J. R. CROW.

ROTARY ENGINE.

APPLICATION FILED OCT. 26, 1914.

1,133,937.

Patented Mar. 30, 1915.

3 SHEETS—SHEET 1.

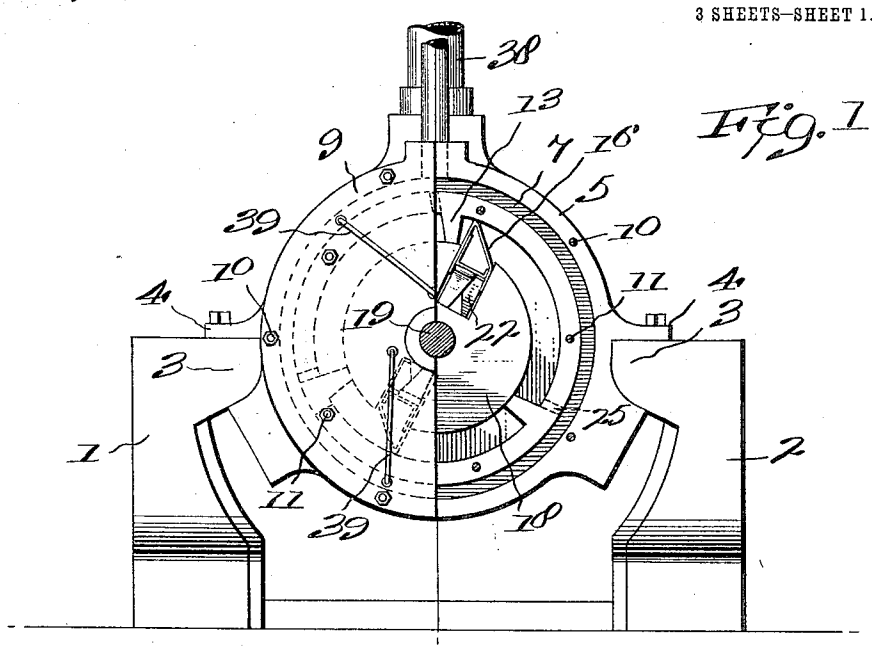


Fig. 1.

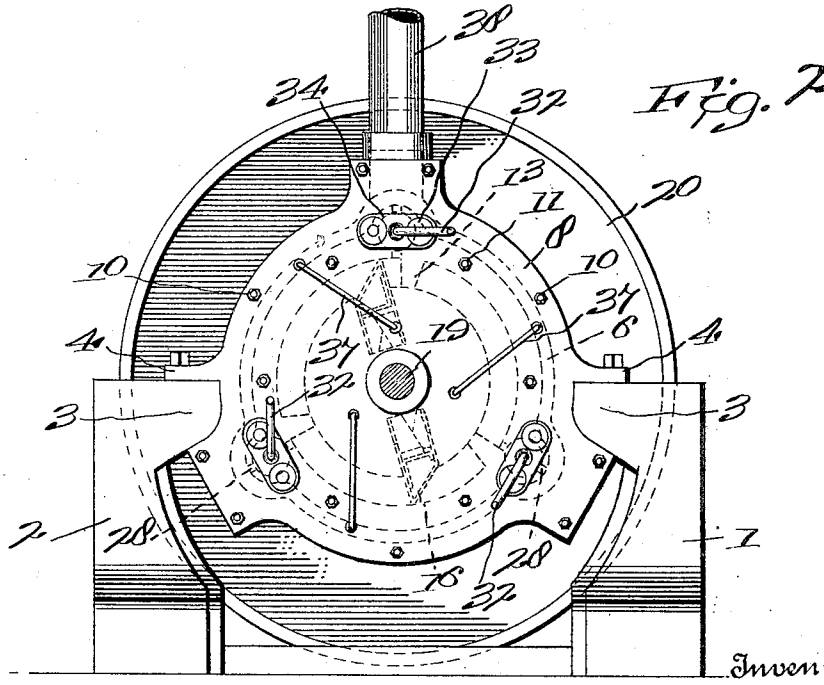


Fig. 2.

