Aug. 10, 1926. 1,595,607

D. W. JONES

INTERNAL COMBUSTION MOTOR

Filed August 27, 1924

Fig. 1.

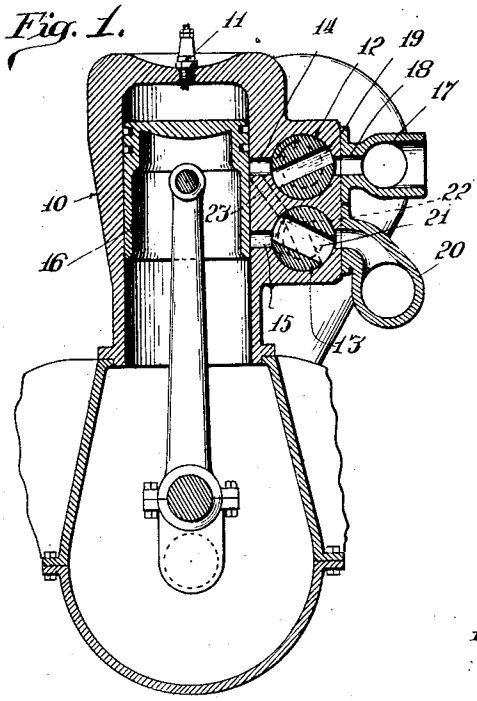


Fig. 2.

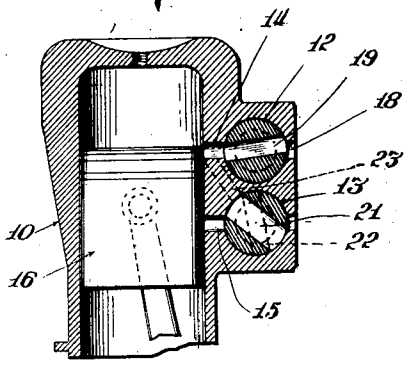


Fig. 3.

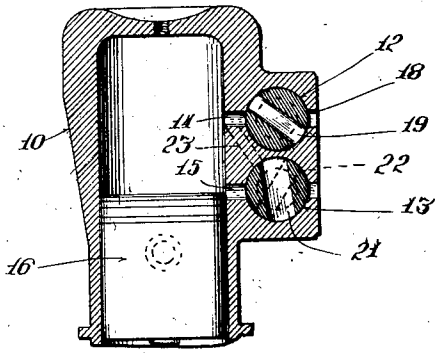


Fig. 4.

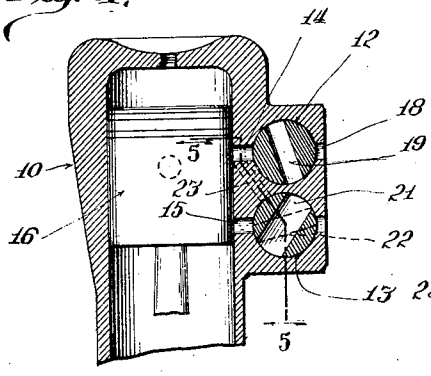
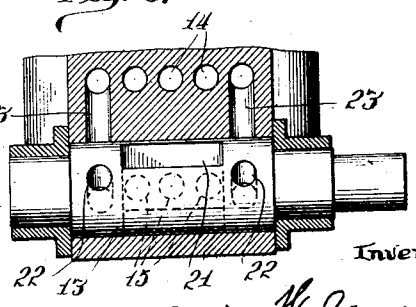


Fig. 5.



Inventor

David W. Jones,

By George Heidman

Attorney

Witnesses

Milton Lenoir

H. E. Gilbert

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UNITED STATES PATENT OFFICE.

DAVID W. JONES, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO HOMER J. BOUCHARD, OF CHICAGO, ILLINOIS.

INTERNAL-COMBUSTION MOTOR.

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My invention relates to an improvement in internal combustion motors and more particularly to the arrangement and location of the inlet and exhaust valves and ports relative to the extreme positions of the piston in the cylinder during the various cycles of operation.

One object of my invention is to provide an internal combustion motor of the four cycle type which is practically free from the difficulties and losses due to leaky valves encountered in internal combustion motors as heretofore constructed where the valves and ports are located in the head of the cylinder; my improvement resulting in the provision of a combustion chamber having no openings or ports in the cylinder during the most effective parts of the compression and expansion strokes of the piston.

A further object of the invention is to provide an internal combustion motor wherein the respective valves are so located and arranged that the valves are not subjected to the action of the explosive mixture; that is to say the valves are protected from the flames of combustion, with the result that the escape of the explosive mixture is practically prevented and the life of the valves increased, as will be more readily apparent from the detailed description of the accompanying drawing, wherein:—

Figure 1 is a vertical sectional view through a cylinder and its piston, with the inlet and exhaust valves thereof; the figure illustrating the movable elements at the initial part of the intake stroke.

