M. MEHLE.

ROTARY MOTOR.

APPLICATION FILED JAN. 14, 1915.

1,244,529.

Patented Oct. 30, 1917.

5 SHEETS—SHEET 1.

Fig. V.

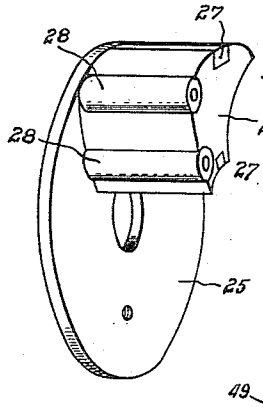


Fig. I.

Witnesses:

Herman Esch

J. Geo. V. Bowers

Inventor:

Michael Mehle

by his Atty Louis B. Mueller.

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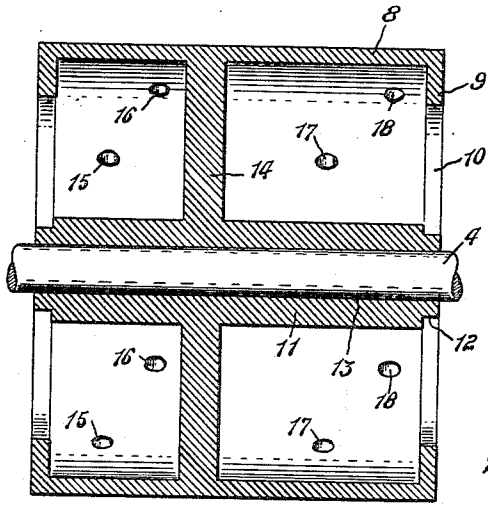


Fig. III.

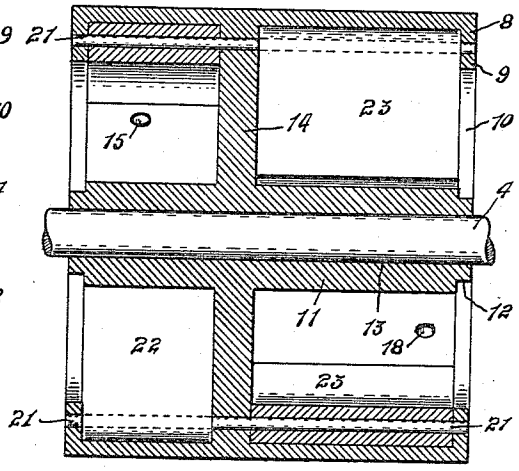


Fig. IV.

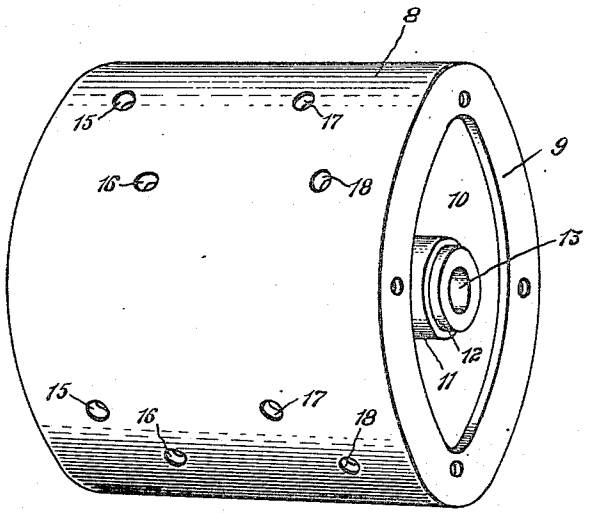


Fig. II.