Witnesses

Edwin J. Bellew.

R. J. Mawhinney.

Inventor

J. R. Crow,

by Wilkinson, Gunster & Mockbee.

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 2.

Fig. 2.

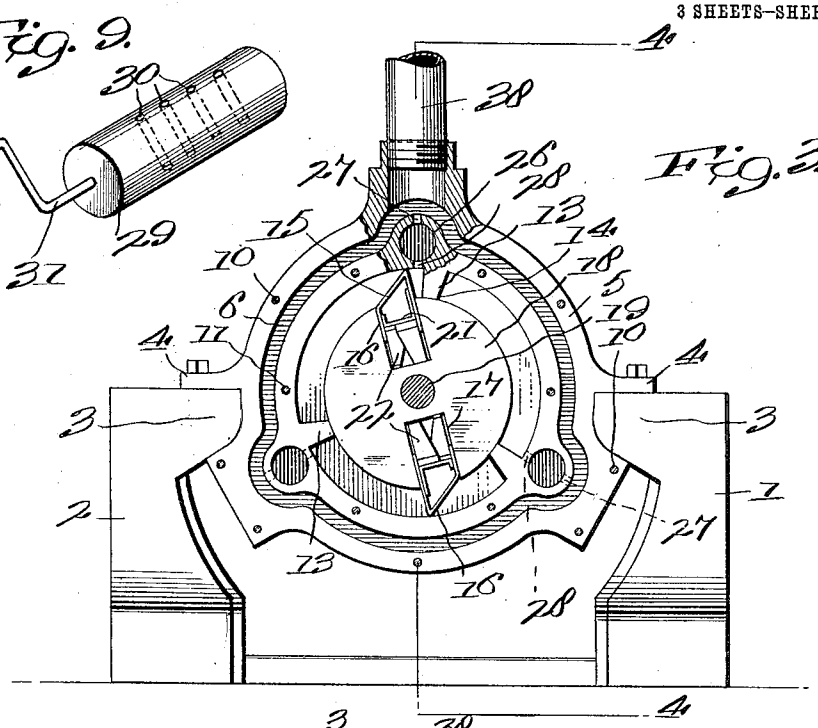
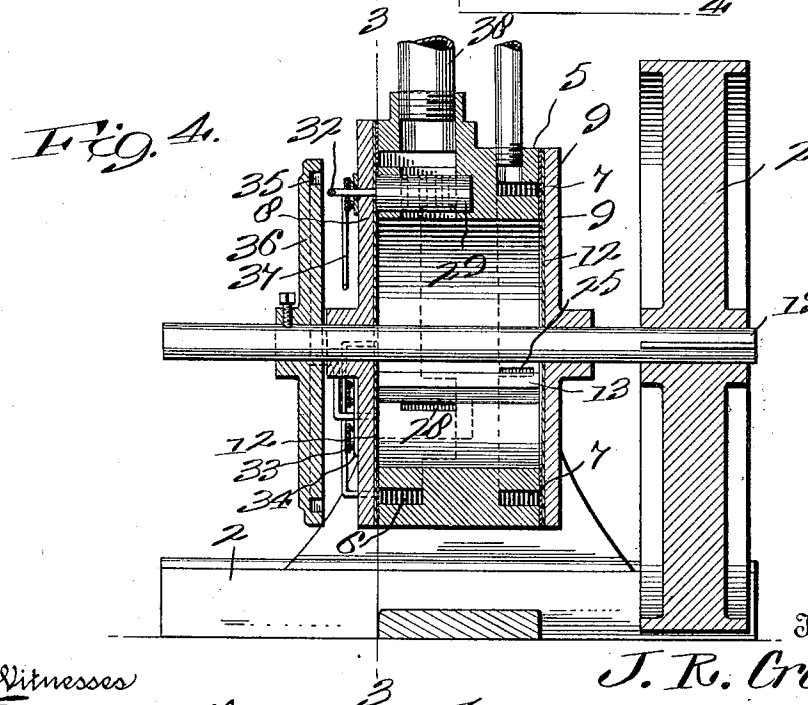


Fig. 3.

