R. SAUNDERS.

ROTARY ENGINE.

APPLICATION FILED JUNE 16, 1915.

1,232,850.

Patented July 10, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

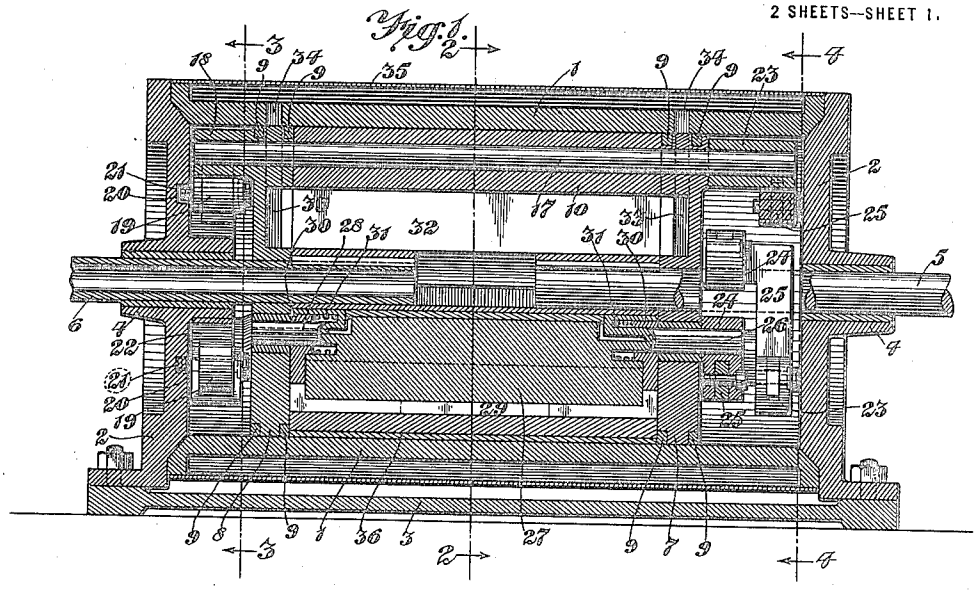
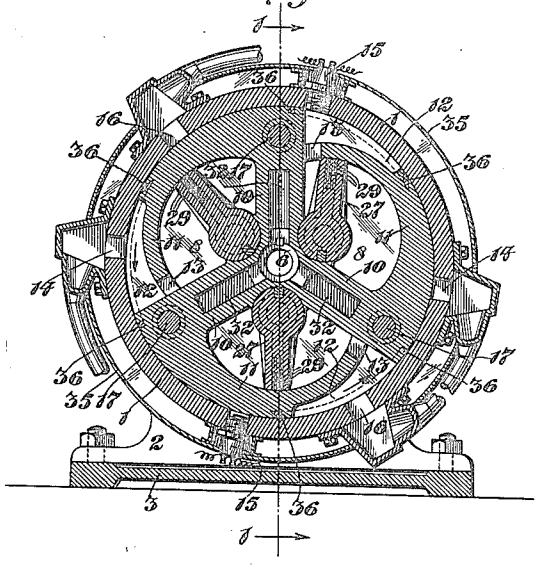


Fig. 2.



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Fig. 3.

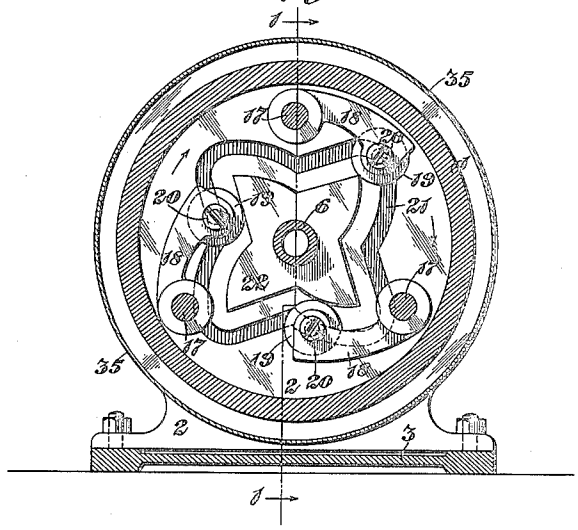
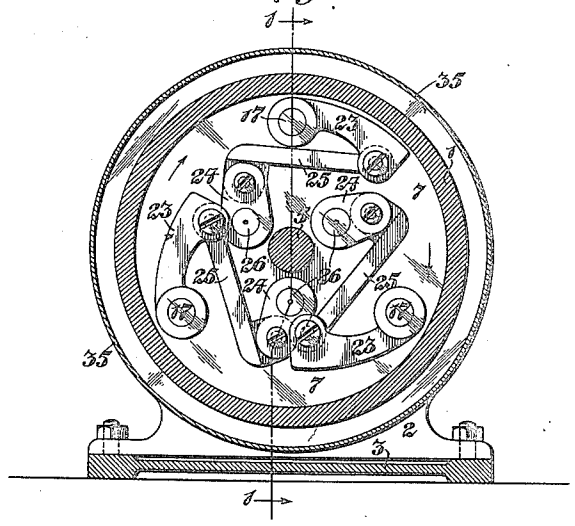