Witnesses:

Herman Ruckh

J. Geo. Barnes

Inventor:

Michael Mehle

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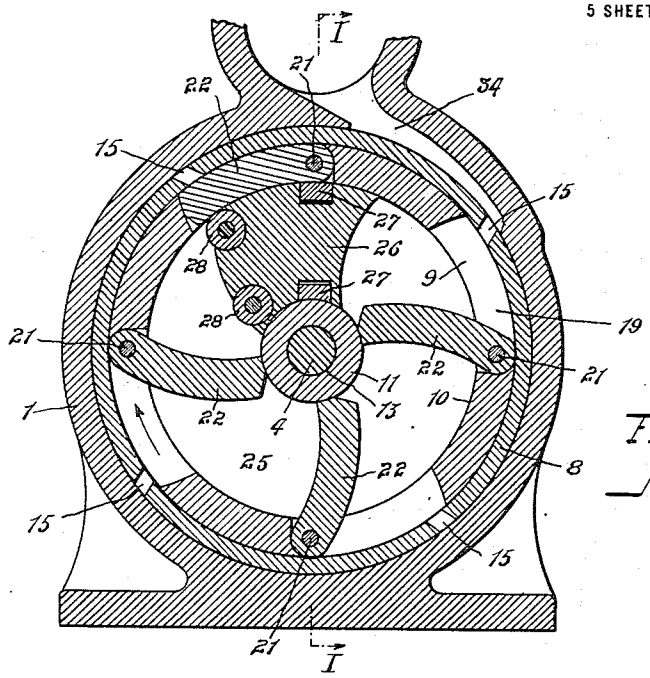


Fig. VI.

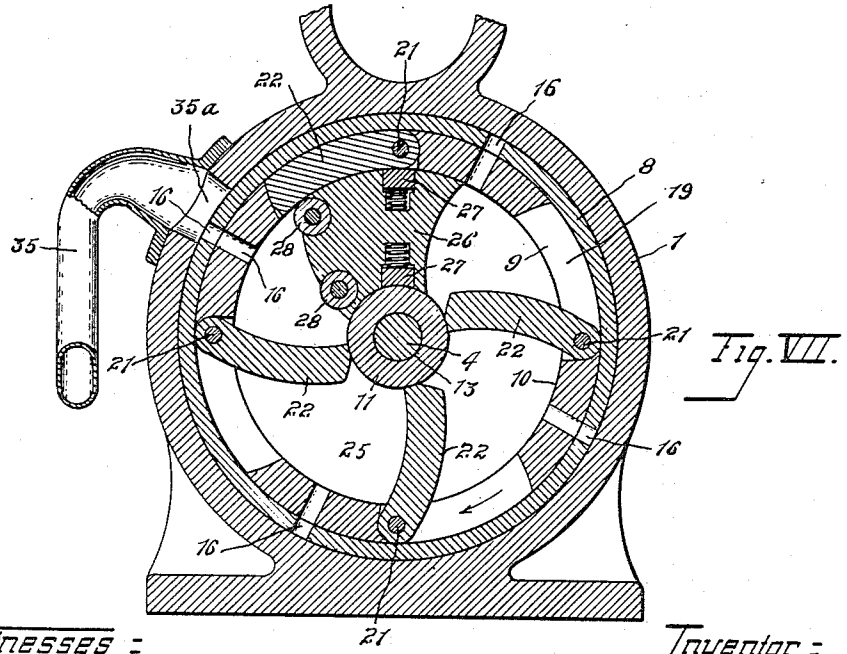


Fig. VII.

Witnesses:

Herman Eisele

J. Geo. Bause

Inventor:

Michael Mehle

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M. MEHLE.

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APPLICATION FILED JAN. 14, 1915.

1,244,529.

Patented Oct. 30, 1917.

