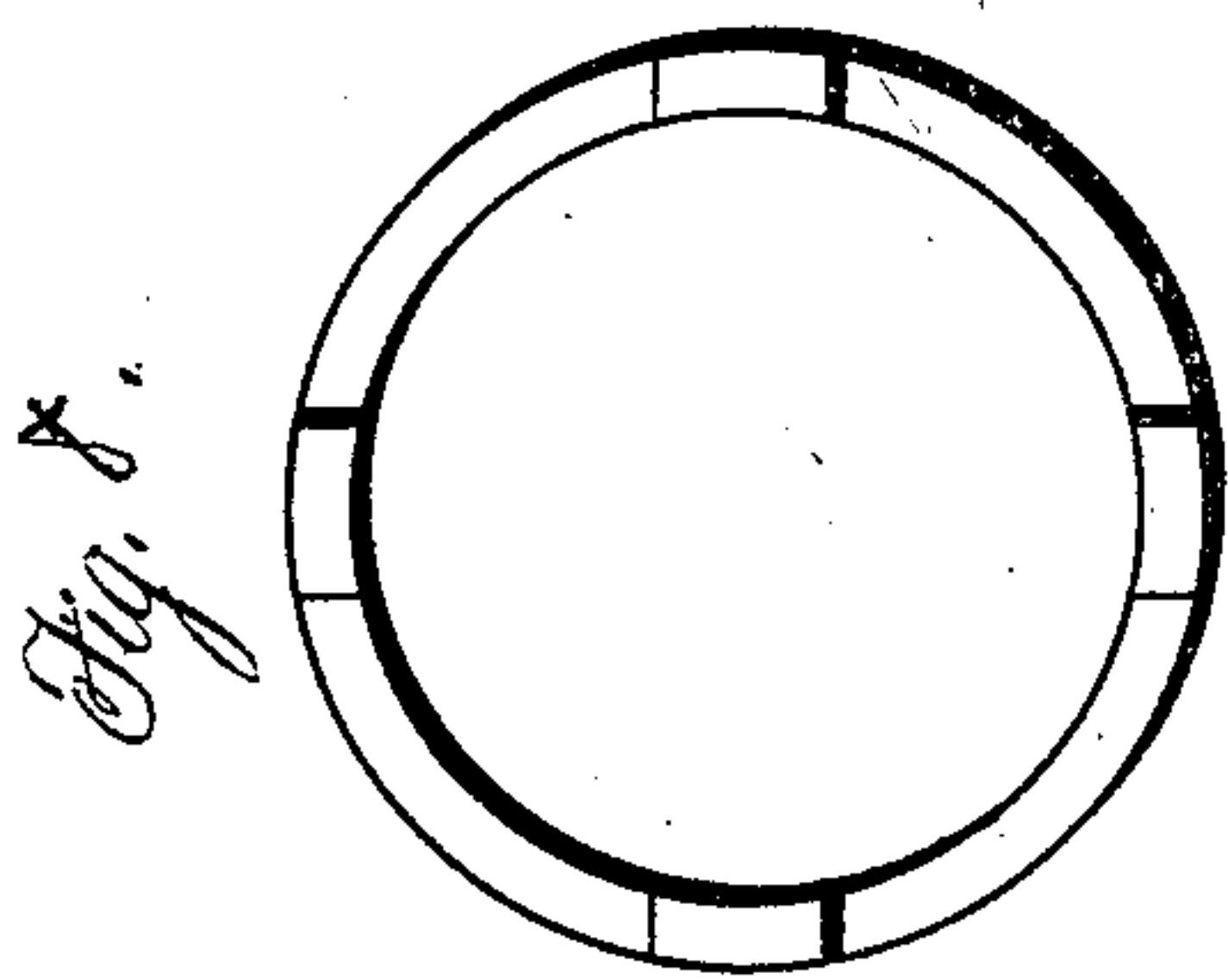
