1-430

Drawing

C. J. HUBBARD.

ROTARY ENGINE.

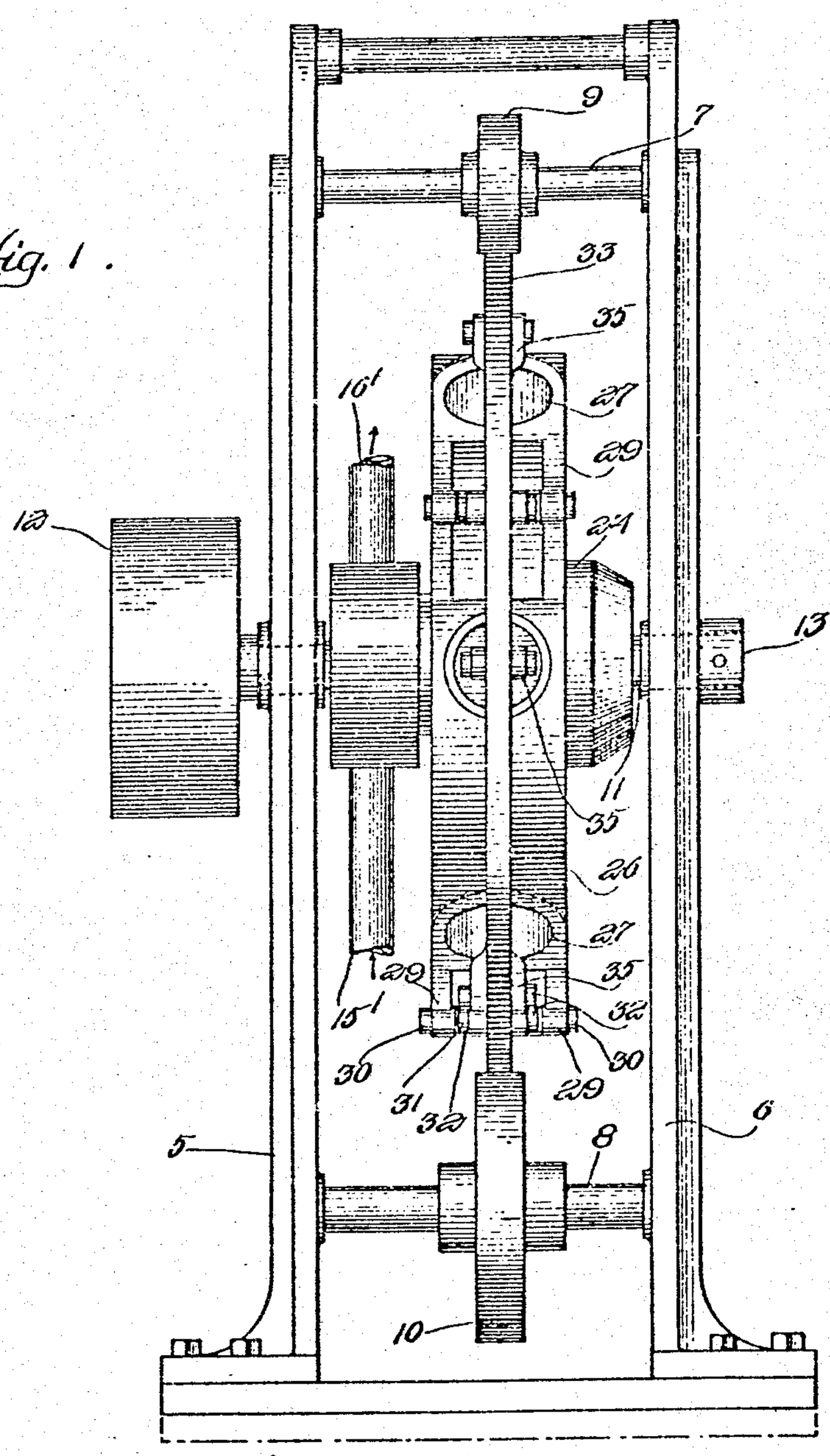
APPLICATION FILED MAR. 7, 1910.

988,938.

