June 20, 1933. R. S. MOORE 1,915,237

INTERNAL COMBUSTION ENGINE

Original Filed March 1, 1933 2 Sheets-Sheet 1

Fig. 1.

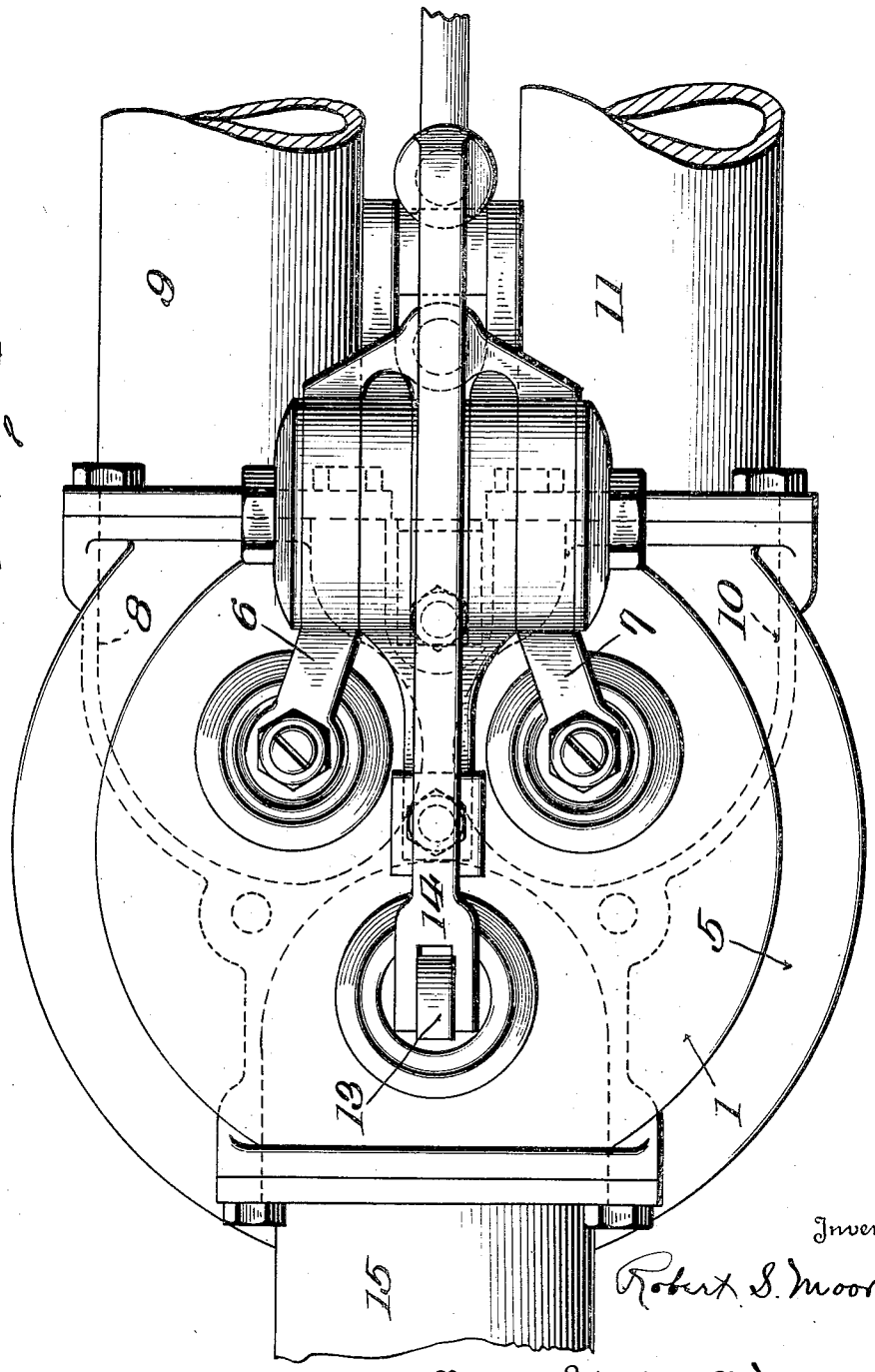

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Fig. 3.

