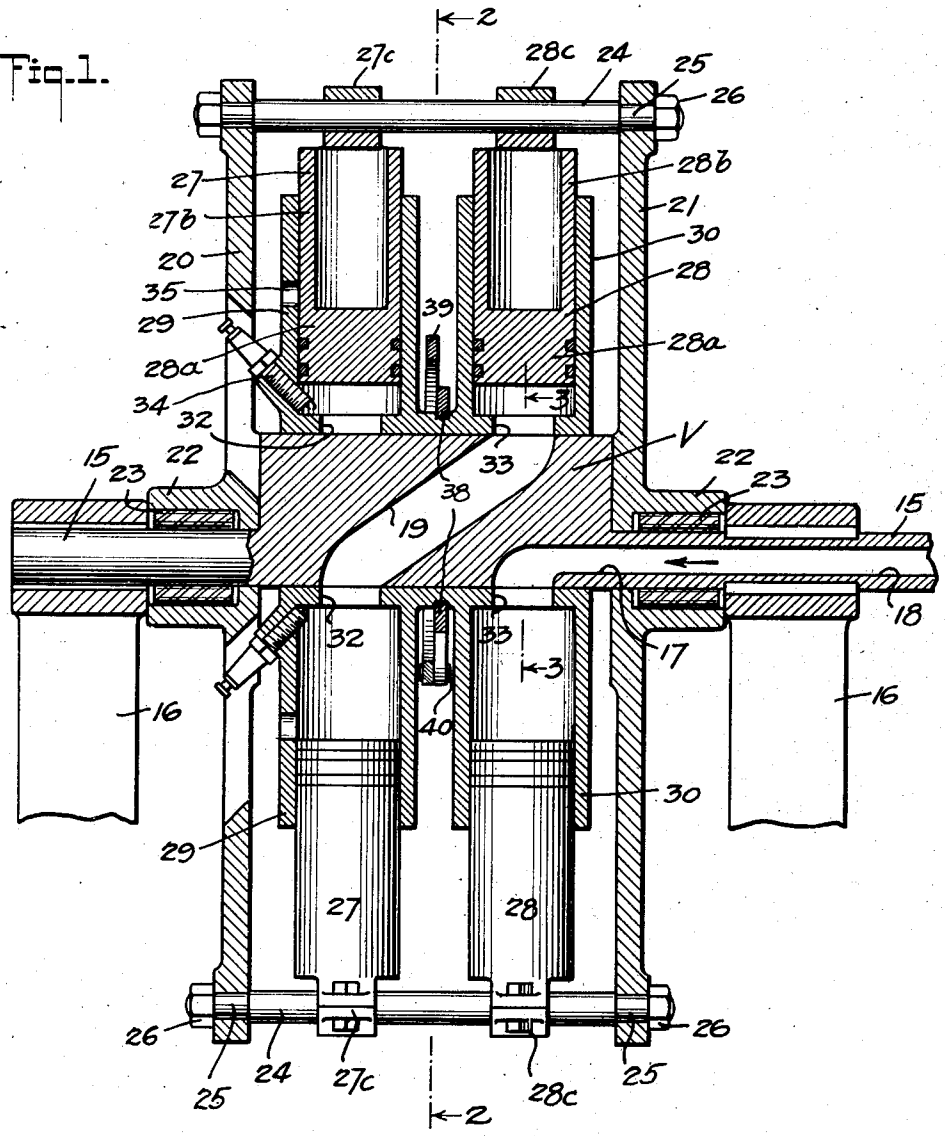
May 4, 1926. 1,583,560

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ROTARY INTERNAL COMBUSTION ENGINE