Fig. 4.



Witnesses

Edwin J. Beller.

R. J. Mawhinney.

Inventor

J. R. Crow,

by Wilkinson, Gaiola & Mackay

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

J. R. CROW.

ROTARY ENGINE.

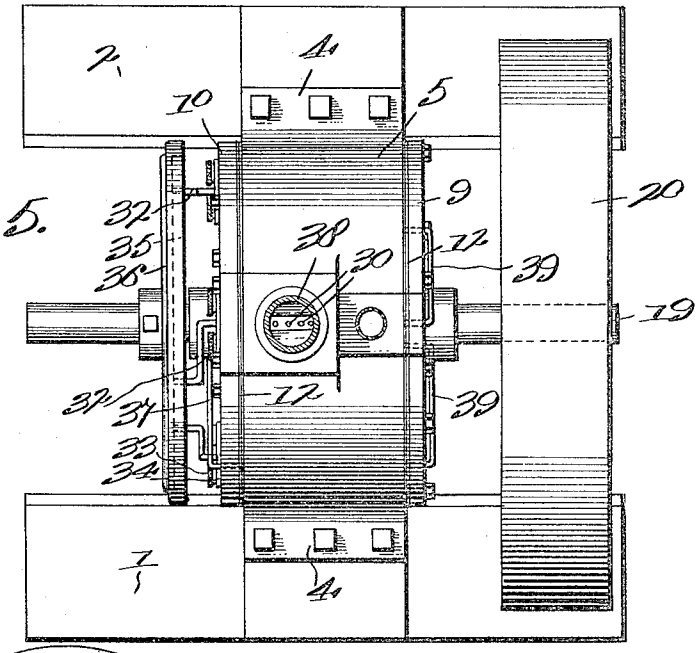
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3 SHEETS—SHEET 3.

Fig. 5.



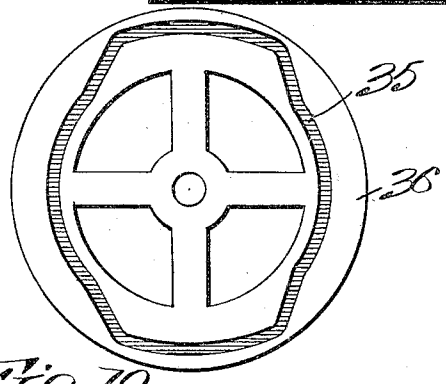


Fig. 10.

Fig. 8.

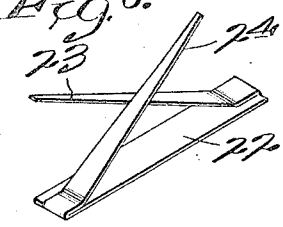


Fig. 7.

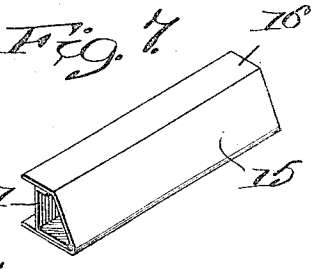
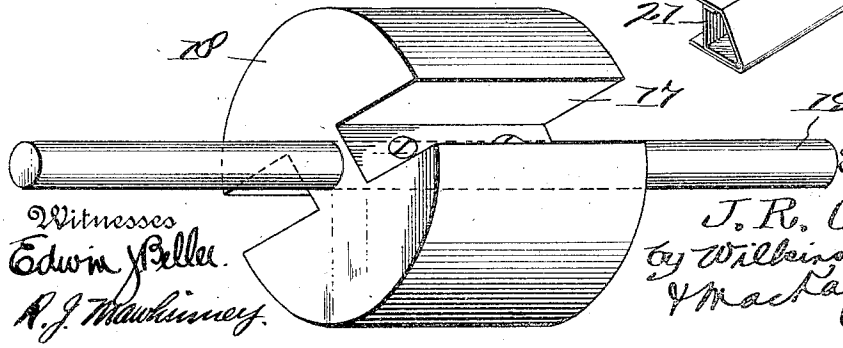


Fig. 6.



