Nov. 6, 1923. 1,473,602

C. P. BROCKWAY

TWO-CYCLE ENGINE

Filed April 8, 1919 3 Sheets-Sheet 1

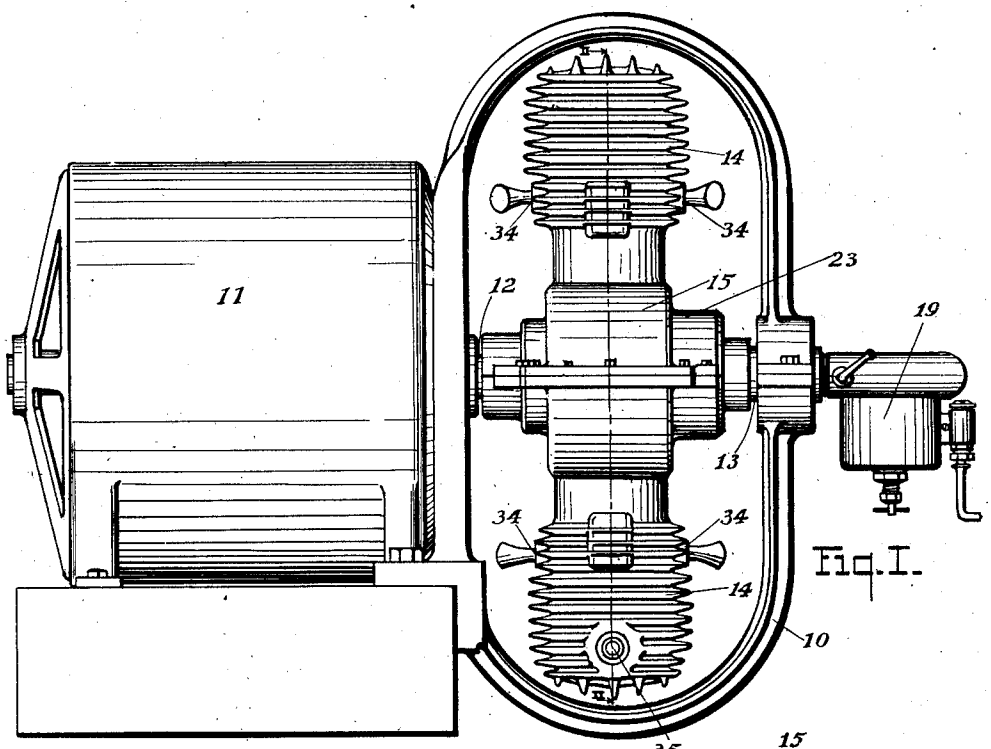


Fig. I.

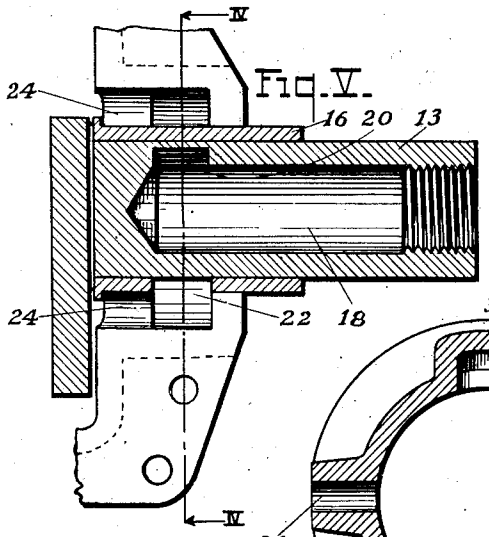


Fig. V.

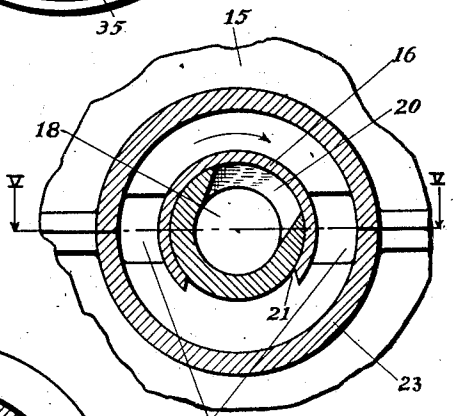


Fig. IV.

