Sept. 20, 1932. P. FREUND 1,878,767

INTERNAL COMBUSTION ENGINE

Filed Nov. 8, 1929 4 Sheets-Sheet 1

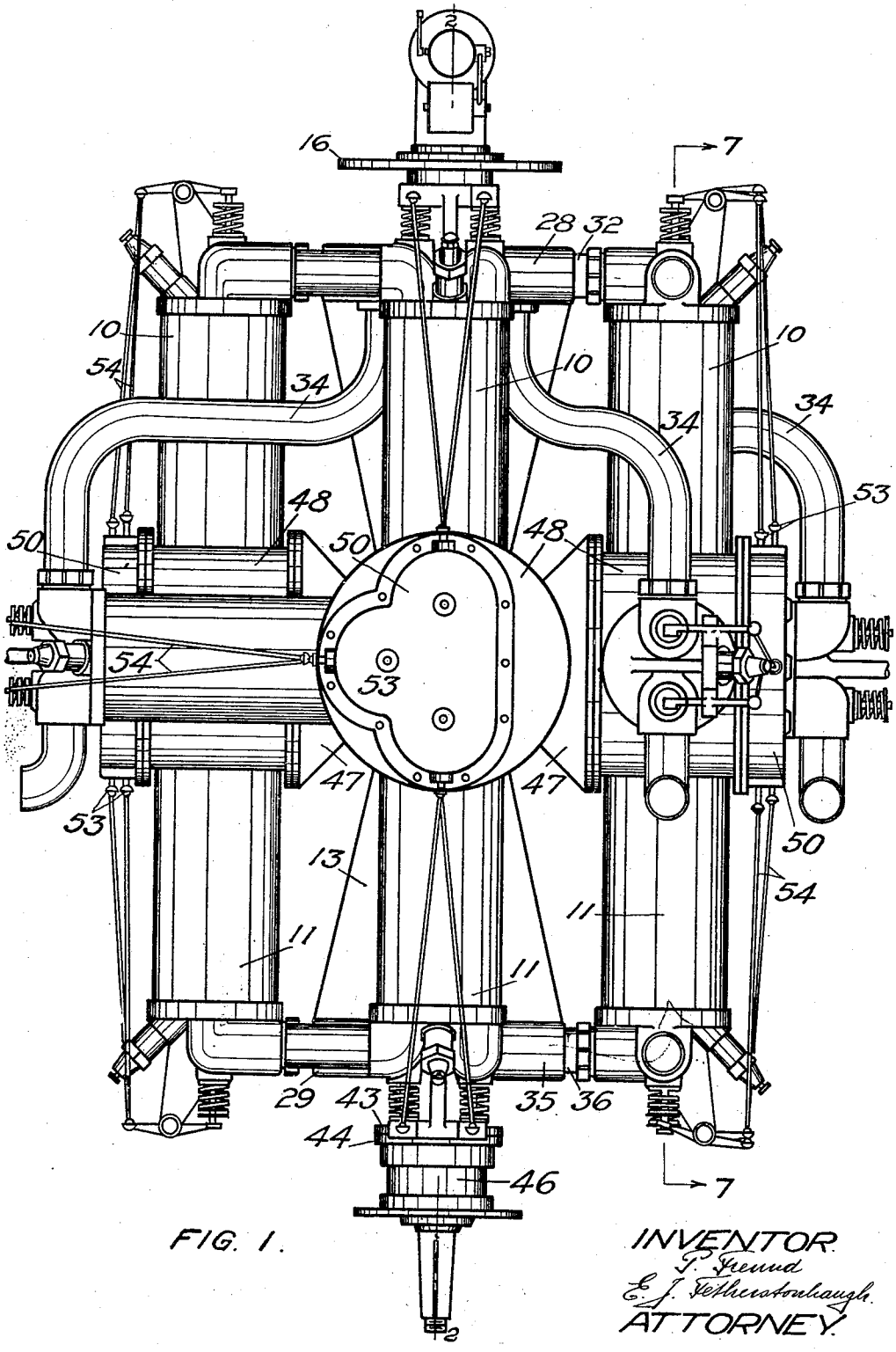

FIG. 1.