5 SHEETS—SHEET 4.

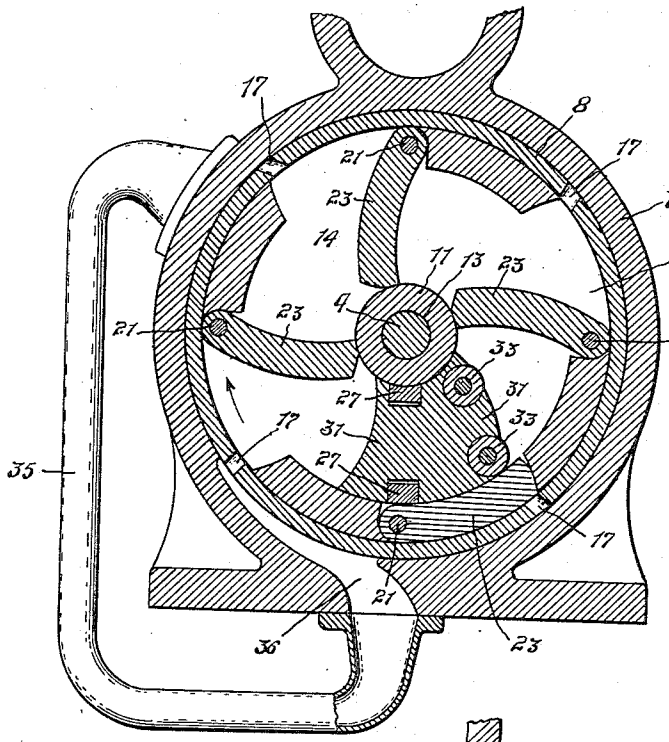


Fig. VIII.

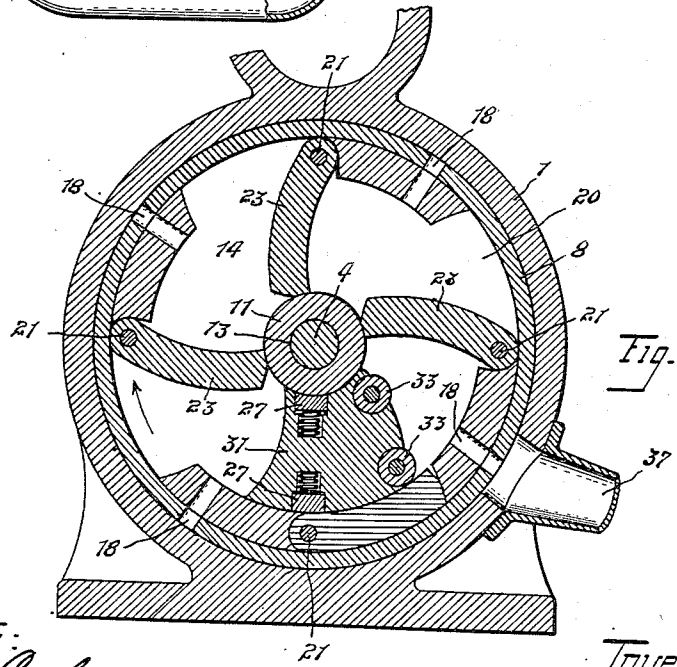


Fig. IX.

Witnesses:

Herman Eisele

J. Geo. Barnes

Inventor:

Michael Mehle

by his Atty

M. MEHLE.

ROTARY MOTOR.

APPLICATION FILED JAN. 14, 1915.

1,244,529.

Patented Oct. 30, 1917.

5 SHEETS—SHEET 5.

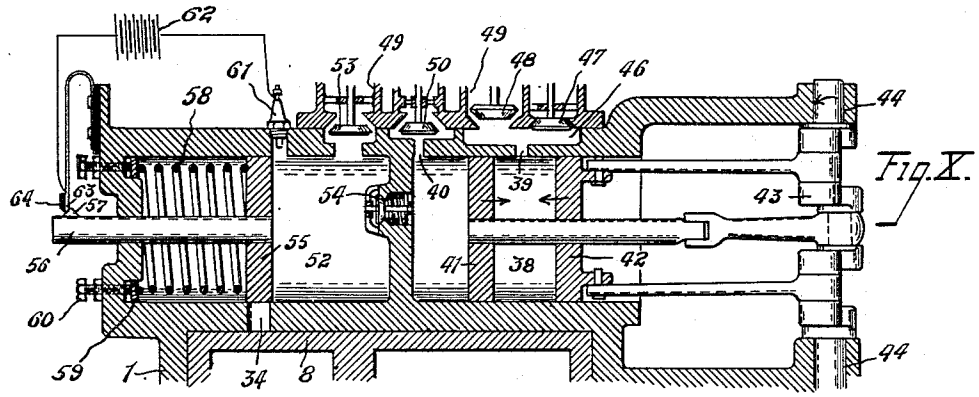


Fig. X.

