C. W. GOODING, JR.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JUNE 10, 1915.

1,163,142.

Patented Dec. 7, 1915.

2 SHEETS—SHEET 1.

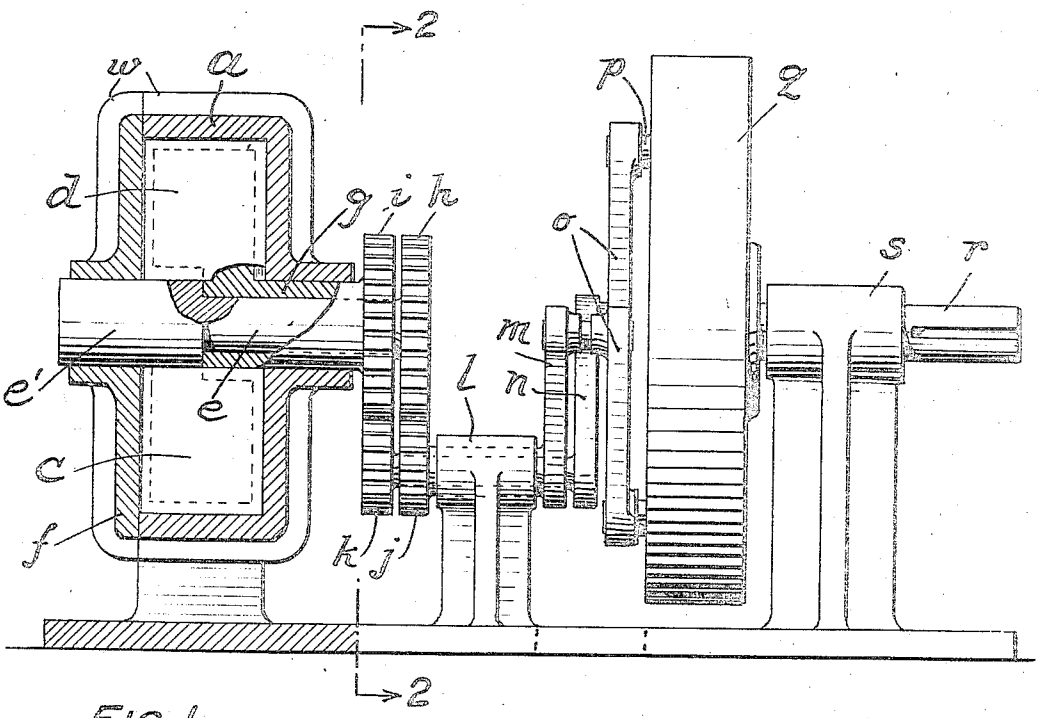


FIG. 1.

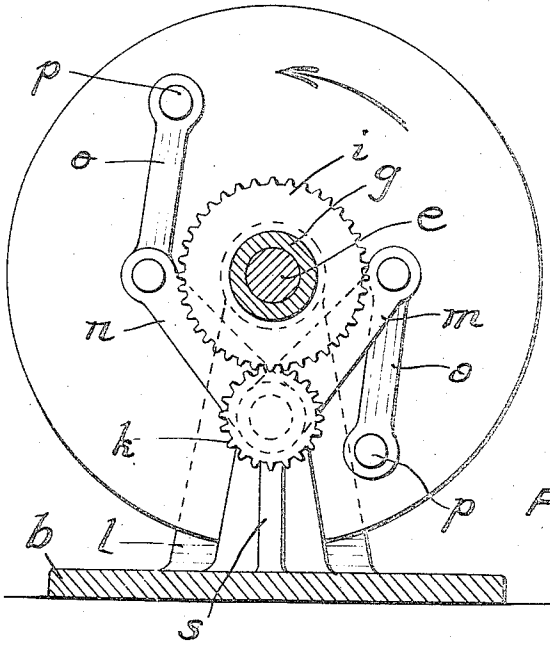


FIG. 2.

WITNESS:

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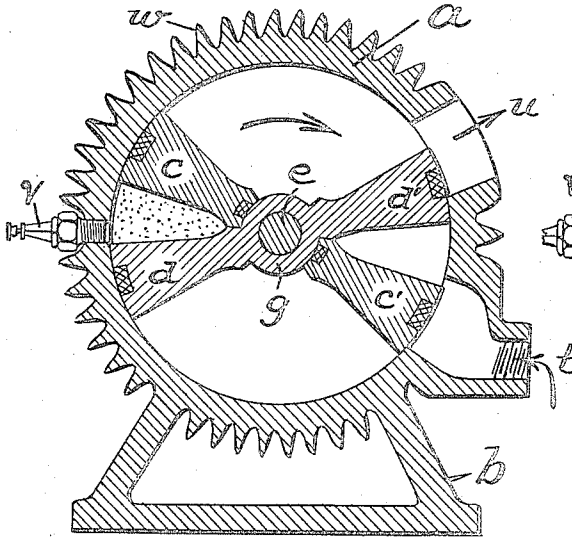


FIG. 3.