Filed Dec. 22, 1924 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

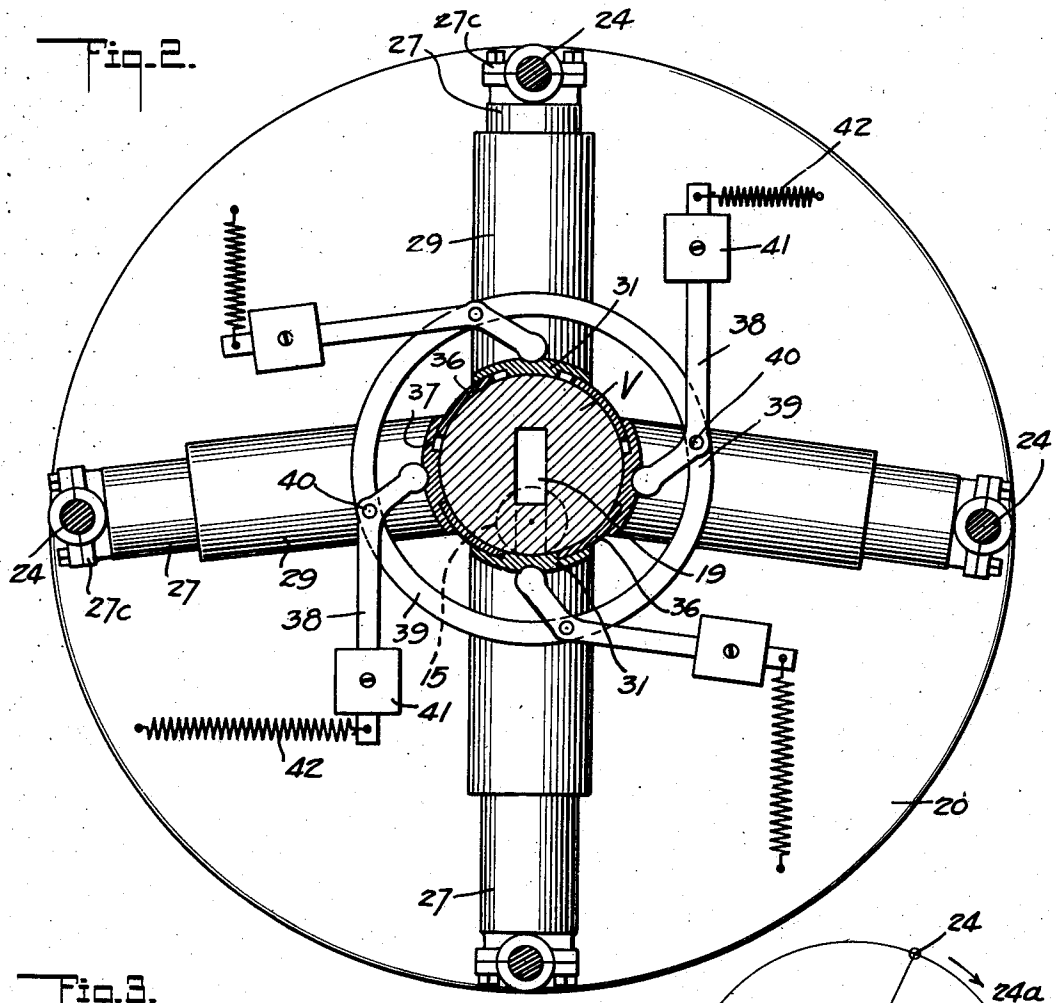


Fig. 3.

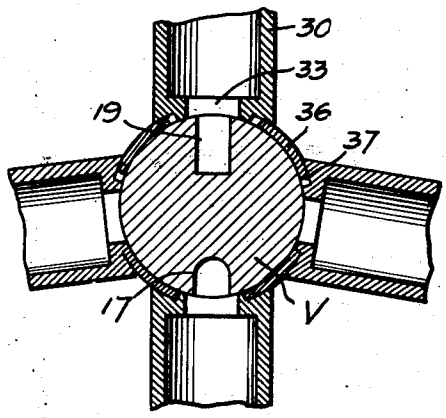
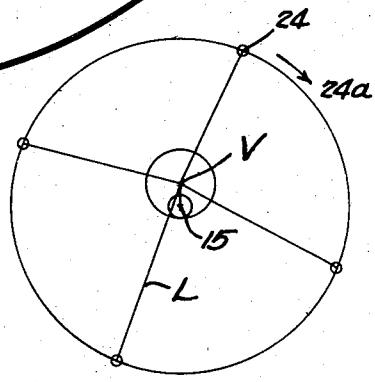


Fig. 4.



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1,583,560

UNITED STATES PATENT OFFICE.

JAMES K. MORRIS, OF MONROVIA, CALIFORNIA.

ROTARY INTERNAL-COMBUSTION ENGINE.

Application filed December 22, 1924. Serial No. 757,514.

