No. 649,772. Patented May 15, 1900.

I. N. STEERS & J. R. ABERCROMBIE.

ROTARY ENGINE.

(Application filed Oct. 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

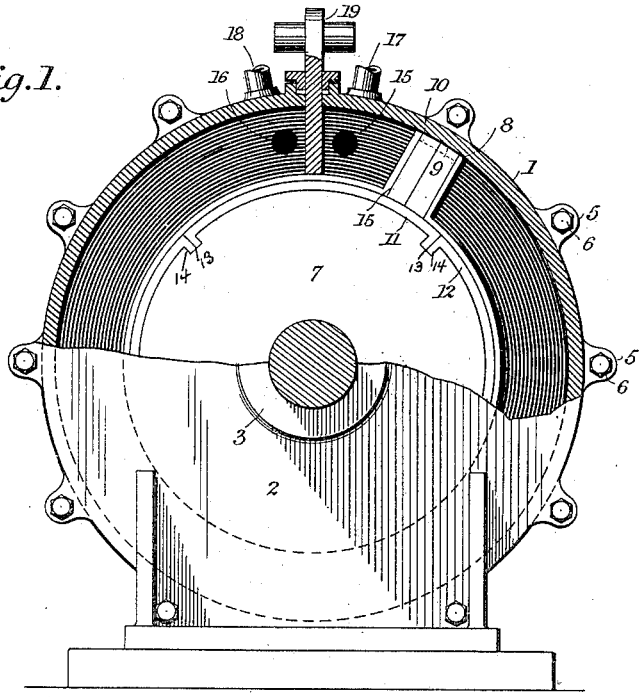

Fig. 2.

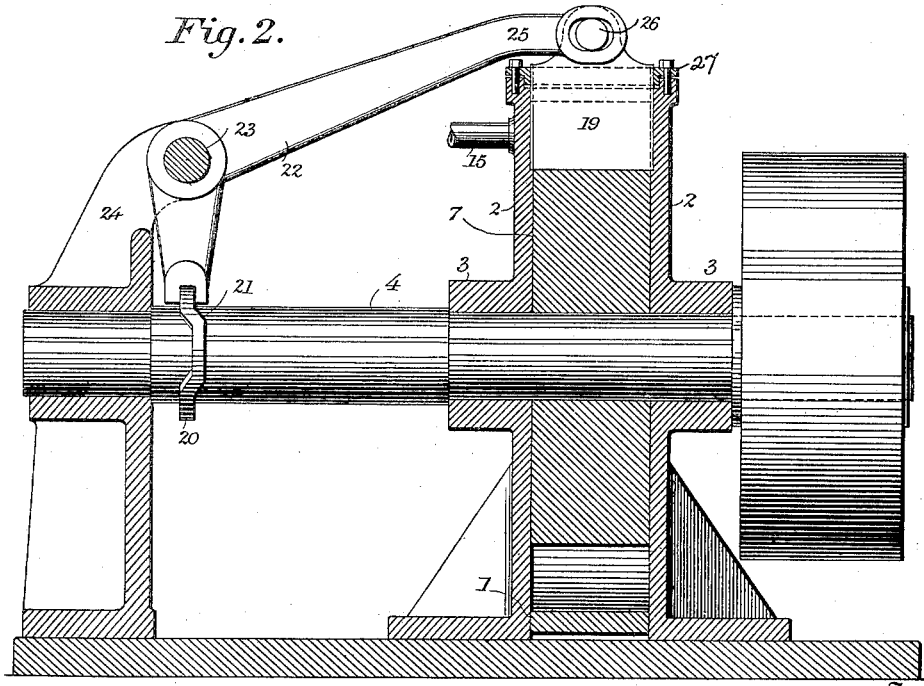

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Fig. 3.