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROY SAUNDERS, OF EAST ST. LOUIS, ILLINOIS, ASSIGNOR TO SAUNDERS MOTOR POWER COMPANY, OF EAST ST. LOUIS, ILLINOIS, A CORPORATION OF ILLINOIS.

ROTARY ENGINE.

1,232,850. Specification of Letters Patent. Patented July 10, 1917.

Application filed June 16, 1915. Serial No. 34,538.

To all whom it may concern:

Be it known that I, ROY SAUNDERS, a citizen of the United States, residing at the city of East St. Louis, county of St. Clair, and State of Illinois, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines.

An object of the invention is to produce a rotary engine, particularly of the internal combustion type but generically adapted for operation by steam also, comprising a cylinder having a rotor member revolubly supported therein and including a plurality of radial arms or wings having chambers to receive the gas or propelling fluid, pivoted compression elements mounted in and cooperating with said rotor member, novel controlling and actuating mechanism for said elements, and improved means for cooling the operating parts of the engine.

With the foregoing and other objects in view my invention consists of the novel construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawings in which—

Figure 1 is a longitudinal sectional view of the engine approximately on the line 1—1 of Figs. 2, 3 and 4.

Fig. 2 is an enlarged cross sectional view on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross sectional view on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged cross sectional view on the line 4—4 of Fig. 1.

The cylinder 1 is rigidly supported by the heads 2, and the latter are secured to an appropriate base 3. The cylinder heads are provided with bearings 4, in one of which is journaled a driving shaft 5 by which the power is transmitted from the engine to the driven mechanism. In the other bearing 4 a hollow or tubular shaft 6 is journaled, said shafts 5 and 6 being axially alined. On the shaft 5 within the cylinder heads 7 and 8 are fixed. The heads 7 and 8 are provided with circumferential grooves in which are seated packing rings 9, preferably of the well known open resilient type which operate against the interior surface of the cylinder and form tight or close joints to prevent escape of the gas or operating fluid.

A rotor member is affixed to the shafts 5 and 6 between the heads 7 and 8, and consists preferably of a number of radial arms or wings 10 integral with the central portion which is secured to the shafts. The outer portions of said arms or wings are integrally connected by arcuate portions 11, each of which forms the third wall of a space or chamber between two adjacent arms or wings (Fig. 2). The rotor member thus formed is substantially cylindrical in cross section. In each connection 11 a power chamber 12 is formed, and from each chamber 12 a passage 13 opens into the adjacent inner chamber of the rotor. In the embodiment illustrated there are three arms or wings 10, though it will be understood that the number may be varied according to necessity or preference. Gas is admitted to the cylinder through passages 14, entering the chambers 12 consecutively and also entering the interior chambers of the piston, and is carried into contact with the sparking devices 15, when the explosion occurs, thus actuating the rotor. Exhaust is effected through the passages 16. The passages 14 and 16 are opened and closed and controlled by the periphery of the rotor.

Each arm or wing of the rotor carries a rock shaft 17, said shafts 17 also extending through the heads 7 and 8. One end of each shaft 17 supports an arm or lever 18, and each of the latter supports a roller 19. The rollers 19 are mounted on axial members 20 which extend into a cam groove 21 in the adjacent cylinder head. The rollers 19 operate against a cam member 22 rigid with the cylinder head, so that as the rotor revolves the shafts 17 will be rocked in their bearings therein.

The opposite end of each shaft 17 has a lever 23 affixed thereto, said levers preferably being substantial duplicates of the levers 18. Each lever 23 is connected with another lever 24 by a link 25, so that said levers 24 will be operated to accompany the levers 23 in their movements. The levers 24 are attached to the projecting shaft portions 26 of the piston members 27 which are mounted in the interior chambers of the rotor, each of said pistons being supported by a shaft portion 26 and a corresponding shaft portion 28 journaled in the head 8. Thus the pistons 27 are operated to their different positions. The pistons 27 form close contact with the walls of the chambers in which they are mounted. Their outer edges have grooves in which packing strips

29 are mounted and the shaft portions 26 and 28 are encircled by packing sleeves 30 which are pressed against the heads 7 and 8 by springs 31 seated in recesses in the pistons.