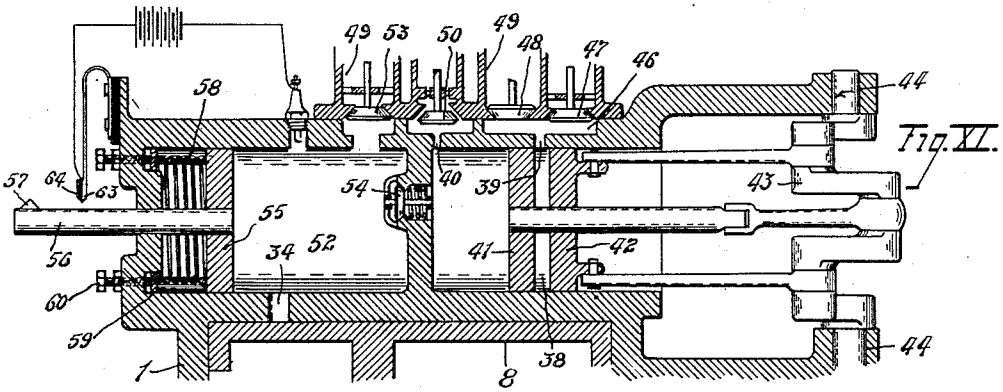


Fig. XI.

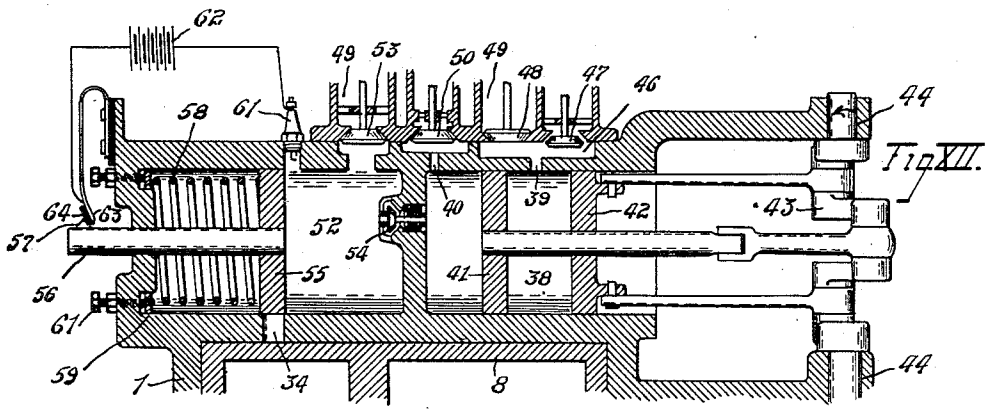


Fig. XII.

Witnesses:

Herman Earle

J. Geo. Barse

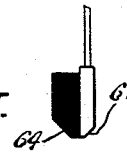


Fig. XIII.

Inventor:

Michael Mehle

by his Atty

Carl A. Mueller.

UNITED STATES PATENT OFFICE.

MICHAEL MEHLE, OF CLEVELAND, OHIO, ASSIGNOR OF NINE-FORTIETHS TO J. GEORGE BANSE AND NINE-FORTIETHS TO CHRISTIAN PETERSEN, BOTH OF CLEVELAND, OHIO.

ROTARY MOTOR.

1,244,529. Specification of Letters Patent. Patented Oct. 30, 1917.