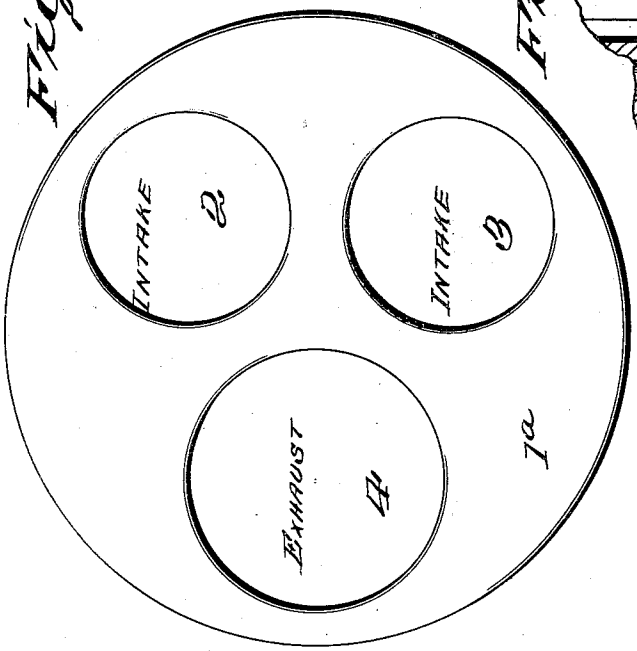


Fig. 4.

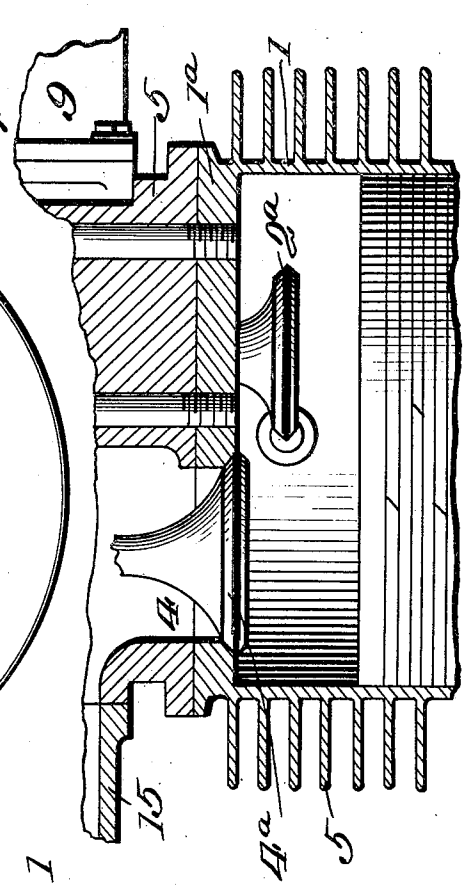
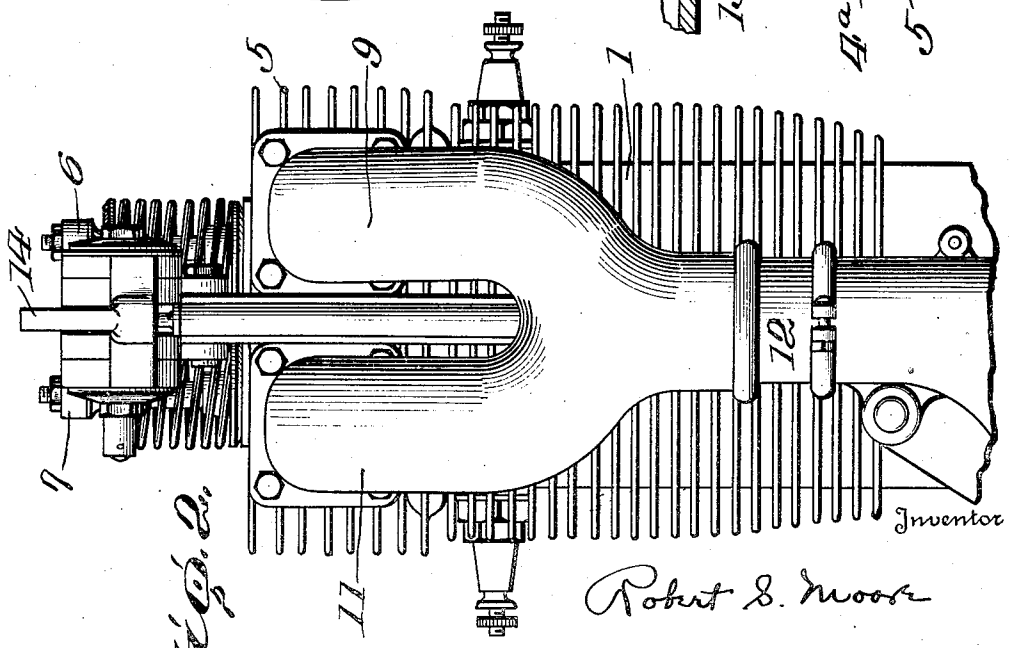


