United States Patent

[11] **3,581,718**

[72] Inventor **David V. Petty**
11125 Osage Avenue, Inglewood, Calif. 90304

[21] Appl. No. **775,831**
[22] Filed **Nov. 14, 1968**
[45] Patented **June 1, 1971**

[54] **ROTARY INTERNAL COMBUSTION ENGINES**
8 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **123/44, 91/491**
[51] **Int. Cl.** **F02b 57/00**
[50] **Field of Search** ..... 123/44 (D); 91/202, 491 (NS); 103/161; 230/177; 92/58

[56] **References Cited**

UNITED STATES PATENTS

1,184,651	5/1916	Johnston	123/44(D)

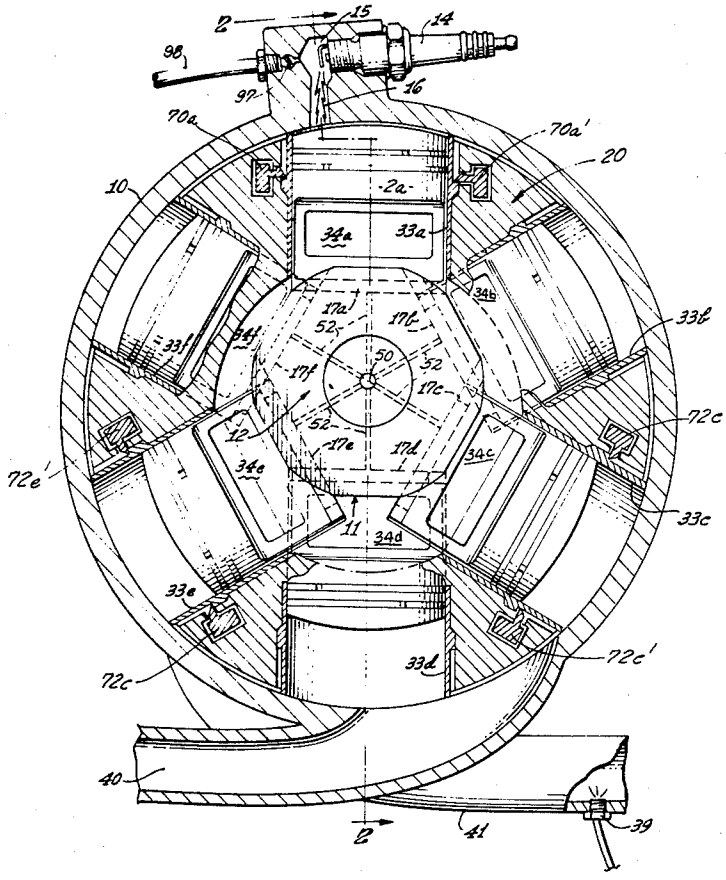
FOREIGN PATENTS

539,675	4/1922	France	103/61
1,265,921	5/1961	France	103/161
837,081	6/1960	Great Britain	103/161

Primary Examiner—Allan D. Herrmann
Attorney—Leroy J. Leishman

ABSTRACT: A rotary internal combustion engine including: a housing comprising a first cylinder **10** closed by parallel end plates, **101** and **101***a*, said housing having an engine block **20** rotatably mounted therein and containing a rotor **11** whose rotational axis is coincident with the axis of said first cylinder, said end plates each having a ball bearing (**19** and **19***a*) eccentrically mounted therein and symmetrically disposed with respect to the ball bearing in the opposite end plate:

a plurality of piston cylinders angularly spaced from each other around said axis within said engine block; a plurality of pistons each slidably mounted in a different one of said piston cylinders and operatively connected to said rotor, said first cylinder having a fuel intake port **41** a and an exhaust outlet **42** angularly spaced therearound, the eccentricity of said ball bearings with respect to the axis of the rotor determining the throw of the pistons; said rotor having a shaft extending from both ends thereof for transmitting power therefrom.