Application filed January 14, 1915. Serial No. 2,255.

To all whom it may concern:

Be it known that I, MICHAEL MEHLE, a subject of the Emperor of Austria, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Rotary Motors, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates generally to rotary motors and more particularly to one adapted for any conceivable expansible working fluid. The drawings merely exemplify an adaptation for an explosive mixture.

The object of my invention has been to design a rotary motor which besides being compact, light and durable will more nearly approach a consummation in efficiency and silence under high speed of operation by reason of reduced friction.

Heretofore, within my knowledge, vanes have been movable independently of movement of the rotor to which they were attached, also, they have been made to swing both toward and away from the rotor shaft. As attesting my familiarity with some earlier inventive efforts I cite United States patents numbered 342,079; 612,191; 634,511; 646,420; 653,788; 704,913; 789,760; and 990,222.

The essential principle of my invention as contradistinguished from such enumerated patents is associated with vanes pivoted outwardly to swing toward the axis and revoluble in unison with, not, relatively to either an inward or an outward confining wall or both. In this manner not only is noisy impact therebetween avoided but the attendant friction as well, and pressure instead of reacting from a fixed surface to concentrate against a moving surface, is equalized between moving surfaces.

The inventive conception is associated with means which are hereinafter explained and variously combined in the claims. While the annexed drawings and particular description thereof, set forth the preferred form embodying my invention, it should be understood that the means only exemplifies one of many diversified mechanical forms with which the principle of my invention may be properly applied.

Figure I is a part section part elevation of a turbine embodying my invention together with certain accessory parts of conventional design.

Fig. II is a perspective view of the rotor.

Fig. III is an axial section of Fig. II showing the primary shaft in place.

Fig. IV is a view corresponding to Fig. III with the vanes also in place.

Fig. V is a perspective view of one of two members adapted to fit against one end of the rotor.

Fig. VI is a section on line VI VI of Fig. I looking in the direction indicated by the arrows.

Fig. VII is a section on line VII VII of Fig. I similarly viewed.

Fig. VIII is a section on line VIII VIII of Fig. I looking in the same direction.

Fix. IX is a section on line IX IX of Fig. I looking in the direction of the arrows.

Figs. X, XI, XII are mainly sectional views showing relative positions of the mechanical agents coöperating to the conversion of the working fluid, different from the position of such agents as illustrated in Fig. I.

Fig. XIII is an enlarged detail of the spark contact.

We notice first in Fig. I that a hollow cylindrical casing 1 has alined bearings 2 and 3 in which the primary shaft 4 is to move. This shaft carries outwardly of the casing a bevel gear 5 while a further continuation thereof is operatively connected with any approved type of high volume blower 6 from which an outlet pipe 7 of accommodation length and shape leads. Mounted for rotary movement as a close mechanical fit within the casing 1 and on the shaft 4 is an annular rotor 8 having annular flanged ends 9 leaving the openings 10 surrounding a hub 11 with slightly reduced extremities 12. The bore of the hub 11 through which the shaft 4 passed has been designated by the numeral 13. The rotor is divided unequally by a partition 14 as is well shown in Figs. I, III and IV. The smaller of the two divisions of the rotor or that one which appears at the left in the figures just referred to, constitutes an initial expansion chamber while the larger is in consequence the secondary expansion chamber. The rotor chamber 8 is fashioned with four sets of peripheral apertures, there being four in each set and quadrantly spaced. The initial expansion cham-

ber has four equi-spaced inlet orifices 15 and four proximately arranged exhaust ports 16. Similarly the secondary expansion chamber has four equi-spaced inlet orifices 17 and four equi-spaced exhaust ports 18. The arrangement of the orifices and ports just mentioned is very clearly seen in Fig. II.