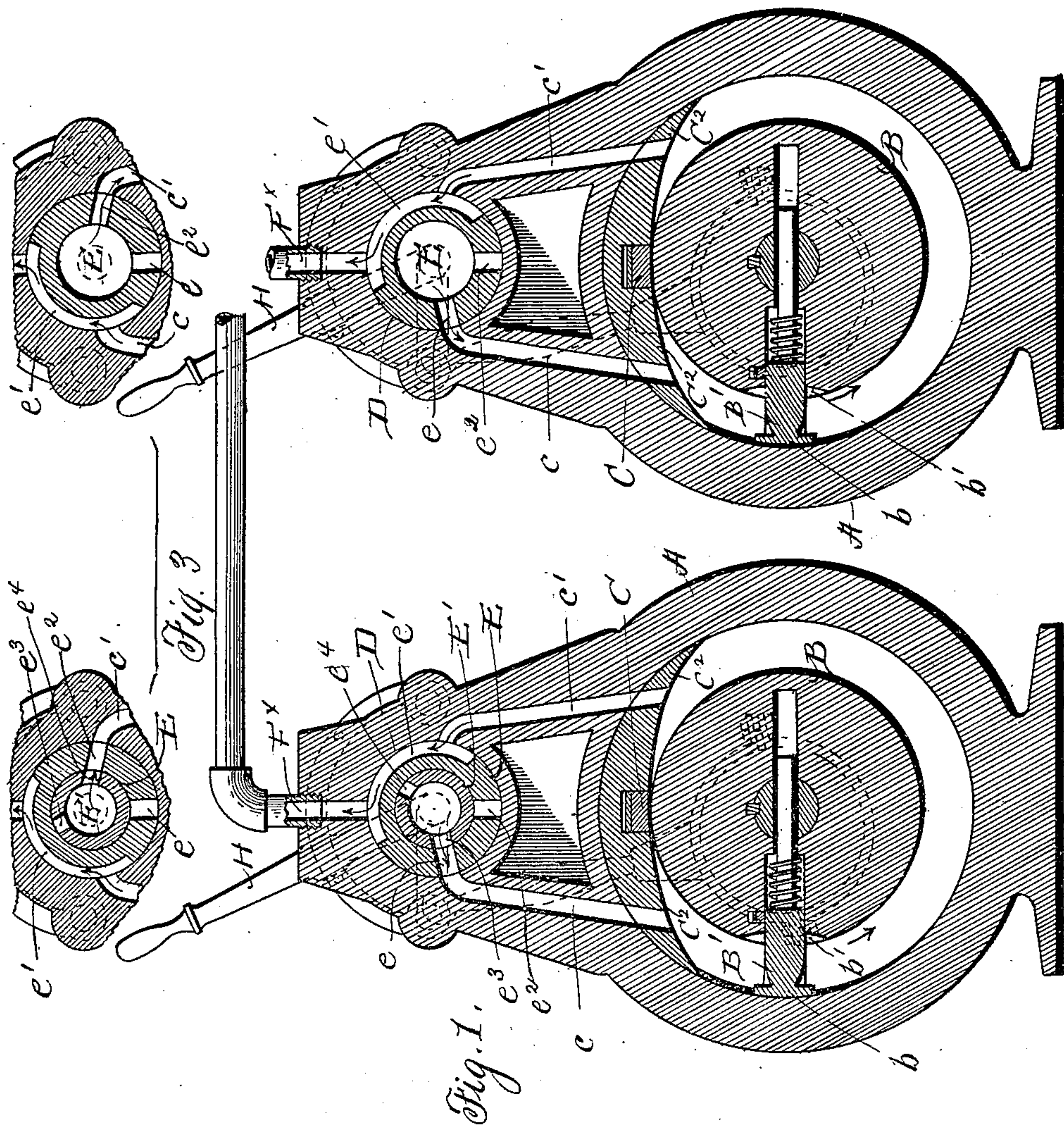
Patented Aug. 13, 1901.