To all whom it may concern:

Be it known that I, JAMES K. MORRIS, a citizen of the United States, and a resident of Monrovia, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Rotary Internal-Combustion Engines, of which the following is a specification.

My invention relates to and has for its purpose the provision of a rotary internal combustion engine having the following advantages: simplicity in construction; economy in operation; absence of vibration; maximum and uniform power at low speeds; super-compression of the combustible fuel by the engine and prior to its entrance to the firing cylinders; and a motor capable of effective and easy lubrication.

It is also a purpose of my invention to provide an engine including a plurality of piston and cylinder units in which the cylinders are rotatable about a fixed axis while the pistons are pivoted and rotatable about another fixed axis eccentric with respect to the first axis, whereby combustible fuel supplied to and ignited in the cylinders will exert a force on the piston which is tangential with respect to the second axis, thereby effecting bodily rotation of the piston and cylinder units.

I will describe only one form of internal combustion engine embodying my invention, and then will point out the novel features thereof in claims.

In the accompanying drawings,

Figure 1 is a view showing in vertical section one form of internal combustion engine embodying my invention;

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a fragmentary vertical sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a view illustrating diagrammatically the parts of the engine shown in the preceding views.

Referring specifically to the drawings, in which similar reference characters refer to similar parts in each of the views, my invention, in its present embodiment, comprises an axle 15 supported in elevated position by spaced standards 16 and suitably locked against rotation in the standards so as to remain stationary during the operation of the engine. Preferably formed integral with the axle and disposed at a point between the standards is a valve body V which is of circular form in cross section and associated with the axle so that its longitudinal axis is eccentric with respect to the longitudinal axis of the axle in the manner clearly illustrated in Figures 2 and 4. This valve body is provided with an intake passage 17 having one end in communication with a passage 18 formed in the axle 15, its opposite end communicating with the periphery of the valve body as clearly shown in Figure 1. The passage 18 is adapted to be placed in communication with a source of fuel supply, such as a carbureter, (not shown), for the purpose of supplying to the intake passage combustible fuel in a gaseous form. The valve body V is also provided with a delivery passage 19 which, as clearly shown in Figure 1, extends diagonally of the valve body with its opposite ends communicating with the periphery of the body at substantially diametrically opposite points.

Rotatable on the axile 15 between the standards 16 is a fly wheel unit consisting in the present instance of disks 20 and 21 having hubs 22 at their centers to receive bearings 23 to support the disks for rotational movement on the axle. These disks 20 and 21 are rigidly secured to each other at circumferentially spaced intervals by means of rods 24 having shouldered ends 25 projecting through suitable openings formed in the disks and threaded to receive nuts 26. In the present instance, I have shown four such rods 24, and pivotally mounted upon each rod are a pair of pistons 27 and 28, each piston consisting of a head 27^a or 28^a and a tubular body 27^b or 28^b provided with a bearing 27^c or 28^c rotatably mounted on the rod 24. These pistons 27 and 28 are mounted to work in a pair of cylinders 29 and 30, respectively, having concave inner ends to conform to the curvature of the periphery of the valve body V so as to have sliding contact therewith. The cylinders are rigidly connected to each other by a web 31 which is likewise curved so as to present no interference to the rotation of the cylinders on the valve body.

As clearly shown in Figures 2 and 3, the inner ends of the cylinders of each pair are provided with ports 32 and 33, respectively which during rotation of the cylinders on the valve body are adapted to register with

the ends of the delivery passage 19, the port 33 being also adapted to register with the discharge end of the intake passage 17.

In the present instance, I have shown four pistons 27 and four cylinders 29 arranged 90° apart, and each piston and the corresponding cylinder constituting a firing or working piston and cylinder unit in which the explosion of the combustible fuel is adapted to occur. To this end, each cylinder 29 is provided with a spark plug 34 disposed adjacent the intake port 32 and to which current is adapted to be supplied in any suitable manner (not shown), so as to effect ignition of the fuel at the proper instant during the operation of the engine. Each cylinder 29 is also provided with an exhaust port 35 adapted to be uncovered when the piston is in its outermost position to allow the exhaust of burnt gases from the cylinder, as will be understood.

