

P. V. WOODWARD.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED OCT. 23, 1909.

967,097.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 1.

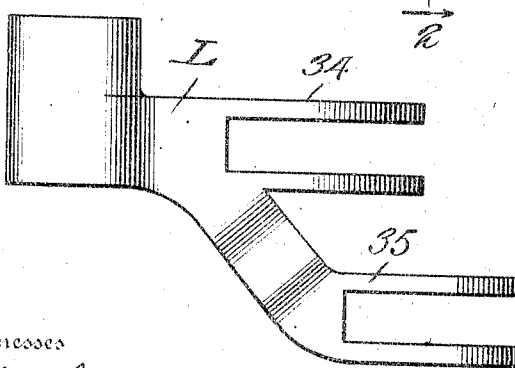
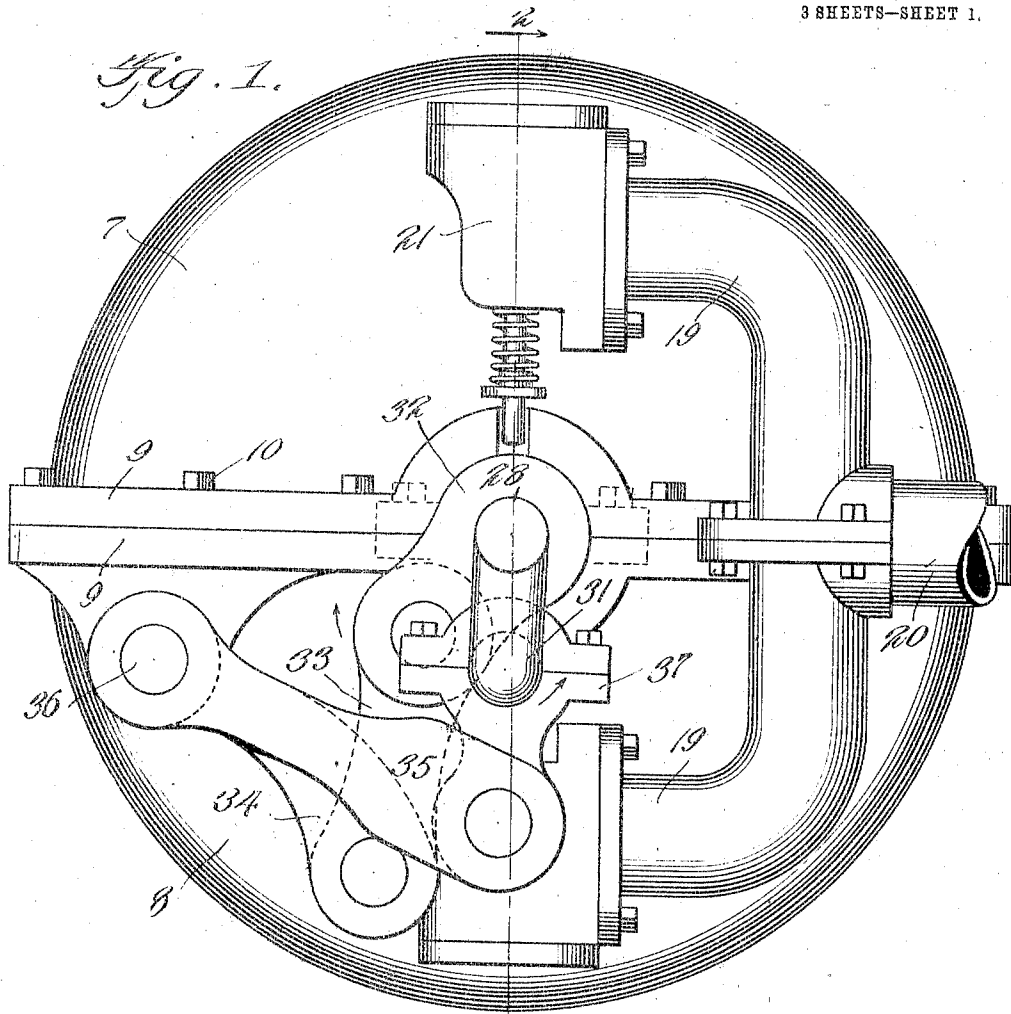


Fig. 5.

