C. M. PALMER.

ROTARY ENGINE.

APPLICATION FILED DEC. 23, 1915.

1,253,716.

Patented Jan. 15, 1918.

2 SHEETS—SHEET 1.

FIG. 2.

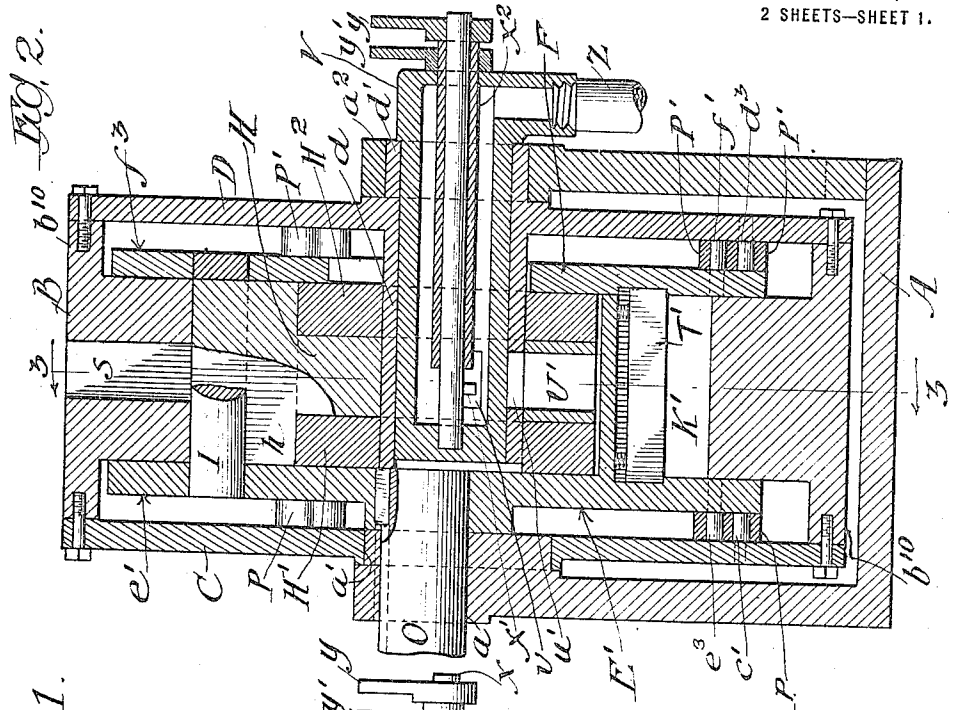
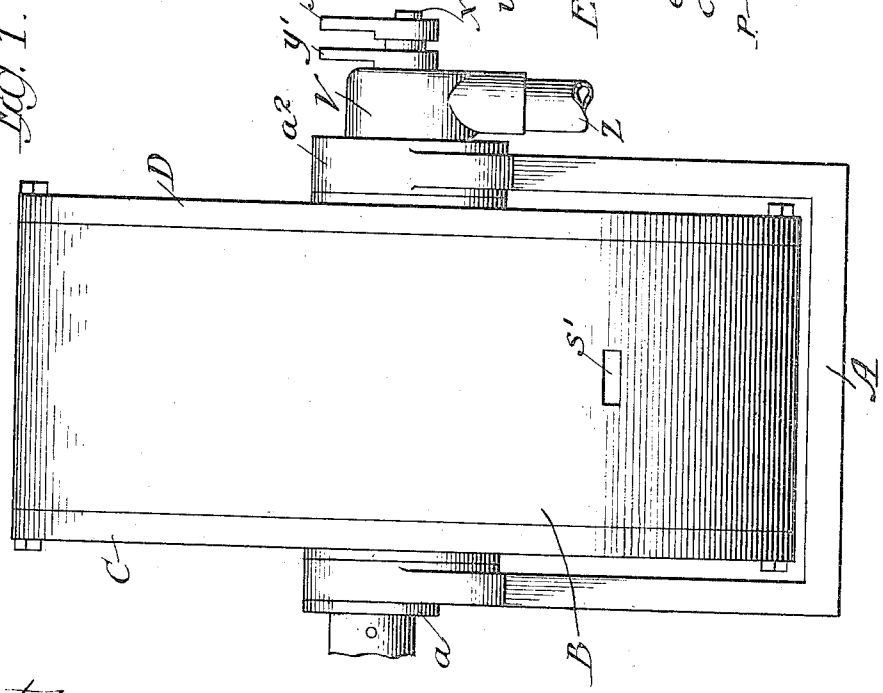


FIG. 1.