The rotor is fully shown in axial section in Fig. IV and in the series of four transverse sections shown by Figs. VI, VII, VIII, and IX. It is to these five figures together with the disclosure of Fig. I that attention is now invited for an understanding of the construction. Consideration of Fig. VI discloses four quadrantly spaced cut-out portions 19 which are in direct communication each with one of the inlet orifices 15 and such cut-out portions may be considered as enlargements of said openings respectively. The secondary expansion compartment is similarly provided with four quadrantly spaced cut-out portions 20 as interior enlargements of and in registry with the four inlet orifices 17. The four cut-out portions 19 are peripherally opposite the four cut-out portions respectively. Four rods 21 pass through alined openings in both of the flanges 9 as appears in Fig. II and also through the partition 14 as appears in Fig. I. These rods are shown in section II in Figs. VI to IX inclusive. Pivotally supported upon each of the rods 21 are a pair of sets of vanes one set of four designated as 22 being within the initial expansion chamber and another set of four vanes 23 in the secondary expansion chamber. The vanes are adapted to fit the cut-out portions 19 and thereby close the inlet orifices 15 or swing inwardly toward and about the hub 11. The vanes 23 are adapted either to snugly occupy the cut-out portions 20 and to close the inlet orifices 17 or to swing inwardly toward the center to butt the hub 11 as a close mechanical fit.

Seated in one of the end openings 10 and secured to the end wall of the casing 1 by means of cap screws 24 passing through suitable openings therein is a disk 25. The disk 25 carries a tripping device portion 26 adapted to extend across the initial expansion chamber and lie in contact with the partition 14. The portion 26 also abuts the interior surface of the rotor chamber and the hub 11, a closure being effected therebetween by means of a pair of oppositely projected and yielding packing surfaces 27 well shown in Figs. I and VII. That exposed side of the portion 26 which is being approached by the vanes 22 according to the direction of rotation indicated by the arrows in Figs. VI and VII carries a pair of protruding anti-friction rollers 28. Seated in the opposite opening 10 is a disk 29 which is similarly secured to the casing by means of cap screws 30. The disk 29 is a duplicate of the disk 25 excepting that the portion 31 projects a greater distance owing to the greater width of the secondary expansion chamber. Such portion 31 is in this case moreover disposed around a distance of 180 degrees with reference to the location of the portion 26 as is apparently inspecting Fig. I and by comparison of say, Figs. VI and VIII. The portion 31 also similarly abuts the interior surface of the secondary expansion chamber and the hub, a closure being effected between it and the former by means of two yielding surfaces 27 well shown in Figs. I and IX. That exposed side of portion 31 which is being approached by the vanes 23 in consideration of the direction of rotation indicated by the arrows in Figs. VIII and IX likewise carries a pair of protruding anti-friction rollers 33.

The casing 1 is provided opposite the initial expansion compartment with an inwardly flared duct 34 shown in Figs. I and VI, with which duct the four inlet orifices 15 are adapted to register successively. A suitable pipe connection 35 fully shown in Fig. VIII connects an enlarged outlet opening 35^a communicating through the casing 1 with the exhaust port 16, of the initial expansion chamber with an inwardly flared inlet opening 36 communicating with the secondary expansion chamber along the path of movement of the inlet orifices 17. The casing 1 is finally provided with a discharge outlet 37 in the path of movement of the exhaust ports 18 so as to register successively therewith the exhaust ports 18.

Above the casing 1 will be seen a receiving chamber 38 which communicates with an air inlet 39 and a fuel inlet 40. The gaseous elements of the mixture which are to be drawn into and expelled from the mixing chamber 38 are influenced as to their course of direction by the movement of two reciprocal pistons 41 and 42, the latter constituting movable end walls of the mixing chamber. They are alternately operable toward and away from each other by means of a crank 43 mounted in suitable bearings 44 which are fashioned in extensions of the casing 1. A bevel gear 45 is supported on a protruding extremity of the crank shaft 43 to lie in mesh with the bevel gear 5 by means of which any motion on the part of the shaft 4 may be transmitted into properly synchronized movement on the part of the pistons 41 and 42. The air inlet 39 is somewhat enlarged outwardly to form an auxiliary chamber 46 into which a common type of puppet valve 47 opens to afford communication with the blown air supply pipe 7 as is clearly seen in Fig. 1. Also communicating with the auxiliary chamber 46 though opening outwardly away from it is another puppet valve 48 leading into a conduit 49 which will presently be referred to.