PATENTED JUN 1 1971

3,581,718

SHEET 1 OF 3

Fig. 1

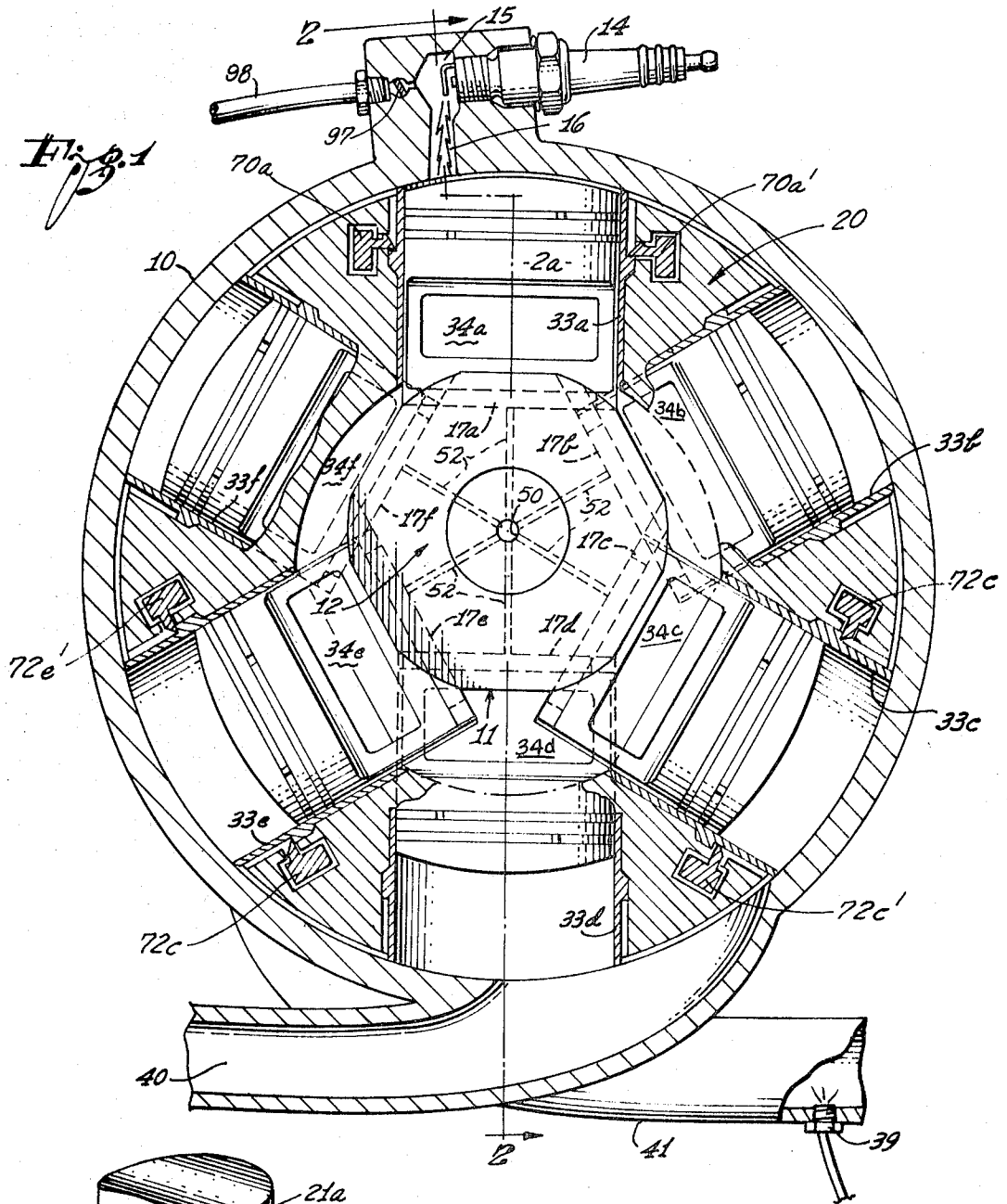
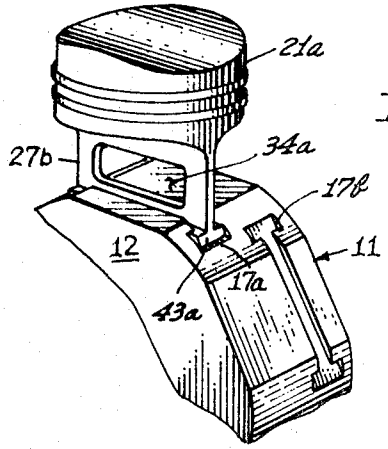