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2 SHEETS—SHEET 2.

FIG. 3

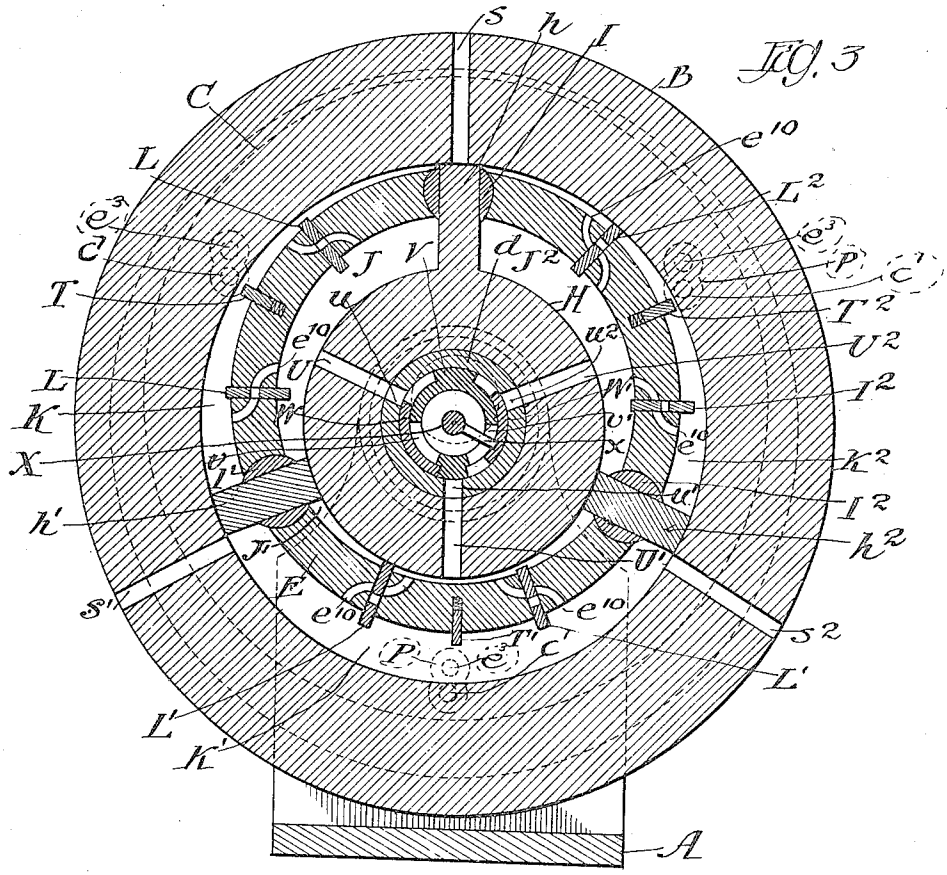
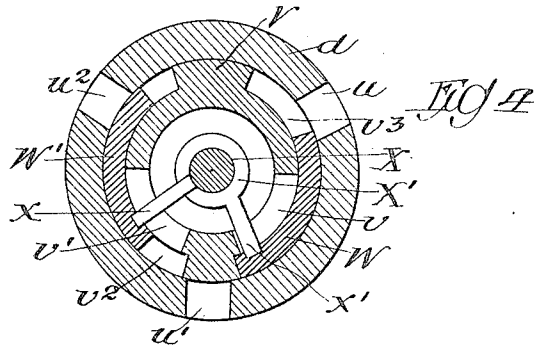


FIG. 4



Witnesses

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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

1,253,716. Specification of Letters Patent. Patented Jan. 15, 1918.

Application filed December 23, 1915. Serial No. 68,453.