Witnesses

Edwin J. Keller.

R. J. Mawhinney.

Inventor

J. R. CROW,

by Wilkinson Guala & MacKaye

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C

UNITED STATES PATENT OFFICE.

JAMES R. CROW, OF CLEVELAND, TENNESSEE.

ROTARY ENGINE.

1,133,937. Specification of Letters Patent. Patented Mar. 30, 1915.

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To all whom it may concern:

Be it known that I, JAMES R. CROW, a citizen of the United States, residing at Cleveland, in the county of Bradley and State of Tennessee, have invented certain new and useful Improvements in Rotary Engines; and I do hereby 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.

The present invention relates to improvements in rotary engines, and consists more particularly in a rotary engine constructed of a rotor provided with slidably mounted pistons coöperating with fixed abutments on the engine cylinder.

It is an object of the present invention to provide a rotary engine of this general type which will have no dead center, but which will be at any point in position to receive the driving medium to propel the rotor.

Another object of the present invention resides in providing a rotary engine which will be simple in construction and arranged to occupy a minimum of space, and wherein the various parts will be so arranged and constructed as to reduce the frictional surfaces and secure steady and noiseless operation.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

In the accompanying drawings forming a part of this application, and in which similar reference symbols indicate corresponding parts in the several views: Figure 1 is a front elevational view, partly in section, of a rotary engine constructed in accordance with the present invention, and with the fly wheel removed. Fig. 2 is a rear elevational view of the same with the valve-actuating disk removed. Fig. 3 is a rear elevational view of the same with the cylinder head removed, and shown partly in section. Fig. 4 is a transverse sectional view of the assembled engine. Fig. 5 is a top plan view of the same. Fig. 6 is a perspective view of the rotor. Fig. 7 is a perspective view of a piston constructed in accordance with the present invention. Fig. 8 is a perspective view of a spring for actuating the piston. Fig. 9 is a perspective view of one of the valves employed in the present construction; and Fig. 10 is an elevational view of the cam disk for actuating the valve.

Referring more particularly to the drawings, 1 and 2 designate pedestals erected in spaced relation on a suitable bed, and constructed with inwardly disposed head flanges 3 for receiving coöperating flanges 4 projecting from diametrically opposite points on a cylinder 5, whereby the latter is rigidly supported. The cylinder 5 is cast with substantially annular intake and exhaust channels 6 and 7, respectively, the same opening on opposite sides of the cylinder and being inclosed by the cylinder heads 8 and 9. The heads 8 and 9 are connected to the cylinder 5 by means of a double annular series of bolts 10 and 11, and the cylinder heads may be arranged to confine any suitable packing 12, found to be necessary in practice.

The cylinder 5 is cast or otherwise formed with fixed abutments 13 of any suitable number, but I preferably employ the three abutments shown as found to give the best results. Each abutment 13 is beveled on one face thereof, as indicated at 14, for coöperating with the inclined faces 15 of the pistons 16, the same being slidably mounted in radial recesses 17 formed in the rotor 18. The rotor 18 is fixedly mounted on a shaft 19 journaled in the cylinder heads 8 and 9, which carries the usual fly-wheel 20.