Figure 2 is a sectional view of the upper part of the cylinder and its valves, with the crank-case or lower part of the cylinder broken away; the figure illustrating the position of the valves and the location of the piston in intake port uncovering position on the intake stroke.

Figure 3 is a similar sectional view illustrating the location of the piston and position of the valves at completion of the intake stroke of the piston and the beginning of the compression stroke.

Figure 4 is a similar sectional view showing the position of the piston and of the valves at the completion of the compression stroke.

Figure 5 is a cross sectional view taken substantially on the line 5—5 of Figure 4 showing the formation and relation of the valve openings to the ports in the cylinder wall.

My invention, as previously stated, relates more particularly to the location of the ports and the valves relative to the extreme positions of the piston and particularly the location of the intake port and valve, regardless of the particular type of valve mechanism employed. For the purposes of exemplification, I have disclosed the motor provided with rotating valves and suitable ports arranged in the wall of the cylinder 10 and shown provided at top with a suitable spark plug as at 11; the upper end of the cylinder, except for the introduction of the spark plug, being imperforate, while the side wall of the cylinder is enlarged or provided with a suitable casing to receive the intake valve 12 and the exhaust valve 13 which are shown rotatably mounted in the wall of the cylinder. The cylinder side wall is shown provided with an intake port 14 and an exhaust port 15 located and communicating with the cylinder interior at points intermediate of the extreme positions of the piston 16. The valve housing portion of the cylinder wall is provided with the usual fuel supply connection 17 communicating with the carburetor; and the housing is shown provided with a port 18 which communicates with the intake valve chamber and is adapted to communicate with the port 19 of the intake valve 12 when the latter has been properly operated or rotated into position to permit passage of the fuel through the valve-port 19 and into intake port 14 and thence into the cylinder when the piston 16 has been reciprocated beneath the intake port 14.

The cylinder wall or valve casing is also provided with the usual exhaust or outlet manifold 20 to receive the exhaust from the cylinder when the main exhaust port 21 of exhaust valve 13 has been positioned to register with the main exhaust port 15 and the port leading to the manifold and also when the auxiliary ports 22 have been brought to register with the auxiliary exhaust or scavenging ports 23.

As the use of rotary valves, generally speaking, has heretofore been known and various methods for operating the valves have been devised, applicant does not deem it necessary to illustrate and therefore to specifically describe the means whereby the

valves are operated, as any suitable operating mechanism may be employed whereby proper operation of the respective valves, relative to the operation of the piston, may be employed.

The construction of the rotary valves, as employed by me, as well as the formation of the ports in the cylinder wall, is more particularly shown in Figure 5; the intake valve 12 which is not shown in this figure, but like exhaust valve 13 is preferably provided with an elongated port transversely through the valve, while the cylinder wall at a point in alignment with the inlet port 18 is preferably shown provided with a series of ports 14 as shown in Figure 5. The wall of the cylinder proper at points registering with some of the ports 14, namely the ports at opposite ends of the row of ports shown in Figure 5, is provided with the downwardly sloping ports 23 which at their lower ends communicate with the valve chamber of the exhaust valve 13. The exhaust valve 13 in addition to the elongated port 21, is provided adjacent to opposite ends with ports preferably leading to and communicating with the main exhaust port 21 in the valve 13, (or with the main outlet port in the casing communicating with the exhaust manifold) and which is adapted to register with the port leading to the manifold 20; the cylinder wall at points in substantial alignment with the connection of the manifold being also provided with a plurality of exhaust ports 15.

In Figure 1 the valves and the piston are shown at the initial part of the intake stroke of the piston, namely a position where the piston 16 fully covers the intake ports 14, as well as the exhaust ports 15, at which time the port 19 of the intake valve 12 (which rotates in the direction of the arrow) is approaching and begins registration with the intake ports 14 and the port 18 communicating with the carburetor. At this stage of the operation, the exhaust port 13 is being rotated so as to move the main exhaust port 21 out of register with the exhaust ports 15, at which time the auxiliary ports 22 in the valve 13 will also be moving out of register with the auxiliary or scavenging ports 23.

The further downward movement of the piston 16 produces the condition disclosed in Figure 2, where the main exhaust port 21 and auxiliary ports 22 of exhaust valve 13 are entirely out of register with the exhaust ports 15 and auxiliary ports 23 in the wall of the cylinder; while on the other hand the intake valve 12 has been rotated sufficiently to practically bring the port 19 of the valve substantially in alignment with the intake ports 14 and ports 18 leading to the carburetor connection, thus permitting inflow of the explosive mixture.

