

April 25, 1939.

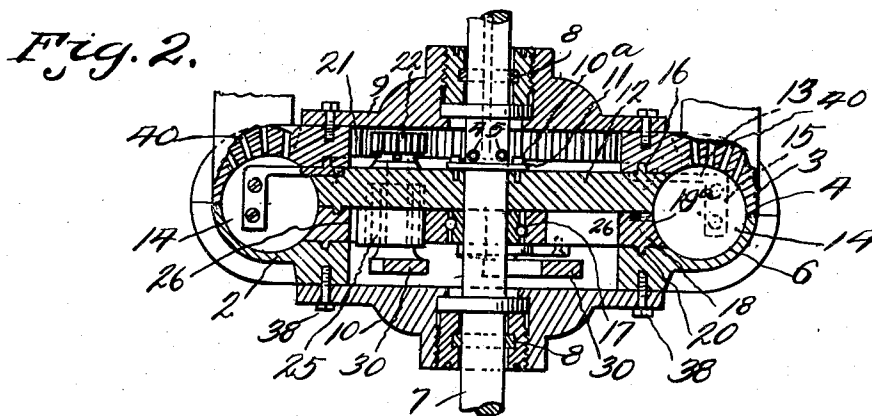
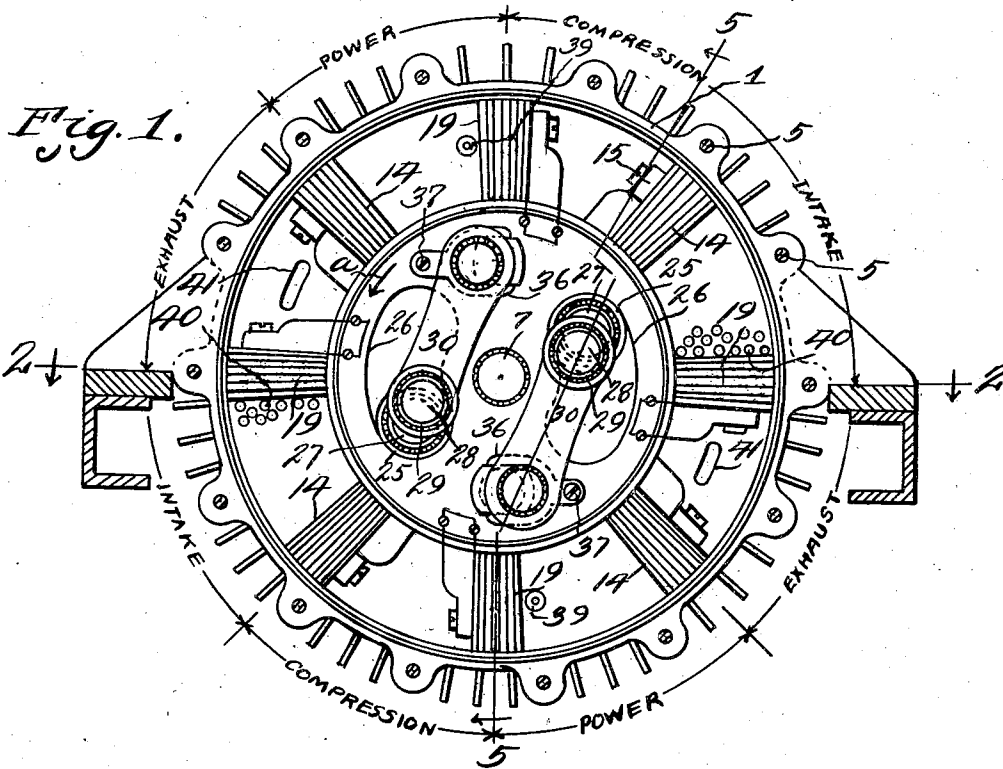
J. E. HORNER

2,156,180

ROTARY ENGINE

Filed Sept. 2, 1937

3 Sheets-Sheet 1



Inventor
Jack E. Horner

Philip A. Merrill

Attorney

April 25, 1939.

