J. F. LEVERING.

ROTARY INTERNAL COMBUSTION ENGINE.

APPLICATION FILED APR. 1, 1914.

1,138,388.

Patented May 4, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

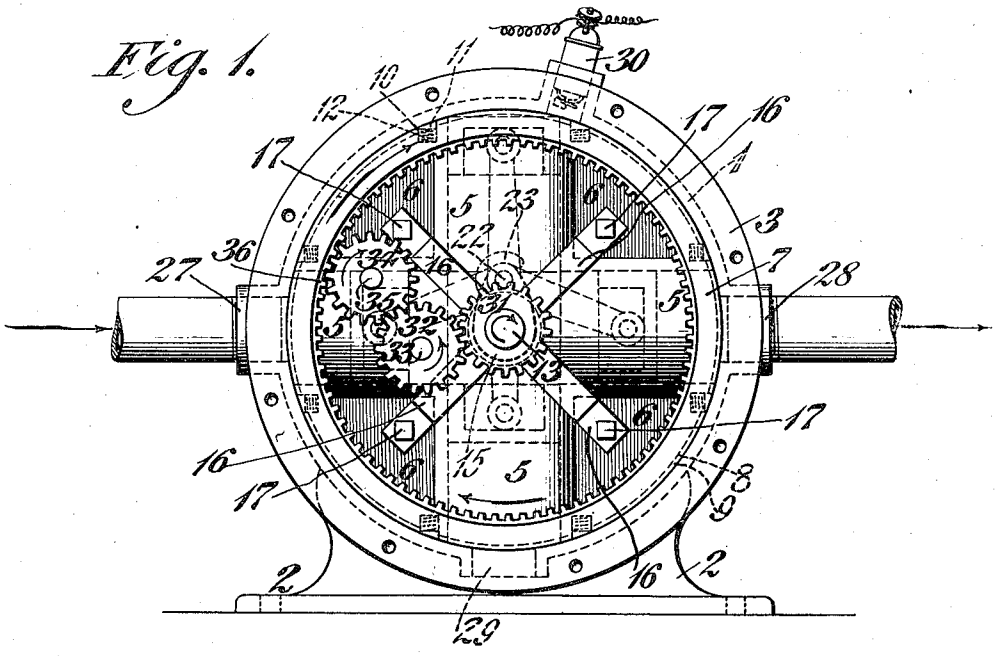


Fig. 2.

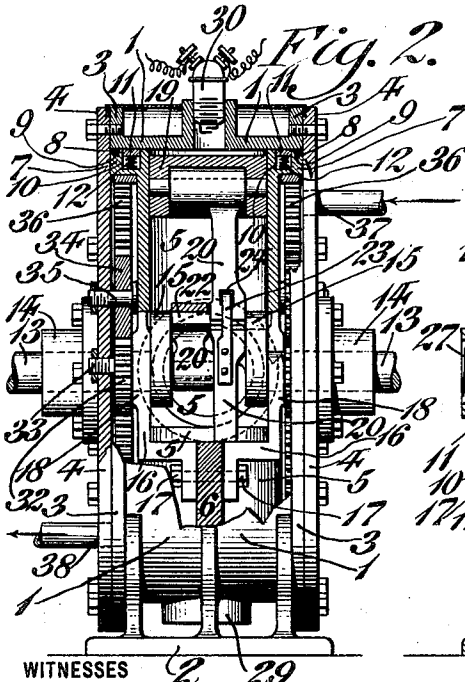
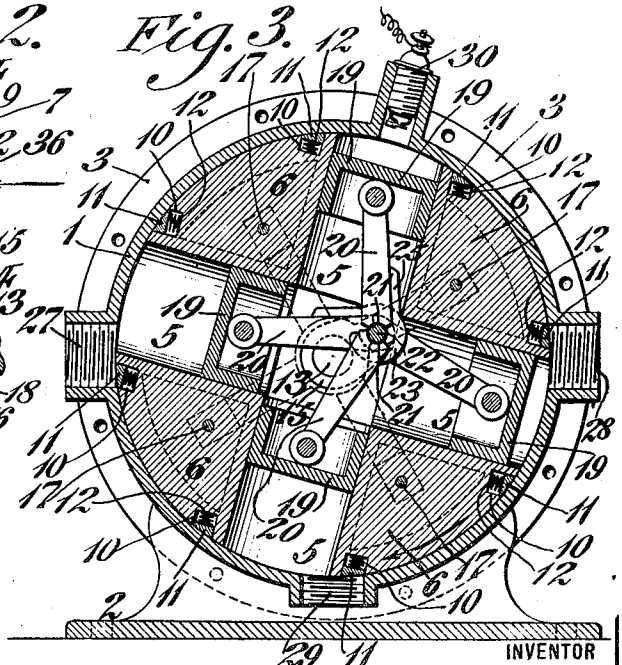