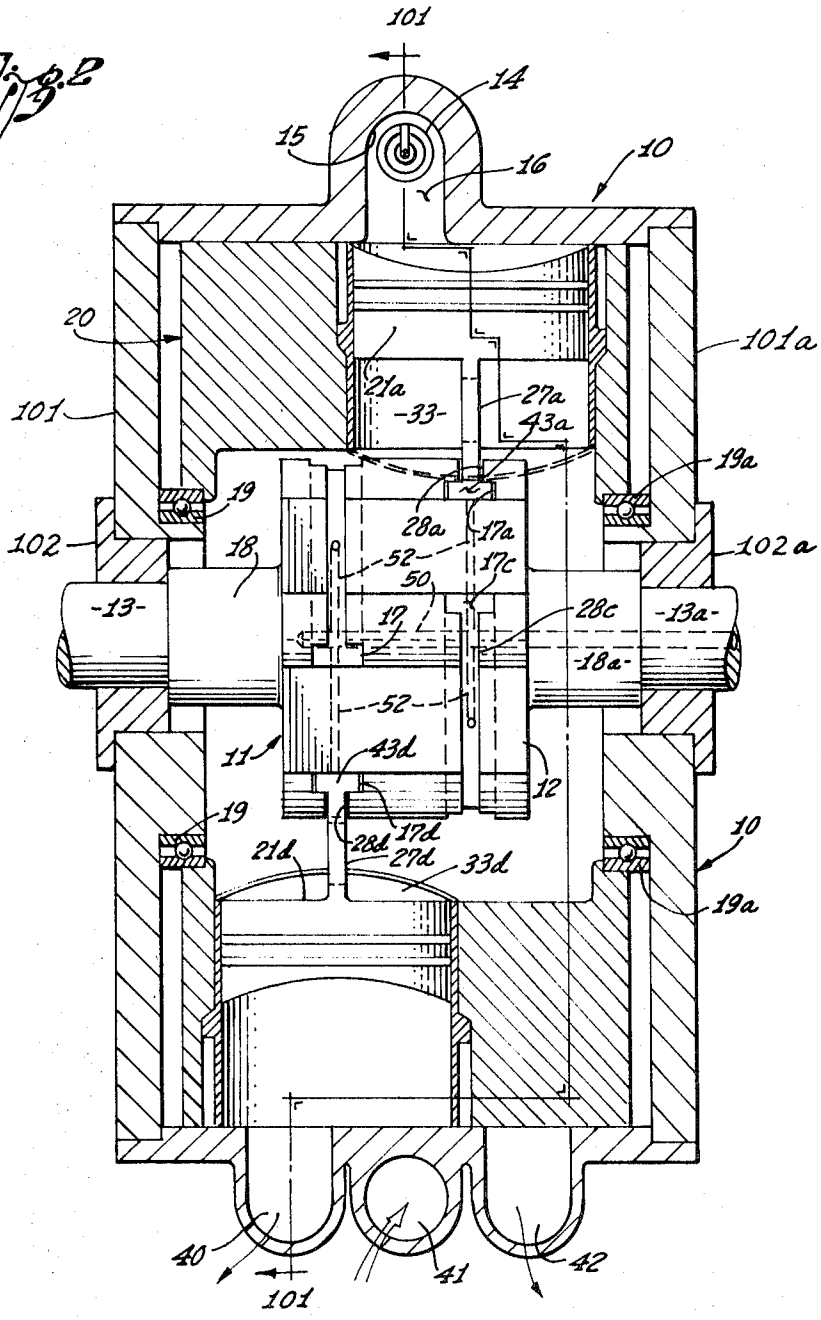
Fig. 3



INVENTOR.
David V. Petty

By LeRoy J. Laichman
Agent

Fig. 2



INVENTOR.
David V. Petty
By LeRoy J. Laishuman
Agent

Fig. 4

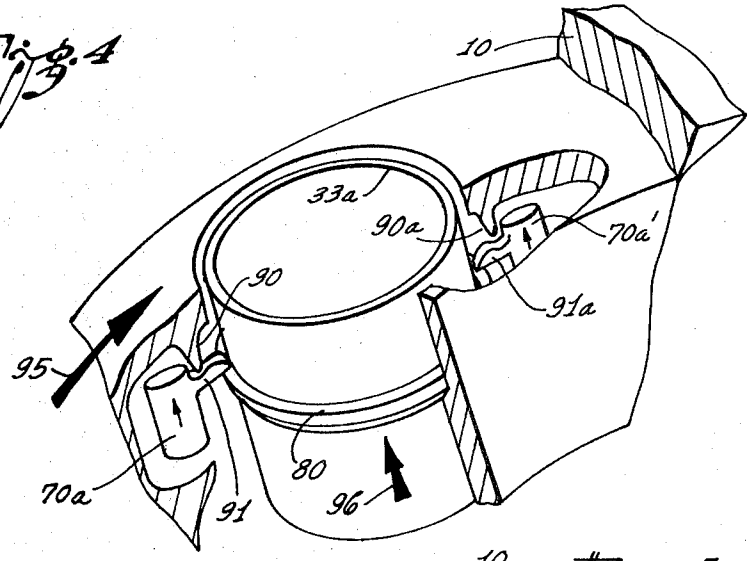


Fig. 5

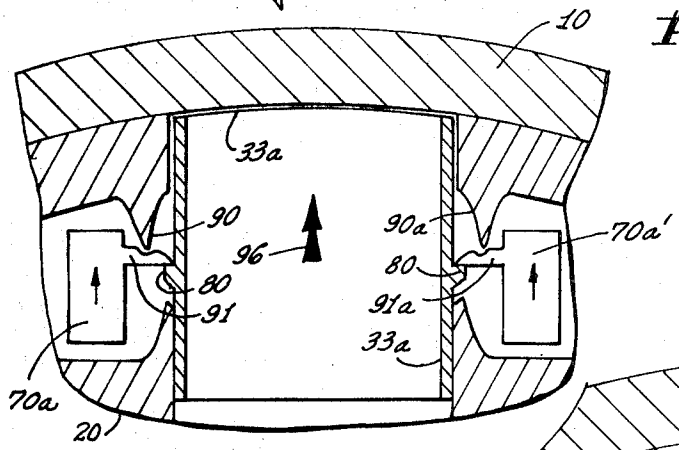


Fig. 6a

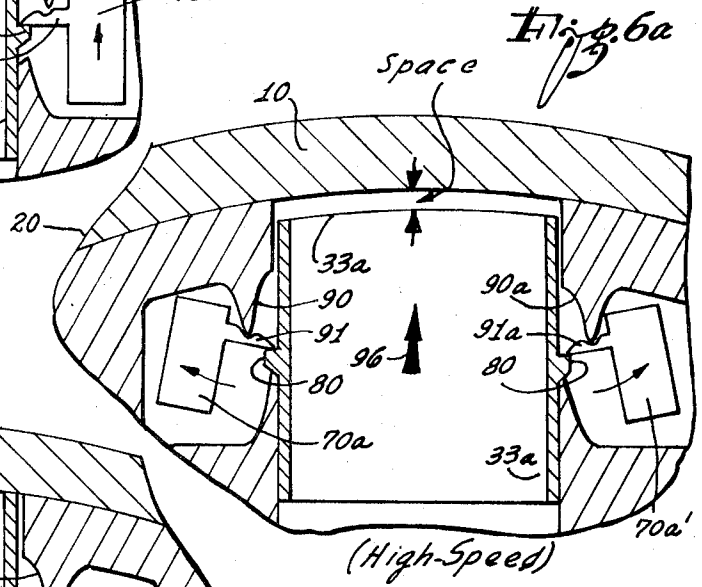
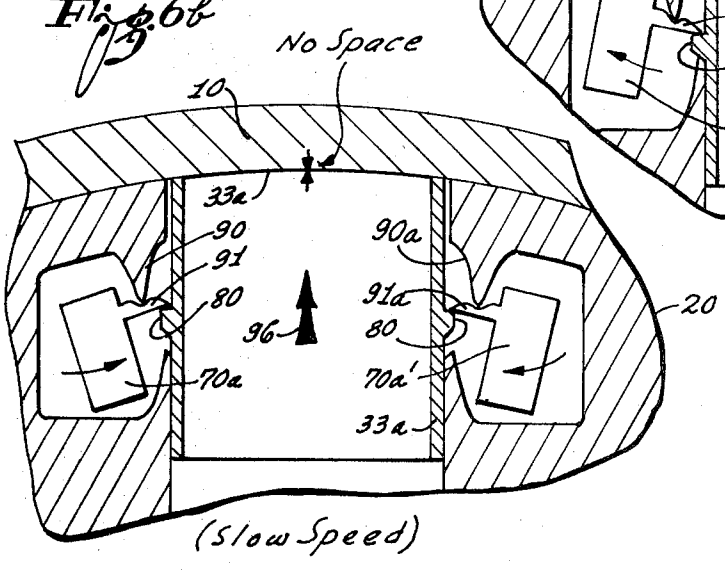


Fig. 6b



INVENTOR.
David V. Petty

By LeRoy J. Leishman
AGENT

ROTARY INTERNAL COMBUSTION ENGINES

SUMMARY

A rotary internal combustion engine comprising a housing with a circular internal wall; a plurality of cylinders angularly spaced around a central rotor, said cylinders having sleeves therein open at both ends and each containing a piston operatively connected to said rotor; means for sequentially introducing gas previously compressed by the piston into the outer ends of the sleeves and igniting it when the pistons are respectively in the positions in which they can apply maximum torque to said rotor, there being appropriately located fuel intake and exhaust outlets in said housing.