Witnesses

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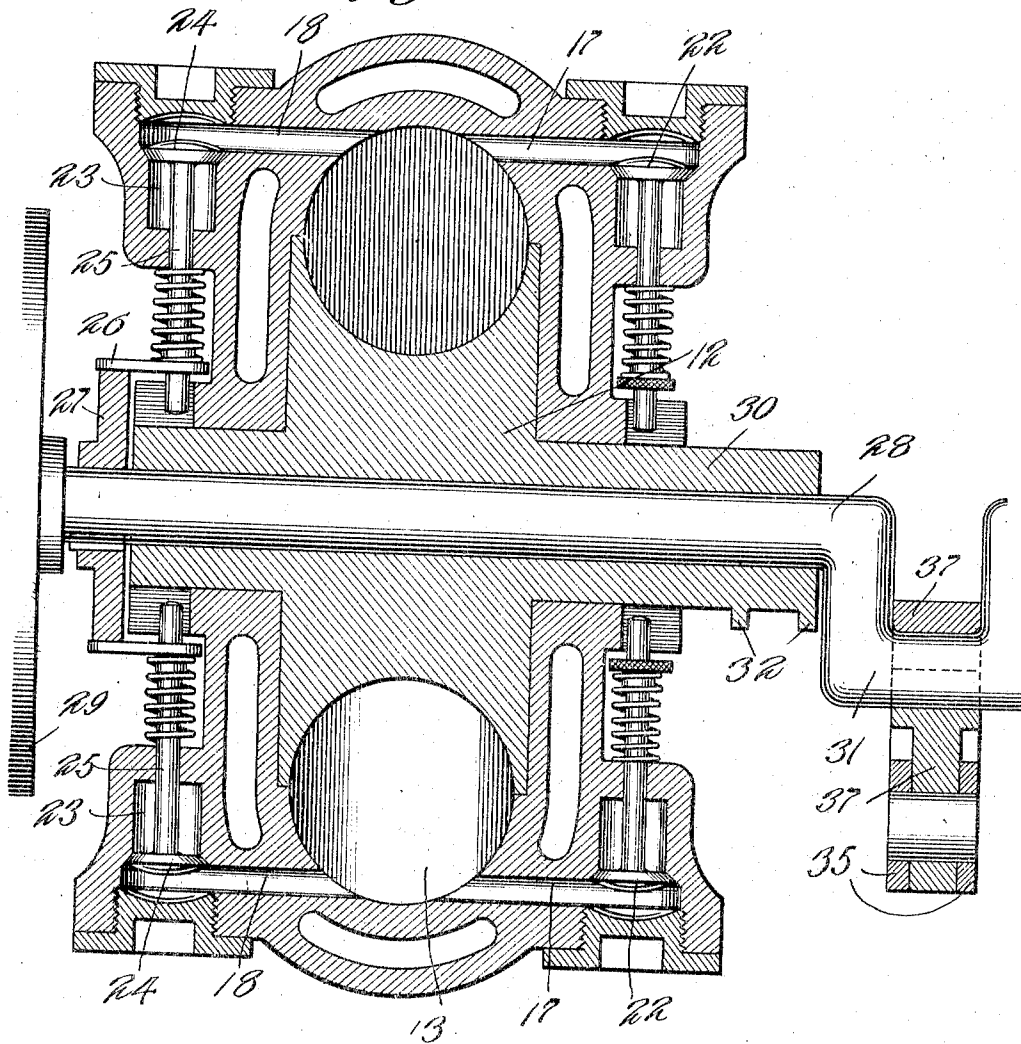
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

