J. H. WILLIAMS.

GAS ENGINE.

APPLICATION FILED DEC. 11, 1911.

1,096,878.

Patented May 19, 1914.

2 SHEETS—SHEET 1.

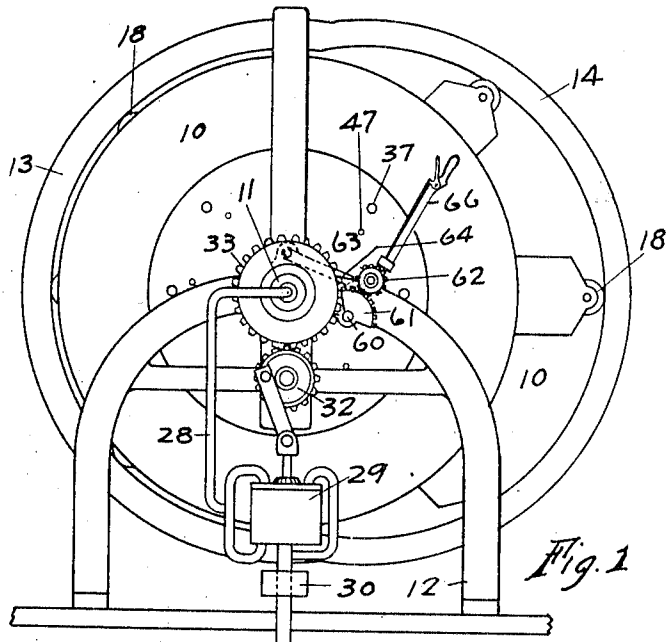



Fig. 1

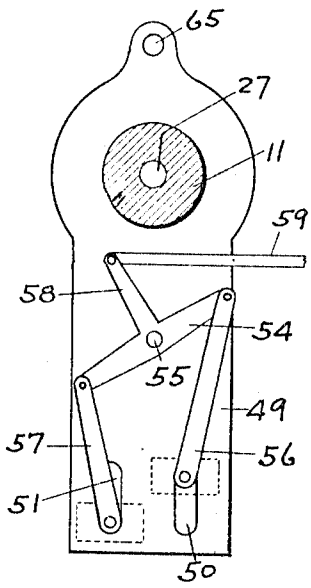



Fig. 6

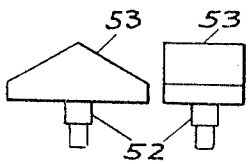



Fig. 7

Fig. 8

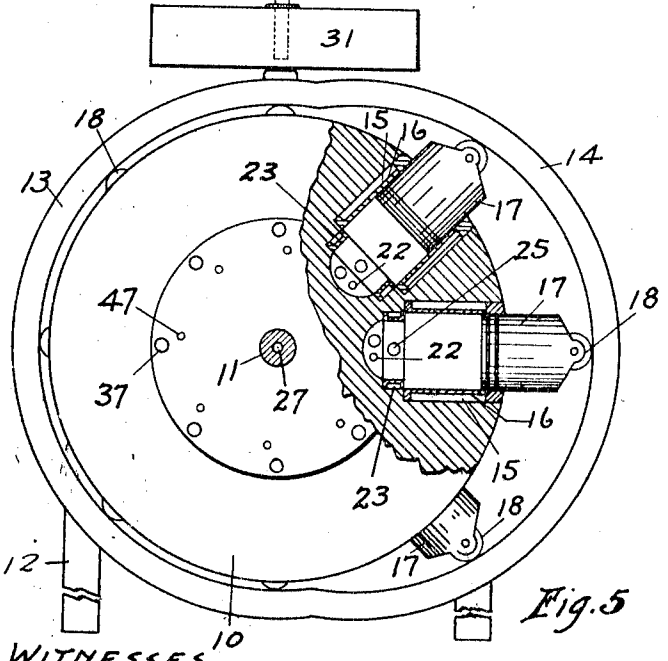



Fig. 5

WITNESSES

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2 SHEETS—SHEET 2.

