

March 17, 1931.

E. E. GOEHLER

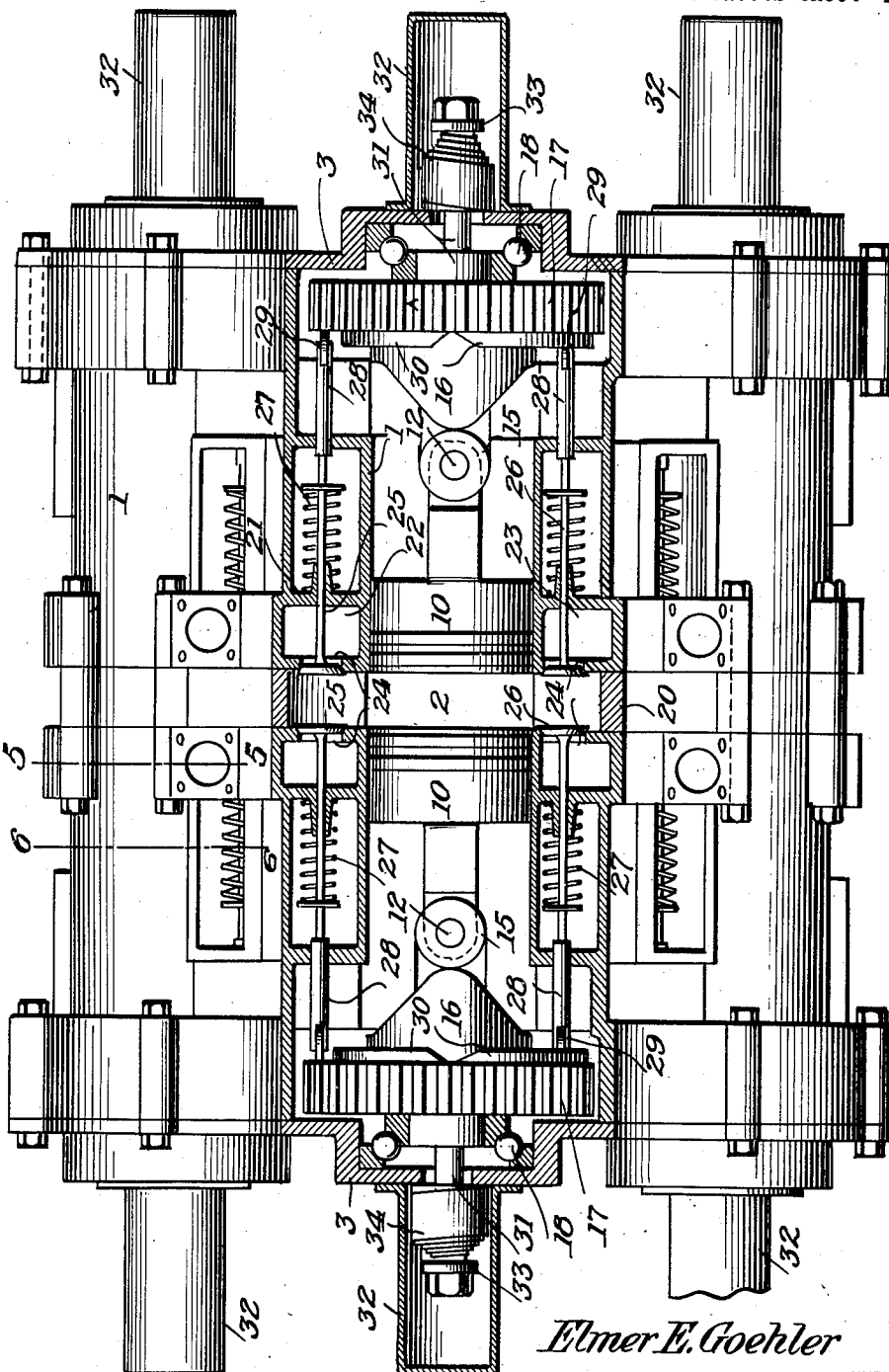
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INTERNAL COMBUSTION ENGINE

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Fig. 1.



Elmer E. Goehler

INVENTOR

BY Victor J. Evans

ATTORNEY

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E. E. GOEHLER

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Fig. 2.