INVENTOR
P. Freund
E. J. Fetherstonhaugh
ATTORNEY

Sept. 20, 1932. P. FREUND 1,878,767

INTERNAL COMBUSTION ENGINE

Filed Nov. 8, 1929 4 Sheets-Sheet 2

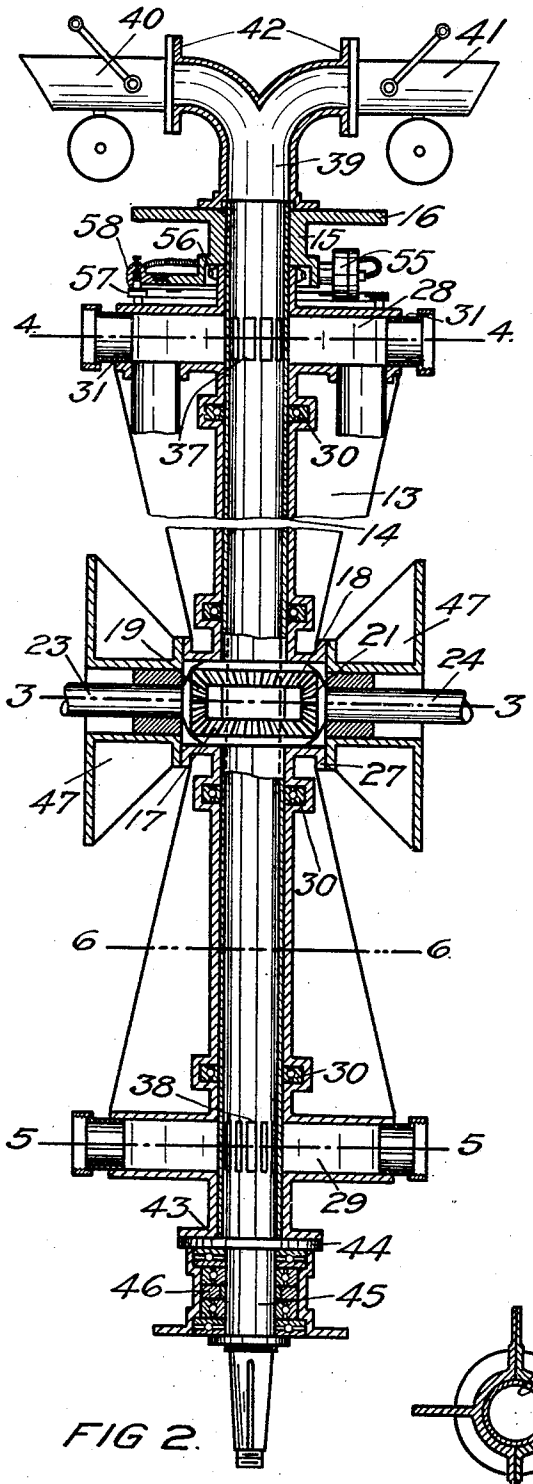

FIG 2.

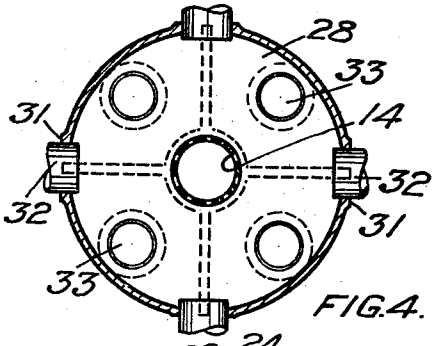

FIG. 4.

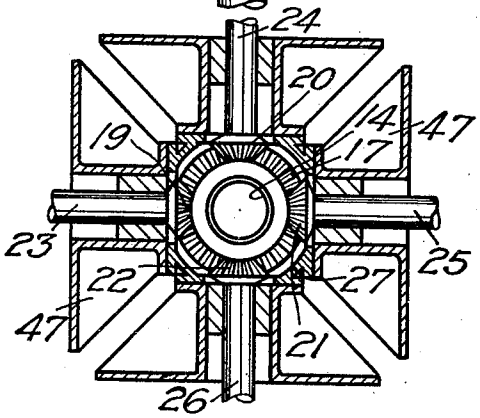

FIG. 3.

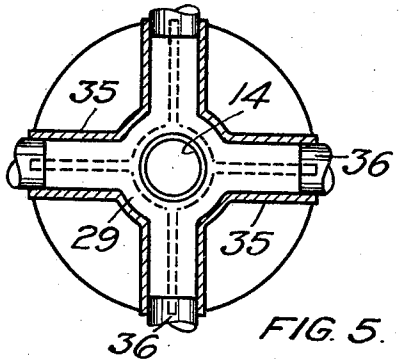

FIG. 5.