Fig. 2.



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Patented June 20, 1933 1,915,237

UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

Original application filed March 1, 1933, Serial No. 659,224. Divided and this application filed May 9, 1933. Serial No. 670,195.

The invention relates to new and useful improvements in internal combustion engines, and more particularly to the arrangement of the intake and exhaust ports and the fuel supply for the engine.

An object of the invention is to provide an arrangement and construction of intake and exhaust ports, whereby a maximum volume of fuel may be taken into the cylinder and exhausted from the cylinder after explosion for a given head area of said cylinder.

In the drawings—

Figure 1 is a plan view showing one cylinder of an internal combustion engine embodying the improvements;

Fig. 2 is a side view of the cylinder;

Fig. 3 is a view showing more or less diagrammatically the relative position and dimensions of the intake ports and exhaust port, and

Fig. 4 is a detail in vertical section showing the exhaust port and the operating valve therefor.

This application is a division of my copending application Serial No. 659,224, filed March 1, 1933. It is also a continuation in part of my application Serial No. 402,703, filed October 26, 1929. The invention is directed to an arrangement and construction of intake and exhaust ports, and also to a fuel supply for the intake ports, whereby a maximum volume of fuel gas may be taken into the engine cylinder, exploded and discharged through the exhaust port for a given area of cylinder head, and at the same time retain a sufficient amount of metal in the head for strength and for cooling purposes. This is accomplished by two intake ports and one exhaust port, all of which are located in the head of the cylinder. The two intake ports are of similar dimensions, and the combined area thereof is greater than the area of the exhaust port, while the area of the exhaust port is greater than the area of either one of the intake ports. The intake and exhaust ports are disposed in the head of the cylinder so that there is substantially the same amount of material between the adjacent ports, and this is only sufficient to give proper strength and cooling efficiency. The intake ports are both supplied with fuel gas from the same carburetor through a common intake manifold. Both intake ports are opened simultaneously to receive the fuel gases, and through this equal supply of fuel gas through the two intake ports from a common source, a relatively large volume of fuel gas may be taken into a cylinder and discharged after explosion for a given area of cylinder head and cylinder displacement.

While the invention may be used in any type of internal combustion engine, it is particularly useful in a multiple cylinder engine wherein the cylinders are arranged radially about the main operated shaft as a center. The construction of the cylinders is similar, and only a portion of one cylinder is shown in the drawings. The cylinder is indicated at 1, and as shown diagrammatically in Fig. 3, the cylinder is provided with two intake ports 2 and 3 and one exhaust port 4. These ports are formed in the head of the cylinder, and the centers of the ports are arranged so that lines connecting the centers form an isosceles triangle with the center of the exhaust port at the apex of the triangle. I have found the best results are obtained when the ports have substantially the following relative dimensions. In a cylinder 4¾ inches in diameter, the two intake ports should have a diameter of approximately 1⅝ inches, which gives an area for each intake port of 2.0739 square inches. The exhaust port should be two inches in diameter and this gives an area of 3.1416 square inches. These relative dimensions can, of course, be varied within certain limits, but it is important that the ports shall be of approximately the dimensions given so as to get the maximum intake with the proper exhaust relief, and with the necessary metal between the ports to give strength and proper cooling efficiency to the head. The cylinder is preferably of the poultice head type, and the poultice head is attached to the cylinder head and serves as a support for the valves controlling the ports and as a connection for the intake manifold and the exhaust manifold. The cylinder has the

head 1^a thereof cast integral with the cylinder, and the poultice head makes contact with this cylinder head 1^a. The poultice head is indicated at 5 in the drawings. Associated with the intake port 2 is a valve, the stem of which extends up through the poultice head where it is operated upon by the rocker lever 6. The stem of the valve associated with the port 3 likewise extends up through the poultice head and is operated upon by a lever 7. The levers 6 and 7 are parts of an integral yoke, so that these two levers and the valve controlled thereby are simultaneously operated to open and close both of the intake ports. There are, of course, springs for holding the valves closed.