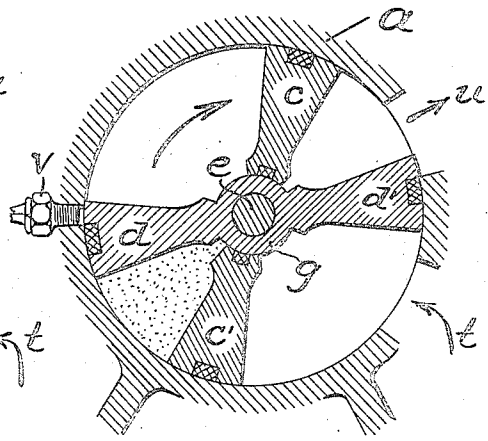


FIG. 4.

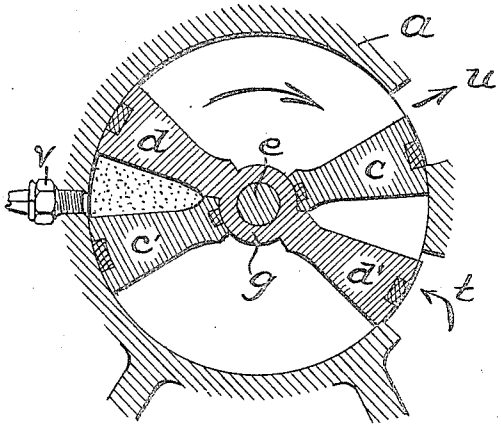


FIG. 5.

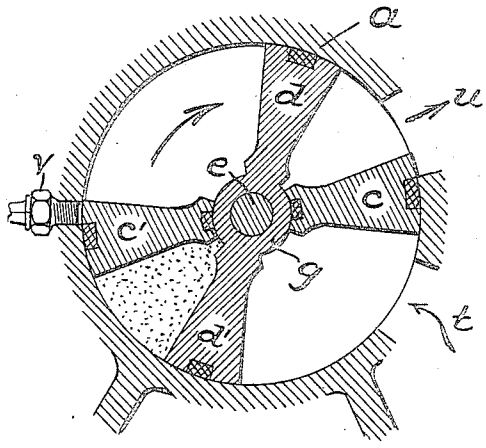


FIG. 6.

WITNESS:

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UNITED STATES PATENT OFFICE.

CHARLES W. GOODING, JR., OF WILMINGTON, DELAWARE.

INTERNAL-COMBUSTION ENGINE.

1,163,142. Specification of Letters Patent. Patented Dec. 7, 1915.

Application filed June 10, 1915. Serial No. 33,249.

To all whom it may concern:

Be it known that I, CHARLES W. GOODING, Jr., a citizen of the United States, residing at Wilmington, county of New Castle, and State of Delaware, have invented a new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to rotary internal combustion engines, and particularly to those applicable to automobile, motor boat and aeroplane uses, when very high speed is desired combined with steadiness of running.

The object of my invention is to provide an engine combining these features with simplicity of construction and the absence of inlet and exhaust valves and to reduce to a minimum the number of moving parts. To this end I have geared the impulse vanes in my cylinder to the fly wheel in a ratio of two to one, whereby the main shaft revolves at twice the speed of the motor, and yet have preserved the centers of shaft and cylinder in alinement, thus aiding in construction and adding to compactness and equilibrium.

I will now describe in detail an embodiment of my invention disclosed in the accompanying drawings, in which—

Figure 1 is an elevational view, partly in section. Fig. 2 is a cross section on the line 2—2 of Fig. 1. Fig. 3 is a cross section through the cylinder and vanes. Figs. 4, 5 and 6 are partial cross sections showing relative angular positions of pistons at succeeding steps in the cycle.