J. T. BOOTES.
ROTARY ENGINE.

(Application filed Mar. 6, 1901.)

(No Model.)

3 Sheets—Sheet 1.



ATTEST—
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3 Sheets—Sheet 3.

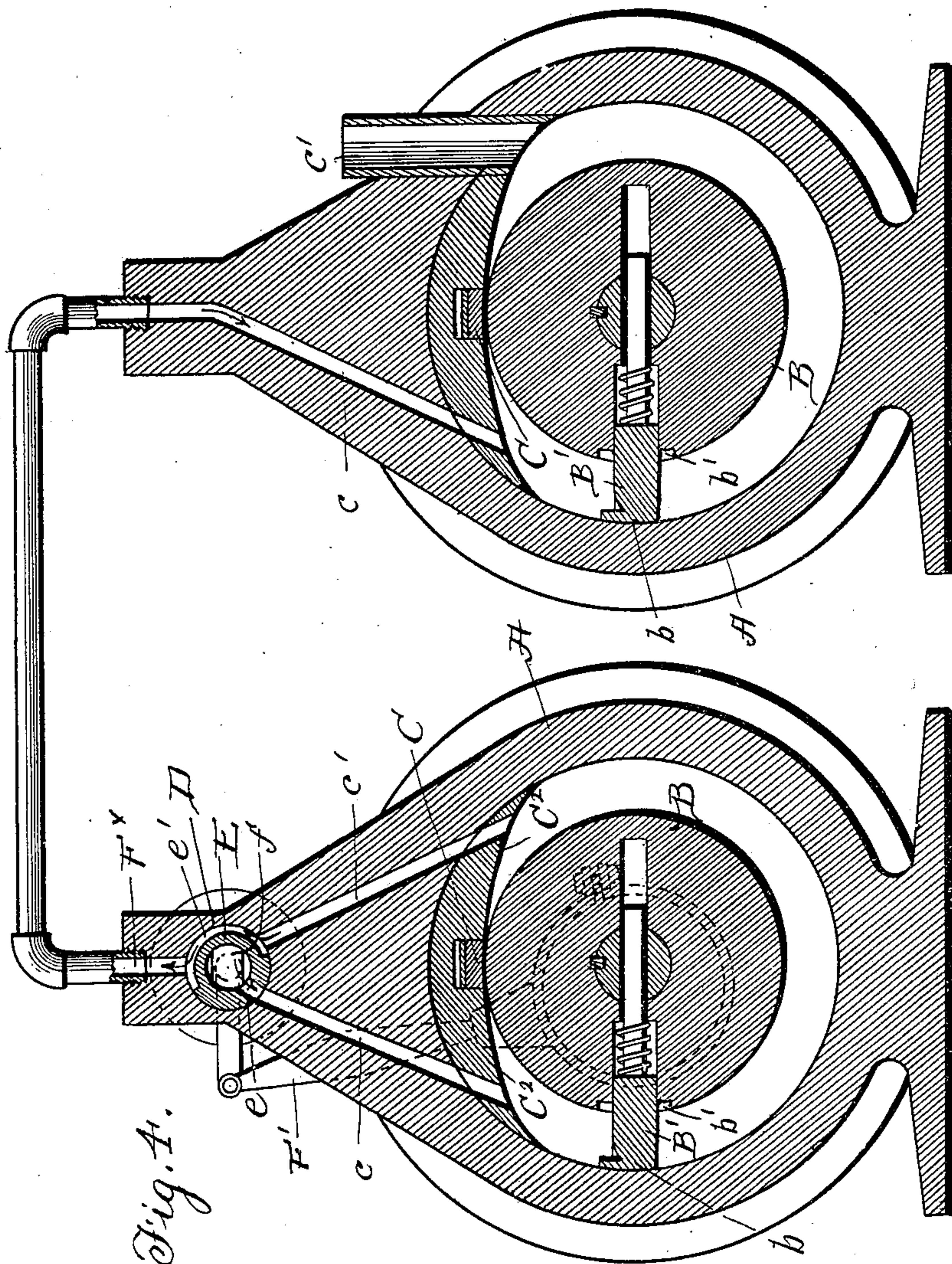


Fig. 4.