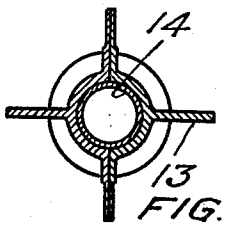

FIG. 6.

INVENTOR
P. Freund.
E. J. Fetherstonhaugh
ATTORNEY.

Sept. 20, 1932. P. FREUND 1,878,767

INTERNAL COMBUSTION ENGINE

Filed Nov. 8, 1929 4 Sheets-Sheet 3

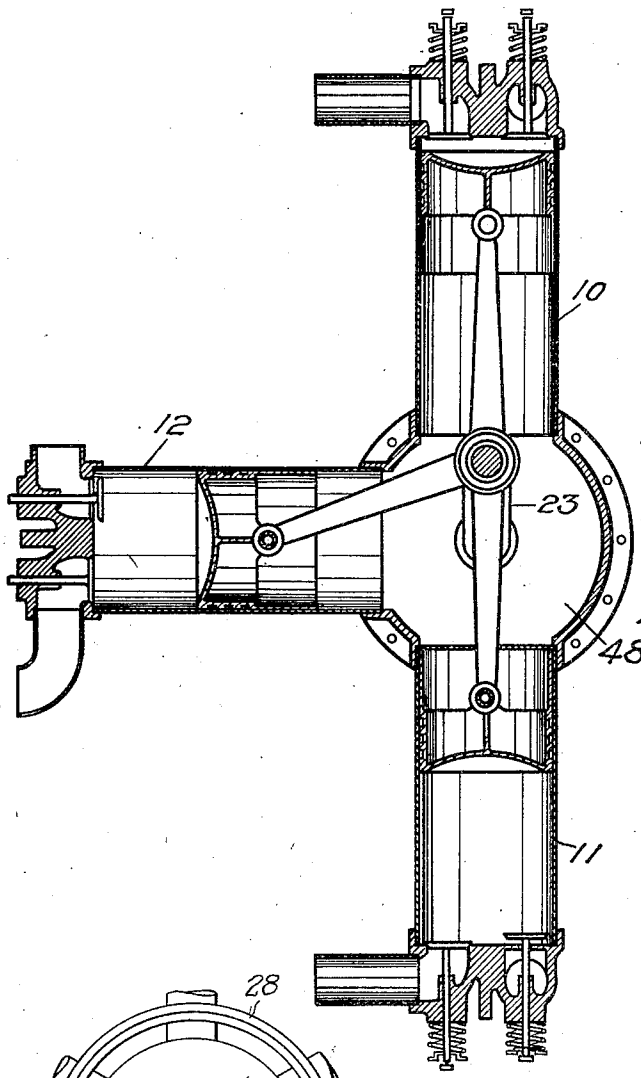

FIG. 7

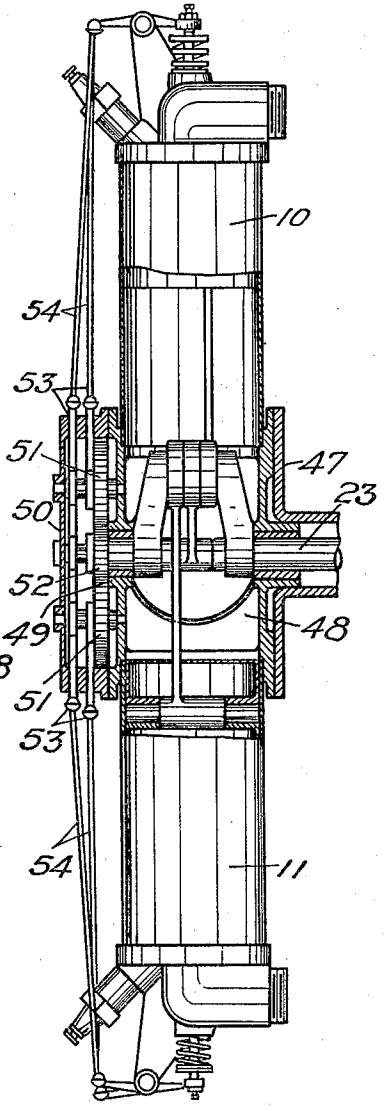

FIG. 8.

