Sept. 14, 1926. 1,599,530

J. J. HOGAN

GAS ENGINE

Filed Jan. 8, 1925

Fig. 4.

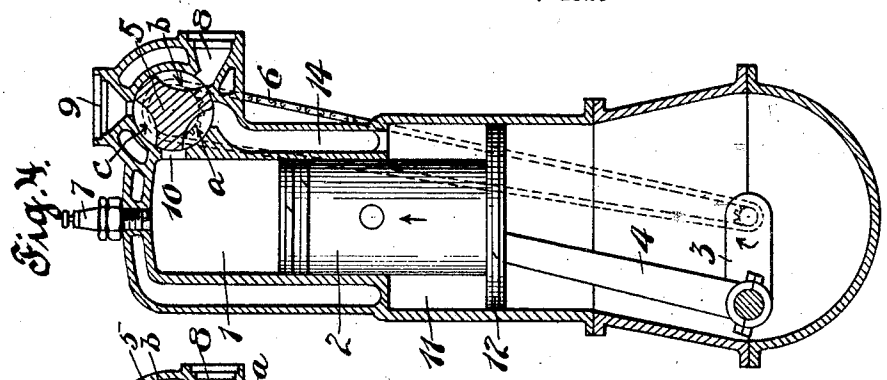


Fig. 3.

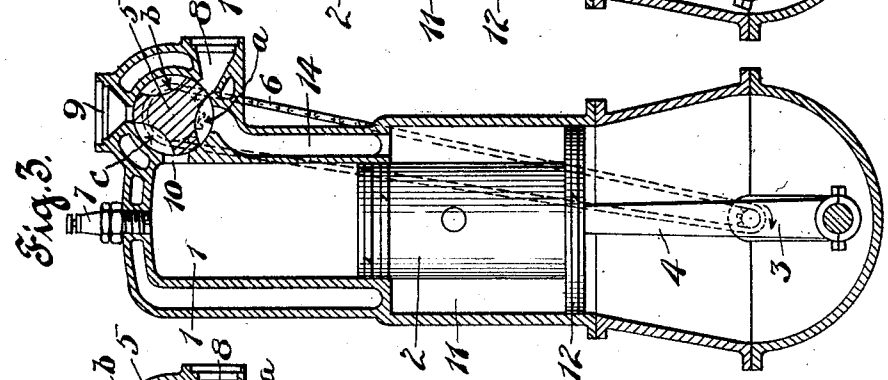


Fig. 2.

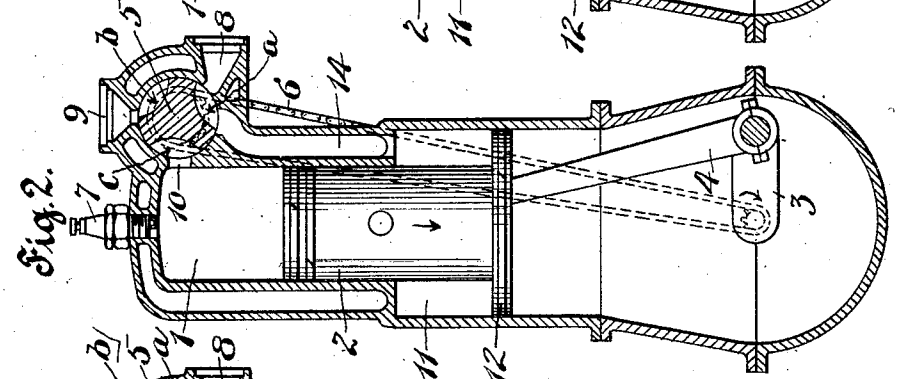
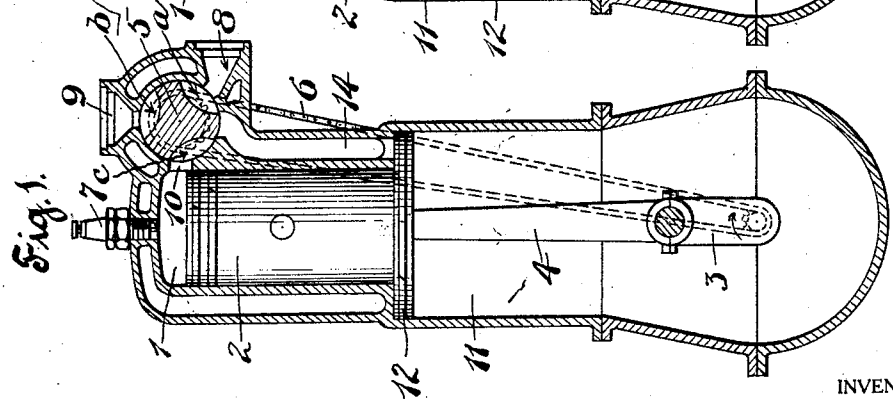


Fig. 1.