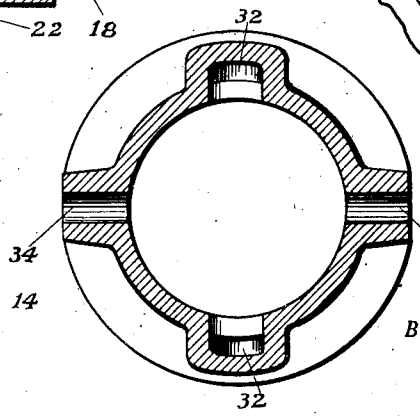


Fig. VI.

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TWO-CYCLE ENGINE

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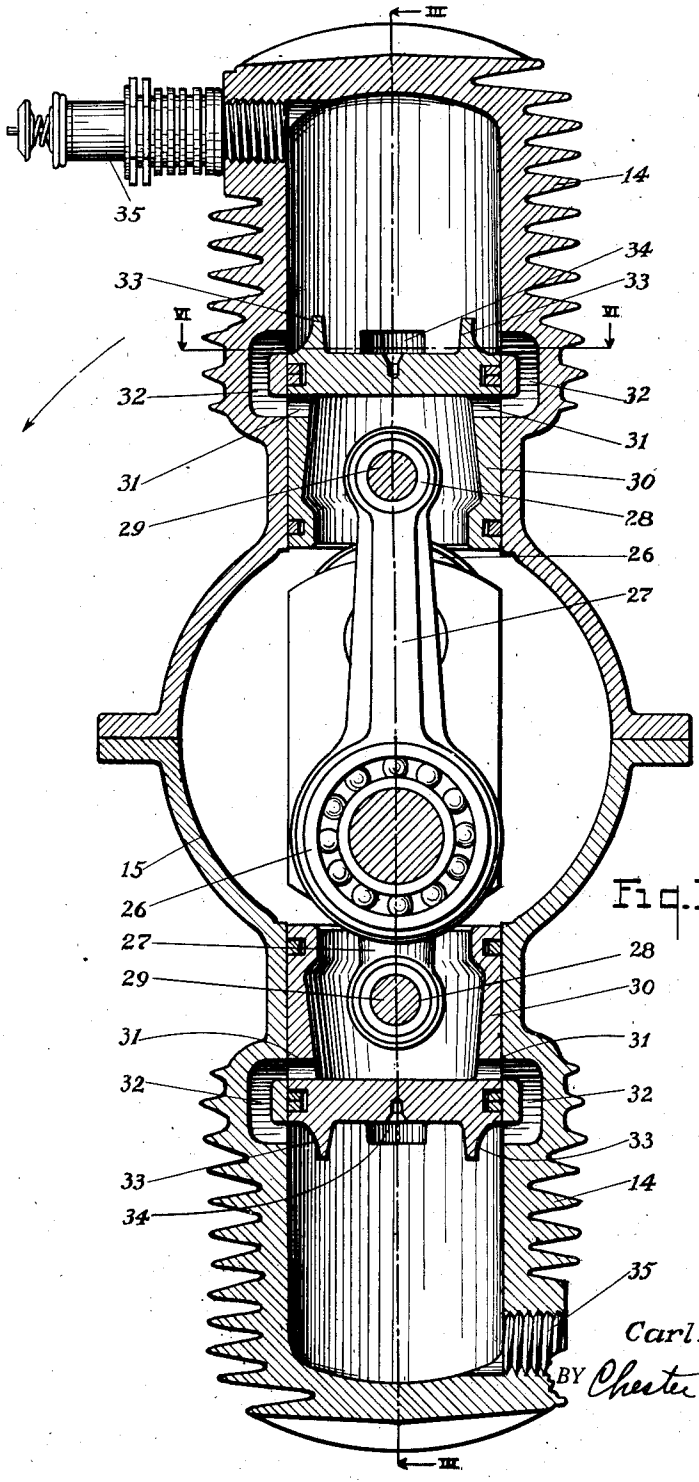


Fig. II.