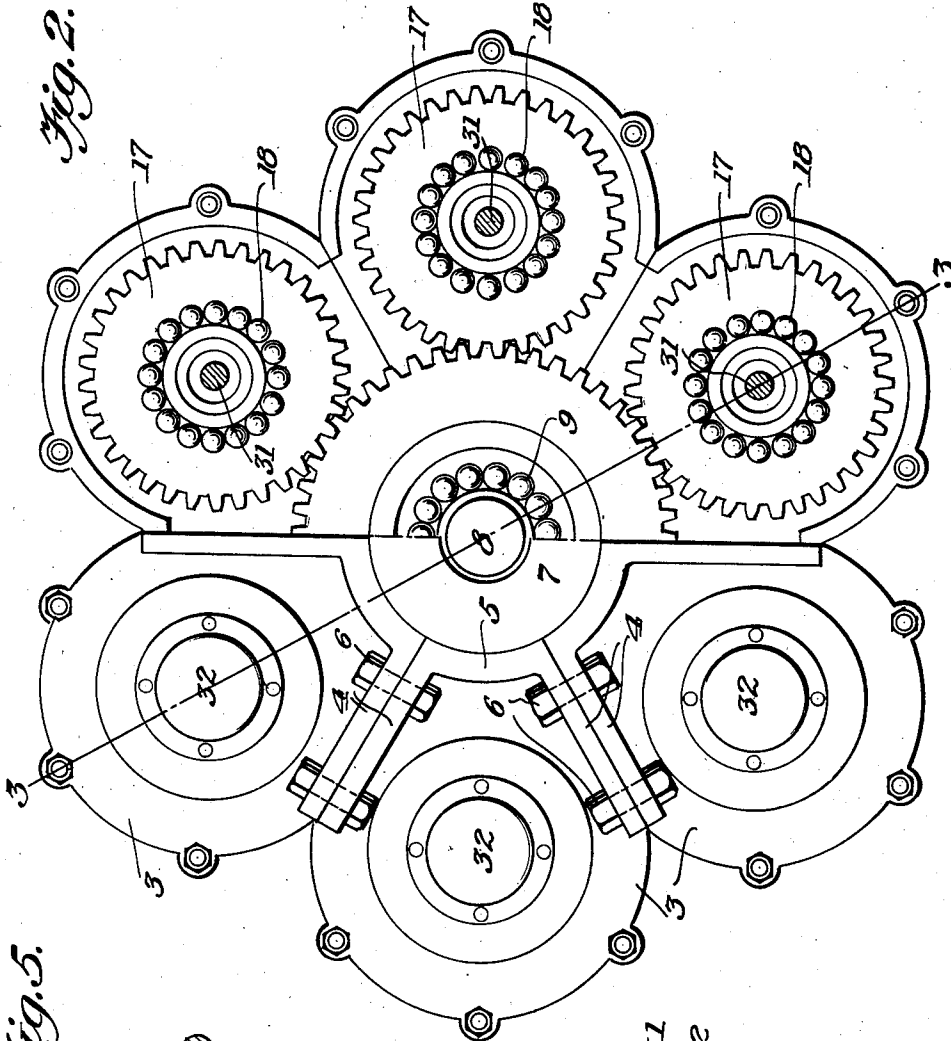


Fig. 5.

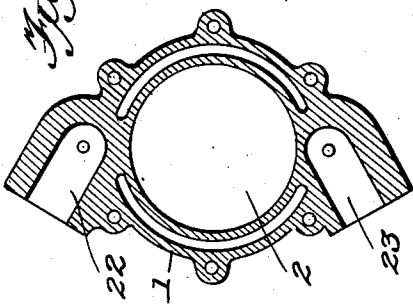
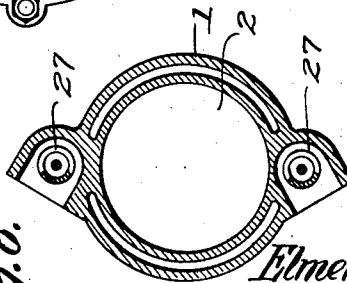


Fig. 6.



Elmer E. Goehler

INVENTOR

BY Victor J. Evans

ATTORNEY

March 17, 1931.