The pistons 16 are preferably two in number, to secure the best results in coöperating with the three abutments 13 shown, and are illustrated in Fig. 7 to be constructed each of a piece of sheet metal bent substantially U-shape and reinforced by a member 21, constructed of sheet metal, similarly bent and arranged to be received within the piston 16 in inverted relation. The pistons 16, as above stated, are slidably mounted in the radial recesses 17 of the rotor 18, and are arranged to be normally projected by any suitable means, preferably by springs of that type disclosed in Fig. 8, wherein each spring is constructed of a single length or strip of resilient metal having its intermediate portion arranged to constitute a base 22, and its ends tapered and bent over in opposite directions upon said base to provide a pair of spring fingers 23 and 24. The base 22 of each of the springs is of a width to be snugly received within the bottom of the respective recess 17 in the rotor 18, and serve to maintain the spring in position, while the fingers 23 and 24 are received between the flanges

of the piston 16 extending beyond the reinforcing member 21. The exhaust channel 7 is in communication with the interior of the cylinder 5 through ports 25, arranged to one side of each of the abutments 13, as disclosed to advantage in Figs. 1 and 4. The intake channel 6 is in communication with the opposite side of each of the abutments 13 through valve chambers or steam chests 26, provided with radially-alining ports 27 and 28, under the control of valves, more particularly illustrated in Fig. 9 to comprise cylinders 29 formed with one or a plurality of transverse apertures 30, and provided with stems 31 bent at their outer ends into cranks 32. The valves 29 are mounted for oscillation in the chambers 26, and the stems 31 thereof project through the adjacent cylinder head 8, to which are secured, by screws 33, packing boxes 34. The cranks 32 extend beyond the packing boxes 34, and are arranged to engage a cam groove 35, formed in a disk 36 mounted to rotate with the shaft 19, as illustrated in Figs. 4, 5 and 10. It will be understood from the formation of the cam groove 35, as advantageously shown in Fig. 10, that the same will operate to constantly maintain one of the valves 29 open so as to secure action of the working fluid upon one of the pistons 16, whereby there will be no dead point in the engine; and that two of the valves 29 will be open except during the interval that either of the pistons 16 is passing an abutment.

While the action of the springs for projecting the pistons 16 has been found to give excellent results, nevertheless such action can be advantageously assisted by conducting steam to the recesses 17 in the rotor 18, and the expansive power thereof utilized for this purpose. In carrying out this feature I provide a plurality of pipes 37, as illustrated in Fig. 2, corresponding in number to the number of abutments 13 employed, and mounted upon the cylinder heads 8, with their ends respectively in communication with the annular intake channel 7 and the interior of the cylinder at points adjacent the center thereof and in substantially radial alinement with the abutments 13. After the pistons 16 have traversed the distance from one abutment to the next successive abutment 13, the fluid in the recesses 17 of the rotor 18, which has, during this movement, been active in forcing the pistons outwardly, is exhausted through pipes 39, similar to the pipes 37, and mounted in the opposite cylinder head 9, in communication respectively with the exhaust channel 7 and the interior of the cylinder, as shown in Fig. 1.

In operation, steam or other active agent is conveyed from any suitable source by means of a pipe 38, to the intake channel 6, into which the same circulates and operates to heat the engine to a high degree, necessary for the best results. From the annular intake channel 6 the fluid passes through the valve or valves 29, which are at the time open, into the interior of the cylinder 5, and expanding between respective abutments 13 and pistons 16 move the latter to rotate the rotor 18. As the rotation of the engine continues the cam disk 36 constantly maintains one and normally maintains two of the valves 29 open, and the third closed, so as to secure substantially constant action of the fluid upon both pistons 16. During the revolution of the rotor 18 the inclined faces 15 of the pistons 16 successively engage the tapered faces 14 of the abutments 13, and cooperate to move the pistons radially inward against the action of the springs 22. Immediately upon clearing the abutments, the respective pistons 16 will be forced outwardly against the cylinder wall by either the action of the springs 22 alone or the combined action of the same and the expansive action of the fluid conducted to the recesses 17 by the pipes 37. The fluid will thereupon expansively act upon the pistons 16 until encountering the next abutment 13, when the cut-off will occur as regulated by the cam disk 36.

It is obvious that those skilled in the art may vary the details of construction and arrangement of parts without departing from the spirit of my invention, and therefore I do not wish to be limited to such features except as may be required by the claims.

