

W. E. HASKELL.
GASOLENE ENGINE.
APPLICATION FILED DEC. 22, 1911.

1,064,476.

Patented June 10, 1913.

3 SHEETS—SHEET 1.

Fig. 1.

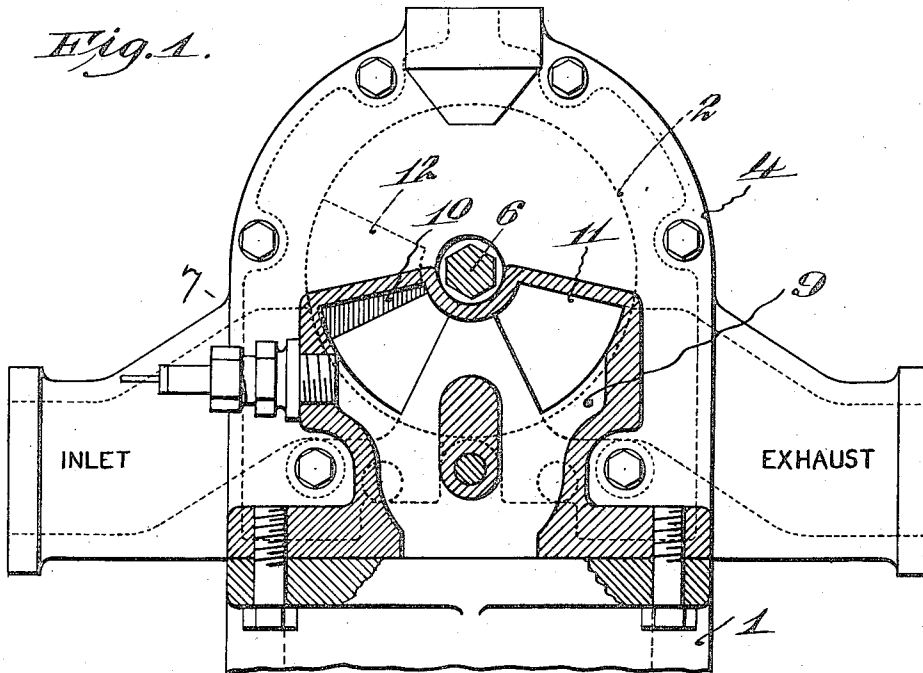
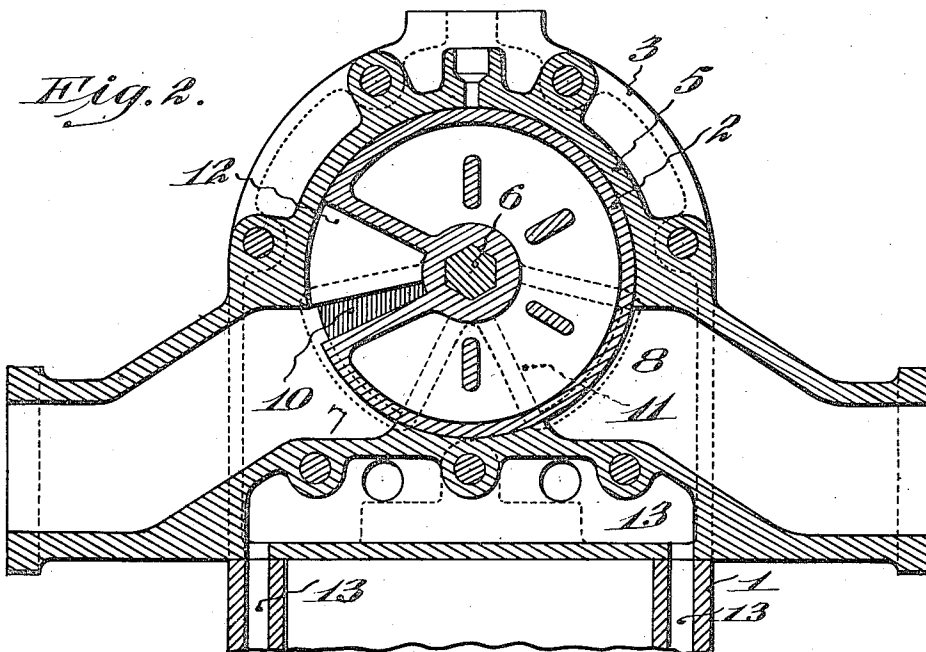


Fig. 2.