To all whom it may concern:

Be it known that I, CHESTER M. PALMER, a citizen of the United States, and resident of the city of Aurora, in the county of Kane and State of Illinois, have made new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to improvements in expansive fluid rotary engines and the invention consists in the combination and arrangement of the parts shown in the drawings and described in the specifications, and is pointed out in the appended claims.

The salient features of the rotary engine embodying my invention may be employed in connection with steam or air engine structures or explosive engine structures, the details of admission and exhaust of the motive fluid being varied to adapt the engine structure to different motive mediums.

Among the objects of the invention are,—to provide a rotary engine which is exceedingly simple in its structure; which is made of but few simply constructed and readily combinable elements; to provide a rotary engine having a minimum resistance to rotary motion due to friction between the relatively moving parts, and to otherwise improve and simplify rotary engines.

In the drawings:—

Figure 1 is a side view of a rotary engine embodying my invention.

Fig. 2 is a section thereof in the plane of the axis of rotation of the engine.

Fig. 3 is a transverse vertical section of the engine.

Fig. 4 is an enlarged sectional detail of the intake ports and governing devices therefor.

Referring to the drawings, A represents the frame of the engine, being U-shaped as herein shown, and provided at the upper ends of its arms with bearings a, a^2. B designates an annular cylinder ring having a cylindric bore eccentric to the bearing a, and provided radially exterior to the bore with rims b^{10}. It is rotatively mounted on the frame A by means of bearing heads C and D bolted or otherwise secured to said end rims b^{10}. The bearing head C has rotative bearing on an external bearing a' of the engine frame and the head D is formed with a bearing trunnion d' which is rotatively mounted in the frame bearing a^2.

E designates a rotary piston which is arranged within the cylinder. Said piston is considerably smaller than the cylinder and is disposed therein eccentrically with respect to the axis of the cylinder. One head E′ of said piston is rigidly mounted on the end of a main shaft O, which latter is rotatively mounted in the frame bearing a. The radially outer portion e' of said piston head E overlaps and fits closely upon the adjacent end face of the cylinder and the piston ring extends across the cylinder and is closed at its end opposite to the head E′ by a piston head F which latter extends beyond the cylinder bore at f^3 and has close sliding contact beyond the piston with the adjacent end of the cylinder. By reason of the eccentric relation of the bearings of the cylinder B and the piston ring E, there is formed between said piston and the cylinder a crescent-shaped chamber such as is clearly shown in Fig. 3.

H, H′, H² designate hubs or collars which are arranged side by side within the hollow piston and transversely fill the hollow piston space from end to end. They are independently mounted on a bearing sleeve d, shown as made integral with the cylinder head D and which extends inwardly therefrom, being concentric to the inner wall of the cylinder B. Said sleeve d is in turn rotatively mounted on a stationary intake pipe V which extends outwardly through the trunnion d' and is connected with a source supplying motive fluid under pressure through a supply pipe Z.

The collars H, H′, H² carry, respectively, piston bars h, h', h^2, which are disposed at uniform angular distances apart, as clearly shown in Fig. 3. Each of said piston bars is made of a radial length to extend to and have sliding contact with cylinder wall (said collars being disposed concentric to the axis of rotation of the cylinder). The bars are made of a transverse width equal to the width of the cylinder between the heads E′ and F. Said piston bars extend through and have close sliding contact with slotted rollers I, I′, I², which are rockingly mounted at their ends in the piston heads. The said sliding piston bars are concave at their inner edges to fit the cylindric body formed by the group of hubs or collars H, H′, H². The said cylinder body, produced by the hubs or collars referred to, forms within the hollow piston a second crescent-

shaped space disposed on the side of the axis of rotation of the piston opposite to the crescent-shaped space between said piston and cylinder. The said piston bars h, h', h^2, therefore extend from said collars or hubs through the two eccentrically disposed crescent-shaped spaces and divide the inner crescent-shaped space into three separate chambers, J, J', J², and likewise divide the outer crescent-shaped space into three separate chambers, K, K', K². The radial piston bars and the parts with which they cooperate to form said chambers, as well also as other contacting relatively movable members of the engine, may have any desired form of packing known to the art.