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

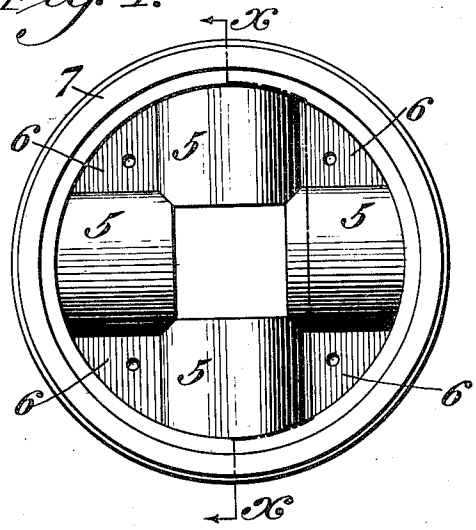


Fig. 5.

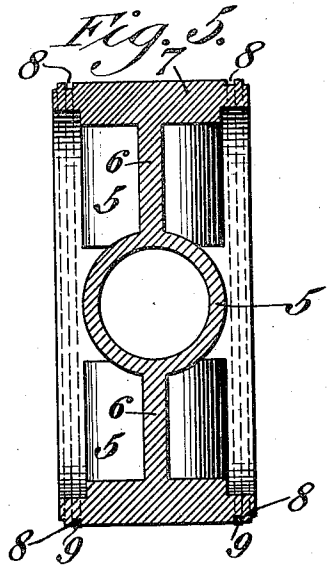


Fig. 6.

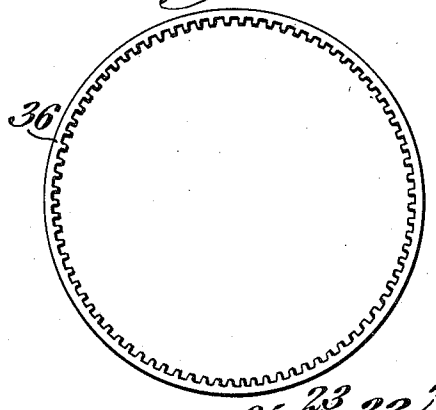


Fig. 7.

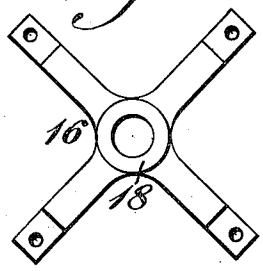


Fig. 8.



Fig. 9.

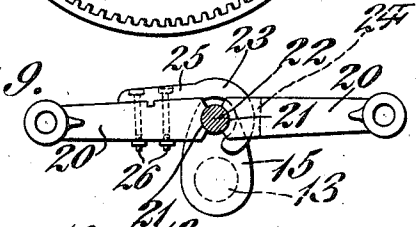


Fig. 10.

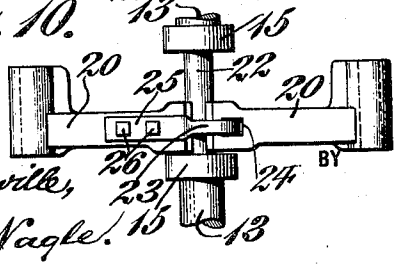
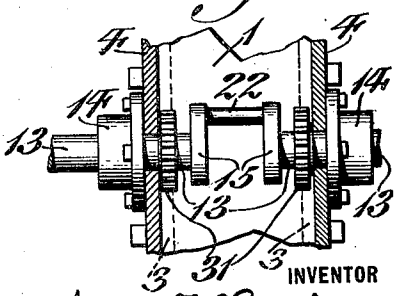


Fig. 11.