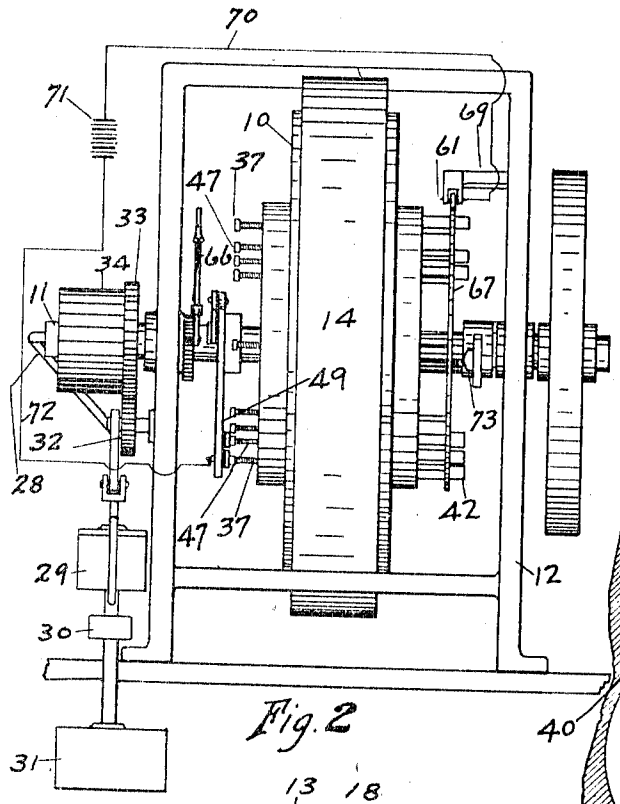



Fig. 2

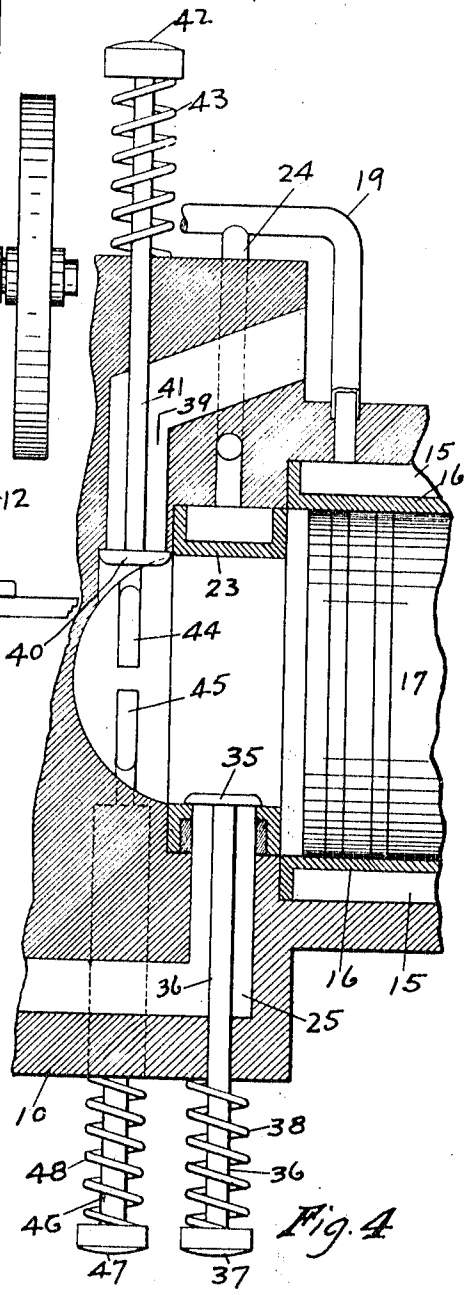



Fig. 4

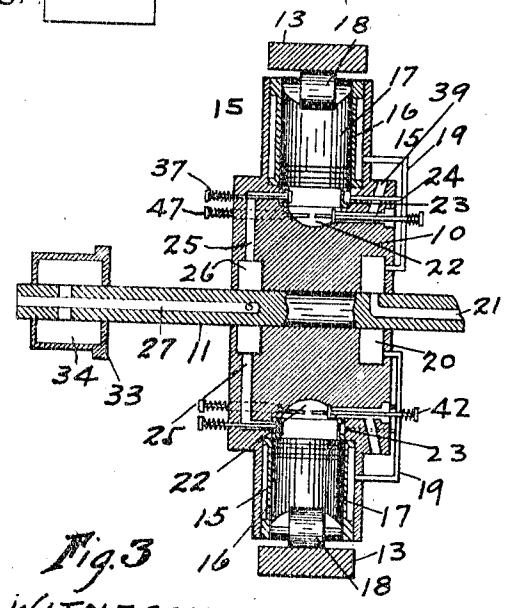



Fig. 3

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# UNITED STATES PATENT OFFICE.