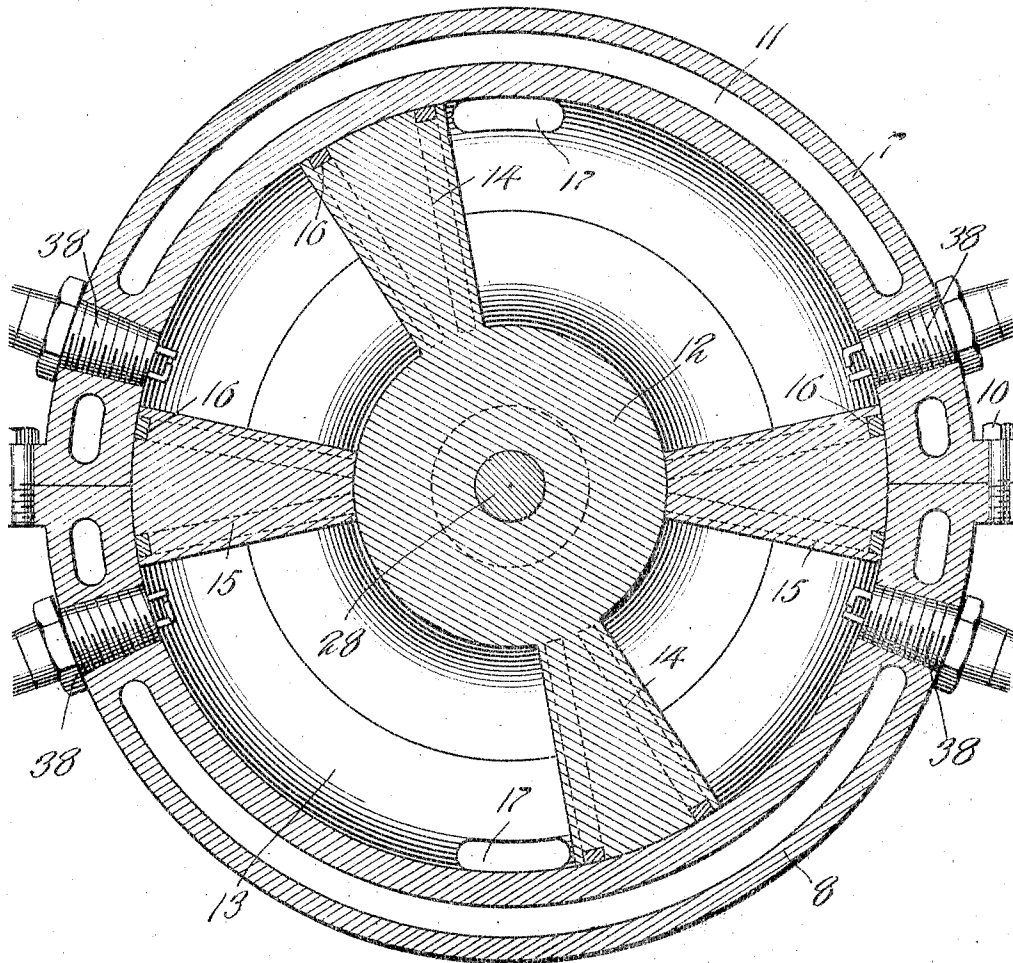
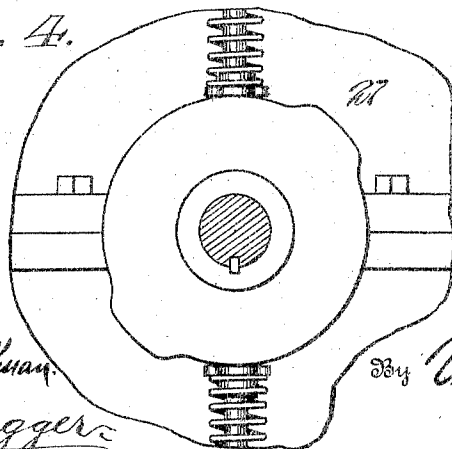


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

PERCY V. WOODWARD, OF LONDON, ONTARIO, CANADA, ASSIGNOR OF ONE-HALF TO
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INTERNAL-COMBUSTION ENGINE.

967,097.

Specification of Letters Patent.

Patented Aug. 9, 1910.

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To all whom it may concern:

Be it known that I, PERCY V. WOODWARD, a citizen of Canada, residing at London, in the Province of Ontario and Dominion of Canada, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and a particular object of the invention is to construct a simple, efficient and powerful engine in extremely compact form.