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JAMES F. LEVERING, OF CHESTER, PENNSYLVANIA.

ROTARY INTERNAL-COMBUSTION ENGINE.

1,138,388. Specification of Letters Patent. Patented May 4, 1915.

Application filed April 1, 1914. Serial No. 828,669.

To all whom it may concern:

Be it known that I, JAMES F. LEVERING, a citizen of the United States, residing at Chester, in the county of Delaware, State of Pennsylvania, have invented a new and useful Rotary Internal-Combustion Engine, of which the following is a specification.

My invention consists of a rotary internal combustion engine in which rotary motion is imparted to a shaft from pistons in a number of radially arranged cylinders revolved concentrically with and around such shaft.

It further consists of improved means for admitting fuel into and exhausting spent gas from the cylinders in such an engine.

It further consists of improved means for connecting the piston-rods in the cylinders of such engine to the crank.

It further consists of improved means for revolving the radiating cylinders from the central shaft to be successively charged and exhausted.

It further consists of other novel features of construction, all as will be hereinafter set forth.

The annexed drawing and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings Figure 1 represents a side elevation of my rotary internal combustion engine with one head removed. Fig. 2 represents an edge view of such engine with portions broken away and illustrated in section. Fig. 3 represents a section of the engine. Fig. 4 represents a side-view of the rotary cylinder-frame. Fig. 5 represents an axial section of the same. Fig. 6 represents a side view of the annular internally cogged gear. Figs. 7 and 8 represent respectively, a side view and edge view of a supporting spider. Figs. 9 and 10 represent, respectively, a detail side view and plan view of the pitmen and their connection to the crank. Fig. 11 represents a detail view of the crank and its support.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the reference numeral 1 indicates an annular casing-wall or flat cylinder, mounted upon a foot, 2, and having at its edges annular flanges, 3, to which heads, 4, are bolted or otherwise secured.

A rotary cylinder-frame, circular in outline, is composed of diametrically opposite, radial cylinders, 5, in the present instance four, connected by webs, 6, between the cylinders, and by a circular rim, 7, through which the outer ends of the cylinder-bores open. Said rim has a rotating fit within the casing-wall, and has peripheral grooves, 8, in which annular packings, 9, fit.

Annular grooves, 10, are formed in the rim around the outer ends of the cylinders, and annular gaskets, 11, in said grooves are forced out against the wall of the casing by springs, 12, or similar yielding means.

A crank-shaft, 13, is journaled in central bearings, 14, in the head of the casing, and has a double crank, 15, within the latter.

Spiders, 16, have their ends secured by bolts, 17, to the webs of the cylinder-frame, and have bearings, 18, at their centers rotatable upon the crank-shaft and having said shaft rotatable within them.

Pistons, 19, are reciprocable in the bores of the cylinders and have the outer ends of pitmen, 20, pivoted within them, being of the short trunk-type. The inner ends of the pitmen of two diametrically opposite cylinders have bearing-notches, 21 engaging the pin, 22, of the crank from opposite sides, and a hook, 23, engages a slot, 24, in one pitman and has its shank, 25, secured to the opposite pitman, by bolts, 26, so that the ends of the opposite pitmen are held with their bearing-notches upon the crank-pin but may turn upon said pin at different angles to each other, owing to the fact that the hooks and the slots are curved on arcs concentric with the crank-pin. The pitmen of one pair are on one side of the middle of the crank-pin and the other pair of pitmen are on the other side of such middle, so that the

ends of the several pairs will be side by side upon the pin.

The casing-wall has a fuel-inlet, 27, for admission of gaseous fuel in one side, and a diametrically opposite exhaust-outlet, 28 for the spent gases in the opposite side, and a scavenging outlet, 29, at a point at right angles to said openings.

An igniter of any preferred form, such as a spark-plug, 30, is inserted in the wall of the casing, slightly in advance of a point diametrically opposite to said scavenging outlet.