The fuel inlet 40 is also enlarged somewhat in an outward direction and is adapted to have a puppet valve 50 open into it and afford communication to a carbureter 51.

Located alongside the mixing chamber 38 is an explosion chamber 52 and into it a puppet valve 53 is adapted to open to afford communication with the air conduit 49. Communication is to be intermittently established between the explosion chamber 52 and the mixing chamber 38 by means of a puppet valve 54 opening into the former. It is from the explosion chamber 52 that the main inlet 34 leads into the rotor casing. A piston 55 is positioned for movement in the explosion chamber 52. It carries a rod 56 extending outwardly of the explosion chamber and there formed with a lug 57. The movement of the piston 55 is controlled by the action of the spring 58, the tension of which may be adjusted according as the adjusting of a ring 59 by means of cap screws 60 is accomplished. Any suitable type of igniter 61 is provided in connection with a battery 62 and also a yielding spark contact 63 supported and suitably insulated from the frame so as to be located in the path of movement of the lug 57. The outer side of the spark contact 63 is insulated at 64 as is seen in Figs. I and XIII, whereby a spark is effected only during the movement of rod 56 in one direction and specifically in a direction tending to cause the compression of the spring 58.

The coöperation of the several converting agents may now be cursorily explained as follows, attention being invited to Figs. X, XI, XII and I in the order named:

In following the cycle of operation as just now directed and looking first to Fig. X which indicates the position of the parts when air is being introduced into the explosive chamber just prior to explosion, it will be noticed that the two pistons 41 and 42 are approaching each other as suggested by the arrows, thereby expelling the air against the action of the puppet valves 48 and 53. At the same time fuel is being drawn in by the opening of the puppet valve 50 in response to the creation of a vacuum behind the piston 41. The enforced entrance of air and hence presence of pressure in the explosion chamber 52 to which fuel will be presumed as having already been supplied is calculated to force the piston 55 and hence the rod 56 outwardly until the lug 57 has effected an electrical contact and occasioned an explosion. The result of such explosion is illustrated in Fig. XI where it will be seen that the lug 57 has been carried some distance beyond the normal position of the spark contact 63 and upon its reaction is to engage the insulation 64 to prevent a spark during such return movement. In the meantime the pistons 41 and 42 have reached the limit of operation toward each other preparatory to their movement of separation as seen in Fig. XII, wherein the parts are seen when the gas is being introduced into the explosion chamber through the puppet valve 54. At the same time the puppet valve 47 is again permitted to open to a fresh supply of air. The finish of such expulsion of fuel into the explosion chamber is seen in Fig. I, and is to be directly followed by the entering of air to commingle with it as was explained in connection with Fig. X. The gases of combustion following the explosion and the position of the parts shown in Fig. XI are caused to be discharged through the opening 34 and into one or the other of the initial inlet orifices 15 to swing open the particular vane 22 which had closed such orifice. Thereafter, as will be understood from an inspection of Fig. VI the expansive energy will be exerted against such vanes rather than against the fixed wall or portion 26 thereby tending to propel the rotor. After the vanes 22 have been carried around through an arc of approximately 270 degrees the discharge ports 16 will successively register with the opening 35^a in the casing as shown in Fig. VII. When pressure is thus successively released into the duct 35 as velocity the particular vane which is following the particular port 16 through which such discharge has been made, is about to engage with the rollers 28 preparatory to again being rolled into its closed position for passage between the interior surface of the casing and the peripheral surface of the portion 26. The discharged gases pass through the duct 35 and the secondary inlet opening 36 into the secondary expansion compartment through the inlet orifices 17, to likewise successively throw open and propel the vanes 23 and eventually emerge through the exhaust ports 18 and exhaust opening 37.