The tubular shaft 6 constitutes a passage to admit water into the rotor, each arm or wing of which is provided with a chamber 32 into which the water enters from the hollow shaft 6. The chambers 32 open into passages 33 in heads 7 and 8, and the latter communicate with slots 34 in the cylinder, so that as the rotor revolves the water will be enabled to flow into the slots 34, and thence into a water jacket 35. In this way the water is maintained in circulation during operation of the rotor, the flow of the water being increased by centrifugal forces resulting from the rotation of the rotor.

Packing elements 36 (Fig. 2) are seated in grooves in the periphery of the rotor, said elements being around the chambers 12, thus maintaining a close joint to prevent escape of the gas under compression.

After gas enters any chamber 12 the corresponding piston 27 is moved from position as shown at the lower part of Fig. 2 to the position shown at the upper right portion of Fig. 2 thus compressing the gas so that when the gas is carried into contact with the sparking devices combustion occurs. Since backward movement of the compression devices is impossible, because of the positive operating connections, and since the rotor is free to revolve some distance with respect to the piston which is on compression the rotor will be driven forward by the explosion, thus driving the shaft 5. This operation is repeated as each chamber 12 receives and has gas compressed therein, the exhaust taking place between the sparking mechanism and the succeeding inlet port. As shown each chamber is charged with gas two times during each revolution, but this arrangement may be varied when desirable. It will be noted that the operation of the pistons 27 is mechanically positive and that the operation is timed so that they are away from the passages 13 while gas is entering the chambers, (see left of Fig. 2) after which the pistons move to compression position as shown at the upper right of Fig. 2. After each explosion the chamber 12 in which the explosion occurs passes an exhaust port 16 before reaching the next inlet port 14 to permit the products of combustion to be discharged. This operation is repeated successively by each of the pistons 27, as will be understood.

I am aware that there may be many variations in the construction of the various parts, and do not restrict myself to specific features. But what I claim and desire to secure by Letters Patent is:

1. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to the drive shaft within the cylinder, a head on the cylinder, rock shafts journaled in the rotor, a lever on each of said rock shafts, a cam on said head whereby said levers are moved to rock said shafts during rotation of the rotor, gas receiving chambers in the rotor, pistons pivotally mounted in the rotor and each being movable to compressing positions at one side of a radial line passing through the axis of the drive shaft and the axes of the pivots of the pistons respectively, and movable from compressing positions to the other side of said radial lines respectively, and connections from said rock shafts for operating said pistons to and from compressing position as aforesaid.

2. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said drive shaft within the cylinder, a head on said cylinder, rock shafts journaled in said rotor, pistons pivoted to said rotor adjacent to said drive shaft and extending toward the periphery of the rotor and being movable to compressing positions at one side of radial lines from the drive shaft through the axis of the pivots of the pistons and movable from compressing positions to opposite sides of said lines, operating connections in connection with each of said pistons, and means for operating said connections by said rock shafts to move said pistons to and from positions of compression as aforesaid as an incident to the rotation of the rotor.

3. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said drive shaft within the cylinder, a head on said cylinder, piston shafts journaled in said rotor adjacent to said drive shaft, pistons in connection with said piston shafts, connections for operating said piston shafts to move the piston to and from positions of compression on opposite sides of radial lines from the drive shaft through the axes of the pistons respectively, a cam in connection with the head of the cylinder, and devices operating on said cam for operating said connections to move the pistons to and from positions of compression at one side of said radial lines to opposite sides of said lines as an incident to the rotation of the rotor.

4. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said shaft in said cylinder, a head on said cylinder, rock shafts journaled in said rotor adjacent to the periphery thereof, a lever on each of said rock shafts, a cam on said head whereby said levers are moved effectively to rock said shafts during rotation of said rotor, gas receiving chambers in said rotor, pistons pivotally mounted in said rotor, levers for operating said pistons, and connections from said first-named to said second-named levers respectively for operating said pistons to and from compressing position.

5. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said shaft within the cylinder, a head on said cylinder, rock shafts journaled in said rotor adjacent to the periphery thereof, pistons pivoted to said rotor adjacent to said drive shaft and extending toward the periphery of the rotor, operating connections in connection with each of said pistons, and means for operating said connections by said rock shafts to move said pistons to and from positions of compression as an incident to the rotation of the rotor.

6. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said shaft in said cylinder, rock shafts journaled in said rotor adjacent to the periphery thereof, pivots mounted in said rotor adjacent to said drive shaft, pistons mounted on said pivots and extending toward the periphery of the rotor, a connection between the pivot of each of said pistons and a corresponding one of said rock shafts, an actuating lever on each of said rock shafts, and a connection between said actuating levers and said cylinder whereby said levers will be actuated to move said pistons to and from positions of compression as an incident to the rotation of said rotor.

