May 24, 1932. F. DE LAUTOUR 1,859,329

GAS PASSAGE OF THE CYLINDERS OF INTERNAL COMBUSTION ENGINES

Filed Aug. 1, 1930 2 Sheets-Sheet 1

Fig. 1.

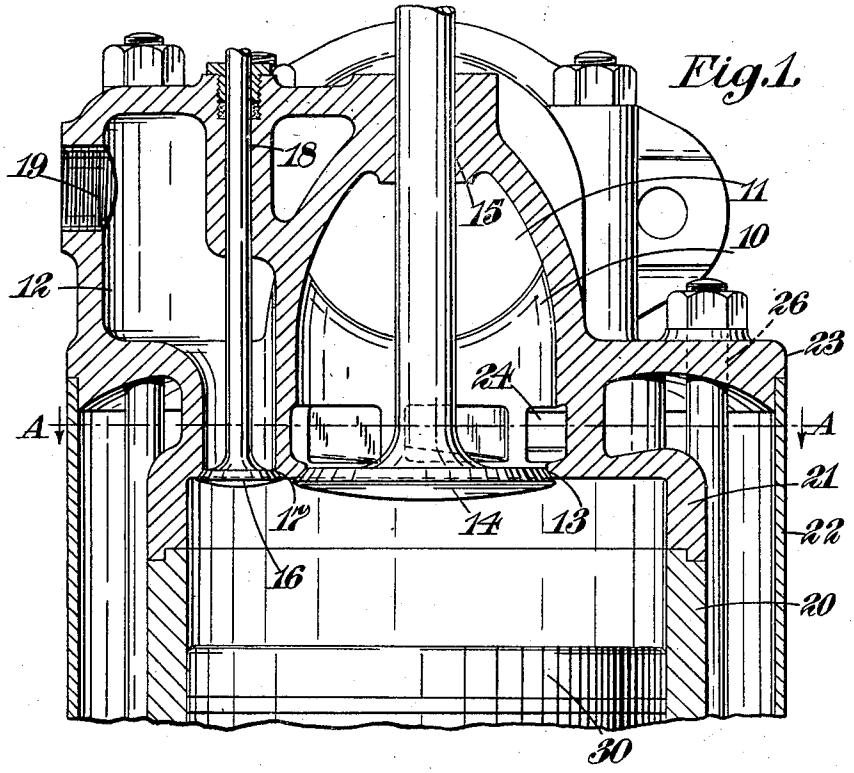
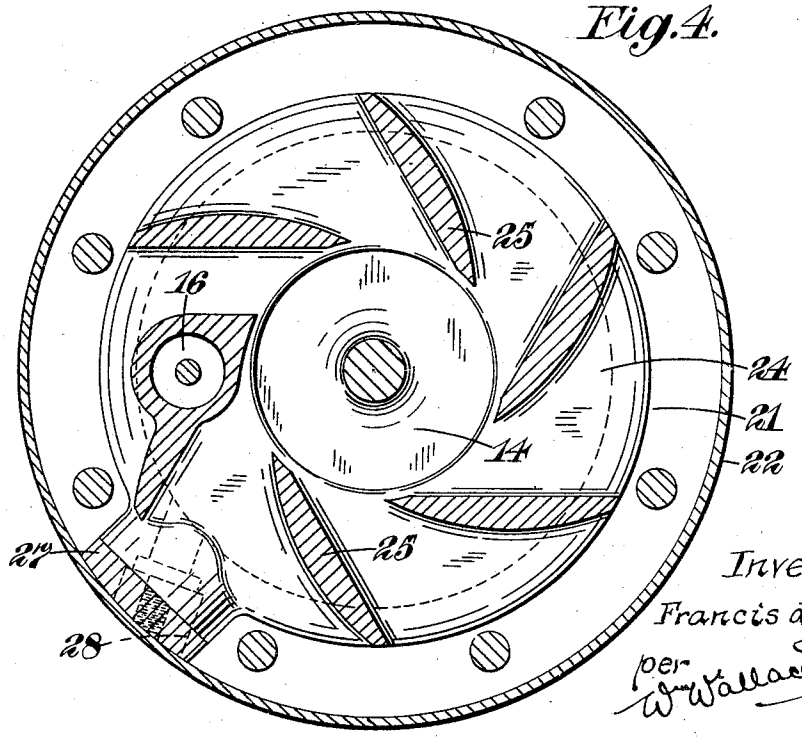


Fig. 4.