Especial mention is again made of the fact that the vanes 22 and 23 while independently movable, nevertheless revolve in unison with any surfaces it is possible for them to contact. This feature constitutes the essence of my invention.

I claim:—

1. A rotary motor comprising a casing provided with an inlet, a shaft projected axially therein, a rotor movable within said casing and having orifices adapted to register with said inlet, vanes opposite each such orifice, a chamber in communication with said inlet, and means including a pair of coacting pistons controlled by the movement of said shaft for supplying fuel to said chamber at predetermined intervals and for converting the same into a motive fluid.

2. A rotary motor comprising a casing, a rotor including an annular compartment having concentric walls and a hub, a vane pivotally mounted to the larger wall of said

compartment and adapted for movement both with and within said casing, such larger wall being provided with a duct, an explosion chamber in communication with said duct, and agencies whereby the thermal energy of the working fluid is converted into kinetic energy within said chamber to be synchronously impinged through such duct and against such vane.

3. A rotary motor comprising a cylindrical casing having an inlet duct, a shaft axially positioned therein, a cylindrical rotor chamber including a hub about said shaft and revoluble between said casing and shaft, a plurality of vanes pivoted interiorly to the outward wall of said rotor chamber, the latter having inlet and outlet ports, free extremities of said vanes being shaped to engage and conform to said hub and means for successively impinging a motive fluid through said inlet and against such vanes as the latter in turn pass the former.

4. A rotary motor comprising a cylindrical casing, having an inlet duct and a discharge outlet, a shaft axially positioned therein, an annular rotor chamber snugly revoluble between said casing and shaft and provided with equispaced inlet orifices and outlet ports in staggered relation thereabout respectively, said orifices and ports being adapted to register with said duct and discharge outlet respectively, a vane pivotally mounted to the outer wall of said chamber and adapted to extend across the latter, and means for impinging a motive fluid against such vane.

5. A rotary motor comprising a casing having an inlet duct, a shaft therein, a hollow rotor movable with said shaft, a closed partition thereacross, said rotor having inlet ports adapted to register with said duct, a plurality of vanes movable both with and within said rotor on each side of said partition, an explosion chamber in communication with said inlet duct, agents controlled by the movement of said shaft whereby the thermal energy of the working fluid is converted into kinetic energy within said chamber, and then expanded through said duct to impinge against the vanes on one side of said partition, and means for connecting such side with the other side of said partition.

6. A rotary motor comprising a casing, a shaft therein, a hollow rotor movable therein and having a hub about said shaft, a fixed member positioned within said rotor, and having a concentric surface spaced from one wall thereof, a concavo-convex vane pivotally carried by said rotor outwardly beyond said hub, the free end of said vane being adapted to abut said hub, rollers upon said member adapted to be engaged by the concave surface of said vane whereby to permit it to pass between said member and wall with said concentric and concave surfaces opposed to each other, and means for impinging a motive fluid against such vane.

7. A rotary motor comprising a casing, having an opening, an annular rotor chamber revoluble therein, a fixed member projected into said rotor and abutting the inward wall thereof, said rotor being provided with circumferential sets of inlet and outlet ports respectively adapted to register with one side of said opening, a plurality of vanes movably attached to the outward wall of said rotor opposite said sets of ports, an explosion chamber in communication with the other side of said opening, agents whereby the thermal energy of the working fluid is converted into kinetic energy impinging within said explosion chamber, such kinetic energy impinging against such vanes and adapted to force them into one extreme position, said member being adapted to return said vanes to the other extreme position.

Signed by me, this 13th day of January, 1915.

MICHAEL MEHLE.

Attested by—
FRANK O. MOYER,
DELO E. MOOK.