IN THE DRAWINGS

FIG. 1 is a cross section through the engine taken substantially on line 101–101 of FIG. 2.

FIG. 2 is a section taken substantially on line 2–2 of FIG. 1.

FIG. 3 is an isometric drawing of one of the pistons and a portion of the rotor, showing how the pistons may be connected to the rotor.

FIG. 4 is a fragmentary perspective view of a portion of the engine block, showing one of the radially movable sleeves, the mounting of the counterbalancing weights and the manner in which the tips of the forward ends of the counterweights' associated rocker arms overlay the rings that surround the cylinders.

FIG. 5 is a longitudinal section through one of the sleeves and its counterbalancing weights.

FIG. 6*a* is a schematic drawing of the same elements shown in FIG. 5, illustrating how the frictional drag of the outwardly moving cylinders against the inner wall of the engine casing, due to centrifugal force at high speed, is neutralized by the reverse pressure exerted by the counterweights and the tips of their associated rocker arms upon the rings that surround the cylinders.

FIG. 6*b* shows how the clearance disappears at slow speed.

The presently preferred embodiment of the invention has a cylindrical housing 10. This surrounds an engine block 20 in which the rotor 11 of the engine is eccentrically mounted. A plurality of angularly spaced piston cylinder sleeves 33*a* to 33*f* is provided in the engine block. The pistons 21*a* to 21*f* are slidably mounted within these sleeves and are operatively connected to the rotor by means of the piston stems or plates 27*a* to 27*f*. Stems or plates 27*a* and 27*d* may be seen diametrically opposite from each other in FIG. 2, but axially spaced from each other.

Ways or grooves 17*a* to 17*f* are provided in the central portion or core of the rotor to receive the T-shaped ends of the plates or stems 27*a* to 27*f*. These plates are lightened by means of the openings 34*a* to 34*f*.

The ends of the housing are closed by parallel end plates 101 and 101*a*, FIG. 2. These end plates each have a ball bearing eccentrically mounted therein, as perhaps best shown in FIG. 2 where the ball bearing on the left is identified by the numeral 19 and on the right by the numeral 19*a*. Closures 102 and 102*a*, FIG. 2, with clearance holes to permit the passage therethrough of the end portions 13 and 13*a* of the main shaft, may be secured to the end plates 101 and 101*a* in any convenient manner.

The rotational axis of the rotor is parallel to the axis of symmetry of the housing but spaced therefrom. The rotor has a multifaced core 11 in the central portion thereof of substantially polygonal cross section. Grooves or ways 17*a* to 17*f* are provided in this core and disposed parallel to the proximal faces thereof. These grooves are shaped to slidably receive the T-shaped ends 43*a* to 43*f* of the plates or stems and serve to guide these plates or stems in their reciprocal transtational movement. An oil supply duct 50 extends centrally into the rotor from one end thereof. Branches 52 extend from this central duct into the ways or grooves and also into the piston cylinder sleeves 33*a* to 33*f*.

The outer ends of the cylinders are open. The sleeves are free to float, but are urged outwardly by centrifugal force. In order to avoid frictional drag between the outer ends of the piston cylinders and the inner wall of the large cylindrical housing 10, a neutralizing mechanism is provided. This comprises counterbalancing weights 70*a* and 70*a'*, FIGS. 4 through 6*b*, inclusive, carried on the outer ends of levers or rocker arms 91 and 91*a*. The downwardly pointed members 90 and 90*a*, which are integral with the cylinder block, act as fulcrums for these rocker arms. At high speed, the centrifugal force of the counterbalancing weights causes them to fly outwardly, assuming a position shown in exaggerated form in FIG. 6*a*. Each pair of counterweights weigh slightly less than the sleeve with which they are associated, but their centrifugal force nevertheless causes them to move radially in an outward direction. Their associated rocket arms, however, reverse the direction of this force, causing the tips 91 and 91*a* of each pair of rocker arms to press on the peripheral ring of the associated sleeve and thus move the sleeve away from the inner wall of the casing 10.

FIG. 5 illustrates at 33*a* the gap between the outer end of the cylinder and the inner wall of the casing 10 at a moderate speed of rotation of the engine block 20 within this casing, and the effect produced by the counterweights at high and low speeds of rotation is shown in FIG. 6*a* and FIG. 6*b*, respectively.