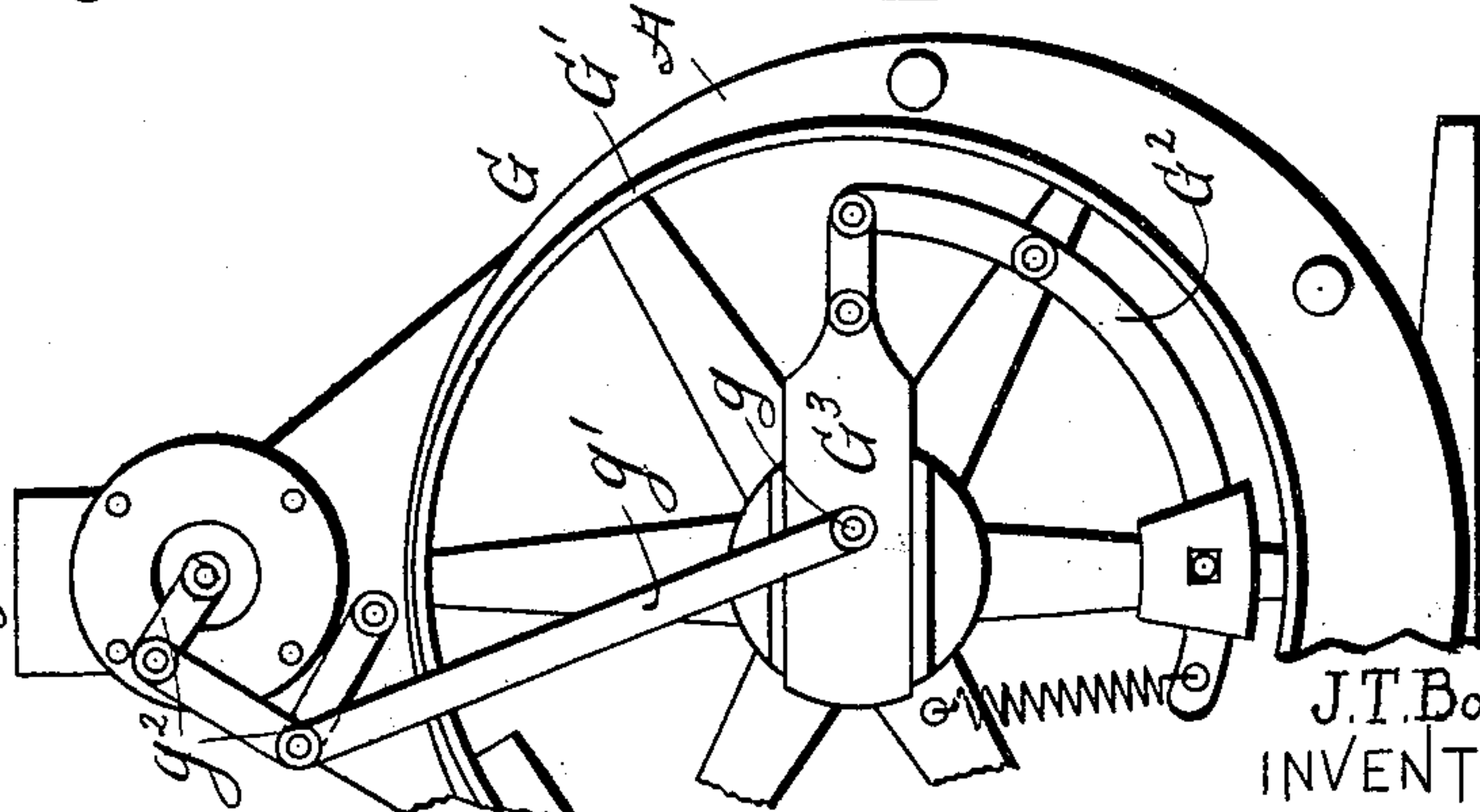


Fig. 11.

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UNITED STATES PATENT OFFICE.

JOHN T. BOOTES, OF WILMINGTON, DELAWARE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 680,635, dated August 13, 1901.

Application filed March 6, 1901. Serial No. 50,010. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. BOOTES, a citizen of the United States, and a resident of Wilmington, in the county of Newcastle and State of Delaware, have made a certain new and useful Invention in Rotary Engines; and I 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a cross-section of my compound reversible engine, partly broken away. Fig. 2 is a vertical longitudinal section. Fig. 3 illustrates the reversed position of valves. Fig. 4 is a cross-section of my stationary compound engine. Fig. 5 is an end view of one of the cylinder-heads with packing-rings removed therefrom. Figs. 6 and 7 are detail views of the valves of the high-pressure cylinder of the reversible engine. Fig. 8 is a front view of packing-ring a' . Figs. 9 and 10 illustrate the packing-ring a^2 . Fig. 11 is a front elevation of the governor for the stationary engine.

This invention has relation to steam-engines, and has for its object the provision of a rotary steam-engine of the reversible or single-acting type working on the same principle as a reciprocating piston-engine in the utilization of the expansive force of the steam or other motive power and provided with improved valve mechanism and improved packing devices.

With these objects in view the invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, I will proceed, first, to describe the single-acting or stationary type of engine, in which the letter A designates the steam-cylinder, having the piston B, provided with a spring-pressed fin B', arranged radially thereto in a slot thereof and having a bearing against the peripheral wall of the cylinder. This fin is provided with a T or L form head b, having a convex surface of the same curvature as the peripheral wall of the cylinder and of somewhat extended bracing character, such head

being received at the limit of its inward movement in depressions b' of the piston to bring such convex head-surface flush with the peripheral surface of the piston. A rear abutment for the steam is provided by a spring-pressed packing-bar C acting against the peripheral surface of the piston and having cam approaches C^2 upon each side thereof to force the fin into its seat, said bar being provided with a spring-pressed end packing c^x . Equidistant from and adjacent to said packing-bar are the steam inlet and exhaust passages $c c'$, respectively, connecting the cylinder with the valve-chamber or steam-chest D of cylindrical character. A vibratory hollow cylindrical valve E, having suitable packing-rings, works closely in this chamber and is provided with a port e through its peripheral wall, arranged to be brought alternately into and out of register with the inlet-passage c . The steam-induction passage F into the valve-chamber or steam-chest communicates with said valve E at one end thereof, which is open, and is spanned by a yoke f of the valve, having an operating-rod connection f' extending through the head of the valve-chamber, suitably packed and having an eccentric and rod connection F' for actuating the same. This valve E has a central reduced portion forming peripheral passage e' , arranged to span exhaust-passage c' and induction-passage F^x , connecting the valve-chamber with the atmosphere or with the low-pressure cylinder.