A further object of the invention is to construct a simple and compact engine in which a positive carrying hub shall be mounted for oscillation within a casing or cylinder having stationary abutments.

A still further object of the invention is to construct a machine of the character described wherein the driven shaft shall be supported for rotation within the oscillating hub, thereby avoiding the necessity of providing exterior bearings for said shaft, and greatly economizing space.

Still further objects of the invention are to simplify and improve the general construction and operation of an engine having the characteristics outlined above.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention; it being however understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the invention may be resorted to when desired.

In the drawings: Figure 1 is an end elevation of an engine constructed in accordance with the invention. Fig. 2 is a vertical sectional view taken on the plane indicated by the line 2-2 in Fig. 1. Fig. 3 is a vertical transverse sectional view taken substantially at right angles to Fig. 2. Fig. 4 is a detail end elevation showing the cam whereby the exhaust valves are actuated. Fig. 5 is a detail plan view of a link forming part of the mechanism whereby the oscillatory movement of the piston carrying hub

is converted into rotary motion when transmitted to the driven shaft.

Corresponding parts in the several figures are denoted by like characters of reference.

The casing of the improved engine, generally known as the cylinder is divided longitudinally of its axis into two parts or members which will be hereinafter referred to as the top piece 7 and the bottom piece 8, said top and bottom pieces being provided with marginal flanges 9 for the reception of connecting means such as bolts or screws 10. The casing members are cored to form passages 11 for water or other fluid whereby the temperature of the casing may be reduced when the engine is in operation.

Supported for rotation in the ends of the casing, axially of the latter is a hub 12 which combines with the interior walls of the casing to form an annular recess or passage 13 of approximately circular cross section. The hub 12 carries two wings or pistons 14 extending in diametrically opposite directions; and abutments 15 which are likewise diametrically opposed are firmly secured or mounted in the annular passage of the casing, the abutments 15 as well as the pistons 14 are provided with packing strips 16 to prevent leakage.

Inlet ports 17 for the gas or explosive vapor are formed in one side or end of the casing about midway between the abutments 15 and exhaust ports 18 are formed in the opposite side or end of the casing also about midway between the abutments. The inlet ports 17 communicate with the branches 19 of the feed pipe 20 through the valve casings 21 in which spring actuated valves 22 are seated to regulate the flow of explosive fluid, said valves being actuated by suction of the pistons; the exhaust ports in like manner communicate with the atmosphere through valve casings 23 wherein are seated spring actuated valves 24, the stems of which are provided with laterally extending lugs lying in the path of a cam 27 mounted upon a shaft 28 which is supported for rotation within the hub 12 axially of the latter and whereby said valves are unseated at proper intervals to permit the escape of the spent gases forming the products of combustion.

A fly wheel 29 may be mounted upon the shaft 28 as well as means of any suitable and well known character for transmitting motion from said shaft.

The hub 12 at one end projects through the casing as shown at 30 and upon the shaft 28 adjacent to said projection is formed a crank 31. The projection 30 of the hub is provided with spaced arms 32 between which is pivotally supported one end of a link 33. A specially constructed link L having arms 34 and 35 which are disposed in different planes and one of which is of greater length than the other, is pivotally supported upon a stud 36 extending from the casing of the machine or from a bracket connected therewith. The link 33, one end of which is connected with the arms 32 is connected at its upper end with the short arm 34 of the link L and the relatively long arm 35 of said link is connected by a pitman 37 with the crank 31 of the rotary shaft 28.

Pairs of spark plugs 38 of ordinary construction are mounted in the casing adjacent to opposite sides of the abutments 15 for the purpose of igniting the gases introduced into the casing.