Witnesses

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3 SHEETS—SHEET 2.

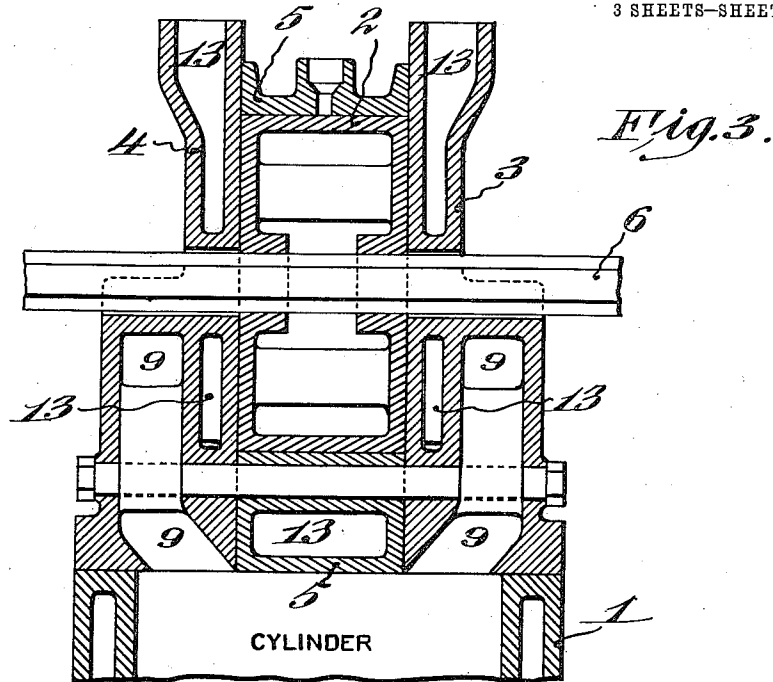


Fig. 4.

PISTON
UP

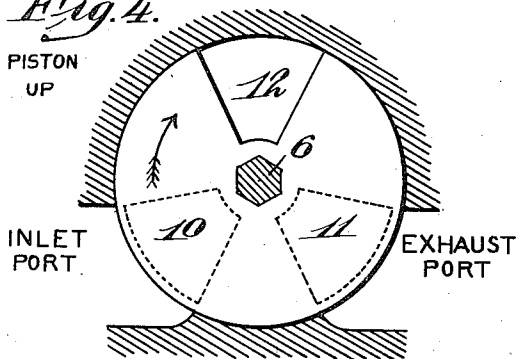


Fig. 5.

PISTON
DOWN

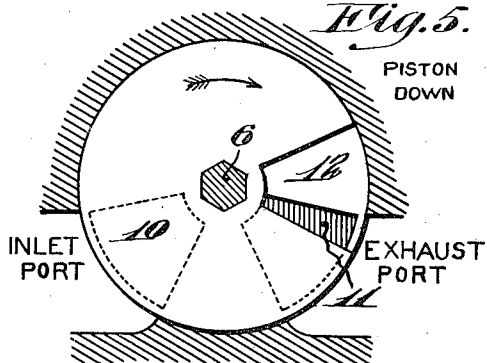


Fig. 7.

PISTON
DOWN

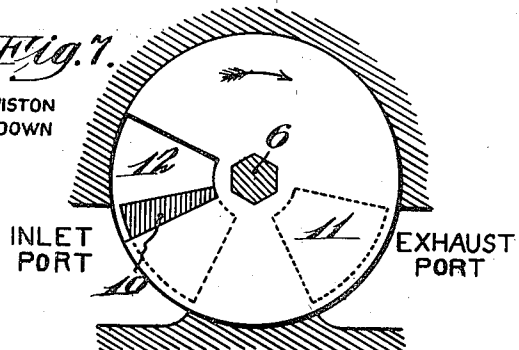
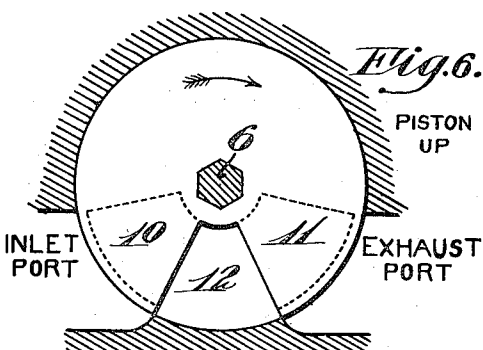


Fig. 6.