The heads A' of the cylinder have annular grooves a therein, spring-pressed washers a' being seated in said grooves and upon which turn annular split expansion-rings a^2 , also seated in said grooves and forming an extension of the peripheral portion of the piston at each side thereof and turning therewith through a pin connection a^3 .

The fin B' has end spring-pressed packing-ribs b^2 seated therein and bearing against the outer lateral surfaces of rings a^2 and against the end walls of the cylinder. A spring-pressed bar b^3 is seated in the piston and has a bearing against a lateral wall of the fin. These devices, in connection with packing-bar C, form an efficient means for preventing escape of steam from the cylinder and for preventing escape of steam from one side of the fin B' to the other in the cylinder.

G designates my automatic steam cut-off, comprising a pulley G' , having a pivoted weighted lever G^2 , arranged under centrifugal force to operate slide G^3 more or less to vary the degree of eccentricity of the pivot g of the eccentric-rod g' to said slide. This eccentric-rod has a parallel-movement link connection g^2 with the shaft of the valve E, which has the usual stuffing-box.

In the reversible engine the automatic cut-off for the steam above described is omitted, and a simple eccentric and rod operates the vibratory valve E' , which in this case is a close fit within valve E, which is operated only as a throttle and when it is desired to reverse the engine. This inner vibratory valve E' , which is also of hollow cylindrical form, has a port e^3 in its peripheral wall and arranged to be brought alternately into and out of register with port e in valve E, which is ordinarily in constant communication with steam-inlet passage c to admit steam to the cylinder.

When it is desired to reverse the engine, valve E is turned through lever-clutch H, which in this case connects with rod f until port e^2 thereof, adjacent and similar to port e and which has hitherto been cut off or out of action, is brought into register with exhaust-passage c' , which will now become the steam-inlet passage. At the same time port e is cut off from action, and peripheral passage e' connects the passage c with the atmosphere and passes out of register with passage c' . Valve E' has a second port e^4 , arranged to be brought alternately into and out of register with port e^2 in valve E, which when the engine is reversed is in constant communication with passage c' to admit steam to the cylinder. In using valve E as a throttle it is turned sufficiently to cut off steam from both passages c and c' .

When these engines are made in the compound form, which is preferred, the stationary low-pressure cylinder will not be provided with a valve and the cylinder for the reversible low-pressure engine will have but one valve to serve to reverse the steam.

What I claim is—

1. In a rotary engine, the cylindrical piston, the spring-pressed packing-bar having a bearing against the peripheral surface of said piston, the cam approaches to said bar, the radial spring-pressed fin working in a slot of

said piston, the spring-pressed end packing for said fin, the spring-pressed lateral packing for said fin, said fin having a bracing T-form head provided with an outer convex surface concentric with that of the piston, the heads of the cylinder having annular grooves therein, the spring-pressed washers in said grooves, and the expansion-rings working in said grooves, and having a pin connection with the piston, whereby they rotate therewith, substantially as specified.

2. In a reversible engine, the valve-chamber, the steam-passages connecting said chamber and the cylinder, a hollow cylindrical throttle and reversing-valve working in said chamber, and having ports in its peripheral wall arranged to be brought into and out of register with said passages, said valve having a peripheral passage arranged to connect either of said steam-passages with the low-pressure cylinder, the hollow cylindrical valve working in said reversing-valve, and having ports in the peripheral wall arranged to be brought in register with the peripheral ports of said reversing-valve, substantially as specified.

3. In a compound reversible rotary engine, the high and low pressure cylinders having each a cylindrical piston, a spring-pressed packing-bar, having a bearing against the peripheral surface of said piston, cam approaches to said bar, and a radial spring-pressed fin working in a slot of said piston, the valve-chamber for the high-pressure cylinder, the steam-passages connecting said chamber and the cylinder, a hollow cylindrical throttle and reversing-valve working in said chamber, and having ports in its peripheral wall arranged to be brought into and out of register with said passages, said valve having a peripheral passage arranged to connect either of said steam-passages with the low-pressure cylinder, the valve-chamber of the low-pressure cylinder, the steam-passages connecting said chamber and cylinder, and a reversing-valve in said chamber, substantially as specified.

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

JOHN T. BOOTES.

Witnesses:

WILBUR L. SASSE,
JOSEPH GOFF.