The fuel gas from a fuel pump, preferably electrically or engine driven, is fed into the firing chamber 15 through the tube 98 and the adjustable valve 97, that provides an idling adjustment.

As is the case with all internal combustion engines, the initial rotary impulse must be supplied by external means, such as a conventional starter connected for positive rotation to one end of the motor shaft. The end 13 is adapted to this purpose. As the engine rotates, gas from any suitable carburetor is received into the conduit 41 through the gas injector 39, FIG. 1.

The construction and shape of the engine housing or shell adapt the engine ideally for either water or air cooling, the air or water being externally applied directly to the housing.

Various alterations and modifications may of course be made in the components hereinbefore described, and any of them may be omitted and replaced by other components or elements performing the same function, or the same function plus additional functions; and they may be reversed or transposed —all without departing from the broad spirit of the invention as succinctly set forth in the appended claims.

I claim:

1. In a rotary internal combustion engine a combination including: (a) a housing comprising a cylindrically shaped shell and two parallel end plates closing said shell, said housing having an engine block rotatably mounted therein; said end plates each having a ball bearing eccentrically mounted therein and symmetrically disposed with respect to the ball bearing in the opposite end plate; a rotor mounted within said engine block with its rotational axis parallel to the axis of the housing but spaced therefrom, said rotor comprising a multifaced core having grooves therein parallel to its faces; (b) a plurality of piston cylinders angularly spaced from each other around said rotational axis; and (c) a plurality of pistons each slidably mounted in a different one of said piston cylinders and each having an integral base member carrying an elongated groove-follower slidably nesting in the groove in the proximal face, the eccentricity of the ball bearings within the end plates determining the throw of the pistons.

2. The combination set forth in claim 1 in which the opposite surfaces of said base member are substantially normal to said rotational axis to assure proper alignment, cooperation and articulation of the associated parts of the engine.

3. The combination set forth in claim 1 with the addition of an ignition chamber exterior of said housing communicating with the interior thereof; a fuel intake port in said housing; an exhaust port in said housing angularly spaced from said intake

port; a fuel-supply conduit communicating with said intake port; and means for injecting fuel into said conduit.

4. The combination set forth in claim 1 in which the rotor comprises a drive shaft extending from at least one end of said core whereby motion may be transmitted thereto and therefrom.

5. The combination described in claim 1 in which each of said plates is provided with a ball bearing whose race is coaxial with the race in the opposite end plate, the races being eccentrically disposed with respect to the axis of symmetry of the housing, the amount of eccentricity determining the length of the piston stroke.

6. The combination set forth in claim 1 with the addition of an oil supply channel extending into said rotor from one end thereof and ducts leading from said channel to said grooves and piston cylinders.

7. The combination set forth in claim 1 in which the rotor has integral end sections of reduced diameter extending through said end plates whereby the rotor is journaled in said plates, at least one of said end sections having an axial duct extending from the exterior thereof to a point within said core that is in the same plane as the recited grooves in the core that are most remote from the axial duct's exterior end, said core having radial ducts connecting said axial duct and said grooves, centrifugal force acting to drive oil from said axial duct through said radial ducts and thence into said grooves and piston cylinders.

8. In a rotary internal combustion engine a combination including: (a) a housing comprising a cylindrically shaped shell and two parallel end plates closing said shell, said housing having an engine block rotatably mounted therein; said end plates each having a ball bearing eccentrically mounted therein and symmetrically disposed with respect to the ball bearing in the opposite end plate; a rotor mounted within said engine block with its rotational axis parallel to the axis of the housing but spaced therefrom, said rotor comprising a multifaced core having grooves therein parallel to its faces; (b) a plurality of piston cylinders angularly spaced from each other around said rotational axis; and (c) a plurality of pistons each slidably mounted in a different one of said piston cylinders and each having an integral base member carrying an elongated groove-follower slidably nesting in the groove in the particular core face to which the groove is parallel, the eccentricity of the ball bearings within the end plates determining the throw of the pistons; and instrumentalities whereby the rotational inertia of said cylinders is utilized to partially offset their centrifugal force in order to avoid frictional drag between the outer ends of said piston cylinders and the inner wall of said cylindrically shaped shell, said instrumentalities comprising counterbalancing weights pivoted on fulcrums formed in said engine block, said weights acting in response to the centrifugal force produced by their own rotation around said rotational axis to neutralize a major portion of the centrifugal force of the cylinders and thus avoid said frictional drag.