PISTON
UP



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3 SHEETS—SHEET 3.

ORDER OF FIRING

1, 4, 2, 6, 3, 5

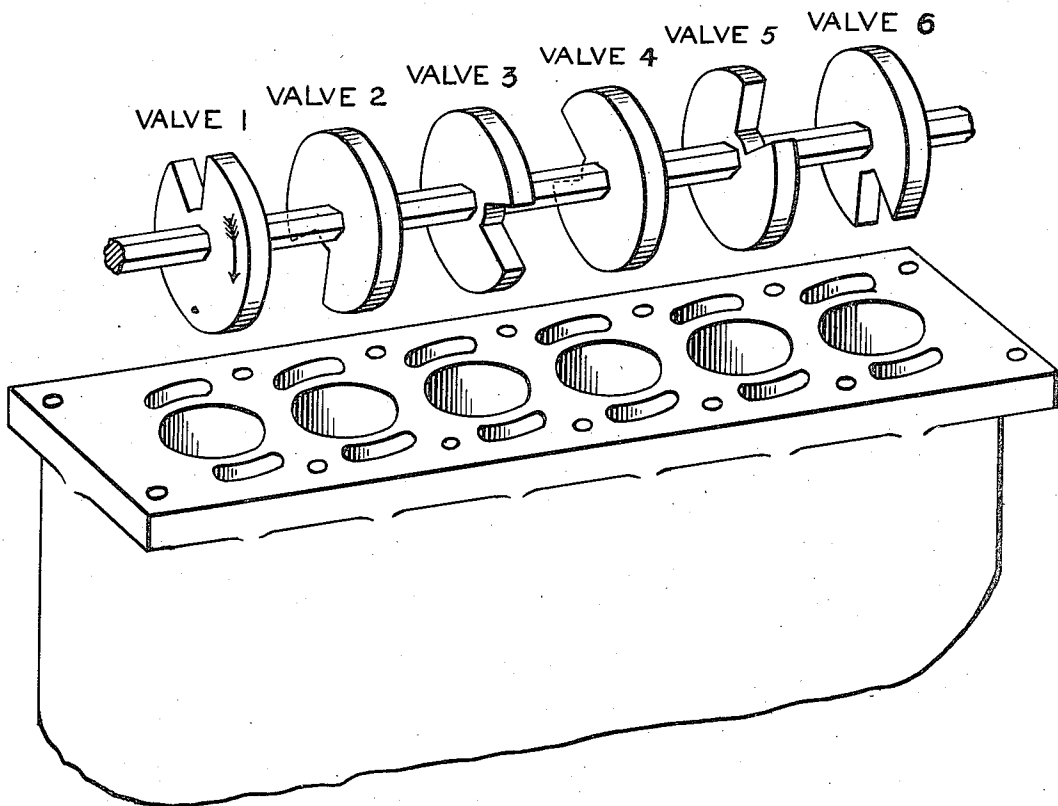


Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM E. HASKELL, OF BRATTLEBORO, VERMONT.

GASOLENE-ENGINE.

1,064,476.

Specification of Letters Patent.

Patented June 10, 1913.

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To all whom it may concern:

Be it known that I, WILLIAM E. HASKELL, a citizen of the United States, residing at Brattleboro, in the county of Windham and State of Vermont, have invented certain new and useful Improvements in Gasolene-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.

The present invention relates to an improvement in gasolene engines.

One object of the invention is to reorganize and improve the valve mechanism of gasolene engines.

Another object is to produce a valve mechanism which is particularly adapted for use in multiple cylinder gasolene engines.

To the above ends, the present invention consists in the gasolene engine hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 is a side elevation of one of the valve casings mounted upon the top of a cylinder; Fig. 2 is a medial sectional elevation of a valve, valve casing and the upper end of a cylinder; Fig. 3 is a medial sectional elevation taken at right angles to the plane of the section illustrated in Fig. 2; and Figs. 4, 5, 6 and 7 are diagrams illustrating the positions of the valve at different times in the cycle of operation of the engine; Fig. 8 is an isometric sketch showing a part of the cylinders of the engine and the valve shaft with the valves thereon, the housings being removed.