E. E. GOEHLER

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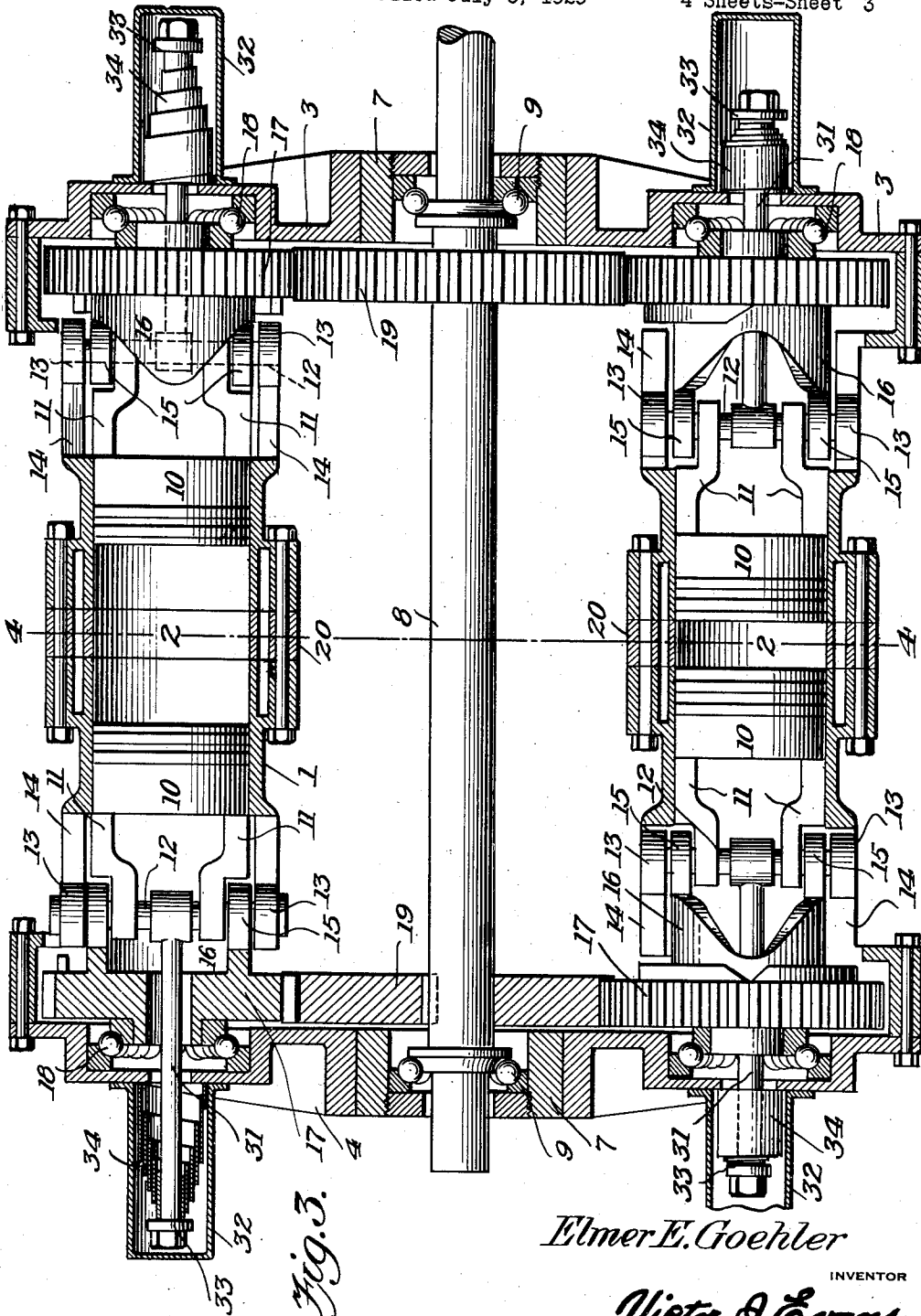


Fig. 3.

Elmer E. Goehler

INVENTOR

Victor J. Evans

ATTORNEY

March 17, 1931.