INVENTOR

J. J. Hogan

BY

Mitchell Brothers

ATTORNEYS

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UNITED STATES PATENT OFFICE.

JOHN J. HOGAN, OF WESTFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO OIL HEAT AND POWER COMPANY, OF PLAINFIELD, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GAS ENGINE.

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My invention relates to certain improvements in internal combustion engines. It consists mainly in a new form of valve mechanism which operates in a unique manner so as to control both the intake and the exhaust and so as to cause the engine to function after the manner of a so-called two cycle engine. By my new and improved construction many advantages are attained as will hereinafter appear.

In the accompanying drawings I have illustrated diagrammatically only such parts of an engine as are necessary to a full understanding of my invention. In said drawings

Figure 1 is a diagrammatic view of the operative parts in one position, the piston being shown at the top of its compression stroke and about to descend on its power stroke.

Figure 2 is a similar view showing the same parts in another position, the piston being indicated as approximately half way down on its power stroke.

Figure 3 is a third view of the same parts indicating the piston at the lower end of its power stroke.

Figure 4 is a similar view showing the parts in a fourth position, the piston being indicated as approximately half way up on its compression stroke.

1 represents a working cylinder having a working piston 2 therein. 3 represents a crank shaft. 4 represents a connecting rod between the working piston and said crank shaft. At one side of the working cylinder is a valve chamber in which there is located a rotatable valve 5. This valve 5 is rotated by any suitable means such as for example a drive chain 6 connected with the crank shaft. The valve driving means is so timed that the valve will be rotated at one-third of the speed of rotation of the crank shaft, that is to say, at one-third engine speed. 7 conventionally represents an igniter such as a spark plug which functions in the usual manner. 8 represents an intake port leading to the valve chamber from any suitable source of gas supply. 9 represents an exhaust port leading from the valve chamber to atmosphere. 10 represents a port which connects the valve chamber with the interior of the working cylinder 1. *a*, *b* and *c* represent a series of passages in the side of the valve 5 which function to connect certain ports at certain times for certain purposes as will later appear. 11 is what I will term a pumping cylinder, the same being preferably located at the lower end of the working cylinder 1 and being of a larger diameter and preferably of larger capacity than the working cylinder. 12 represents a pumping piston operating in the pumping cylinder 11, said pumping piston being preferably connected to the lower end of the working piston. 14 represents a port leading from the valve chamber to the interior of the pumping cylinder 11. The various parts are assembled on any suitable engine frame in any well known manner. It will be understood that I have described and shown only a preferred form and arrangement of the various parts and that many changes may be made without departing from the spirit and scope of the invention.

I have illustrated and described the invention in connection with only one cylinder unit but it is obvious that the number of cylinder units employed may be increased as desired. Where more than one is employed the usual "manifolds" for the intake and exhaust ports would naturally be employed.

Operation.—Starting with the parts as shown in Figure 1. It may be assumed that the piston is at the top of its stroke, with live gas in the combustion chamber under compression and ready for ignition. Upon ignition, the piston 1 is forced down in the direction of the arrow (Fig. 2) on its power stroke. This causes valve 5 to turn, so that passage *a* therein will connect ports 8 and 14 whereby, as the pumping piston 12 descends, more live gas will be drawn into the pumping cylinder 11 from the supply source. Figure 2 indicates the piston as half-way down on this power stroke.

When the piston reaches the end of this power stroke, as indicated in Figure 3, it will be noted that the valve 5 has closed port 8 and that the passage *a* will have been moved to such a position that it will shortly open port 10 and put it in communication with port 14, as shown in Figure 4. As soon as this occurs the ascending piston 9 causes the live gas within the pumping cylinder 11 to be forced through port 14, passage *a*, and port 10 into the combustion chamber of the working cylinder 1. Just before the piston reaches the top of this return stroke, the

valve 5 will cut off the port 14 from the port 10 so that when the charge now contained in the combustion chamber is ignited, its entire energy will be expended against the piston 2, causing it to descend on the next power stroke. This movement causes the valve 5 to continue to revolve so as to shift the passage *a* in a clockwise direction toward the exhaust port 9 which opens to atmosphere. When the piston has reached the bottom of its stroke, as shown in Figure 3, the passage *a* will be in such a position as to shortly put the port 10 in communication with atmosphere through the exhaust port 9. This occurs as soon as the piston 2 ascends slightly on its return stroke whereby dead gases now contained in cylinder 1 will be released and quickly exhausted through the port 10, passage *a* and port 9. To exhaust this dead gas requires but a moment, and immediately thereafter the valve 5 will cut off the port 10 from the exhaust port 9 and again put port 10 in communication with the port 14 through the medium of passage *b* so that the combustion chamber may be filled with the next charge of live gas during the balance of the return stroke of the piston.