I claim:

1. In a rotary engine of the character described, the combination of a cylinder provided with intake and exhaust ports, an abutment mounted in said cylinder, a rotor journaled to revolve in said cylinder and provided with a radial recess therein, and a piston slidingly mounted in the recess in said rotor and constructed of a piece of sheet metal bent substantially U-shape and formed with an inclined outer surface for coöperating with said abutment to force the piston inwardly, substantially as described.

2. In a rotary engine of the character described, the combination of a cylinder provided with intake and exhaust ports therein, an abutment mounted in said cylinder, a rotor journaled in said cylinder and provided with a recess therein, and a piston slidably mounted in the recess in said piston and comprising a piece of sheet metal bent substantially U-shaped and formed with an inclined outer face adapted to coöperate with said abutment to move the piston inwardly, and a reinforcing member constructed of sheet metal bent substantially U-shaped and inserted in said piston in inverted relation, substantially as described.

3. In a rotary engine of the character described, the combination of a cylinder pro-

vided with intake and exhaust ports therein, an abutment in said cylinder, a rotor journaled in said cylinder and provided with a recess therein, a piston slidingly mounted in said recess, and spring means for snugly tending to project said piston and constructed of a sheet metal strip arranged to provide a base for snugly fitting the recess in said rotor, and a pair of over-turned fingers arranged to engage the under side of said piston and normally project the same, substantially as described.

4. In a rotary engine of the character described, the combination of a cylinder provided with intake and exhaust ports, an abutment mounted in said cylinder, a rotor journaled in said cylinder and provided with a recess therein, a piston slidingly mounted in the recess in said rotor and comprising a piece of sheet metal bent substantially U-shape and formed with an inclined outer surface adapted to coöperate with said abutment to force the piston inwardly, and a reinforcing strip bent substantially U-shaped and inserted in inverted relation between the flanges of said piston, and spring means for normally tending to project said piston located in the recess in said rotor and comprising an intermediate base adapted to snugly fit said recess, and a pair of spring fingers bent over on said base and adapted to be received between the flanges of said piston, substantially as described.

5. In a rotary engine of the character described, the combination of a cylinder provided with intake and exhaust channels therein, a plurality of abutments projecting into said cylinder, a rotor journaled in said cylinder and provided with a plurality of radial recesses therein, a piston mounted to slide in each of said recesses and comprising a substantially U-shaped piece of metal formed with an inclined outer face coöperating with said abutments to force the pistons inwardly, spring means located in the recesses beneath said pistons for normally tending to project the same, a plurality of rotary valves mounted in said cylinder for controlling the intake ports therein, cranks connected to said rotary valves and projecting from said cylinder, and a disk mounted to rotate with said engine and provided with a cam groove engaging the cranks on said valves for actuating the latter to open and close the intake ports, substantially as described.

6. In a rotary engine, the combination of a cylinder formed with annular intake and exhaust ports, a plurality of cylindrical valve chests formed in said cylinder, intake ports in said valve chests, rotary valves mounted in said valve chests for controlling the intake ports therein, cranks on said rotary valves, a cam disk mounted to rotate with said engine and arranged to engage the cranks on said valves and actuate the latter to open and close the intake ports, an abutment mounted in said cylinder for each of said valve chests, a rotor journaled to revolve in said cylinder and provided with a plurality of radial recesses therein, pistons mounted to slide in said radial recesses and comprising each a piece of sheet metal bent substantially U-shaped and formed with an inclined outer face for engaging said abutments to move the pistons inwardly, and a reinforcing member bent substantially U-shaped and inserted in inverted relation between the flanges of said pistons, and spring means for normally projecting said pistons and comprising each a single strip of metal arranged to provide an intermediate base for snugly fitting the recesses in said rotor, and a pair of tapering fingers bent over in opposite directions on said base and adapted to engage beneath said reinforcing member and between the projecting flanges on the respective piston, substantially as described.

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

JAMES R. CROW.

Witnesses:
W. S. Beford,
G. G. Movil.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."