The piston, comprising the parts, E, E', F, rotates in the same direction as the cylinder B, and said piston and cylinder are coupled together by means of short, stout links P, P' which are mounted on the crank studs e^3 and f' formed on the piston heads and on other studs c', d^3 formed on the cylinder bearing heads. As herein shown, three of said couplings are employed, being annularly spaced at uniform distances around the axis of rotation of the parts. Said links and their connection to the cylinder and piston are made strong and compact so as to reliably transmit stresses from one rotating part to the other without imposing stress on the piston blades.

The series of chambers K, K', K² are provided with exhaust ports, S, S' and S² which are adapted to be closed at appropriate times by the radial piston bars h, h', h^2, the piston bars having oscillatory movement across the ports during each cycle of rotation of the engine, as will be observed from an inspection of Fig. 3 of the drawing. Such oscillatory movement of the piston bars is due to the eccentricity of the hollow piston relatively to the common axis of rotation of the cylinder and said piston bar collars or hubs, it being obvious that the piston bars are swung away from each other as the inner cylindric body, composed of the hubs H, H', H², approach the piston ring, as shown at the lower side of Fig. 3, and approach each other as the central cylindric body recedes from the piston ring. Thus, during a portion of the cycle of rotation of the engine the exhaust ports are closed by the piston bars and during other portions of said cycle certain of the exhaust ports are open.

The chambers J, J', J² are provided with intake ports, U, u, U', u', U², u^2 formed in the collar H and bearing d and which are adapted to register with ports v, v' formed in the intake pipe V before referred to.

e^{10} designates a series of ports leading from the inner crescent-shaped space within the hollow piston E and the outer crescent-shaped space between said piston and the internal wall of cylinder. Said ports are adapted to be controlled by sliding ported valves L, L', L², which said valves are adapted to be opened by contact with the inner wall of cylinder B and closed by contact with one of the collars H, H', H², or other suitable valve actuating means.

T, T', T² designate auxiliary piston bars which are mounted in the hollow piston E and have a limited radial movement to engage with the inner wall of the cylinder B during the portion of the cycle of rotation of the parts when said ring-like portion of the piston approaches the inner wall of the cylinder, being held a limited distance outwardly by backing springs, as shown. The said auxiliary piston bars serve as steam abutments with respect to the ports in advance of the same as steam passes from the inner to the outer chambers through the piston ports so as to prevent back pressure of steam in said outer chambers. It will be understood that so far as the general function of the auxiliary piston bars are concerned, they may be otherwise mounted and operated.

The engine may be started, governed, stopped and reversed by means of intake valves W, W', (Figs. 3 and 4) which have rocking movement in seats v^2, v^3 formed in the outer wall of the intake pipe V. Said valves are adapted to be operated by a rod X and a sleeve X', respectively, which are mounted concentrically in the intake pipe V, in the manner shown in Fig. 2, and are provided at their outer ends with operating levers Y, Y', respectively, adapted to be connected with a suitable governing device. The connections between the rod X and the sleeve X' and said valves consists of radial rigid arms x, x', as shown in Fig. 4.

In the operation of the engine in an anti-clockwise direction, referring to Fig. 3, the valve W is closed over the port v, and the port v' is opened by operating the valve W' through the medium of the rod X and the lever Y. By rotating the cylinder B about ten degrees, steam or other expansive fluid flows through the ports u', U' to the chamber J' and, reacting upon the piston bar h^2, rotates the engine by expansion to the position shown by J². The valve L', coming in contact with the cylinder B, by reason of the eccentric mounting of the piston, or otherwise operated, is thereby opened and the expansive fluid from said chamber J' flows into the chamber K' thereby rotating the engine by a compound expansion of the motive fluid through the position shown by chamber K to about the illustrated position of chamber K'. The exhaust through the ports S' and S², which are opened at this position by reason of the oscillatory movement of the piston bars h', h^2 with respect to the cylinder B, is now effected. All of the chambers of the two series act in succession in the

manner described during each rotation of the engine.

In the use of the engine, thus constructed, as an explosive engine, the chambers formed by the sub-divisions of the inner crescent-shaped space constitute pump chambers, while those formed by the sub-divisions of the outer crescent-shaped space form the explosion chambers of the engine cylinder. When the construction is embodied in an explosive engine any suitable cooling means known to the art may be employed.