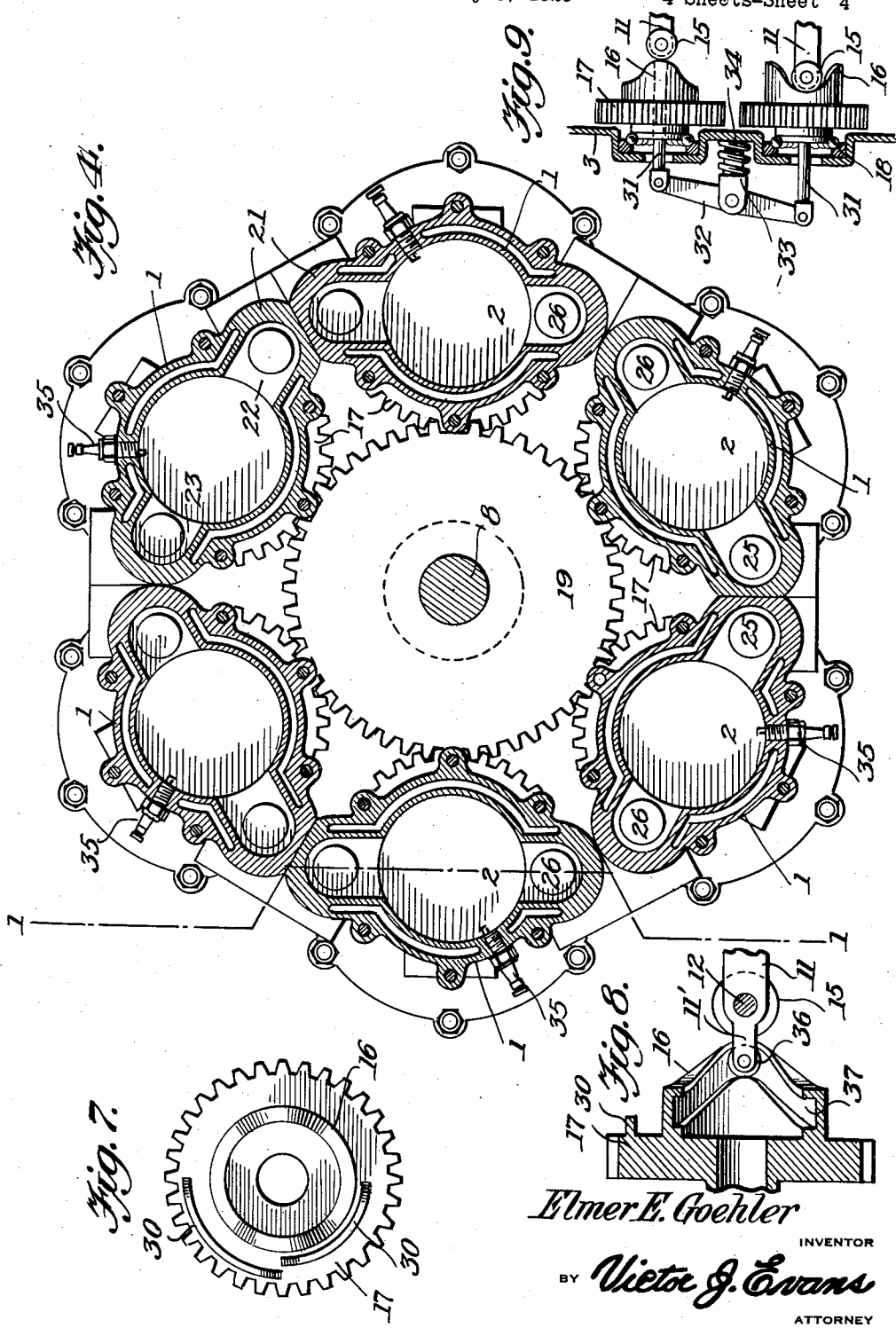
E. E. GOEHLER

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4 Sheets-Sheet 4



*Elmer E. Goehler*  
INVENTOR  
BY *Victor J. Evans*  
ATTORNEY

# UNITED STATES PATENT OFFICE

ELMER E. GOEHLER, OF PORTLAND, OREGON

INTERNAL-COMBUSTION ENGINE

Application filed July 5, 1929. Serial No. 376,180.

This invention relates to an internal combustion engine, the general object of the invention being to provide an annular arrangement of cylinders, each cylinder having a pair of pistons therein, cam means for causing the reciprocatory movement of the pistons and a centrally arranged shaft which is geared to the cam means whereby the power strokes of the pistons will cause the cam means to rotate and thus rotate the shaft and cause the cam means to give the pistons their inward strokes.