JOSEPH H. WILLIAMS, OF CASHMERE, WASHINGTON, ASSIGNOR OF ONE-HALF TO NORMAN S. TITCHENAL, OF CASHMERE, WASHINGTON.

## GAS-ENGINE.

1,096,878. Specification of Letters Patent. Patented May 19, 1914.

Application filed December 11, 1911. Serial No. 665,078.

*To all whom it may concern:*

Be it known that I, JOSEPH H. WILLIAMS, a citizen of the United States, residing at Cashmere, in the county of Chelan and State of Washington, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to gas engines and has for an object to provide improved form of rotary gas engine with improved inlet and exhaust valves and mechanism for operating the same.

A further object of the invention is to provide improved means for conducting the gaseous mixture to the cylinders.

A further object of the invention is to provide a rotating head carrying a plurality of cylinders and pistons mounted radially therein with a race-way surrounding the head, part of which is eccentric to the head.

With these and other objects in view the invention comprises certain novel constructions, combinations and arrangement of parts as will be hereinafter more fully described and claimed.

In the drawings:—Figure 1 is a view of the improved engine in end elevation. Fig. 2 is a view of the engine in side elevation. Fig. 3 is a vertical diametrical sectional view through the head and operating parts. Fig. 4 is an enlarged detail sectional view through the inlet and exhaust ports. Fig. 5 is an end view of the head and race with part of the framework removed and part of the head broken away to show the cylinders and pistons and their relation to the head. Fig. 6 is a detail view of the valve-operating, cam-carrying member. Fig. 7 is a view in side elevation of one of the valve-operating cams. Fig. 8 is a view in end elevation of one of the valve-operating cams.

Like characters of reference indicate corresponding parts throughout the several views.

The improved rotary engine which forms the subject matter of this application comprises a head 10 mounted upon a hollow shaft 11 and journaled in a frame 12. Rigidly connected with the frame 12 is a race-way 13, one part of which, as 14, is eccentric to the head 10, as indicated more particularly at Figs. 1 and 5.

The head 10 is provided with a plurality of radially disposed openings 15 into which cylinder casings 16 are inserted to form cylinders for the reception of pistons 17. The pistons 17 carry rollers 18 traveling within the race 13, as indicated more particularly at Figs. 1 and 5.

The opening 15 about the cylinder casing 16 serves to provide a chamber for water jacketing the cylinders, such openings communicating by means of pipes 19 with a central chamber 20 formed in the head 10 and shown particularly at Fig. 3, which chamber communicates by a passage 21 through the shaft 11 with any source of supply for cooling fluids.

Beneath each of the cylinders 16 an ignition chamber 22 is provided with a hollow water jacketed ring 23 interposed between such chamber 22 and cylinder 16. The jacketed ring 23 communicates with the cooling fluid through a pipe 24 which communicates with the pipe 19.

Communicating with the ignition chamber 22, immediately at the ring 23, is a passage 25 which communicates with the chamber 26 formed in the head similar to and opposite the chamber 20 and which likewise communicates with the passage 27 of the hollow shaft 11. The hollow shaft 11 is supplied with fuel through a pipe 28 from a pump 29 which in turn communicates through a carbureter, shown conventionally at 30, with a fuel reservoir 31. The pump 30 is operated by a crank pinion 32 which receives motion from a gear 33 carried upon a drum 34 which drum is hollow and communicates with the hollow shaft 11 and serves the double purpose of equalizing the pressure of the gaseous mixture introduced to the shaft by the pump 29, and also has a pulley for a belt to transmit the power to other objects.

The inlet port 25 is controlled by a valve

35 which closes such port and is carried by a valve stem 36 which extends outwardly beyond the lines of the head and is provided with a cam head 37 and is held normally closed by a spring 38, such arrangement of parts being shown particularly in detail at Fig. 4.

Opposite the inlet 25 and valve 35 an exhaust port 39 is provided in the head 10 opening to the atmosphere and controlled by a valve 40 carried upon a valve stem 41 which extends beyond the lines of the head and is provided with a cam head 42 and is held normally closed by a spring 43.

Within the ignition chamber a pair of spark terminals 44 and 45 are located, the latter of which is carried upon a stem 46 which extends beyond the lines of the head and terminates in a cam head 47 and held normally apart by a spring 48.