Patented Apr. 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

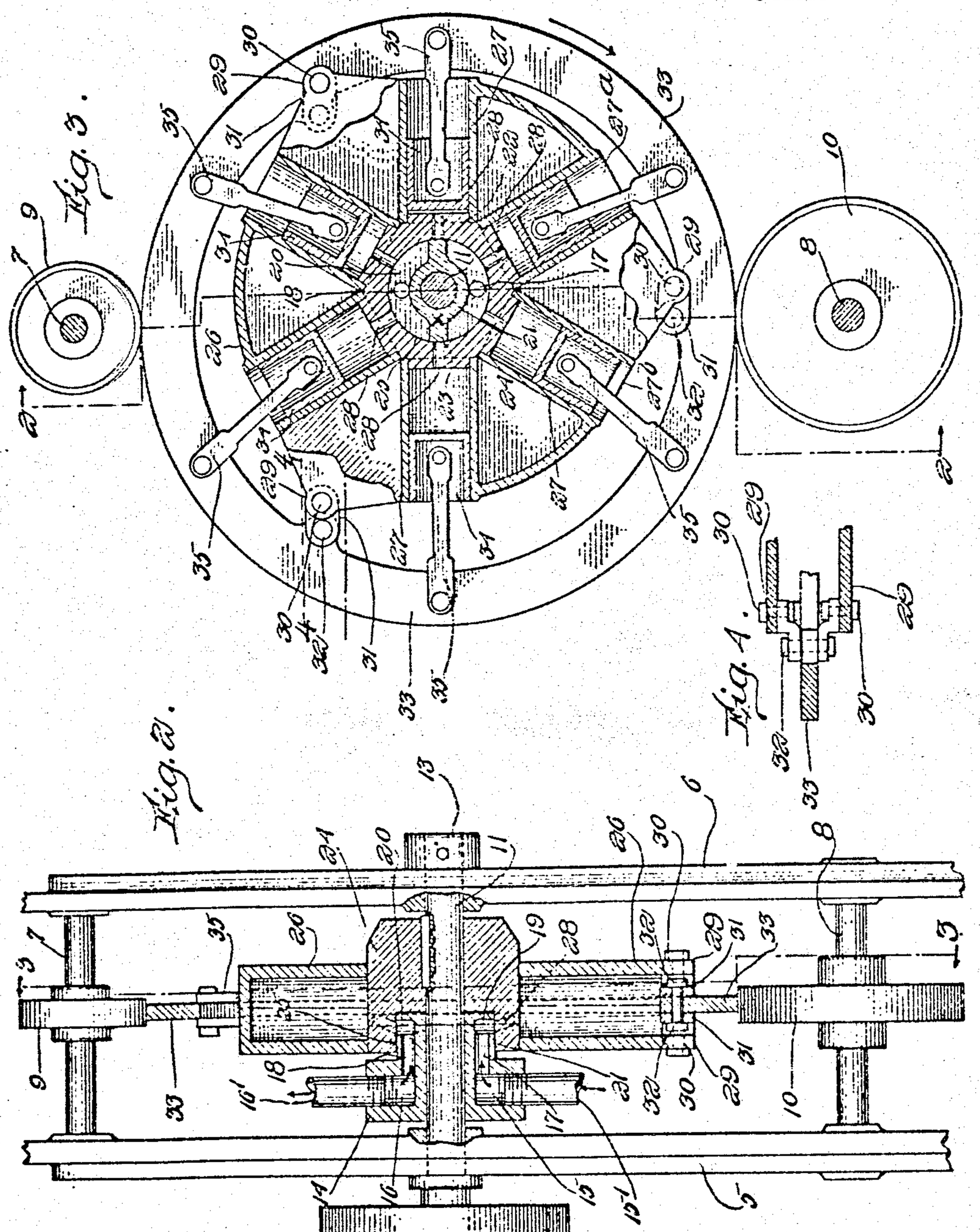

Fig. 4.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

988,938. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed March 7, 1910. Serial No. 547,747.