A further object of the invention is to provide cams associated with the before mentioned cam means for operating the inlet and exhaust valves of the cylinders.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figure 1 is an elevation with one of the cylinders in section.

Figure 2 is an end view, with parts broken away, to show some of the gears.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line 4—4 of Figure 3.

Figure 5 is a section on line 5—5 of Figure 1.

Figure 6 is a section on line 6—6 of Figure 1.

Figure 7 is a face view of one of the cam gears.

Figure 8 is a sectional detail view showing a modification.

Figure 9 is a sectional view showing a further modification.

In these views, the numeral 1 indicates a number of cylinders arranged in an annulus, each cylinder being formed of two sections separated at their inner ends to form

the combustion space 2 and with the outer ends of the sections suitably connected to the heads 3, the heads being provided with the flanges 4 which are integrally connected with the segments of rings 5, the flanges being connected together in pairs by the bolts 6. A bearing member 7 is placed in each ring and suitably attached thereto and a shaft 8 is rotatably supported by said bearing members and is provided with the anti-friction means 9. A pair of pistons 10 is arranged in each cylinder and one in each section thereof and the outer part of each piston carries a pair of arms 11 which support a shaft 12, said shaft carrying a pair of outer rolls 13 engaging the side walls of slots 14 formed in each section of a cylinder and a pair of inner rolls 15 which are engaged by the circular cam part 16 on a gear 17 which is provided with the thrust bearings 18. The gears are arranged in the heads of the cylinders and the gears at each end of the cylinder mesh with a gear 19 fastened to the shaft 8. Each combustion space 2 is closed by a substantially ring-shaped part 20 and the inner end of each section of each cylinder is formed with the enlargements 21, one of which contains the exhaust passage 22 and the other the inlet passage 23 and the enlargements are also formed with the ports 24 which connect the passages with the space 2. These ports form valve seats for the exhaust valve 25 and the inlet valve 26. These valves are normally kept closed by the springs 27 and the push rods 28 for the valve stems have rolls 29 on their outer ends which are engaged by the small cams 30 on each gear 17. One of these cams 30 operates the inlet valve and the other the exhaust valve during the rotation of the gear. It will, of course, be understood that the inlet passages are connected with a carbureter or the like and the exhaust valves with an exhaust manifold.

The rod 31 is rotatably connected with the central part of each shaft 12 and extends through the head 3 into a housing 32 attached to each head, and the outer end of each rod has a cap 33 thereon against which presses a

spring 34 in the housing, this spring tending to hold the piston in its outward position.

From the foregoing it will be seen that the rotary movement of the gears 17 will cause the cam parts 16 thereon to push the cylinders inwardly on the compression and exhaust stroke against the action of the springs 34 and on the power strokes of the pistons, the rollers 15, engaging the cam parts 16, will act to rotate the gears and this rotary movement of the gears is transmitted by the gears 19 to the shaft 8. A suitable ignition system is provided for the motor, the spark plugs of which are shown at 35, with their inner ends extending into the combustion spaces 2 and the cylinders may be cooled either by air or water.

In the modification shown in Figure 8, each piston is drawn outwardly by a small roll 36 attached to an extension 11' of each arm 11 and engaging a cam groove 37 formed in each cam part 16. Thus in this form of the invention, the rods 31 and the springs 34 are omitted.

In the modification shown in Figure 9, the rod 31' of each pair of pistons are connected together by a lever 32 and a member 33 is pivoted to the center of the lever and is engaged by a spring 34 pressing against a stationary part of the device and tending to move the rod 32 and the two pistons outwardly. As will be seen, one piston is at its inner limit of movement and the other piston at its outer limit of movement, with the rocker arm arrangement holding the rolls against the cams. As will be seen, this engine is very compact, due to having its cylinders arranged in an annulus and parallel with the propeller shaft. It will produce great power, due to the high ratio of piston travel and to the fact that the explosions expand in two directions. The reciprocating parts are perfectly balanced, due to the fact that one part is directly opposite another part, which moves in exactly the opposite directions the same distance and at the same time. Due to the construction of the intake and exhaust cams, the valves open quickly and remain open and then close quickly. By varying the shape of the power cam, the number of strokes and length of strokes can be varied. Due to the construction of the motor, there is no side thrust of the pistons and the number of valves per cylinder is limited only by the outside circumference of the cylinder.