Likewise it will be obvious that the concentrically mounted cylinder B and piston bar carrying collar H, H′, H² and the eccentrically disposed piston, coupled together as shown, may, by proper arrangement of inlet and outlet valves be adapted to use as a fluid compressor.

It will be understood that the structural details of the engine shown may be varied within the spirit and scope of the claims hereto appended and that the invention is not limited to such details except as the same are hereinafter claimed and as imposed by the prior art.

I claim as my invention:—

1. A rotary engine comprising a cylinder and its heads; a piston eccentrically disposed therein; piston bars associated with said cylinder and piston, and short, stout links connected to studs mounted on the cylinder heads and on the ends of the eccentric piston for the purpose set forth.

2. A rotary engine comprising a cylinder and a piston eccentrically disposed therein, with means to couple the piston and cylinder together to rotate them in the same direction, inlet ports, exhaust ports, and radial piston bars to divide the cylinder into separate chambers and to control said exhaust ports.

3. A rotary engine comprising a cylinder; a piston eccentrically disposed therein; main piston bars associated with said cylinder and piston and dividing the crescent-shaped space between the cylinder and piston into a plurality of chambers; a plurality of ports in the piston between each two adjacent main piston bars; valves controlling said ports; auxiliary piston bars between the ports of each pair, and means to couple the cylinder and piston to rotate them in the same direction.

4. A rotary engine comprising a cylinder; a piston eccentrically disposed therein; main piston bars associated with said cylinder and piston and dividing the crescent-shaped space between the cylinder and piston into a plurality of chambers; a plurality of ports in the piston between each two adjacent main piston bars; valves controlling said ports; auxiliary piston bars between the ports of each pair, and means independent of the main piston bars for coupling the cylinder and piston to rotate them in the same direction.

5. A rotary engine comprising a cylinder; a piston eccentrically disposed therein; main piston bars associated with said cylinder and piston and dividing the crescent-shaped space between the cylinder and piston into a plurality of chambers; a plurality of ports in the piston between each two adjacent main piston bars; valves controlling said ports; auxiliary piston bars between the ports of each pair, and means to couple the cylinder and piston to rotate them in the same direction, said cylinder being provided with a series of exhaust ports controlled by said main piston bars.

6. A rotary engine comprising a cylinder provided with exhaust ports, a hollow piston eccentrically disposed therein to form a crescent-shaped space, a cylindric body disposed eccentrically within the hollow piston and concentrically to said cylinder to provide within the hollow piston a crescent-shaped space eccentrically opposite to the first-mentioned crescent-shaped space and composed of separately rocking collars or hubs, with means to couple the piston and cylinder together, whereby they rotate in the same direction, and piston blades severally fixed to said collars or hubs and extending through packed openings in the hollow piston and engaging at their outer edges the inner wall of said cylinder.

7. In a rotary engine, means for providing two series of inner and outer lunate chambers by means of eccentrically mounted rotary members, said members coupled together and adapted to rotate in the same direction; steam abutment members in said chambers; valved ports between adjacent inner and outer pairs of said chambers of said two series and inlet and exhaust ports, whereby the chambers are compoundedly acted upon by an expansive fluid to produce rotary motion of said members.

8. The combination of eccentrically mounted rotary members which are coupled together and adapted to rotate in the same direction, whereby two series of lunate chambers are formed, of valve connections between pairs of chambers of said two series, with means whereby they may be operated and inlet and exhaust ports, substantially as set forth.

9. The combination with a cylinder, a piston eccentrically mounted therein to form within the cylinder a crescent-shaped space, piston bars to divide said crescent-shaped space into a plurality of chambers, and couplings between the ends of the piston and cylinder and independent of the piston bars to connect said cylinder and piston to rotate in the same direction, with valved inlet and exhaust ports associated with said chambers.

10. A rotary engine comprising a cylinder

member, a piston member eccentrically disposed therein to rotate in the same direction as the cylinder member, a piston separate from and movable over a bearing face of the cylinder member curved concentrically to the axis of the cylinder member and a coupling member between the piston member and the cylinder member, constructed to operate wholly independent of the piston to transmit stresses from one member to the other.

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