The illustrated embodiment of the invention is described as follows:—The cylinder 1 of the engine is of usual form and is surmounted by a valve housing. The housing is tripartite, having two side sections and a middle section. The valve 2 is a disk valve, cylindrical in form, with a segmental opening formed therein. The two side sections 3 and 4 are similar in form, right and left hand, and embrace between them the middle section 5, which is provided with a cylindrical valve opening extending entirely therethrough which receives the valve 2. The valve shown in the drawings is intended for use in a six-cylinder engine and is driven by a hexagonal valve shaft 6 which is received

in a hexagonal opening in the center of the valve. The middle section is provided upon opposite sides with peripheral inlet and exhaust openings, through which the incoming mixture is introduced into the engine and through which the burnt gases are exhausted, respectively. The inlet port 7 is generally rectangular in shape, and closed and opened by the valve 2 which revolves in close contact therewith; the exhaust port 8 is of the same shape. The sections 3 and 4 have passages to convey the mixture into the cylinder and to convey the burnt gases therefrom. The passage 9 from the valve chamber to the cylinder is shown in section in Fig. 1. This passage is double, each side section being provided with a passage 9. Each passage 9 is provided with two ports opening into the sides of the valve chamber. These ports are indicated at 10 and 11 in Fig. 2. They are segmental in form and substantially identical in size with the opening 12 in the valve. These passages 9 lead, as shown in Fig. 3, to the cylinder.

A description of the mode of operation of the valve is conveniently given by referring to Figs. 4, 5, 6 and 7, wherein the ports 10 and 11 are shown and the valve opening 12 is shown in the different positions in which the parts occupy at successive stages in the operation. It is to be noted that in Fig. 4 the valve occupies a position with the opening therein at the top. This is the position of the valve at the beginning of the working stroke. It is to be understood that the valve rotates once to each two rotations of the crank shaft. During the working stroke the valve moves from the position indicated in Fig. 4 to the position indicated in Fig. 5; at which time the working stroke ends, the exhaust port 11 having begun to open before the completion of the working stroke, in accordance with the common practice. It will be observed that during the working stroke and while a high pressure exists in the engine cylinder, this pressure is exerted upon the opposite axially opposed sides of the valve through equal and opposed areas, so that the valve is perfectly balanced not only by equal and opposite pressures, but by pressures which are exerted in exactly opposite directions, so that there are no unbalanced strains exerted upon the valve. The exhaust continues until the piston has again reached the top of the cylinder at which time the valve occupies the position indicated in

Fig. 6. The closing of the exhaust and the opening of the intake occur simultaneously, as the edges of the exhaust and inlet ports correspond line for line with the edges of the valve opening. The intake begins and continues during the next down stroke of the piston at the end of which stroke the valve occupies the position indicated in Fig. 7, with the inlet port nearly closed and the up stroke of the piston about to begin. As soon as the port 10 is closed by the movement of the valve slightly beyond the position indicated in Fig. 7, compression begins and continues throughout the rest of the up stroke of the piston until the piston reaches the top of its stroke, then the valve again occupies the position indicated in Fig. 4. It is to be noted that during this compression stroke, as during the working stroke, the pressures upon the opposite side of the valve disk are equal, opposite, and completely balanced. Provision is made for water-jacketing the valve, the spaces 13 being water-jacket spaces.

The valve is truly cylindrical in form and the valve opening extends from side to side completely through the valve and completely through its exterior, so that the valve is a true cylinder with a sector removed (except for the very point of the sector). The edges of the valve opening, moving as they do around in the valve chamber, will prevent any accumulation of soot or solid carbonaceous matter upon the walls of the valve chamber so as to cause the valve to "seize." These edges not only scrape the entire side walls of the valve chamber, but they also scrape its peripheral wall as well. The valve is efficiently cooled by the water-jacketing. As indicated in Fig. 3, provision is made for admitting oil to the valve chamber so as thereby to secure efficient lubrication of the valve. It is to be observed that the expansion and contraction of the valve and its housing in the direction of the axis of the valve, are the same at all times. There is, therefore, always the same fit between the valve and the sides of the housing. This fit secures the closing of the engine cylinder because it secures the closing of the ports 10 and 11 in the passages 9 which lead to the cylinder. Any lack of fit on the periphery of the valve is immaterial to the tightness of the cylinder. The construction lends itself with exceptional facility to multiple cylinder engines, because a single valve shaft may extend through all of the valves of a multiple cylinder engine. The valves are all identically alike, the hexagonal openings therein being located in the same position in each with relation to the segmental opening. The proper timing of the valve for each cylinder is secured by putting it on the hexagonal shaft in its proper position for that cylinder. Fig. 8