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TWO-CYCLE ENGINE

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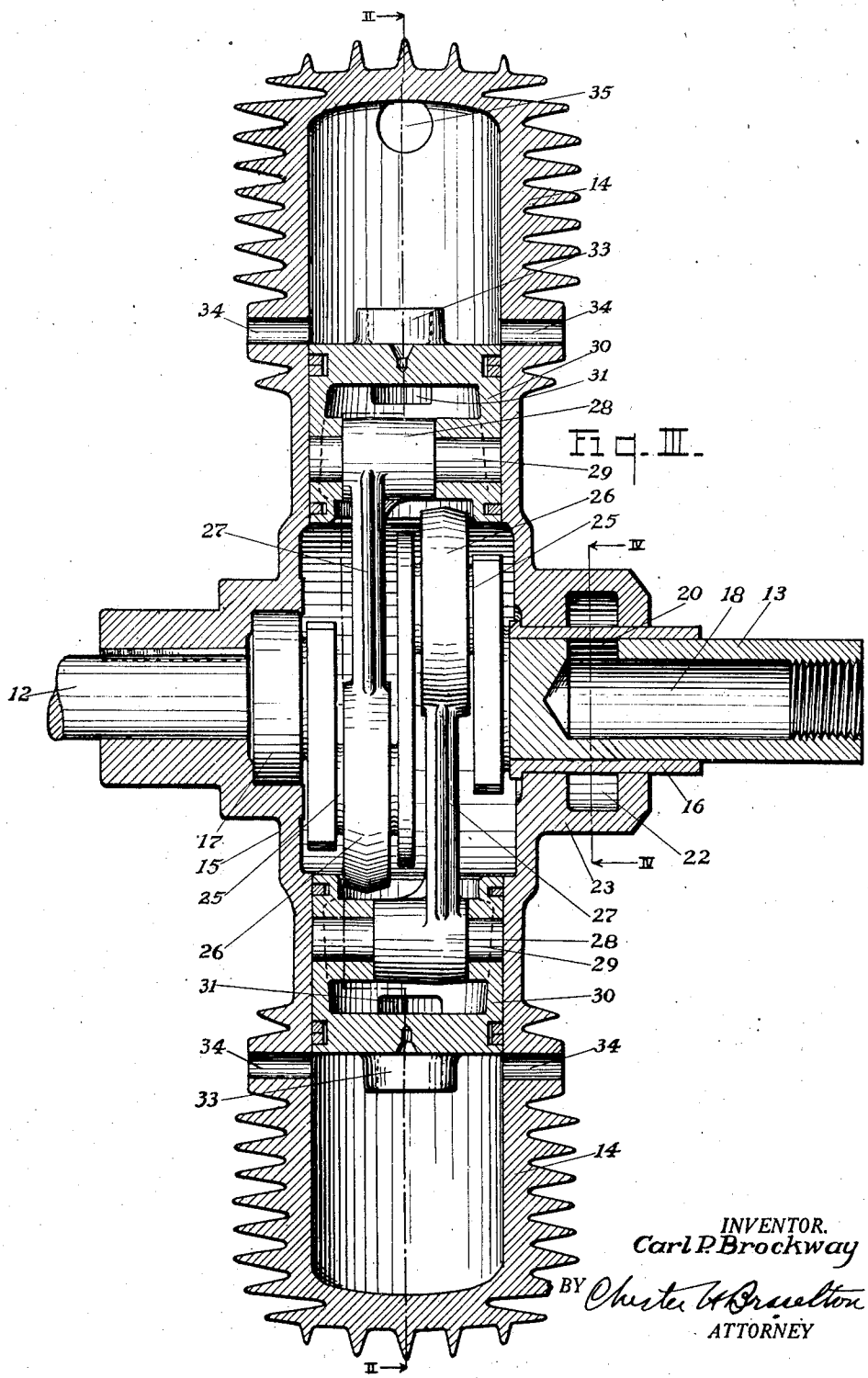


Fig. III.

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Patented Nov. 6, 1923. 1,473,602

UNITED STATES PATENT OFFICE.

CARL P. BROCKWAY, OF TOLEDO, OHIO, ASSIGNOR TO INDUSTRIAL RESEARCH CORPORATION, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE.

TWO-CYCLE ENGINE.

Application filed April 8, 1919. Serial No. 288,574.

To all whom it may concern:

Be it known that I, CARL P. BROCKWAY, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Two-Cycle Engines, of which I declare the following to be a full, clear, and exact description.

This invention relates to improvements in internal combustion engines, and in particular, engines of the type in which the cylinders are arranged radially about a common crank case. Certain features of my invention are applicable equally to engines in which the cylinders are stationary, as well as to those in which the cylinders revolve, while other features are of value only in revolving cylinder engines.