For precompressing the combustible fuel supplied to the cylinders 29 and to thus greatly increase the horse power of the engine, I have provided the pistons 28 and the cylinders 30, each piston and cylinder constituting a fuel compressing unit and there being one unit for each of the firing piston and cylinder units. It will, of course, be understood that any number of firing piston and cylinder units may be provided or any number of fuel compressing units, and all without departing from the spirit and scope of the invention.

To prevent the intake and delivery passages 17 and 19, respectively, from being uncovered during rotation of the cylinders 29 and 30 about the valve body V, I have provided bridge plates 36 which as shown in Figures 2 and 3, have their edges extended beneath recessed portions 37 of the cylinders so as to span the spaces between the cylinders, and to thus cover the passages when the ports 32 and 33 are not in registration therewith.

To prevent radial movement of the cylinders 29 and 30 which are subjected to the action of centrifugal force during the operation of the engine, I have provided urging elements each of which is responsive to the action of centrifugal force to exert an inward pressure upon the cylinders, such pressure increasing in direct proportion to any increase in the centrifugal force. Each urging element comprises a lever 38 fulcrumed on an annulus 39 at the point indicated at 40 and provided with a short arm which bears against the corresponding web 31 of any pair of cylinders 29 and 30. The long arm of the lever is provided with a weight 41 adjustable thereon and operating in conjunction with a spring 42 to normally urge the lever about its pivot to exert inward pressure upon the short arm. From this construction it will be readily seen that during operation of the engine the weight 41 will be thrown outwardly under the action of centrifugal force to set up a pressure against the web which increases as the rotational speed of the engine increases. In the present instance, I have shown one urging element for each pair of cylinders, and all of the levers of these elements are mounted upon the annulus 39.

The operation of the engine is as follows: Assuming that rotation of the flywheel disks 20 and 21 has been initiated, and the parts of the engine are in the positions shown in Figure 1, a charge of vaporized fuel is drawn into the lower compression cylinder 30 under the outward movement of the piston 28. At this instant the port 33 of such cylinder is in registration with the discharge end of the passage 17 so that fuel from the passage 18 is free to be drawn into the cylinder. As this particular cylinder moves upwardly in its rotation, the piston moves upwardly of the cylinder by virtue of the fact that its path of rotation is eccentric with respect to the axis of the valve body V, as will be clearly understood by reference to Figure 4, wherein V designates the axle of the valve body, 15 the axis of the axle, L the longitudinal axes of the piston and cylinder units, and the path of rotation of the bars 24 by the circle 24^a. When the above referred to cylinder has traveled 180° in a clockwise direction, as when viewed in Figure 4, the piston is moved into its innermost extreme position, as illustrated in Figure 1, and under the movement of such piston the fuel charge is compressed. Upon reaching this 180° position, the port 33 registers with the upper end of the delivery passage 19 so that the compressed charge of fuel discharges into the delivery passage for immediate delivery to one of the cylinders 29 of the firing units. As the cylinder 30 reaches the 180° position, the corresponding firing cylinder 29 occupies what may be termed the 0° position wherein its port 32 is in registration with the lower end of the passage 19 to admit the compressed fuel to the cylinder. At this instant, the corresponding piston 27 of the cylinder 29 has reached its outermost extreme position and is moving inwardly so as to close the exhaust port 35 and to ultimately further compress the fuel charge. The closing of the exhaust port 35 may occur immediately after opening of the intake port 32 so that the compressed fuel can be utilized to scavenge the cylinder of burnt gases. It will, of course, be understood that the inward movement of the piston 27 is a result of the eccentric mounting thereof with respect to the mounting of the cylinder, as has been described in connection with the movement of the pistons 28. Consequently, when the piston has reached the 180° posi-

tion or its uppermost position, it is moved to its innermost extreme position to effect further compression of the fuel charge to a relatively high degree. Immediately thereafter or immediately after the piston and cylinder have passed upper dead center, the respective spark plug functions to ignite the highly compressed fuel charge.