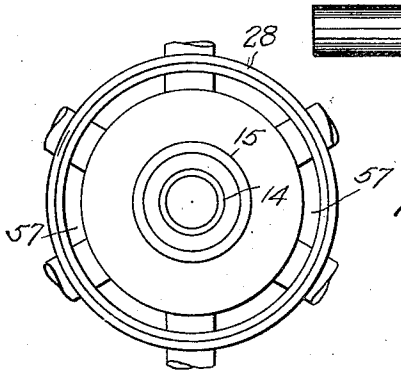

FIG. 10

INVENTOR
P. Freund.
E. J. Fetherstonhaugh.
ATTORNEY

Sept. 20, 1932. P. FREUND 1,878,767

INTERNAL COMBUSTION ENGINE

Filed Nov. 8, 1929 4 Sheets-Sheet 4

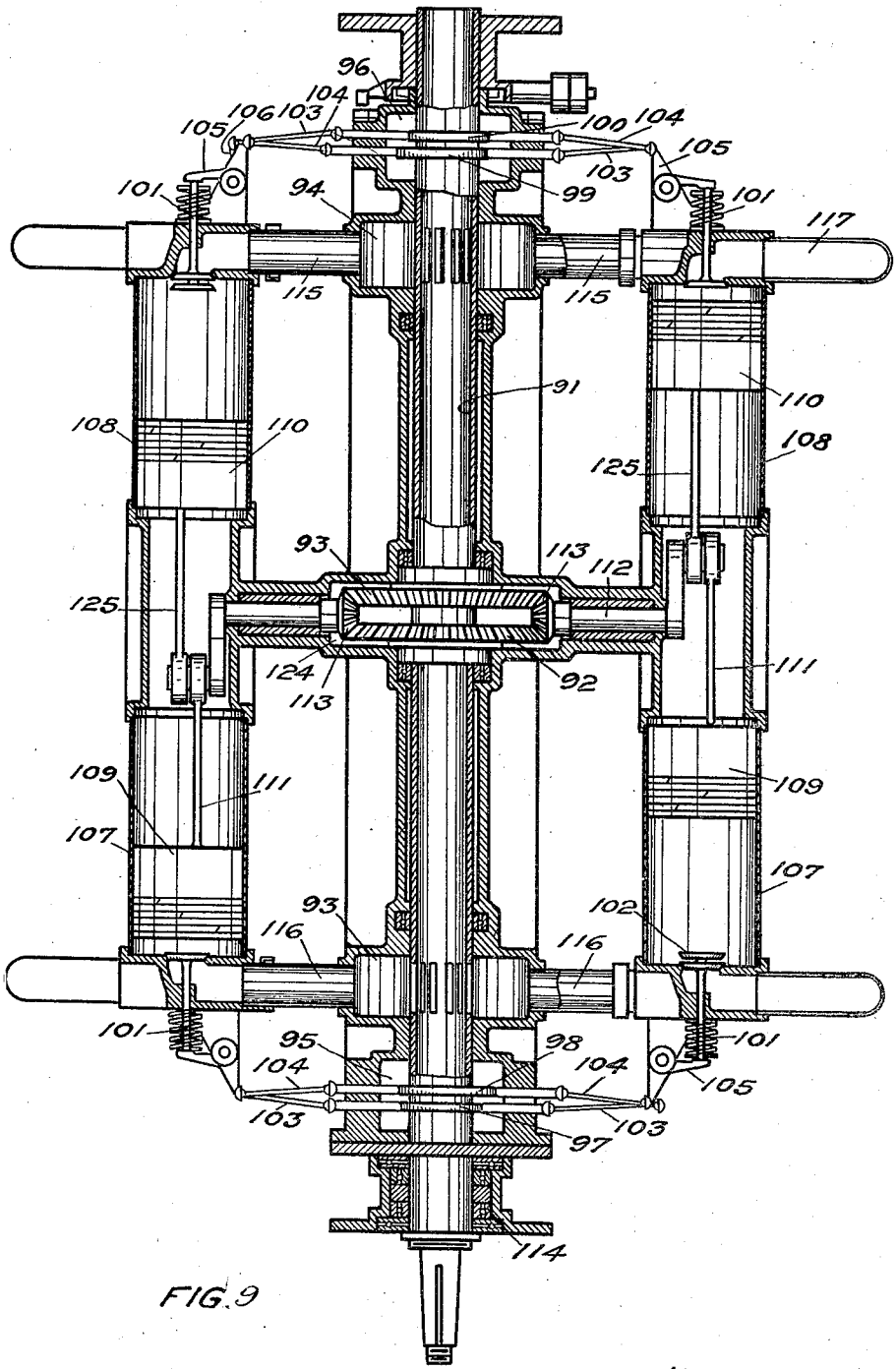

FIG. 9

INVENTOR
P. Freund
BY C. J. Fetherstonhaugh
ATTORNEY

Patented Sept. 20, 1932 1,878,767

UNITED STATES PATENT OFFICE

PHILLIP FREUND, OF FARMINGDALE, NEW YORK, ASSIGNOR OF ONE-HALF TO RICHARD WILLIAM FAUGHNAN, OF FARMINGDALE, LONG ISLAND, NEW YORK

INTERNAL COMBUSTION ENGINE

Application filed November 8, 1929. Serial No. 405,683.