Mounted upon the shaft 11 is a plate 49 shown in detail at Fig. 6, such plate being provided with slots 50 and 51 through which extend the shanks 52 of cams 53. The cams 53 are operated by a walking beam 54 pivoted as at 55 upon the plate 49 and connected to such cams through the mediums of the links 56 and 57. The walking beam 54 is actuated by a lever 58 which connects by a link 59 to a shaft 60. The shaft 60 is rigidly connected with a segmental gear 61 intergeared with a gear 62 carried on a shaft 63 which also carries a link 64 connected with the top of the plate 49, as at 65, shown at Figs. 1 and 6.

The cams 53 are in position to engage the cam heads 37 and 47 of the inlet and spark terminals respectively and when the plate is depending, as shown at Fig. 2, the inlet and sparking will cause the head to rotate in one direction but when reversed through the medium of the lever 66 so that the plate 49 stands upwardly, the admission of gas and the ignition of the same will cause the head to rotate in the opposite direction. It will be apparent that when the lever 66 is manipulated to turn the plate 49 upwardly it will likewise rotate the shaft 60 to change the positions of the cams 53 from those shown at Fig. 6.

The spark terminal 44 is directly connected with a ring 67 which is in contact with a roller 68 carried by an arm 69 and through a wire 70 with a source of electrical energy shown conventionally at 71. From the source of electrical energy 71 a wire 72 extends to the plate 49 to form contact with the spark plug head 47 so that when the spark terminal 45 is depressed to touch the terminal 44 current is applied and when the head 47 leaves the cam a spark is produced.

To actuate the exhaust valve 40 a cam 73 is rigidly extended outwardly from the frame, as indicated at Fig. 2, in position to engage the head 42 of the exhaust valve.

In operation with the parts assembled as indicated in the figures, the gas will be admitted to the cylinders at the bottom so that when ignited the pressure of the piston upon the eccentric portion 14 of the race 13 will cause the head to rotate in the direction indicated by the arrows in Figs. 1, 2 and 5. When reaching the point of greatest eccentricity the exhaust valve is opened to exhaust the vitiated gases from the cylinder and the eccentricity of the race forces the piston inwardly for the remainder of the rotation. When the device is reversed and the plate 49 is extended upwardly as above explained, the gas is admitted at the top with like results and the exhausting is done at the center of eccentricity the same as when the head is rotating in the opposite direction.

I claim:—

1. In an engine, a head provided with radial cylinders, pistons slidably mounted in the cylinders, a track surrounding the head a part of which is struck upon an arc eccentric to the head, rollers carried by the pistons in engagement with the track, conduits leading to the cylinders, valves arranged to control the inlet and exhaust from the cylinders, means to open the inlet valves, means to change the position of the inlet valve operating means to diametrically opposite points relative to the head, and a fixed exhaust valve operating means located intermediate such diametrical points.

2. In an engine, a head provided with radial cylinders, pistons slidably mounted in the cylinders, a track surrounding the head, a part of which is struck on an arc eccentric to the head, rollers carried by the pistons in engagement with the track, conduits leading to the cylinders, valves arranged to control the inlet and exhaust from the cylinders, an engine shaft, a plate rotatably mounted on the shaft, sets of spring operated valves and igniters having stems extending beyond the head, a pair of cams slidably mounted on said plate and arranged to contact with the ends of said valve and said igniters, a walking beam pivotally mounted on said rotatable plate, a lever attached to the walking beam, a sector pivotally mounted adjacent said engine shaft, a link connecting said lever and sector, and means to rotate said plate whereby the cams are moved relative to each other, and said plate moved to a diametrically opposite position about said shaft.

3. In an engine, a hollow shaft, a head mounted upon the shaft and having conduits communicating with the passage of the shaft, cylinders formed radially in the head and communicating with the conduits, valves interposed between the conduits and the cylinders controlling the inlet and exhaust valve stems extending from the head

in parallelism with the shaft, an arm carried by the shaft, cams carried by the arm adapted to actuate the valve stems to open the inlet valves, means to rotate the arm about the shaft to a diametrically opposite point and an exhaust cam fixed intermediate the diametrical points.

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

JOSEPH H. WILLIAMS.

Witnesses:
E. F. STOWELL,
N. S. TITCHENAL.