It is thought from the foregoing description that the advantages and novel features of the invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts, provided that such changes fall within the scope of the appended claims.

What I claim is:—

1. An internal combustion engine comprising a plurality of horizontally disposed and annular arranged cylinders having oppositely arranged slots, a pair of pistons in each cylinder and adapted to reciprocate in opposite directions and to provide a central explosive chamber in each cylinder, intake and exhaust valves for said cylinders, heads formed on the outer ends of the cylinders, a central power shaft journaled in said heads, spaced pairs of arms secured to the pistons, rods connecting the arms of each pair and extending into the slots, guide rollers journaled on the rods and engaging the walls of the slots, gears journaled in said heads, cams on said gears to operate the intake and exhaust valves, a second set of cams on said gears, cam rollers on said rods and engaging the second mentioned cams to move the pistons inwardly of the cylinders on rotation of the gears and to rotate the gears on the power stroke of said pistons, means connecting the gears to the shaft, and means for normally urging the pistons inwardly of the cylinders to cause the cam rollers to always ride their respective cams.

2. An internal combustion engine comprising a plurality of horizontally disposed and annular arranged cylinders having oppositely disposed slots, a pair of pistons in each cylinder and adapted to reciprocate in opposite directions and to provide a central explosive chamber in each cylinder, horizontally disposed intake and exhaust valves for said cylinders, heads formed on the outer ends of the cylinders, a central power shaft journaled in said heads and arranged centrally of the cylinders, spaced pairs of arms secured to the pistons, rods connecting the arms of each pair and extending into slots, guide rollers journaled on the rods and engaging the walls of the slots, gears journaled in said heads, cams on said gears to operate the intake and exhaust valves, a second set of cams on said gears, cam rollers on said rods and engaging the second mentioned cams to move the pistons inwardly of the cylinders on rotation of the gears and to rotate the gears on the power stroke of said pistons, master gears connecting the first named gears to the shaft, and means for normally urging the pistons outwardly of the cylinders to cause the cam rollers to always ride their respective cams.

3. An internal combustion engine comprising a plurality of horizontally disposed and annular arranged cylinders having oppositely arranged slots, a pair of pistons in each cylinder and adapted to reciprocate in opposite directions and to provide a central explosive chamber in each cylinder, intake and exhaust valves for said cylinders, heads formed on the outer ends of the cylinders, a central power shaft journaled in said heads,

spaced pairs of arms secured to the pistons, rods connecting the arms of each pair and extending into the slots, guide means journaled upon the rods and engaging the walls of the slots, gears journaled in said heads, 5 cams on said gears to operate the intake and exhaust valves, a second set of cams on said gears, cam rollers on said rods and engaging the second mentioned cams to move the 10 pistons inwardly of the cylinders on rotation of the gears and to rotate the gears on the power stroke of said pistons, means connecting the gears to the shaft, connecting rods connected to the first named rod and extending 15 through the heads, and springs interposed between the ends of the rods and the heads to normally urge the pistons outwardly of the cylinders to cause the rollers to ride their respective cams.

4. An internal combustion engine comprising a plurality of horizontally disposed and annular arranged cylinders having slots, a pair of pistons in each cylinder and adapted to reciprocate in opposite directions and to 25 provide a central explosive chamber in each cylinder, intake and exhaust valves for said cylinders, heads on the cylinders, a central power shaft journaled in said heads, spaced pairs of arms secured to the pistons, rods connecting the arms of each pair and extending 30 into the slots, guide rollers journaled on the rods and engaging the walls of the slots, gears journaled in said heads, cams on said gears to operate the valves, a second set of 35 cams on said gears, cam rollers on said rollers and engaging the second mentioned cams to move the pistons inwardly of the cylinders on rotation of the gears and to rotate the gears on the power stroke of said pistons, 40 means connecting the gears to the shaft, rods connected to the first named rods and extending through the heads and tension means associated with the second named rods to normally urge the pistons outwardly of the 45 cylinders to hold the rollers in engagement with their respective cams.

In testimony whereof I affix my signature.

ELMER E. GOEHLER.

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