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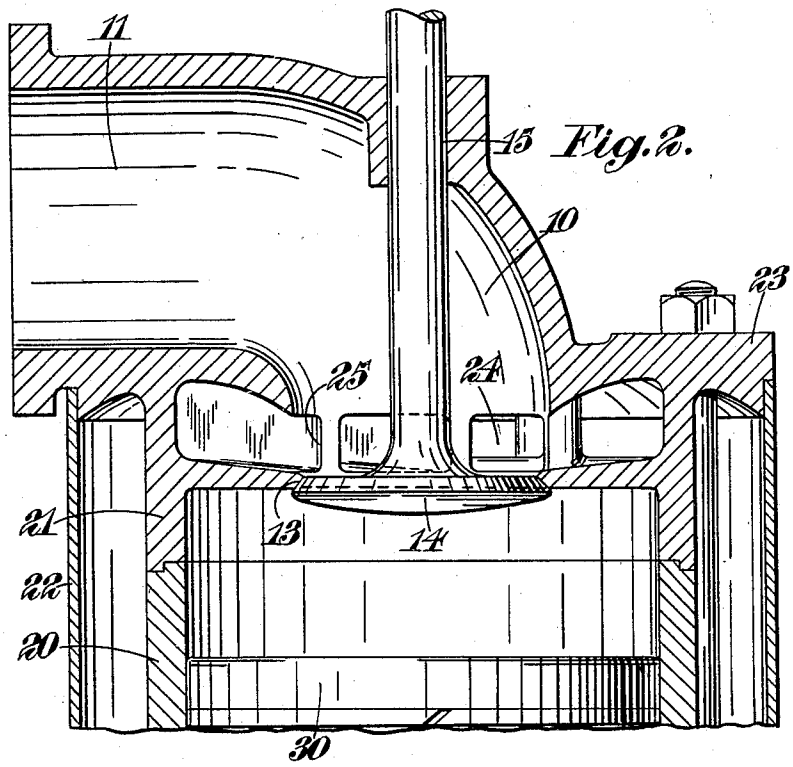


Fig. 2.

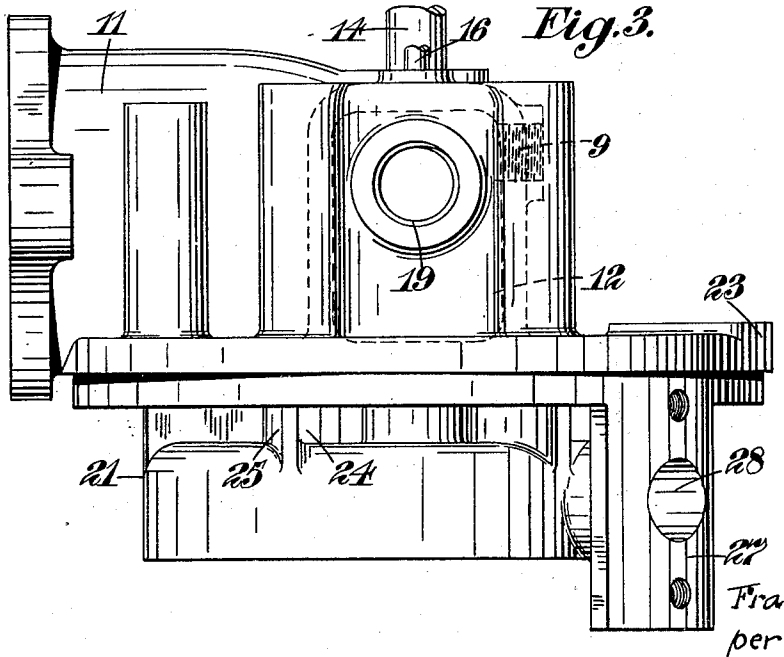


Fig. 3.