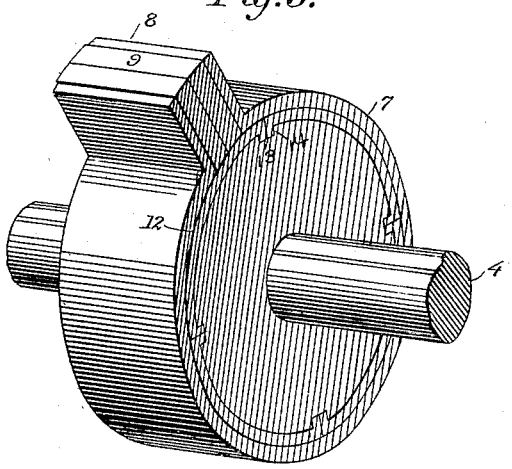
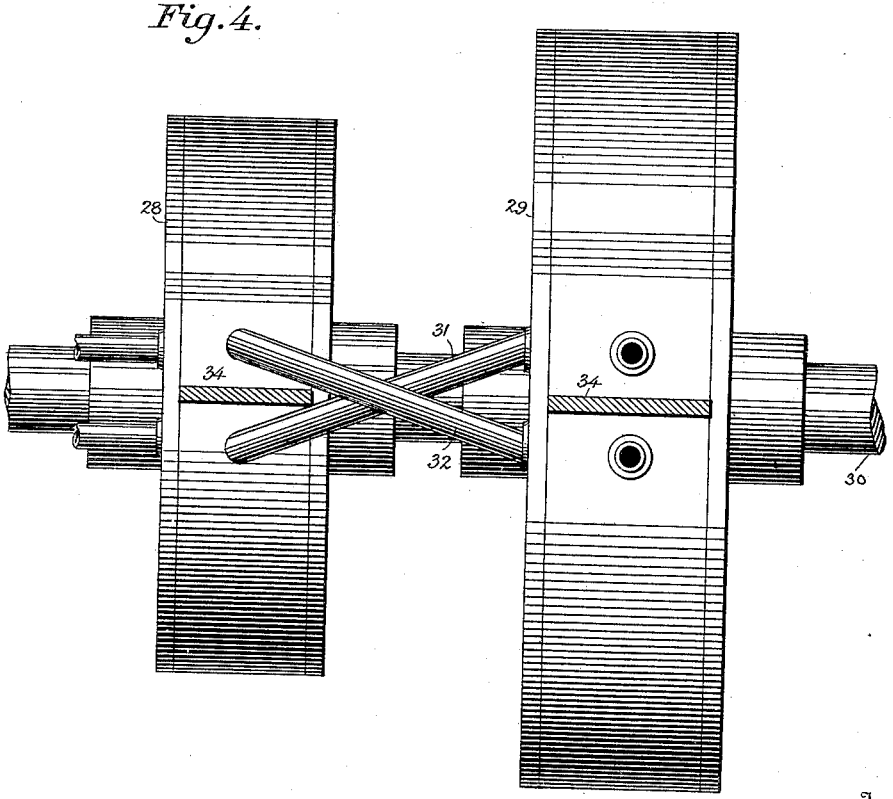


Fig. 4.



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UNITED STATES PATENT OFFICE.

ISAAC N. STEERS AND JAMES R. ABERCROMBIE, OF ROBINSON, ARKANSAS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 649,772, dated May 15, 1900.

Application filed October 30, 1899. Serial No. 735,199. (No model.)

To all whom it may concern:

Be it known that we, ISAAC N. STEERS and JAMES R. ABERCROMBIE, citizens of the United States, residing at Robinson, in the county of Benton and State of Arkansas, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to rotary engines; and its primary object is to provide an improved engine embodying few parts and combining simplicity and economy of construction with effectiveness in operation.

The characteristic features of our invention will be fully described hereinafter and defined in the appended claims.

In the accompanying drawings, which form part of this specification, Figure 1 is a side elevation of our improved engine with a part of the cylinder or casing removed to show the interior construction. Fig. 2 is an elevation, partly in section, illustrating the means for operating the cut-off valve which controls the supply and exhaust ports of the engine. Fig. 3 is a detail perspective view of a portion of the rotary piston and its shaft; and Fig. 4 is a plan view of a modified construction, showing our invention embodied in a compound engine.

The casing of the engine comprises a ring or annular shell 1 and counterpart side plates 2, each of the latter being formed with an integral sleeve or cylindrical extension 3, said sleeves extending laterally in opposite directions diametrically opposite each other to form a bearing for the shaft 4. The plates 2 are provided with radial perforated lugs 5 for the reception of transverse bolts 6, which secure the plates in position upon the ring or shell 1.

Upon the shaft 4 is rigidly secured a solid disk or hub 7, which constitutes the rotary piston of the engine and is provided with a radially-projecting peripheral block 8, forming an abutment or piston-head. This block or piston-head is packed by a series of packing-rings 9, which are applied transversely of the periphery of the rotary piston and extend beyond the surface of the sides and outer end of the block 8 to form a steam-tight packing between said block and the side plates and outer ring of the casing. The hub or rotary piston is slotted at the point 10 to facilitate the attachment of the packing-rings 9. The piston 7 is formed at each side with an annular groove or channel 11 near its periphery to receive a packing-ring 12, said rings projecting sufficiently beyond the side surfaces of the piston to prevent the escape of steam between the sides of the piston and the side plates of the casing. The piston is formed at diametrically-opposite points with radial recesses 13, which communicate with the grooves 11 to receive tongues or lugs 14, projecting from the packing-rings 12, said tongues or lugs serving to lock the packing-rings upon the piston and insure their revolution with the piston.