From the foregoing it will be seen that the valve passages *a*, *b*, and *c*, operate successively to function as above described, each passage operating alternately as an intake and exhaust passage. The port 10 also operates alternately as an intake and exhaust port.

It is preferable that the capacity of the pumping cylinder 11 be somewhat greater than the capacity of the working cylinder so that a supercharge of gas will be injected into the latter on each return stroke of the piston 12.

By providing the intake and exhaust for the working cylinder in the upper part of the combustion chamber, the usual exhaust outlet commonly found near the bottom of the working cylinder (in engines of the two cycle type) is avoided and hence the force of the expanding gas may exert itself against the working piston throughout its entire down stroke, which obviously is a feature of great advantage.

By causing the valve to move at only one-third engine speed, wear thereon is greatly reduced. Furthermore, since only a comparatively small part of the valve is exposed to contact with hot gases at any one time, the temperature of the valve is easily kept within safe limits greatly simplifying the problem of lubrication and avoiding the danger of overheating, burning or warping.

What I claim is:

1. In an internal combustion engine, a working cylinder and a piston therein, a pumping cylinder and a piston therein, a valve chamber having one port leading to the working cylinder, another to the pumping cylinder, another to a source of gas supply and another to the atmosphere, a rotatable valve in said chamber with means to rotate the same at one-third engine speed, said valve operating to first connect the gas supply port with the pumping cylinder, to then connect the pumping cylinder with the working cylinder, and to then connect the working cylinder with the port to atmosphere.

2. In an internal combustion engine, a working cylinder and a piston therein, a pumping cylinder and a piston therein, a valve chamber having ports therein to admit gas into said chamber, to transfer gas therefrom to said pumping cylinder, to admit gas to the working cylinder from the valve chamber and to discharge gas from said chamber to the atmosphere, a rotatable valve in said chamber, said valve operating to first connect the gas supply port with the pumping cylinder, to then connect the pumping cylinder with the working cylinder and to then connect the working cylinder with the port to atmosphere with means to rotate said valve at one-third engine speed.

3. In an engine of the two cycle type, a cylinder, a single valve having a plurality of passages therein for controlling the admission of live gas to said cylinder and the exhaust of dead gas therefrom, with means for operating said valve at one-third engine speed.

4. In an engine of the two cycle type, a cylinder, a rotatable valve having three independent passages therein for controlling the admission of live gas to said cylinder and the exhaust of dead gas therefrom, with means for rotating said valve at one-third engine speed.

5. In an internal combustion engine of the two cycle type, a working cylinder having a combustion chamber and having a port located in the head thereof for admitting and discharging gas into and from said combustion chamber, a valve chamber, a gas supplying means communicating with said valve chamber including a pumping cylinder, an exhaust outlet from said valve chamber, and valve mechanism in said valve chamber for connecting said gas supplying means with said combustion chamber at one time and for connecting said combustion chamber with said exhaust outlet at another time.

6. In an two cycle engine, a cylinder, a piston, a combined inlet and exhaust port in the head of said cylinder, valve mechanism therefor, means for feeding gas under pressure into said cylinder from a source of supply, said valve mechanism closing the first mentioned port during the full power stroke of the piston and opening said port for exhaust purposes for the first part only of the return stroke and then opening said

cylinder to said gas feeding means for a substantial part of the balance of the same return stroke.

7. In a two cycle engine, a cylinder, a piston, a combined inlet and exhaust port in the head of said cylinder, valve mechanism therefor, means for feeding gas under pressure into said cylinder from a source of supply, said valve mechanism closing the first mentioned port during the full power stroke of the piston and opening said port for exhaust purposes for the first part only of the return stroke and then opening said cylinder to said gas feeding means for a substantial part of the balance of the same return stroke, said valve mechanism also opening said gas feeding means to a source of gas supply during the power stroke of the piston whereby said feeding means will be charged during said period.

8. In an engine of the two cycle type, a working cylinder, a single valve for controlling the admission of live gas to said cylinder and the exhaust of dead gas therefrom, with means for operating said valve at one-third engine speed, with means for delivering gas under pressure into said cylinder during the admission period.

9. In an engine of the two cylinder type, a working cylinder, a single valve for controlling the admission of live gas to said cylinder and the exhaust of dead gas therefrom, with means for operating said valve at one-third engine speed, with means for delivering gas under pressure into said cylinder during the admission period, said means comprising a pump of greater capacity than the capacity of said cylinder whereby a supercharge of live gas may be forced into said cylinder.

JOHN J. HOGAN.