The cylinder *a* is mounted on the base plate *b*, and contains the two diametral pistons consisting of vanes *c*, *c'* and *d*, *d'*. Vanes *c*, *c'* are connected to the enlarged portion *e'* of a shaft *e*. mounted in bearings in the cylinder and its head *f*. Vanes *d*, *d'* are connected to a sleeve *g*, on shaft *e*, whose diameter is the same as the enlarged portion *e'* thereof. Shaft *e* and sleeve *g* carry on their outer ends gears *h*, *i*, which mesh with pinions *j*, *k*, of one half their size. Pinions *j* and *k* are carried by a concentric sleeve and shaft mounted in a bearing on the base plate, and have attached at the other ends thereof, respectively, arms *m* and *n*. The outer extremities of arms *m* and *n* are connected by links *o* with pins *p* carried by the fly wheel *q*, and symmetrically located diametrically opposite each other thereon. The fly wheel is attached to the end of the driving shaft *r* carried by suitable bearings *s* on the base *b*.

The cylinder is provided with inlet port *t* and exhaust port *u*, and with a single firing plug *v*. Cylinder and head may be cast with external fins *w* for cooling and it is understood a fan may be used in connection therewith in the usual manner, and the whole incased in a draft hood if desired, such features being no part of my invention, but set forth in an application filed of even date herewith, Serial No. 33,248.

The cycle of operation is as follows: Assume the pistons to be in the position shown in Fig. 3. There is a compressed charge of explosive mixture between vanes *d* and *c*, which at this moment is ignited by firing plug *v* and vane *c* is impelled forward as shown in Fig. 4, discharging ahead of it the spent gases of the previous explosion through exhaust *u*. At the same time vane *c'* has drawn a fresh charge of explosive mixture through port *t* and compressed the preceding charge between itself and vane *d*. The parts are carried forward by momentum until in the position shown in Fig. 5, when firing of the last mentioned charge takes place. Vane *c'* is held practically stationary by virtue of the relative angularity and speeds of arm *m* and its link at this time, while vane *d* is impelled forward as shown in Fig. 6. In this movement the spent gases are exhausted, a charge of explosive mixture is compressed between vanes *d'* and *c'* and a fresh charge is drawn into the cylinder. Momentum carrying the parts forward to the firing position, it will be seen that the pistons will occupy the position of the pistons shown in Fig. 3, only transposed the one for the other. We have therefore been through a half revolution, the succeeding steps being exact repetitions. Each vane as it passes inlet port *t* draws a charge into the cylinder, at the same time compressing a charge ahead of it, the opposite vane meanwhile receiving the impelling force of an explosion and at the same time expelling spent gases from a compartment ready for a new charge. Each piston is made alternately to do the work, while the other piston is held practically stationary.

During the half revolution of piston c, c' described above, gear h connected therewith turned its pinion j through a complete revolution, which through its arm and link, gave the fly wheel a complete revolution. It is therefore seen that the fly wheel revolves at twice the average speed of the pistons. Moreover, as is seen in Figs. 1 and 2, the cylinder a and stand bearings s may be bored in alinement, and the fly wheel, main shaft and propellers or other work driven thereby, revolve on the same center as the piston vanes.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In an internal combustion engine, the combination of a piston chamber, two pairs of vanes therein rotatable at differential and variable speeds on a common axis, two gears on the shafts of the respective pairs of vanes, two pinions rotatable on a common axis and meshing with the respective gears, a fly-wheel on the axis of the vanes, links pivoted to the fly-wheel on opposite sides of its center, and arms, one on the shaft of each pinion, pivotally connected to the respective links.

2. In an internal combustion engine, the combination of a fly-wheel shaft, a fly-wheel thereon, a piston chamber, a piston shaft and a surrounding sleeve extending into said chamber, said shafts being on a common axis, two vanes on the sleeve, two vanes on the piston shaft, said vanes contained within the cylinder, a counter-shaft and a surrounding sleeve, gearing between the piston shaft and the sleeve on the counter-shaft, gearing between the sleeve on the piston shaft and the counter shaft, arms respectively on the counter shaft and on its surrounding sleeve, and links connecting said arms with diametrically opposite points on the fly-wheel.

3. In an internal combustion engine, the combination of a piston chamber, a single spark plug at one side thereof, said chamber having a single intake for the fuel gas and a single outlet for the spent gas, both located approximately opposite the single spark plug, two pairs of vanes in the piston chamber rotatable at differential and variable speeds on a common axis, two pinions rotatable on another axis and geared to the shafts of the respective pairs of vanes, two arms carried by the shafts of the respective pinions, a fly-wheel, and links connecting said arms with points on the fly-wheel diametrically opposite its center.

In testimony of which invention I have hereunto set my hand at Wilmington, on this 21st day of May, 1915.

CHARLES W. GOODING, JR.

Witnesses:

W. SCOTT VERNON,

E. E. WALL.