15 and 16 designate steam-inlets, and 17 and 18 the steam-exhaust ports.

19 designates a cut-off valve arranged between the two inlet-ports 15 and 16 and suitably packed to be steam-tight in its movement.

The operation of the mechanism as thus far described is as follows: Steam entering through the inlet 15 impinges directly against the block or piston-head 8, forcing it around and revolving the piston 7 and shaft 4. The steam exhausts through the port 18. A reversal of the engine is effected by closing the ports 15 and 18 and admitting steam through the inlet 16 and exhausting through the port 17.

To secure a complete revolution of the piston 7 and its continuous revolution, it is necessary to raise the cut-off valve 19 out of the path of movement of the block or piston-head 8 at the proper time and force it inward again after the passage of the piston-head. To accomplish this reciprocatory movement of the valve, we provide the mechanism shown in Fig. 2, comprising a ring or flange 20 on the shaft 4, provided with an offset or cam surface 21, and a bell-crank lever 22, fulcrumed at its angle-point upon a shaft 23, having bearing in a bracket 24. The lower end of the short arm of the lever 22 is forked to straddle the flange 20, and the end 25 of the long arm of said lever is pivotally secured to the cut-off 19 by means of a pin 26. The cut-off extends through a cover or casing 27, which is secured upon the main casing of the engine

to protect the cut-off valve and prevent the escape of steam during the movement of said valve. By the means thus described the cut-off 19 is raised at the proper instant to permit the passage of the piston-head and is lowered to place again immediately after the passage of said piston-head.

In Fig. 4 we have shown our invention embodied in a compound engine comprising two cylinders 28 and 29, each containing a piston and piston-head similar to those shown in Fig. 1, fixed upon a shaft 30. The two cylinders are connected by steam-passages 31 and 32, and each is provided with a cut-off valve 34 and operates in the manner well known in the art of expansion-engines. If the piston-heads on the rotary pistons within the cylinders 28 and 29 are in horizontal alinement, a single lever (similar to the lever 24 of Fig. 2) would operate both cut-offs and the pistons would work in unison; but if said piston-heads are arranged at different points on each of the two rotary pistons, so as to be out of horizontal alinement, it will be impossible for the engine to stop on a dead-center, for if the piston-head on one piston should stop under its cut-off the head or block of the other piston would be in a position to receive the impact of the exhaust-steam from the other cylinder to carry the shaft around and move the block or piston-head of the first-named piston to a working position.

It will be observed that by our improved construction we secure the full and direct pressure of the boiler against the block or piston-head and confine said pressure between the solid hub or piston and the casing and that the vibration incident to the reciprocating engine is avoided. Our construction also affords a leverage or resistance for the steam extending over nearly the entire surface of the circumference of the hub, which results in an increased power for the same amount of steam over a reciprocating engine.

We claim—

1. In a rotary engine the combination with a cylindrical casing comprising an annular shell and counterpart sides provided with shaft-bearings, of a shaft journaled in said bearings, a hub on the shaft and provided with a radial head, a reciprocatory cut-off valve, steam-inlet ports piercing one of the casing sides immediately adjacent to the valve, exhaust-ports piercing the annular shell and likewise immediately adjacent to the opposite sides of the valve, a slotted bell-crank lever engaging a pin upon the valve and having its opposite extremity forked, and an annular flange upon the shaft, engaging the forked end of the lever and having an offset or cam surface designed to effect the oscillation of the lever by the rotation of the shaft.

2. In a rotary engine the combination with a casing, of a shaft, a hub carried thereby and provided with a radial head, and with an annular groove and a series of radial recesses in each side face, said recesses being of greater width than the groove and extending therefrom toward the shaft, and said head being provided with a recess extending across its bearing-faces and with a slot piercing it at its base, packing-ring segments within the grooves and having terminal angular portions within the radial recesses, and a packing-ring extending through said slot and within the recess of the head.

3. In a rotary engine, the combination with a cylindrical casing comprising an annular shell, and counterpart sides provided with shaft-bearings and secured by transverse bolts; a shaft supported in said bearings; a solid hub or piston fixed upon said shaft and provided with a radial block constituting an abutment or piston-head; inlet and exhaust ports for the cylinder; a cut-off valve, and means for reciprocating said valve comprising a bell-crank lever, pivotally secured at one end to the valve and forked at its opposite end; and an annular flange on said shaft formed with an offset or cam surface with which the forked end of the lever engages.

In testimony whereof we affix our signatures in presence of two witnesses.

ISAAC N. STEERS.
JAMES R. ABERCROMBIE.

Witnesses:
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THOS. S. HART.