By reference to Figure 4, it will be clear that with the piston and cylinder unit at upper dead center, the centers 24, V and 15 are vertically alined, but that as soon as the unit passes to the right from dead center, the relation of the centers 24, and 15, change to set up a lever arm between the centers V and 15 against which acts the force of the expanding fuel. However, as the center V is stationary in the sense that it will not respond to the force of the expanding fuel thus causing the latter to react on the piston and thereby set up a force tangent to the axis 15 which results in driving the unit in the circular path 24^a. As the unit progresses in a clockwise direction, the length of the lever arm increases, reaching a maximum at the 90° position of the unit where the greatest rotational force is exerted on the unit, and diminishing from this point to the 180° position, at which the lever arm no longer exists. At this 180° position or lower dead center, a new charge of fuel is forced into the cylinder and the burnt gases simultaneously exhaust.

In actual operation the firing of each cylinder occurs once in every revolution of the unit, and irrespective of the speed of rotation, each charge of fuel is precompressed in the corresponding cylinder 30 and further compressed in the cylinder 29 to substantially the same maximum degree, whereby the power impulses at low speeds will be effective to propel the engine, irrespective of the load imposed thereon.

Although I have here described and shown only one form of rotary internal combustion engine embodying my invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit of the invention and the spirit and scope of the appended claims.

I claim as my invention:

1. An engine comprising a plurality of piston and cylinder units in which the cylinders of all of the units are rotatable about a fixed axis and the pistons of all of the units are pivoted and rotatable about another fixed axis eccentric to the first fixed axis whereby combustible fuel supplied to and ignited in the cylinders will exert a force on the pistons which is tangential to the second axis, thereby effecting bodily rotation of the piston and cylinder units, fuel compressing piston and cylinder units mounted to rotate about the same axes as the first mentioned piston and cylinder units, thereby effecting compression of fuel in the cylinders, and means operable by rotation of the units for supplying the compressed fuel to the cylinders of the first mentioned piston and cylinder units in a predetermined order.

2. An engine comprising an axle, a valve body fixed eccentrically to the axle and having a delivery passage, a flywheel fixed concentrically to the axle, firing piston and cylinder units having the pistons thereof pivoted on the flywheel and rotatable therewith and concentrically of the axle, and the cylinders slidably secured to the valve body to rotate about the latter as a center, ports in the cylinders which during rotation of the latter are adapted to successively register with the delivery passage, and means operable by rotation of the piston and cylinder units for supplying combustible fuel under pressure to the delivery passage.

3. An engine comprising an axle, a valve body fixed eccentrically to the axle and having an intake passage and a delivery passage, a flywheel fixed concentrically to the axle, firing piston and cylinder units having the pistons thereof pivoted on the flywheel and rotatable therewith and concentrically of the axle, and the cylinders slidably secured to the valve body to rotate about the latter as a center, ports in the cylinders which during rotation of the latter are adapted to successively register with the delivery passage, fuel compressing piston and cylinder units having the pistons thereof pivoted on the flywheel and rotatable therewith and concentrically of the axle and the cylinders slidably secured to the valve body to rotate about the latter as a center, ports in the cylinders which during rotation of the latter are adapted to successively register with the intake and delivery passages.

4. An engine as embodied in claim 2 wherein means is provided for maintaining the cylinders in sliding engagement with the valve body against the action of centrifugal force.

5. An engine as embodied in claim 3 wherein means is provided for maintaining the cylinders of all of the units in sliding contact with the valve body against the action of centrifugal force.

6. An engine as embodied in claim 2 wherein means are provided for urging the cylinders into engagement with the valve body, said means being responsive to increase their urging action as the centrifugal force increases.

7. An engine as embodied in claim 2 wherein means are provided for urging the cylinders into engagement with the valve body, said means comprising levers having weighted ends responsive to the centrifugal force to move the other ends of the levers against the cylinders.

8. An engine as embodied in claim 2

wherein means are provided for urging the cylinders into engagement with the valve body, said means comprising levers having weighted ends responsive to the centrifugal force to move the other ends of the levers against the cylinders, and springs normally urging the weighted ends of the levers outwardly.

9. An engine as embodied in claim 2 wherein bridge plates extend between the cylinders to maintain the intake and delivery passages closed when the latter are uncovered by the cylinders.

10. An engine comprising a plurality of rotatable piston and cylinder firing units, a plurality of rotatable piston and cylinder compressing units, and means operable by rotation of all of the units for supplying fuel to the cylinders of the compressing units where it is compressed and discharged into the cylinders of the firing units for subsequent ignition, all in a predetermined sequence to effect continuous rotation of all of the units.

JAMES K. MORRIS.