To all whom it may concern:

Be it known that I, CHARLES J. HUBBARD, of Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

This invention has reference to improvements in rotary engines having series of prime movers adapted to be driven by elastic fluid and comprising two members, *i. e.* a primary and a secondary or annular member rotatable conjointly about different axes.

The object of this invention is to so construct a rotary engine that the actuating mechanism or primary member thereof may be balanced with respect to the driven element, whereby vibration of the engine is reduced.

Other objects of the invention will appear from the following description.

The invention consists in the peculiar features of construction and combination of parts as shall hereinafter be more fully described and pointed out in the claims.

Figure 1, represents an end view of the improved rotary engine. Fig. 2, represents a partial sectional view of the engine taken on line 2—2, Fig. 3. Fig. 3, represents a partial sectional view taken on line 3—3 Fig. 2. Fig. 4, represents a sectional detail view, taken on line 4—4, Fig. 3, showing the manner in which the primary member is pivotally connected to the annular member.

Similar numerals of reference designate corresponding parts throughout.

In carrying this invention into practice, in its preferred construction, I provide a frame having the side members 5 and 6, herein shown as vertical, connected by the shafts 7 and 8 on which are rotatively mounted the respective rollers 9 and 10.

Journaled in bearings of the frame members 5 and 6 is the shaft 11 having the pulley 12, at one end, and the usual collar 13 at the other end. This shaft 11 extends through and supports the fluid delivery and exhaust member 14 having the inlet chamber 15 and the exhaust or outlet chamber 16 which are connected, by the channels 17 and 18, respectively with the segmental grooves 19 and 20 formed in the periphery of the contracted extension 21 of said member 14, the material between the ends of said grooves 19 and 20 forming the cutoffs 22 and 23. Elastic fluid, under pressure, is supplied to the chamber 15 through the pipe 15′ and the exhausted gases are conveyed from the chamber 16 through the pipe 16′.

Keyed to the shaft 11 is the hub 24 which at one end has the chamber 25 into which the contracted extension 21 of the member 14 extends. The primary member or prime mover member 26 is formed in part with the hub 24 and is furnished with a series of radially extending cylinders 27, 27, open at their outer ends and having at their inner ends ports 28, 28 formed in the hub 24 and communicating with the chamber 25 at points in line with the segmental grooves 19 and 20 of the contracted extension 21 of member 14. At equal distances around the periphery of the member 26 are pairs of ears 29, 29 furnished with pivots 30, 30 on which links 31, 31 are pivotally mounted, said links being also pivotally mounted on the studs 32, 32, mounted on the annular rotary member or ring 33, which is supported between rollers 9 and 10. Freely slidable in the cylinders 27, 27 are the pistons 34, 34 having pivoted piston rods 35, 35 each of which at its outer end, is pivotally connected with the ring 33.

It is to be noticed that the ring 33 rotates about axis x which is eccentrically disposed with relation to the axis of the shaft 11 and that this offset of the axis x from that of said shaft 11 equals the distance between the axes of pivots 30 and 32 which would represent the throw of the crank of an ordinary reciprocating engine, while the thrust of the piston rods on the ring 33 is resisted by the roller 10 and its shaft 8.

As shown in Fig. 3 of the drawings, cylinder 27^a is receiving steam or other elastic fluid, under pressure, through its port 28 from the groove 19 of the motive fluid delivery member 14 and the piston 34, of said cylinder, moving outward, under pressure of the fluid, exerts an outward thrust, by means of the piston rod 35 on the rotary ring 33, at an angle to the radius of said rotary ring. As such outward thrust is resisted by roller 10 which rotates freely, rotation of ring 33 in the direction of the arrow is effected. As the cylinders move from position of cylinder 27^a to that of 27^b the thrust of the piston rods continues to be exerted at an angle to the radius of ring 33, such angle being measured by the angle