Two pinions, 31 are secured upon the crank-shaft, one at each head of the casing, and said pinions mesh with idler-pinions, 32, journaled upon studs, 33, upon the inner sides of the heads of the casing, and said idlers mesh with pinions, 34, journaled upon studs, 35, upon the inner sides of the heads and meshing with internally cogged annular gears, 36, secured within the overhangs of the rim of the cylinder-frame. The pinions and idlers are of a diameter one-fourth of the internal diameter of the internally cogged rim, or the pinions and gear are of such dimensions and gear that the internally cogged rim will be driven one revolution during four revolutions of the crank-shaft and its pinions.

In practice, assuming the parts of the engine as being in the positions illustrated in Fig. 3, and the inlet open and supplying fuel, the cylinder having its open end passing the intake has and still is drawing fuel into it by the piston moving inward. The charged cylinder opposite the spark-plug in which the piston has been forced outward to compress the charge, which is then exploded, has such compressed charge exploded, thus imparting rotary motion to the crank-shaft. The next preceding cylinder has in the mean time registered with the exhaust and the outwardly moving piston in said cylinder has forced the spent gases out through the exhaust, and the next preceding cylinder has been scavenged by the piston in the same expelling remaining gases and then drawing in fresh air, whereupon the cycle is again repeated. As the cylinder frame makes one-fourth of a revolution for each full revolution of the crank-shaft, each cylinder will be charged, compressed, fired, exhausted and scavenged—once—in each full revolution of the cylinder-frame. As the charging and exhausting of the cylinders is performed by successively bringing the outer open ends of the cylinders to register with the intake, firing device, exhaust and scavenging port, all valves are dispensed with, thus dispensing with more or less complex valve-gear and the consequent wear and liability of breakage or displacement of small machine elements, rendering the engine simple and durable of construction and operation.

All movable parts of the engine are inclosed within the casing and lubrication of such parts can be performed by admitting the lubricant through an inlet, 37, in the upper portion of one head and letting out the lubricant through an outlet, 38, in the lower portion of the other head, so that by suitable connection between such inlet and outlet, not illustrated, lubricant can be circulated through the engine and keep all parts fully supplied.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed provided the principles of construction set forth respectively in the following claims are employed.

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

1. In a rotary internal combustion engine, a cylindrical casing provided with an inlet and a diametrically opposite exhaust, a frame rotatable in said casing and formed with a plurality of pairs of diametrically opposite radiating cylinders having open outer ends successively registering with said inlet and exhaust, a crank-shaft journaled centrally in said casing and formed with one crank, pistons in said cylinders and connected to said crank, and gearing connected to said crank-shaft and frame to impart rotary motion to the latter at a ratio of one revolution of said frame to a number of revolutions of the crank-shaft equal to the number of cylinders.

2. In a rotary internal combustion engine, a cylindrical casing provided with an inlet, an igniting device, an exhaust diametrically opposite said inlet and a scavenging port at right angles to said inlet and exhaust; a frame rotatable in said casing and having radiating cylinders formed with open outer ends successively registering with said inlet, igniting device, exhaust and scavenging port; a crank-shaft journaled centrally in said frame and casing and formed with one crank; pistons in said cylinders; pitmen connected to said pistons and the crank of the shaft, and gearing connected to said crank-shaft and frame to impart rotary motion to the latter at a ratio of one revolution of the frame to a number of revolutions of the crank-shaft equal to the number of cylinders.

3. In a rotary internal combustion engine, a cylindrical casing having heads and provided in its wall with diametrically opposite inlet and exhaust, an igniting device and a scavenging port at right angles to said inlet and exhaust, a frame rotatable within said casing and provided with packing rings and formed with radiating cylinders having open outer ends; pistons reciprocable in said

cylinders, a crank-shaft journaled in central bearings in the heads of the casing, pitmen connected to said pistons and the pin of said crank-shaft, annular internally cogged gears upon the sides of the cylinder-frame, gears upon the crank-shaft, and gears journaled upon the heads of the casing and meshing with the gears upon the crank-shaft and the annular internally cogged gears.

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Witnesses:
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