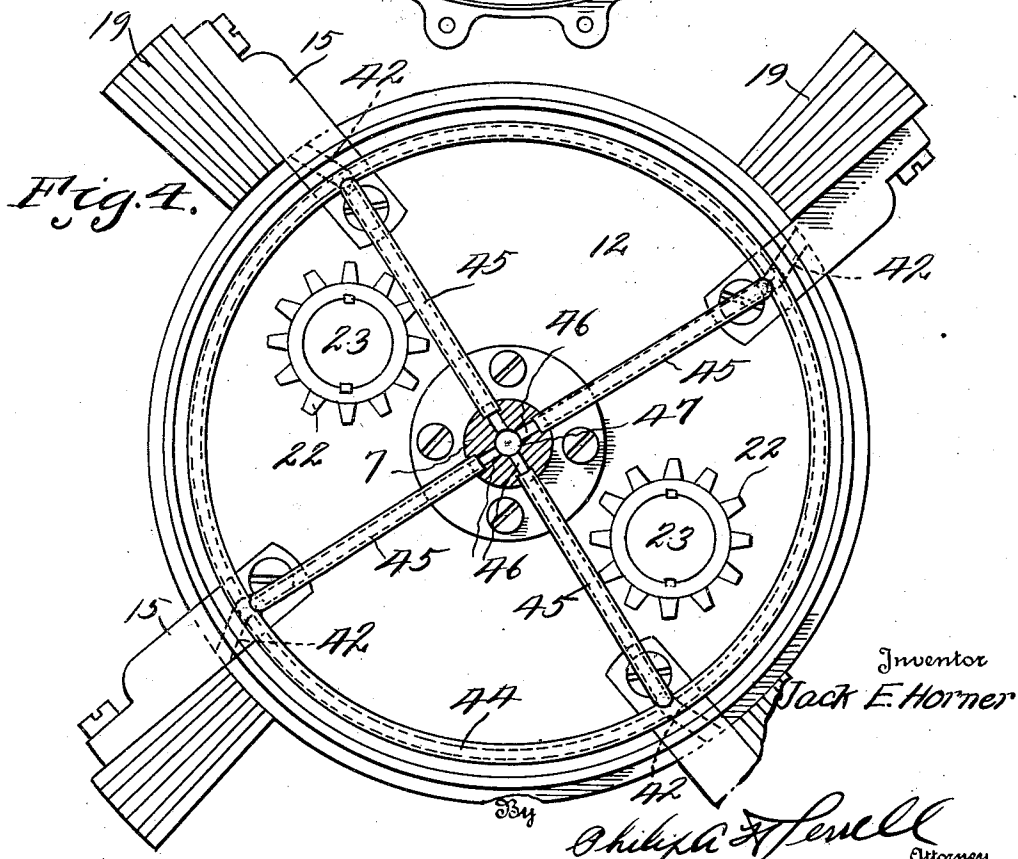
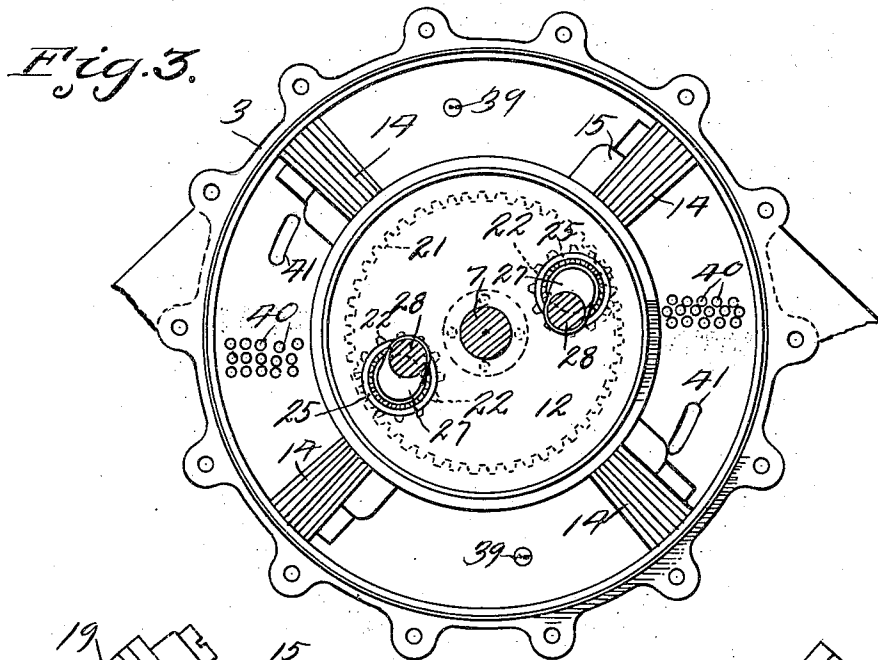
J. E. HORNER

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3 Sheets-Sheet 2



Inventor

Jack E. Horner

Philip A. Fenell
Attorney

April 25, 1939.

J. E. HORNER

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Fig. 5.