From the foregoing description taken in connection with the drawings hereto annexed the operation and advantages of this invention will be readily understood by those skilled in the art to which it appertains. It is obvious that the cam whereby the exhaust valves are actuated shall be so constructed and so disposed that the exhaust valves will be opened at proper intervals and permitted to remain open the proper length of time, or while the piston carrying hub moves a predetermined distance. The operation at diametrically opposite sides of the cylinder is identical. The parts are so related that when either piston passes an exhaust port, the exhaust valve will be moved to an open position and will be permitted to close only after sufficient time has been given for the exhaust to take place. By the continued movement of the piston the inlet valve will be opened by suction and explosive gas or vapor will be caused to enter into the space between the rear side of the piston (with reference to its direction of movement) and the abutment at one side of the casing. The admission of gas will continue until the movement of the piston carrying hub is reversed; the gas will now become compressed between what is now the front side of the piston (with reference to its direction of movement) and the proximate abutment until at the moment of ultimate compression the charge becomes ignited and the movement of the piston carrying hub is again reversed as a consequence of the resilient explosion. In the meantime, the spent gases have become exhausted from the space between the opposite side of the piston and the proximate abutment and a fresh charge has been admitted to become subsequently compressed and ignited, and the motion will thus continue indefinitely,

the oscillatory motion of the piston carrying hub being transformed into a rotary motion of the crank carrying shaft. Thus it will be seen that with only two valve controlled inlets and two valve-controlled exhaust ports 4 explosions will occur for each complete oscillation of the piston carrying hub. It will also be seen that the construction of the improved engine is extremely simple, its operation complete in every detail and that it is by no means liable to get out of order.

Having thus described the invention, what is claimed is—

1. In an internal combustion engine, a cylinder, abutments dividing the cylinder into diametrically opposite chambers, a hub supported for oscillation and carrying pistons extending into the chambers, two inlet ports opening into diametrically opposite chambers, suction actuated valves controlling said inlets, two exhaust ports communicating with the diametrically opposite chambers, spring seated valves controlling the exhaust ports, a rotary crank shaft extending through the hub, a cam upon said shaft engaging and actuating the exhaust valves, and motion transmitting and converting means connecting the rotary shaft with the oscillatory hub.

2. In an internal combustion engine, a cylinder, abutments dividing the cylinder into diametrically opposite chambers, a hub supported for oscillation and carrying pistons extending into the chambers, two inlet ports opening into diametrically opposite chambers, suction actuated valves controlling said inlets, two exhaust ports communicating with the diametrically opposite chambers, spring seated valves controlling the exhaust ports, a rotary crank shaft extending through the hub, a cam upon said shaft engaging and actuating the exhaust valves, a crank upon the hub, a link supported for oscillation upon the cylinder casing and having two arms of different length, a rod connecting the short arm of said link with the crank of the hub, and a pitman connecting the long arm of said link with the crank of the rotary shaft.

3. In an internal combustion engine, a cylinder, abutments dividing the cylinder into diametrically opposite chambers, a hub supported for oscillation and carrying pistons extending into the chambers, two inlet ports opening into diametrically opposite chambers, suction actuated valves controlling said inlets, two exhaust ports communicating with the diametrically opposite chambers, spring seated valves controlling the exhaust passages, a rotary crank shaft extending through the hub, a cam upon said shaft engaging and actuating the exhaust valves, a crank upon the hub, a link supported for oscillation upon the cylinder casing and having two arms of different length, a rod con-

necting the short arm of said link with the crank of the hub, and a pitman connecting the long arm of said link and the crank of the rotary shaft.

5 4. In an internal combustion engine, a cylinder, abutments dividing the cylinder into diametrically opposite chambers, a hub supported for oscillation and carrying pistons extending into the chambers, two inlet ports
10 opening into diametrically opposite chambers, suction actuated valves controlling said inlets, two exhaust ports communicating with the diametrically opposite chambers, spring seated valves controlling the exhaust
15 passages, and naving stems extending in-

wardly in the direction of the axis of the cylinder and provided with laterally extending lugs, a rotary crank shaft extending through the hub, a cam upon said shaft engaging and actuating the exhaust valves, by contact with the laterally extending lugs upon the stems of said valves, and motion transmitting and converting means connecting the rotary shaft with the oscillatory hub. 20

In testimony whereof I affix my signature 25
in presence of two witnesses.

PERCY V. WOODWARD.

Witnesses:

GEO. H. KEYES,

RICHARD STEWART.