shows the valves on the valve shaft with the valves occupying their proper positions on the shaft with respect to their respective cylinders. Valve 1 is shown in the position of the valve in Fig. 4, and as a 4-cycle, 6-cylinder engine fires six times to each revolution of its valve shaft, it follows that the valves must be arranged 60° apart. The customary order of firing is here shown, valve 1 being in the position which it occupies at the beginning of a working stroke. As the valve shaft is turned during this stroke through an arc of 60° , the opening in valve 4 is brought to the top and into the position of the valve at the beginning of the working stroke of its cylinder. A further motion of 60° brings the valve 2 to the beginning of the working stroke for its cylinder, and so on in the order shown until a complete revolution of the valve shaft has successively brought all the valves on the shaft into firing positions and restored valve 1 to its original position. It is to be observed that, in general, the shaft is a regular polygon, the number of whose sides is an integral multiple of the number of cylinders. For example, a square shaft is adapted for use with a 1, 2 or 4 cylinder engine; a hexagonal shaft is adapted for a 1, 2, 3 or 6 cylinder engine; while a pentagonal shaft is adapted for a 1 or 5 cylinder engine. The valve housing, with its valve, may be assembled in one structure, and placed on the engine as an integral part. This contributes to facility in assembling and taking down the engine. The valve housings with their valves are identical in structure and interchangeable each for each. This contributes to economy of manufacture. The valve is nicely supported by its chamber; the valve shaft does not need any bearing, nor any stuffing boxes, and because of these facts, it does not need any lubrication. The large area of the valve engaging the walls of the valve chamber and the large areas of the shaft engaging the valve secure good wearing conditions. The valve openings and the ports are large and contribute to the free and rapid flow of the mixture and exhaust. As indicated in Fig. 1, the spark plug is located in the passage 9 and inasmuch as there are four similar surfaces adapted to receive spark plugs, the side sections are adapted for use on either side and provision is had for the use of two spark plugs each located in an inlet passage completely scavenged of burnt gases.

Another feature of advantage incident to the present construction resides in the fact that only a small area of the valve is exposed at one time to the heat of the burning gases; furthermore, to whatever extent one part of the valve is exposed to the hot gases, to approximately the same extent all of the parts of the valve are similarly exposed, so

that the valve is substantially uniformly heated. Referring to the drawing, it will be seen that the areas of the ports 10 and 11 will heat the portion of the valve extending from the upper edge of the inlet port to the right hand edge of the opening in the valve, and that the portion of the valve between the left hand edge of the opening therein and the upper edge of the inlet port will be heated by the outward flow of the exhaust gases.

While the present invention is hereby described and claimed as an improvement in gasolene engines, it is to be understood that it is not intended thereby to exclude from the purview of the invention other forms of internal combustion engines with which the invention is adapted for use.

So far as I am informed of the state of the art, I believe it to be broadly new to provide a gasolene engine with a balanced rotary valve, as I believe I am the first to produce a rotary valve for use in connection with gasolene engines in which the valve is not subjected to unbalanced pressures during the explosion and compression.

Having thus described my invention, what I claim as new is:—

1. A gasolene engine having, in combination, a single rotary valve, a valve housing embracing the valve and having inlet and exhaust passages for leading the mixture from the intake to the valve space and from the valve space to the exhaust and passages from the cylinder to the valve space opening upon axially opposite sides of the valve so as thereby to counterbalance each other and to relieve the valve from unbalanced pressures during explosion, substantially as described.

2. A gasolene engine having, in combination, a cylinder, a valve housing on the cylinder, a single rotary valve mounted in the valve housing and provided with an opening therein, inlet and exhaust ports in the valve housing, and passages from the valve space to the cylinder opening into the valve space upon axially opposite sides of the valve and being of equal counterbalancing areas, substantially as described.

3. A gasolene engine having, in combination, a cylinder, a valve housing on the cylinder, a rotary valve in the valve housing provided with a sector-shaped opening therein, inlet and exhaust ports in the housing opening on the periphery of the valve, passageways in the valve housing to the cylinder having ports opening upon axially opposite sides of the valve and being of equal area, substantially as described.