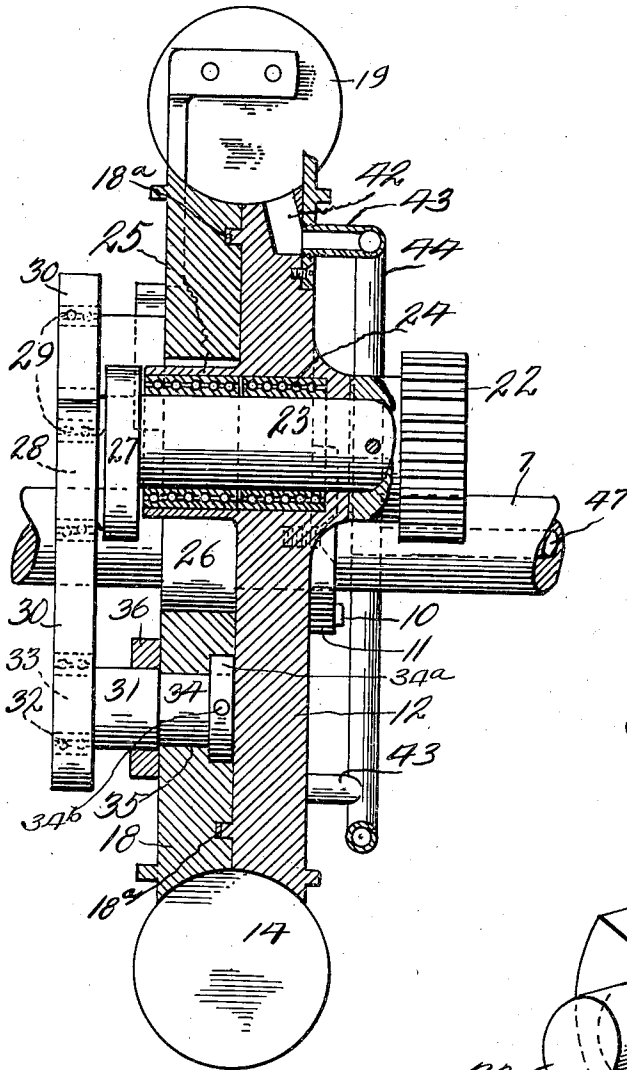


Fig. 7.

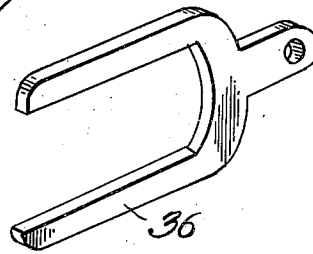
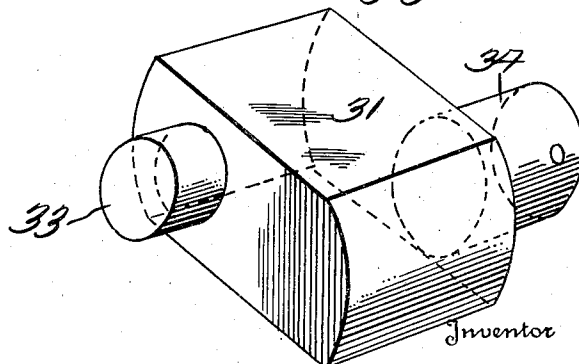


Fig. 6.



Inventor

Jack E. Horner

By *Philip A. Howell*

Attorney

UNITED STATES PATENT OFFICE

2,156,180

ROTARY ENGINE

Jack E. Horner, Dinsmore, Fla.

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4 Claims. (Cl. 123—11)

The invention relates to rotary engines of the type comprising a casing having rotating discs provided with cooperating pistons movable towards and away from each other for the cycles of operation, and which discs are driven from an internal gear ring through cranks and link connections for the various piston operations for imparting rotary movement to a shaft rotatable with one of the discs.

A further object is to place the discs in facial engagement and to provide a driven crank shaft extending through one of the discs and rotatable therein and through arcuate openings in the other discs and terminating in cranks to the outside of the last named disc and having link connections to the outer side of the last named disc.

A further object is to provide adjusting means in connection with the links whereby the relative movement of the cooperating pistons in relation to each other may be varied for allowing the engine to be operated with different kinds of fuel for varying the compression, thereby allowing the utilization of low grade fuel and the operation of the device on the Diesel principle.

A further object is to provide breather means to the rear of some of the pistons carried by the discs and discharging through the driven shaft, which breather means also acts as cooler means by the exhaustion of hot air and the intaking of cool air during the piston operations when going through their cycles of operation.

A further object is to provide breather pipe connections between the driven shaft port and the rear sides of some of the pistons, and through an annular manifold pipe.