The invention relates to an internal combustion engine as described in the present specification and illustrated in the accompanying drawings that form part of the same.

The invention consists essentially of the combined reciprocatory and rotary movements derived in the manner described to rotate the driving shaft as pointed out in the claims for novelty following a description containing an explanation in detail of an acceptable form of the invention.

The objects of the invention are to lighten the weight of the engine, particularly for use in airplanes and yet multiply the cylinders to the greatest extent possible with safety to the structure; to simplify the transmission of power from a crank mechanism and at the same time centralize the transmission shaft, and thereby insure a natural balance, which will greatly relieve the torque effect and consequently eliminate bent shafts; to utilize the explosions in such a manner as to obtain the maximum power from a given quantity of fuel, thus economizing in the consumption of the oils and yet improve the running conditions; to construct an engine in which accessibility and concentration of parts are features that will facilitate the assembly, the operation and the maintenance of the machine; and generally to provide in this type of engine, economy, durability and efficiency.

In the drawings, Figure 1 is an elevational view of a 12 cylinder rotatory motor.

Figure 2 is a sectional view on the line 2—2 in Figure 1 of the central supporting member showing the driving gears, manifolds, thrust bearing, and drive shaft.

Figure 3 is a cross sectional view taken on the line 3—3 in Figure 2 of the level driving gears.

Figure 4 is a cross sectional view taken on the line 4—4 in Figure 2 of the upper intake manifold in section.

Figure 5 is a cross sectional view taken on the line 5—5 in Figure 2 of the lower intake manifold.

Figure 6 is a cross section on the line 6—6 in Figure 2 of the central supporting member.

Figure 7 is a longitudinal sectional view on the line 7—7 in Figure 1 of one group of cylinders.

Figure 8 is a part sectional elevational view taken at right angles to Figure 7 showing the timing gears and cams.

Figure 9 is a longitudinal sectional view of a modified form of motor having 12 cylinders arranged in horizontal pairs around a common central supporting member.

Figure 10 is a detail showing a plan view of the rotating manifold bearing the contact ring and showing the segments, and the terminals adapted to be connected to the several cylinders.

Like numerals of reference indicate corresponding parts in the various figures.

Referring to the drawings, the cylinders are arranged in groups of three, indicated by the numerals 10, 11, and 12, the cylinders 10 and 11 being horizontal to the axis and 12 at right angles or vertical to the axis.

The central supporting member 13 rotates around a fixed hollow shaft 14 which is fixedly secured to the hub 15 of the circular flange 16. Centrally on the shaft are the bevel gears 17 and 18, the gear 17 being securely keyed to the shaft 14 while the other gear 18 is loosely mounted on said shaft. The bevel gears 19, 20, 21 and 22 are securely keyed to the crank shafts 23, 24, 25 and 26, and mesh with the large bevels 17 and 18 on the stationary shaft 14.

The central supporting member 13 forms a housing 27 for the bevel gears 17 and 18 and also forms the intake manifolds 28 and 29 for the cylinders and rotates on the ball races 30 on the shaft 14.

The intake manifold 28 feeds eight of the cylinders, four of the horizontal cylinders 10 and four vertical cylinders 12 and is formed of a hollow circular casing with the openings 31 for the intake pipes 32 leading to the horizontal cylinders 10 and the openings 33 in the bottom for the intake pipes 34 leading to the vertical cylinders 12, while the manifold 29 feeds the remaining four horizontal cylinders 11. This manifold is similar in construction to the manifold 28, but has the long sleeves 35 to the intake pipes 36.

The shaft 14 is hollow and has a series of

ports 37 registering with the intake manifold 28 and the ports 38 registering with the manifold 29, so that the manifolds are always open to the inside of the hollow shaft 14. A T fitting 39 forms the intake pipe proper and is secured to the stationary flange 16 over the protruding end of the hollow shaft 14 forming a divided continuation of the central passage of said shaft. The carbureters 40 and 41 are secured to the flanges 42 of the intake pipe 39.