that would be shown in Fig. 3 by lines drawn through the axes of the two members and meeting in the center of the outer pivoted connection of the connecting rods. The force of the outward driven pistons will be exerted rotatively during the half revolution; that is, while said angle is maintained. In such forward rotation movement of the ring 33, in the direction indicated by the arrow in Fig. 3, the member 26 is drawn in the same direction by the links 31, and the shaft 11, to which the hub 24 of said member 26 is keyed, is driven. As the ports 28, 28 of the respective cylinders move in succession past the wall or cut off 23 the motive fluid supply is cut off from said ports and, immediately thereafter, said ports are brought into communication with the outlet groove 20 which receives the exhausted gases from said ports in succession as the pistons are forced into their cylinders by reason that the path of movement of the ring 33 at the exhaust side is nearing the axis of the member 26 until the ports 28 are brought, in succession, in line with the wall or cut off 22 of the motive fluid supply chest formed by the contracted portion 21 of members 14.

It should be noted that the ring 33, being pivotally connected by links with the primary member 26, which revolves on a fixed axis, the revolution of the ring 33 upon another fixed axis, is secured by confining the ring 33 in such manner that it cannot be forced in either direction upon a line that is at a right angle to the common plane of the two axes. The method of such confinement herein shown is by means of the rollers 9 and 10, but I do not thus limit myself.

While I have herein described a prime mover member particularly adapted for operation by steam or other elastic fluid, supplied from a source exterior to the engine, it is obvious that the cylinders may be arranged for the internal combustion of fuel.

It is to be noted that the links 31, 31, are always parallel to each other and to the median line of said member 26 and ring 33, drawn through their axes, whereby the action of said links is to balance each other.

Having thus described my invention I claim as new and desire to secure by Letters Patent—

1. A rotary engine comprising a primary member including a plurality of fluid pressure operated pistons and piston rods pivotally connected at their inner ends to the pistons, a shaft extending through the primary member and projecting from each side thereof, bearings for the projecting ends of said shaft, an annular member surrounding the primary member and having its axis parallel to and off-set with respect to the axis of the primary member and further having the outer ends of the piston rods pivotally-connected thereto, links having their ends connected respectively to and overlapping said members and independent of the piston rods and disposed for securing the rotation of the annular member synchronously with the primary member on a fixed axis, and friction reducing devices bearing against opposite sides of the annular member and so disposed as to prevent the rotation of the axis of the annular member about the axis of the primary member and further confining the annular member in the plane of the thrust of the pistons in two directions at right angles to the longitudinal direction of the links.

2. A rotary engine comprising a primary member including a plurality of fluid pressure operated pistons and piston rods pivotally connected at their inner ends to the pistons, a shaft extending through the primary member and projecting from each side thereof, bearings for the projecting ends of said shaft, an annular member surrounding the primary member and having its axis parallel to and off-set with respect to the axis of the primary member and further having the outer ends of the piston rods pivotally-connected thereto, bearings carried by the primary and annular members, and with the bearings of one member in close proximity to the bearings of the other member, links pivotally-connected at one end to the bearings of the primary and at their other ends to the bearings of the annular member and independent of the piston rods and disposed for securing the rotation of the secondary synchronously with the primary on a fixed axis, the bearings for said links being extended in two directions so that the bearings and the wear upon them will be at all times true and central, and friction reducing devices bearing against opposite sides of the annular member and so disposed as to prevent the rotation of the axis of the annular member about the axis of the primary member and further confining the annular member in the plane of the thrust of the pistons in two directions at right angles to the longitudinal direction of the links.

3. A rotary engine comprising a shaft, a hub keyed to said shaft intermediate the ends thereof, a primary member surrounding said hub and including a series of cylinders radially disposed with respect to and secured to the hub, said primary member further including pistons mounted in said cylinders and piston rods pivotally connected to the pistons, means for supplying and exhausting motive fluid to and from the cylinders through the hub, an annular member surrounding the primary member and having its axis parallel to and off-set with respect to the shaft, means for pivotally-connecting the piston rods to said annular

member, outwardly extended bearings carried by said primary member and inwardly extended bearings carried by said annular member and in close proximity to the bearings of the primary member, said bearings permanently extending in parallel planes, links having their ends pivotally connected upon the extended bearings of said members and permanently disposed in planes extending transversely with respect to the axis of said annular member and shaft, and revoluble bearings engaging the periphery of said annular member.

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