A further object is to provide means whereby the pistons may be easily attached to or removed from the discs.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:

Figure 1 is a view in elevation of the rotary motor, showing one side of the casing removed, and showing the various pistons in open position.

Figure 2 is a horizontal sectional view taken on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1, showing

one of the discs removed, and the crank drive shaft carried thereby.

Figure 4 is a rear elevation of the disc shown in Figure 3, and showing the breather system.

Figure 5 is a vertical transverse sectional view taken on line 5—5 of Figure 1.

Figure 6 is a detail perspective view of the stroke adjusting block.

Figure 7 is a detail perspective view of the stroke adjusting block yoke.

The invention is an improvement on my prior patent application Serial Number 72,204, filed April 1, 1936, Patent No. 2,092,254, September 7, 1937.

Referring to the drawings, the numeral 1 designates the casing of the rotary engine and 2 and 3 sections thereof having annular groove and rib connections 4 of a packed type for forming a leak proof connection between the sections. The sections of the casing are connected together by means of transverse bolts 5 as shown in Figure 1. Sections 2 and 3 form an annular piston chamber 6, round in transverse cross section, and in which the movable parts of the rotary engine are disposed. Extending axially through the casing is a drive shaft 7, the ends of which are supported on antifrictional bearings 8 of the cover plates 9 and 10. Secured to the shaft 7 by means of bolts 10a, extending through a flange 11 of the shaft 7, is a power disc 12, which disc has secured thereto on its outer side and countersunk in said outer side the arms 13 of power pistons 14. Arms 13 terminate in transverse arms 15 secured to the pistons, therefore it will be seen that it will not be necessary to form the power pistons 14 as an integral part of the power disc 12. Power disc 12 is provided with a rib and groove packed connection 16 to the casing section 3, as clearly shown in Figure 2.

Rotatably mounted on the shaft 7 on antifrictional bearings 17, and in facial engagement with the power disc 12 is a head disc 18, which head disc has a groove and rib packing connection with the disc 12 and with the casing section 2 at 18a and 20, therefore it will be seen that leakage between the casing and between the discs is prevented during the rotation of the parts.

During the operation of the engine the head pistons 19, carried by the head disc 18, are intermittently and simultaneously advanced and retarded for completing cycles of operation in the usual manner for the intake, compression, power, and exhaust operations, and these zones of operation are indicated in Figure 1 wherein the pistons are in open position, and at the ends of the

particular operation. During the operation of the device, the pistons 14 and 19 moved relative to each other, that is to open and closed positions for driving under the impulse of the explosions the power pistons 14 in the direction of the arrow *a*, Figure 1, for imparting a continuous rotation in said direction to the engine drive shaft 7. It will be noted by placing the discs 12 and 18 in facial contact a positive structure is provided, taking up the minimum amount of room and obviating the formation of a chamber between the discs, which is now the practice. By placing the discs in facial contact and operating the discs through link connections to the outside of the disc 18, all the working parts can be easily reached for repair and inspection purposes without dismantling the entire machine.

The discs are operated by means of an internal gear raceway 21 carried by the casing section 3, and with which internal gear the planetary gears 22 carried by the power disc 12 mesh, as clearly shown in Figures 2 and 3.

Planetary gears 22 are carried by crank shafts 23 rotatably mounted in antifrictional bearings 24 carried by the power disc 12, and in an extension boss 25 thereof. The extension bosses 25 extend transversely of the head disc 18, and through arcuate openings 26 therein, and terminate to the outside of the head disc 18. Shafts 23 are provided with cranks 27 having their arms 28 rotatably mounted in antifrictional bearings 29 of links 30, which links are disposed on opposite sides of the drive shaft 7 and are in parallel relation. The links 30 have their other ends connected to stroke adjusting blocks 31 by means of antifrictional bearings 32 and the extension arms 33 of the blocks. Stroke adjusting blocks 31 are provided with shafts 34, which may be rotatably anchored in any way at 35 in the head disc 18, for instance by sleeves 34*a* secured to shafts by pins 34*b*. It will be noted that shafts 33 and 34 are out of axial alinement, and the blocks 31, when rotated, will shorten or lengthen the stroke of the pistons during their cycles of operation, hence it will be seen that the compression may be increased or diminished or increased according to the nature of the fuel used, thereby allowing the same engine to be utilized as a Diesel type of engine.