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UNITED STATES PATENT OFFICE

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GAS PASSAGE OF THE CYLINDERS OF INTERNAL COMBUSTION ENGINES

Application filed August 1, 1930, Serial No. 472,386, and in Great Britain August 21, 1929.

This invention is for improvements relating to the gas passages of the cylinders of internal combustion engines, of the type in which only a single valve or set of valves is used, for the discharge of the exhaust gases and then for the admission of the succeeding air charge for the combustion of the next charge of fuel.

The present invention comprises, in an internal combustion engine of the type described, the combination with a valve controlling a port in the cylinder head, and an outlet passage leading away therefrom, of means for causing a continuous flow of air through said passage.

Preferably the said air flow is made to sweep across a face of the valve so as to ensure adequate cooling of the valve.

According to another feature of this invention, the said air stream is directed on to the rear face of the valve by a series of jets so disposed as to give the air a swirling motion coaxial with the cylinder axis.

A particular embodiment of this invention will now be described, by way of example, with reference to the accompanying drawings, of which—

Figure 1 shows a sectional elevation of a cylinder head and a part of the cylinder of an internal combustion engine embodying this invention.

Figure 2 is another sectional elevation of the cylinder head and the part of the cylinder on a plane at right angles to the section-plane of Figure 1.

Figure 3 is an outside elevation corresponding to Figure 2.

Figure 4 is a horizontal section or plan view along the line A—A of Figure 1.

The cylinder head shown in the drawings is for use in an oil engine in which a charge of oil and air is ignited by the high temperature produced at the end of the compression stroke of the piston. Such an engine is commonly called a "compression-ignition" engine.

In the present example, in order to facilitate the starting of the engine an auxiliary valve-controlled chamber is provided in the cylinder head. The construction and function of this additional chamber are described in detail below.

Referring more particularly to Figures 1 and 2, the cylinder head comprises two main parts; a main gas passage 10, communicating with an exhaust passage 11, and an auxiliary chamber 12 which is an integral part of the casting of the cylinder head and is formed slightly at the side thereof. The gas passage 10 communicates at its lower end with a port 13 which constitutes a seating for a poppet valve 14, the stem of which passes through a hole 15 in the crown of the gas passage 10. The auxiliary chamber 12 is also provided with a poppet valve 16 which is seated at 17, the stem of which passes through a cylindrical hole 18 in the top of the auxiliary chamber 12. A port 19, for connection to an induction pipe and a threaded hole 9 (Figure 3) to take a sparking plug, are also provided in the wall of the auxiliary chamber 12.

The two chambers 10 and 12 open downwardly into the top of the cylinder, the internal wall 20 of which engages the lower ring 21 of the cylinder head casting. The external wall or jacket 22 of the cylinder engages a flange 23 which is formed integrally with the cylinder head casting and projects beyond the ring 21 by a distance equal to the space of the cylinder walls. This space is continued in the cylinder head as an annular passage which is divided by six vanes 25 into a series of ports 24 which communicate on the inside with the gas passage.

The six vanes 25 are symmetrically disposed in the passage 24 and serve to hold together the upper and lower portions of the cylinder head. The inner face of each vane (see now also Figure 4) is in a vertical plane tangential to the periphery of the port 13, while the outer face is a slightly convex cylindrical surface. One of the vanes is enlarged and bored as shown to accommodate the stem of the poppet valve 16 passing through the auxiliary chamber 12.

The flange 23 of the cylinder head is provided with a series of holes 26 to accommodate bolts for securing the cylinder head to the cylinder, and also with a lug 27 (see Fig-

ures 3 and 4) to which is secured a fuel oil supply conduit (not shown). A hole 28 is formed in the lug 27 and passes through the wall of the ring 21, whereby oil may be injected into the cylinder.

The operation of the engine will now be described:—A continuous stream of air is caused to flow between the internal and external walls 20 and 22 of the cylinder, through the passage 24 and out through the exhaust passage 11. This stream may be produced by any convenient means such as, for example, a pump connected to the crank case end of the cylinder jacket 22 or a suction chamber or induction fan arranged in the exhaust system. The combined effect of the vanes 25 and the curved shape of the top of the annular passage 24 is to direct the air on to the outer surface of the main poppet valve 14 in a series of swirling jets and to establish a pressure, greater than atmospheric pressure, in the gas passage 10.