In Fig. 4 there is shown a portion of the exhaust port with the valve 4*a* controlling the same, which is closed, and also at 2*a* a portion of one of the valves which controls one of the intake ports. These valves are of the usual construction, and further illustration thereof is not thought necessary.

There is an L-shaped port leading from the intake port 2 to the outer face of the poultice head, and this L-shaped port is indicated by the broken line 8 in Fig. 2. A pipe 9 for supplying fuel gas is attached to the poultice head and the fuel gas passes through this pipe 9 into the L-shaped port and thence through the intake port 2 when the valve is open. There is also an L-shaped port 10 associated with the intake port 3, and a pipe 11 which is secured to the poultice head, and the fuel gas supplied to this pipe 11 passes through the L-shaped port 10 and through the intake port 3 when the valve associated therewith is open. The pipes 9 and 11 are joined together and are connected to a pipe 12. These pipes 9, 11 and 12 form the intake manifold. The pipe 12 extends to a distributor valve when the invention is embodied in a multiple cylinder engine, and from thence to a single carburetor which supplies fuel gas equally to both intake ports.

Associated with the exhaust port 4 is a valve having a stem 13 which is connected to a lever 14. There is a port in the poultice head which connects with this exhaust port 4, and a pipe 15 attached to the poultice head receives the exhaust gases and discharges the same from the engine. The valve mechanism which is shown in detail in the application forms no part of the present invention, but is shown, described and claimed in my co-pending application of which this application is a division.

Referring again to Fig. 3 of the drawings, it will be noted that the intake ports are spaced from each other substantially the same distance that each intake port is spaced from the exhaust port, and the amount of metal between the ports is only sufficient to give proper strength and proper cooling efficiency to the head. By this arrangement, the greatest possible intake area is provided in the cylinder head with a proper area for exhaust of the exploded gases when a maximum volume of fuel gas is taken into the engine through the intake ports. With this maximum area whereby the gases may be taken into the engine and exploded and then exhausted, and the control of the valves which simultaneously open the intake ports to an equal extent for receiving the fuel gases, and the connection of the intake ports to a common intake manifold supplying the fuel gases thereto, I am able to supply the internal combustion engine with a maximum volume of fuel gas for a given displacement. While the exhaust port is of less area than the combined area of the intake ports, it has sufficient capacity to take care of the exploded gases as they are expelled from the engine as the pressure of the explosion is much greater than the pressure on the inflowing gases through the intake ports. Furthermore, when two intake ports are used supplied from a common source, and furnishing fuel to a common combustion chamber, a greater turbulence is produced which causes the fuel gas mixture to practically fill the entire combustion chamber in the cylinder, and the taking in of this large volume of fuel gas under the great turbulence increases the power produced for a given cylinder displacement. Furthermore, by the use of a single exhaust valve, there is a quick exhausting of the burnt gases with a minimum friction area over which the gases pass. This arrangement of the intake and the exhaust ports also greatly contributes to the efficient cooling of the engine.

Having thus described the invention, what I claim as new and desire to secure by Letters-Patent, is—

An internal combustion engine including in combination a cylinder having two independent intake ports supplied with fuel gases from a common supply passage and one exhaust port in the head thereof, said intake ports being of fixed dimensions and operating under all loads to equally supply fuel to the engine, said ports being disposed so that lines joining the centers thereof form an isosceles triangle, with the center of the exhaust port at the apex thereof, and so that the distance between the adjacent edges of the respective ports is approximately the same, a valve associated with each port, the valves of the intake ports being simultaneously operated for controlling said ports, the combined area of the two intake ports being greater than the area of the exhaust port, and the area of each intake port being less than the area of the exhaust port.

In testimony whereof, I affix my signature.

ROBERT S. MOORE.