The further downward movement of the piston 16 to the lowest point of its stroke, namely to the completion of the intake stroke, as shown in Figure 3 (which also constitutes the beginning of the compression stroke), uncovers all the ports in the side wall of the cylinder, while the intake valve 12 will have been positioned so that its port 19 will be out of register with the ports 14 and 18 and further inflow of explosive mixture shut off. At the same time the exhaust valve 13 will be positioned where all of its ports are out of register with the main exhaust ports 15 as well as will the auxiliary or scavenging ports 23.

The piston at this stage begins its upward or compression stroke, thereby immediately covering the exhaust ports 15, while the intake valve is still in a position where its port is out of register with the ports 14 in the wall of the cylinder, thus preventing escape of the explosive mixture which is being compressed by the upward movement of the piston; the intake ports being completely covered by the piston 16 before the latter reaches the completion of its compression stroke as illustrated in Figure 4. Ignition of the compressed explosive mixture taking place, the piston 16 begins its expansion stroke, the initial point of which is that shown in Figure 4, namely at the completion of the compression stroke. At this stage of operation, the intake valve 12, with its intake port 19, is out of register with the intake port 14, as shown in Figure 4, and will continue to be so during the entire expansion stroke as well as during the exhaust or up-stroke of the piston; while the exhaust valve 13 is moving toward position where its main exhaust port 21 will approach the exhaust ports 15 in the cylinder wall; the main port 21 being brought to register with the ports 15 after the piston 16 has reached the lowest point of its expansion stroke, namely at the initial point of its exhaust stroke, so that the exploded gases may then find egress through the exhaust ports after the piston has uncovered the ports and reached the lowest point of the stroke.

It is evident that even though the valves may become somewhat loose and have a tendency to leak, very little efficiency will be lost because the piston acts as a closure for the ports; and at the same time a small quantity of the exploded gases may remain in the upper part of the cylinder to provide a cushioning effect for the piston at the end of its exhaust stroke; the exhaust valve being closed before the piston reaches the end of its exhaust stroke. The auxiliary or scavenging ports 22 and 23 are so arranged, relative to the main exhaust port and the exhaust valve 13 and the inlet ports 14 of the cylinder, that the ports 22 and 23

will be brought to register after exhaust ports 15 have been closed by the piston so as to permit a scavenging of the motor.

With the arrangement and location of the valves and more particularly of the intake valve as shown and described, it is evident that the valves are protected from the flames of combustion, the life of the intake valve thus greatly enhanced and at the same time a more efficient motor provided.

I have shown and described what I believe to be a simple adaptation of my invention, which has been described in terms employed merely as terms of description and not as terms of limitation, as structural modifications are possible and may be made without, however, departing from the spirit of the invention.

What I claim is:

1. In an internal combustion motor, a cylinder having a closed end and provided with a reciprocable piston, inlet ports in the side wall of the cylinder at a point below the maximum compression stroke of the piston, exhaust ports in the side wall of the cylinder above the maximum expansion stroke of the piston, a pair of rotary valves for controlling said ports, the location of the ports relative to the piston and the relation between the valves being such that when the piston moves downwardly on the intake stroke to uncover the intake port the inlet valve will be in admitting position while the exhaust port will be covered by the piston until the latter reaches the initial point of its compression stroke, the exhaust valve remaining in closed position until the piston again returns on its expansion stroke.

2. In an internal combustion motor, a cylinder having a closed end and provided with a reciprocable piston, inlet ports in the side wall of the cylinder at a point below the maximum compression stroke of the piston, exhaust ports in the side wall of the cylinder above the maximum expansion stroke of the piston, scavenging ports leading from a point in alignment with the inlet ports in the cylinder proper to the exhaust valve, and separate inlet and exhaust valves for controlling the respective ports, the location of the ports relative to the piston and the relation between the valves being such that when the piston moves downwardly on the intake stroke to uncover the intake ports, the inlet valve will be in admitting position while the exhaust port will be covered by the piston and the exhaust valve out of register with the scavenging ports until the piston reaches the initial point of its compression stroke, the exhaust valve remaining in closed position until the piston again returns on its expansion stroke.

3. In an internal combustion motor, a cylinder having a closed end and provided with a reciprocable piston, inlet ports in the side wall of the cylinder at a point below the maximum compression stroke of the piston, exhaust ports in the side wall of the cylinder above the maximum expansion stroke of the piston, scavenging ports leading from a point in alignment with the inlet ports in the cylinder proper to the exhaust valve, and separate inlet and exhaust valves for controlling the respective ports, the exhaust valve being provided with a main port adapted to register with the exhaust ports in the cylinder and auxiliary ports adapted to register with the scavenging ports.

DAVID W. JONES.