When the valve 14 opens, at the end of a power stroke, the exhaust gases are diluted with air in the gas passage 10 and then driven out through the exhaust passage 11 by the combined action of the piston (30) and the air stream. The exhaust gases are cooled by being thus mixed with the air stream and this renders the engine more silent in running than it otherwise would be.

When the exhaust stroke is complete, a charge of oil is injected into the cylinder through the hole 28 and, at the same time, a charge of air from the gas passage 10 enters through the port 13 and atomizes the oil. If no air stream were provided, the charge of air would enter the cylinder solely by the suction of the descending piston 30, but with the arrangement provided by this invention, the air is forced into the cylinder by the pressure, above referred to, which is produced by the air stream in the gas passage 10. The volumetric efficiency of the engine is thus increased.

In addition to the functions above mentioned, the air stream also serves to cool the cylinder as it passes between the internal and external walls 20 and 22 and further, it plays on to the outer face of the valve 14 and cools it.

As is well known, a considerable effort is required to start a compression-ignition engine. In an engine using a cylinder head such as is described above and illustrated in the accompanying drawings, starting is readily accomplished by the use of the auxiliary chamber 12. The valve 16 (which may be operated manually) is opened, the fuel oil supply is cut off and gasoline vapour is admitted from a carburetor through the port 17. With the valve 16 open the compression volume of the cylinder is increased by the volume of the auxiliary chamber 12, and the engine may be easily started up as a gasoline engine. When a sufficient speed has been attained, the valve 16 is closed, the fuel oil supply is established and the engine proceeds to run, as it is designed to run, as a compression-ignition engine.

I claim:—

1. An internal combustion engine of the kind described having a mushroom valve controlling a central port in the cylinder head, an inlet and an outlet passage communicating therewith through which a continuous flow of air is maintained, and guide vanes disposed in the inlet passage for causing the flow to swirl co-axially with the valve over the outer face thereof.

2. An internal-combustion engine of the kind described having a central port in the cylinder head, a mushroom valve controlling said port, walls forming an annular inlet passage in the cylinder head, and an outlet passage, and through which passages a continuous stream of air is maintained, and guide vanes formed between the said walls to cause the flow of air to swirl co-axially with the valve over the outer face thereof.

3. An internal-combustion engine of the kind described having a central port in the cylinder head, a mushroom valve controlling said port, walls forming an annular inlet passage in the cylinder head, an outlet passage, and through which passages a continuous flow of air is maintained, and a series of guide vanes formed between the said walls for causing the flow of air to swirl co-axially with the valve over the outer face thereof, and the said walls being curved to direct the swirling air downwardly on to the outer face of the valve.

4. An internal combustion engine of the kind described having a mushroom valve controlling a port in the cylinder head, an inlet and an outlet passage communicating therewith through which a continuous flow of air is maintained, guiding means for causing the flow of air to swirl co-axially with the valve over the outer face thereof, wherein the inlet passage constitutes a continuation of an air jacket surrounding the cylinder, through which jacket the flow of air passes before reaching the valve.

5. An internal-combustion engine of the kind described having a central port in the cylinder head, a mushroom valve controlling said port, walls forming an annular inlet passage surrounding the port, an outlet passage communicating with the port and through which passages a continuous flow of air is maintained, and a series of guide vanes formed between the said walls to cause the flow of air to swirl co-axially of the valve and over the outer face thereof, and the said walls constituting a continuation of an air jacket, surrounding the cylinder through which the flow of air passes before reaching the valve.

6. An internal-combustion engine of the

character described comprising a port in the cylinder head, a valve controlling said port, an inlet passage communicating with said port and through which passage a continuous flow of air is maintained, an outlet passage also communicating with said port, and guiding means whereby said flow of air is caused to swirl co-axially with the valve over the outer face thereof.

7. An internal-combustion engine of the kind described having a port in the cylinder head, a valve controlling said port, an inlet and an outlet passage both communicating with the port, and through which passages a continuous flow of air is maintained, and guiding means whereby said flow of air is caused to swirl co-axially with the valve over the outer face thereof.

In testimony whereof I affix my signature.

FRANCIS DE LAUTOUR.