7. A rotary engine comprising a cylinder, a drive shaft, a rotor attached to said shaft in said cylinder, rock shafts journaled in said rotor adjacent to the periphery thereof, an actuating lever on each of said rock shafts, means whereby said levers will be actuated to rock said shafts as an incident to the rotation of the rotor, pivots mounted in said rotor parallel with said drive shaft, pistons connected to said pivots and arranged to be operated laterally to and from positions of compression at opposite sides of radial lines from the drive shaft passing through the axes of the pivots of the pistons, and connections between said rock shafts and the pivots of said pistons whereby said pistons will be operated to and from positions of compression as an incident to the rotation of the rotor.

8. A rotary engine comprising a cylinder, a rotor within the cylinder, pistons pivoted to the rotor adjacent to the axis thereof and movable respectively to positions of compression at one side of radial lines from the axis of the rotor passing through the axes of the pivots of the pistons respectively, and movable from positions of compression to opposite sides of said lines, rock shafts supported by the rotor, connections between said rock shafts and the axes of the pistons respectively, a lever attached to each of said rock shafts, and a cam for operating said levers as required to move said pistons to and from positions of compression, as aforesaid, as an incident to rotation of the rotor.

9. A rotary engine comprising a cylinder, a rotor within the cylinder, a head on said cylinder, pistons pivoted to said rotor adjacent to the axis thereof and extending toward the periphery of the rotor and movable respectively to positions of compression at one side of radial lines from the axis of the rotor passing through the axes of the pistons respectively, and movable respectively from positions of compression to opposite sides of said lines, rock shafts carried by the rotor, operating connections from said rock shafts for actuating each of said pistons to and from positions of compression as aforesaid, a lever in connection with each of said rock shafts, and a device attached to the head of the cylinder for actuating said levers as required to move the pistons to and from positions of compression, as aforesaid, as an incident to the rotation of the rotor.

10. A rotary engine comprising a cylinder, a power transmission shaft, a rotor attached to said shaft within the cylinder, a head on said cylinder, pistons pivoted to said rotor adjacent to the axis thereof and extending toward the periphery of the rotor and movable respectively to and from positions of compression on opposite sides of radial lines from the axis of the rotor passing through the axes of the pistons respectively, rock shafts journaled in the rotor, operating connections from said rock shafts for actuating the pistons respectively, an element in connection with the head of the cylinder, and levers attached to said rock shafts controlled by said element for rocking said shafts and actuating said connections to move the pistons to and from positions of compression, as aforesaid, as an incident to the rotation of the rotor.

11. A rotary engine, comprising a cylinder, a rotor in said cylinder, a plurality of water chambers in said rotor, a passage for admitting water into said water chambers, a water jacket on said cylinder, and passages for admitting water from said chambers into said water jacket while said rotor revolves.

12. A rotary engine, comprising a cylinder, a rotor within the cylinder, pistons pivoted to the rotor adjacent to the axis thereof, and movable respectively to positions of compression at one side of radial lines from the axis of the rotor passing through the axes of the pivots of the pistons respectively and movable from positions of compression to opposite sides of said lines, operating connections in connection with each of said pistons, and means for operating said connections to move said pistons to and from positions of compression as aforesaid as an incident to rotation of the rotor.

13. A rotary engine, comprising a cylinder, a rotor within the cylinder, a head on

said cylinder, pistons pivoted to said rotor adjacent to the axis thereof and extending toward the periphery of the rotor and movable respectively to positions of compression at one side of radial lines from the axis of the rotor passing through the axes of the pistons respectively, and movable respectively from positions of compression to opposite sides of said lines, operating connections for each of said pistons, and mechanism under control of a part of the head of the cylinder for actuating said connections to move the pistons to and from positions of compression as aforesaid as an incident to the rotation of the rotor.

14. A rotary engine, comprising a cylinder, a power transmission shaft, a rotor attached to said shaft within the cylinder, a head on said cylinder, pistons pivoted to said rotor adjacent to the axis thereof and extending toward the periphery of the rotor, and movable respectively to and from positions of compression on opposite sides of radial lines from the axis of the rotor passing through the axes of the pistons respectively, operating connections for each of said pistons, an element in connection with the head of the cylinder, and mechanism controlled by said element for actuating said connections to move the pistons to and from positions of compression as aforesaid as an incident to the rotation of the rotor.

In witness whereof I have signed this specification in the presence of two subscribing witnesses.

ROY SAUNDERS.

Witnesses:

CHAS. A. BECKER,

JOHN D. RIPPEY.