One object of the invention is the provision in engines having a plurality of radially mounted cylinders, so arranged as to be bisected by a single plane perpendicular to the crank shaft, of connecting rods having bearings, the center lines of which are offset in order to cause the bearings for the piston pins to extend beyond the middle of the latter.

Another object of the invention is the provision of means for taking fuel into the engine through one of the bearings therefor, said means including a valve for closing the crank case during the inward motion of the pistons.

Another object is to improve the vaporization of the fuel, centrifugal force due to the rotation of the cylinders being taken advantage of to throw the heavier particles of liquid fuel against the inside of the hot piston head, and a port being provided through the piston wall just beneath the head from which the gas enters a by-pass and is thence carried into the combustion chamber.

Another object is the provision of means for effectively scavenging the cylinder after the explosion, the said means consisting in the employment of two exhaust ports diametrically opposed and two intake openings diametrically opposed on a line at right angles to the line of the exhaust ports, the piston being provided with a pair of deflecting walls to direct the incoming gases up opposite sides of the cylinder, the spent gases being thereby forced down and out of the exhaust ports.

A further object is the provision of a mounting for the spark plug in the forward side wall of the cylinder, in order that centrifugal force may carry carbon and lubricating oil away from the plug rather than into it whenever the engine is given a rotational acceleration as when it is being started.

Still another object is the provision of a mounting for a revolving cylinder engine which shall be simple in construction and efficient in operation, and capable of being satisfactorily supported from one side only.

Other objects, and objects relating to details of construction and economies of manufacture, will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Figure I is a side elevation of a rotating cylinder engine embodying my invention, the engine being shown direct connected to a dynamo-electric machine for current generating purposes.

Fig. II is a central longitudinal section of the engine alone taken perpendicularly to the crank shaft, or upon the line II—II, Fig. I.

Fig. III is a central longitudinal section taken parallel to the shaft, or upon the line III—III, Fig. II.

Fig. IV is a detail cross section taken on the line IV—IV, Fig. III, showing the rotary valve which controls the intake of fuel to the crank case.

Fig. V is a detail horizontal cross section taken on the line V—V, Fig. IV.

Fig. VI is a view of the engine cylinder in cross section on the line VI—VI, Fig. II.

Similar reference characters refer to like parts throughout the views.

In the drawings I have shown a two cylinder, opposed, rotary engine, but this showing is for purposes of illustration merely, as some of the features of the invention are equally applicable to stationary cylinder engines, and some are applicable to engines having more than two cylinders. In Fig. I, I have shown a mounting 10 for the engine consisting of a loop having straight sides and semi-circular ends. the bearings upon which the engine rotates being supported in the sides of the mounting. The latter may be secured by suitable fastenings to the casing of a dynamo-electric machine 11, thus

providing an electric generating unit of extremely light weight and great portability.

The mounting 10 at the left in Figs. I and III supports a rotating shaft 12, while at the right it is clamped to a stationary shaft 13. As shown in the drawing, each cylinder 14 is built integral with half the crank case 15. Before the two halves are bolted together, a bearing sleeve 16 is inserted between them on the right side (Fig. III), and a collar or bearing ring 17 is mounted in a recess in the inner left side of the casing. Within the ring 17 is rotatably mounted one end of the crank shaft, the other end being integral with shaft 13. In the operation of the engine the sleeve 16, ring 17 and shaft 12 rotate with the cylinders, while the crank shaft including the straight portion 13 remains stationary. Shaft 13 is bored out centrally at 18 to form a path for the fuel gas as it enters the engine from any desired source, such as the carbureter 19 shown in Fig. I. The bore 18 does not extend through the inner end of the shaft 13, but is in communication with the radial port 20 which registers once during each revolution with a port 21 in the sleeve 16, the latter port being constantly in communication with an annular passage 22 in the bearing boss 23 of the crank case. Ports 24 connect the annular passage with the interior of the crank case.

The lubrication of the engine is accomplished preferably by mixing lubricating oil with the liquid fuel before the latter passes into the carbureter, or by introducing small quantities of lubricating oil into the fuel gas as it passes from the carbureter into the crank case. In either method the oil penetrates to every part of the engine and to the main bearings in particular.