The adjusting blocks 31 are held in adjusted position by means of yokes 36, which are detachably connected by means of screws 37 to the outer face of the head disc 18, therefore it will be seen that when it is desired to change the stroke, it will only be necessary to remove the cover plate 10 by removing the bolts 38 and ready access may be had to the stroke adjusting means as well as the other working parts, therefore it will not be necessary to dismantle the machine casing as a whole. When it is desired to change the stroke the yokes 36 are removed along with the screws 37 and then the blocks 31 are rotated one hundred and eighty degrees after the links 30 are disconnected or with them in place if desired. This operation places the extension arms 33 of the blocks on the opposite side of the axis of the shafts 34, consequently the links 30 move the pistons closer together thereby varying the stroke. After the adjustment of the blocks the yokes 36 are again placed in position for holding the blocks in this suggested position. The same is true when access is desired to the opposite side of the engine and at which time the cover plate 9 is removed.

As the power and head discs revolve the cycles

of operation take place. Referring to Figure 1, it will be seen that opposite pistons 14 and 19 are on the power stroke while the other pairs of pistons are at the ends of the intake stroke, and upon the further advance of the head disc 18, the charge is compressed between each pair of pistons 14 and 19 for the firing operation at the spark plugs 39. The intake ports 40 are oppositely disposed and the charge may be controlled in any suitable manner. It will be noted that the intake ports 40 and exhaust ports 41 are in the casing section 3, and as the upper pair of pistons to the left are at the end of the power stroke, the adjacent piston 19 of the head disc will be advanced by the link connection during the movement of the power piston 14, and will rapidly catch up with said piston for the exhaust operation through the port 41. The same operation takes place at the opposite sides of the engine, and the operation continues during the running of the engine. Inlet ports may be controlled through any suitable valve means.

From the above it will be seen that a compact rotary engine is provided of the disc type wherein the discs are in facial engagement and the head disc is advanced and retarded through a driving connection of the planetary gear type, extending through the power disc and an elongated bearing boss 25 and a crank and link connection to the outside of the head disc, thereby simplifying the machine and reducing the number of parts.

During the operation of the device it is desirable to provide breather means for the chambers between the cylinders formed by cooperating pistons 14 and 19, so air will not become compressed therein or a vacuum formed therein.

To accomplish the breather operation the power disc 12 is provided with a plurality of ports 42, Figures 5 and 4, which ports discharge through the rim of the power disc and have connected to their inner ends outwardly extending pipes 43, which discharge into the annular discharge pipe 44. Annular discharge pipe 44, at spaced points, is provided with inwardly extending pipes 45, the inner ends of which are connected in radial ports 46 in the drive shaft 7. Ports 46 are in communication with an axially disposed discharge port 47 in the drive shaft, therefore it will be seen that air may be sucked from the atmosphere or discharged from the atmosphere during the operation of the engine, and that this breather operation will not only prevent a vacuum forming or compression operation between the pairs of pistons 14 and 19, but will also suck in cool air for cooling the cylinders, which is particularly desirable in high speed engines, and in short stroke operations. If desired, to add additional cooling means it will only be necessary to force cooling air to the breather system, and this system can be also used for forcing lubricant into the machine.

The invention having been set forth what is claimed as new and useful is:

1. The combination with a rotary engine comprising a casing, discs mounted in said casing, cooperating pistons carried by said discs, means for moving said pistons towards and away from each other for the cycles of operation thereof, a shaft carried by said disc and driven thereby, of breather conduit means extending through the shaft and in communication with the chambers between the pairs of pistons and through the rim of one of said discs.

2. A device as set forth in claim 1 wherein the outer rim of one of the discs is provided with in-

wardly extending ports and pipe connections between said ports and the breather passage through the shaft.

3. A device as set forth in claim 1 including
5 pipe connections between the ports in the disc and the port in the shaft, said pipe connection comprising an annular manifold adjacent the disc and branch pipe connections between the manifold and ports and shaft port.

10 4. A rotary engine comprising a casing, a power disc within the casing, a driven shaft carried by the power disc, a head disc rotatably mounted on the shaft, cooperating pistons carried by said discs within the casing, a pinion raceway within
15 the casing to the outside of the power disc, pinions in connection with said raceway, pinion shafts rotatably mounted in bearings of the

power disc and extending through openings in the head disc, cranks carried by said pinion shafts and disposed to the outside of the head disc, link connections between said cranks and the head disc to control the relative motion of the
5 piston-discs and disposed to the outside of the head disc and within the casing, means for adjusting the stroke, said stroke adjusting means comprising a plurality of rotatable head members pivoted to the head disc, a crank pin carried by
10 each of said headed members out of axial alignment with the pivotal point of the head members, and to which the links are connected and means for holding the headed members in a plurality of positions.

JACK E. HORNER.

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