4. A gasolene engine having, in combination, a cylinder, a valve housing provided with a cylindrical valve chamber, a rotary disk valve mounted in and fitting said chamber provided with a sector-shaped valve

opening, said housing being provided with peripheral ports opening into said valve chamber and with passages leading to the cylinder and having equal, axially opposed, lateral ports also opening into said valve chamber, substantially as described.

5. A gasolene engine having, in combination, a cylinder, a rotary valve, a valve housing provided with a cylindrical valve chamber and with inlet and exhaust passages having ports opening into the periphery of said valve chamber and also with passages leading to the cylinder and having equal and axially opposed ports opening into the sides of the valve chamber, substantially as described.

6. A gasolene engine having, in combination, a cylinder, a rotary valve, a valve housing having a cylindrical valve chamber and provided with inlet and exhaust passages having ports opening into the periphery of the valve chamber and also with passages leading from the cylinder having equal and opposed ports opening into the sides of the valve chamber, said ports being four in number, two being used during intake and two being used during exhaust, and all four being closed during explosion, substantially as described.

7. A gasolene engine having, in combination, a cylinder, a valve housing provided with a cylindrical valve chamber and with inlet and exhaust passages having ports opening into the periphery of said valve chamber and also with passages leading to the cylinder, and having equal and opposed ports opening into the sides of the valve chamber, said housing consisting of three sections, a middle section of the thickness of the valve and two side sections embracing the ends of the disk valve, substantially as described.

8. A gasolene engine having, in combination, a cylinder, a rotary valve, a multiple-part valve housing provided with a cylindrical valve chamber and with inlet and exhaust passages having ports opening into the periphery of said valve chamber and also with passages leading to the cylinder and having equal and axially opposed ports opening into the sides of the valve chamber, substantially as described.

9. A gasolene engine having, in combination, a plurality of cylinders, a corresponding number of rotary valves, valve housings embracing the valves, said valves being provided with regular polygonal central openings having the number of sides corresponding to the number of cylinders of the engine, and a regular polygonal valve shaft fitting said openings in the valves, so that the valves may be set on the shaft angularly spaced with relation to each other by the angle, or multiple thereof, which is subtended by one of the sides of the regular

polygon of cross section of the shaft and the cylinders correspondingly timed in firing, substantially as described.

10. A gasolene engine having, in combination, a plurality of cylinders, a corresponding number of rotary valves, valve housings embracing the valves, said valves being provided with regular polygonal central openings having the number of sides corresponding to an integral multiple of the number of cylinders of the engine, and a regular polygonal valve shaft fitting said openings in the valves, so that the valves may be set on the shaft angularly spaced with relation to each other by the angle, or multiple thereof, which is subtended by one of the sides of the regular polygon of cross section of the shaft and the cylinders correspondingly timed in firing, substantially as described.

11. A 6-cylinder gasolene engine having, in combination, cylinders, rotary valves having regular hexagonal central openings, a hexagonal valve shaft fitting said openings in the valves, and valve housings embracing the valves, so that the valves may be set on the shaft angularly spaced with relation to each other by an angle of 60° , or a multiple thereof, and the cylinders correspondingly timed in firing, substantially as described.

12. A gasolene engine having, in combination, a cylinder, a valve housing on the cylinder, a rotary valve in the valve housing provided with a sector-shaped opening therein, inlet and exhaust ports in the housing opening on the periphery of the valve, passageways in the valve housing to the cylinder

der having ports opening upon axially opposite sides of the valve space, said passageways being symmetrically disposed and provided with spark plug bosses, substantially as described.

13. A gasolene engine having, in combination, a cylinder, a rotary valve, a valve housing embracing the valve having inlet and exhaust passages opening upon the periphery of the valve and lateral passages opening upon the sides of the valve and extending to the cylinder, the ports of the latter passages being the only areas of the valve exposed to the heat from the cylinder during explosion, substantially as described.

14. A gasolene engine having, in combination, a plurality of cylinders, a rotary valve for each cylinder, the valves being provided with regular polygonal central openings having the number of their sides corresponding to the number of cylinders, and a valve shaft having corresponding regular polygonal surfaces adapted to engage the respective valves, said surfaces lying in the surfaces of the same prism, so that the valves may be set on the shaft angularly spaced with relation to each other by the angle, or multiple thereof, which is subtended by one of the sides of the polygon of cross section of the shaft and the cylinders correspondingly timed in firing, substantially as described.

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Witnesses:

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