The crank shaft includes two crank pins 25, upon which are mounted rotatably the inner bearings 26 of connecting rods 27. The outer ends of the rods have comparatively long bearings 28 so as to extend past the center line of the piston pins 29, thereby reducing, if not eliminating, uneven wear between the pins 29 and the bearings 28. The pistons 30, in which the pins 29 are mounted, have hollow interiors from which lead ports 31 located directly beneath the piston heads. When a piston is at the bottom of its stroke the ports 31 register with the lower or inner ends of by-passes 32, the upper or outer ends of the latter being uncovered at the same time so as to provide an unobstructed path for the incoming gas to the combustion chamber. On the upper or outer surface of each piston head are integral deflecting walls 33, by which the gas is directed upwards along the inner walls of the cylinder. As will be obvious from the drawings, the respective ports 31 and by-passes 32 are diametrically opposed. Each cylinder is provided with a pair of exhaust ports 34 which are also diametrically opposed and arranged on a line at right angles to the line of the inlet passages.

Spark plugs 35 are mounted in the sides of the cylinders at their upper or outer end, each plug being located on that side of the cylinder which is in advance during rotation of the engine. It is thus seen that when the engine is given an angular acceleration, especially in starting when clean spark plugs are most desired, particles of unvaporized fuel or carbon tend to be flung to the back side of the cylinder and away from the spark plug due to the inertia of such particles.

The operation of my invention will be obvious from the foregoing description. While the pistons are moving upward or outward, the gas intake passage through the shaft 13 to the crank case is open, and fuel is drawn into the crank case. As the pistons begin to descend or move inward, this passage is closed and the gas in the crank case is compressed by the inward movement of the pistons. When a piston has reached the position shown in Figs. II and III of the drawings, the by-passes 32 are uncovered by the piston and the port 31, whereupon the compressed gas rushes into the combustion chamber and is deflected upwardly or outwardly by the deflecting walls 33, which cause it to move along opposite sides of the cylinder to the head of the latter and then downwardly in the middle driving the spent gases out through the exhaust port 34. The up or out stroke of the piston, after closing the inlet and exhaust ports compresses the gas in the combustion chamber and at the proper predetermined time the charge is fired by a spark across the terminals of the spark plug 35.

One feature of my invention to which I wish to call particular attention is that, because of the course of the fuel through the crank case and because of the arrangement of the ports 31 in the piston wall, directly beneath the piston head, heavier particles of fuel not theretofore vaporized, after being crowded by centrifugal force against the bottom surface of the hot piston head are thereby vaporized, and as soon as the piston in its down stroke reaches the position shown in the drawing, this vaporized fuel passes at once into the combustion chamber. Consequently there is a very small proportion of unvaporized fuel entering the combustion chamber and the efficiency of the engine is correspondingly increased.

I am aware that the particular embodiment of my invention above described, and illustrated in the accompanying drawings, is susceptible of considerable variation without departing from the spirit thereof, and, therefore, I desire to claim my invention broadly

as well as specifically, as indicated by the appended claims.

I claim as my invention:

1. In a gas engine, a fixed hollow journal, a plurality of radially arranged cylinders each containing a power piston, a common crank case for said cylinders mounted to rotate around said journal, said journal having an opening through its side connecting with the hollow interior thereof, and a valve sleeve constituting a bearing for said crank case upon said journal, said sleeve having an opening therethrough adapted to register with said journal opening, said crank case being formed to provide a continuously open passage to the exterior of said sleeve, whereby the fuel mixture is drawn in and compressed by the said power pistons.

2. In combination with a plurality of rotary cylinders having a common crank case, a gas intake to said crank case, comprising a fixed hollow journal, having a radially extending port, and a sleeve carried by said crank case revolving around said journal, said sleeve having a port adapted to register with said first named port.

3. In combination with a plurality of rotary cylinders having a common crank case, pistons mounted to move inwardly at the same time and outwardly at the same time in said cylinders, a gas intake to said crank case having a valve arranged to close while the gases in the crank case are being compressed during the inward strokes of the pistons, said intake valve comprising a fixed hollow journal having a radially extending port, and a bearing sleeve carried by said crank case revolving around said journal, said sleeve having a port adapted to register with said first named port while the pistons are moving outwardly.

In testimony whereof, I affix my signature.

CARL P. BROCKWAY.