The stationary shaft 14 extends through the flange 43 and ends at the flange 44 of the driving shaft 45, said flange 44 being secured to the flange 43, and therefore connected to the rotating central supporting member 13 encircling the shaft 14.

The flanges of the crank cases 48 of the cylinder groups are secured to the flanges of the shaft housings 47 which are in turn secured to the sides of the bevel gear housing 27, thus becoming part with the central rotating member 13.

The crank shafts 23, 24, 25 and 26, are journalled in the bearings provided in the housings 47 and the bearings 49 of the timing cases 50.

The timing gears 51 are driven off the gear 52 operating the valves through the tappets 53 and push rods 54. The ignition timing being arranged through the contact breaker 55 driven by the gear 56 off the end of the rotating manifold 28, and through the rotating insulated ring 57 and the collector brush 58, the ring having segments connected to the cylinders.

In the operation of this form of the invention the entire motor revolves around the stationary shaft 14, the groups of cylinders firing, and rotating the small bevels 19, 20, 21 and 22 which travel around the face of the stationary bevel 17. The bevel 18 rotates but in an opposite direction and does nothing else but take part of the thrust from the small bevels off the driving bevel 17. The flanges 16 are the securing or foundation plates and are attached in any suitable way to the frame or chassis.

A modification is illustrated in Figure 9 in which twelve cylinders are arranged in groups of two having a common crank case and arranged horizontally around a common driving bevel.

In this form of the invention the central stationary hollow shaft 91 has the bevel gear 92 keyed thereto, the bevel gear 93 being loosely journalled thereon, the central member being formed in the same way as the preceding form, with the intake manifolds 93 and 94 and bevel gear casing 124 and the housings 95, and 96 covering the cams 97, 98 and 99, 100 secured to the stationary shaft, the valves 101 and 102 being operated by the push rods 103 and 104 and the rockers 105 and 106.

The cylinders 107 and 108 have the pistons 109 and 110 and connecting rods 125 and 111 driving the crank shaft 112 to which is secured the bevel gear 113 meshing with the bevel gear 92.

A combined thrust and ball bearing 114 is provided, the housing of which forms a foundation or securing plate for the motor.

The short pipes 115 and 116 connect intake manifolds 93 and 94 with the cylinders and the T shaped pipes 117 are for the exhaust.

In this invention the use of the central stationary shaft and the centralizing of the transmission shaft therefrom is quite an important feature of the engine, as in consequence of this arrangement the crank shafts center on one stationary gear or on two stationary gears, as the case may be, and these stationary gears form a path for the pinions operated by the crank shafts, which insures not only a positive drive, but a mechanism in which the driving elements are evenly balanced, so as to insure easy and smooth running conditions.

There are also extremely salient features connected with the arrangement of the cams and the operation of the valves and in the ignition devices.

The inlet manifolds must also be particularly mentioned, as well as the exhaust passages, for while these are incidental to the general construction of the engine, they are on the other hand extremely important parts conducive to the regular and unrestricted operation of the engine and consequently to its efficiency.

What I claim is:—

1. In an internal combustion engine, a rotating frame, cylinders carried by said frame, a stationary frame and stationary shaft forming the support for said rotating frame, pistons operating in said cylinders, and having connecting rods extending therefrom, a plurality of crank shafts journalled in said rotating frame, and operated respectively by groups of said connecting rods, a stationary gear fixedly mounted on said stationary shaft and an opposing loosely mounted gear, pinions fixedly mounted on said crank shafts and driven thereby and travelling on said stationary gear and engaging said loose gear, said cylinders arranged in pairs horizontal and parallel with the said stationary shaft, said cylinders having separate combustion chambers, and common crank cases, and valve gear operated by the rotation of said cylinders around said stationary cams.

2. In an internal combustion engine, a rotating frame, cylinders carried by said frame, a stationary frame and stationary shaft forming the support for said rotating frame, pistons operating in said cylinders, and having connecting rods extending therefrom, a plurality of crank shafts journalled in said rotating frame and operated respectively by

groups of said connecting rods, a stationary gear fixedly mounted on said stationary shaft and an opposing loosely mounted gear, pinions fixedly mounted on said crank shafts and driven thereby and travelling on said stationary gear and engaging said loose gear, said cylinders arranged in groups, horizontal and vertical to the said stationary shaft, the cylinders having separate combustion chambers and common crank cases, with a common valve operating gear to each of said groups.

Signed at St. Albans, New York, U. S. A., this 1st day of October, 1929.

PHILLIP FREUND.