Jan. 3, 1933. H. L. HORNING 1,892,838

INTERNAL COMBUSTION ENGINE

Filed Aug. 22, 1928

Fig. 1.

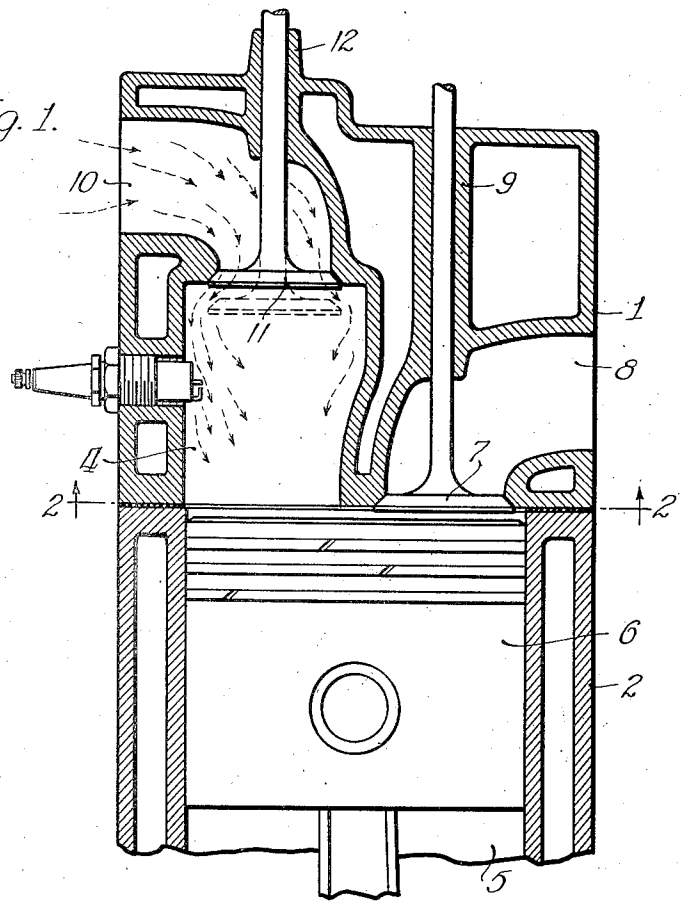
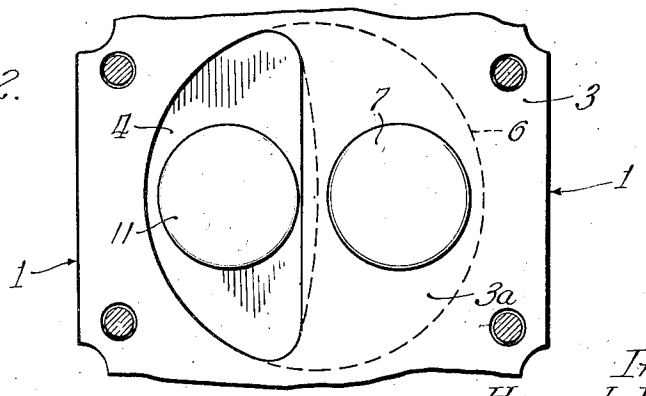


Fig. 2.



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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

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This invention relates to internal combustion engines, and more particularly to engines of the overhead valve type.

My invention is concerned more particularly with the provision of a compact turbulence producing combustion chamber and associated parts so related as to dispose the exhaust valve outside of the combustion chamber, reducing the hot spots in the combustion chamber to a minimum, while permitting the spark plug to be disposed to best advantage within the combustion chamber. Further objects and advantages of my invention will appear from the detailed description.

In the drawing:

Figure 1 is a vertical sectional view through the engine head and the upper portion of the cylinder block, constructed in accordance with my invention, parts being shown in elevation; and

Figure 2 is a horizontal sectional view taken substantially in the plane of line 2—2 of Figure 1.

In the embodiment of my invention illustrated by way of example, the head 1 is secured upon the top of cylinder block 2 in a known manner, this head and the block being formed separately. The head and the cylinder block are cored out, where feasible, to provide space for circulation of the cooling medium, as is well known in the art. The head 1 is provided with a flat or planar underface 3, through which opens a combustion chamber 4 formed in the head, the lower end of this combustion chamber being of approximately semicircular shape and overlying a portion of the area of cylinder 5. A portion 3^a of the flat underface of head 1 overlies the remaining portion of the area of the cylinder. A piston 6 reciprocates in cylinder 5 and the space between this piston, when in raised position, and portion 3^a of the head 1 is such that the fuel mixture entrapped in this space is ineffective. Portion 3^a of the head and the corresponding portion of the cylinder 6 thus cooperate to provide a shielded area within which is disposed an exhaust valve 7 which seats in the inner end of an exhaust passage 8 formed in head 1, the head being also formed with a suitable valve stem guide 9.

It will be noted that the seat for valve 7 is formed so that the inner or lower face of this valve is flush with the under face of the head. The exhaust valve is thus disposed out of the combustion chamber 4 and in the shielded area.

Head 1 is further provided with an inlet passage 10 which opens into the combustion chamber 4 at the top thereof. Communication between passage 10 and chamber 4 is controlled by an inlet valve 11, the stem of which operates through a guide sleeve 12 formed in the head. A spark plug 13 is secured through the head laterally thereof and projects into chamber 4, the electrodes of this spark plug being disposed in the path of the entering or incoming charge. The spark plug is preferably disposed near the top of the combustion chamber, as illustrated, and in the path of the incoming charge which impinges directly upon the spark plug and exerts a desired cooling effect thereon.

By constructing the combustion chamber 4 as illustrated and described, it is possible to obtain great turbulence. The degree of this turbulence will vary with variation in the piston clearance, that is the clearance between the piston and the end of the bore of the cylinder, and the amount of shielded area of the piston, which corresponds to the area of portion 3^a of the under face of head 1. By varying these factors, the turbulence can be varied within wide limits.

In the construction illustrated, great turbulence is obtained, which I believe to be new in overhead valve engines.

In the illustrated embodiment of my invention, I have shown the parting line between the head and the cylinder at the plane of the exhaust valve seat. I do not limit myself to this construction, however, as the parting line could also be located at the plane of the inlet valve seat or the combustion chamber could be formed in a spacer or block with parting lines at the inlet and the exhaust valve seats. In such case, the spacer or blocks would form with the upper member or head a head structure corresponding to that illus-

trated. I also contemplate forming the head and the cylinder in one casting. It is not necessary, therefore, that the head be formed as illustrated and the term "head" as used herein and in the appended claims is to be construed as covering any structure, whether formed in one or more parts or formed integrally with the cylinder, which performs the functions above set forth of the head shown in the illustrated embodiment of my invention.

I have illustrated and described my invention, by way of example, as applied to an internal combustion engine of the asperating type. It can be applied, however, to advantage to engines of other types such as, for instance, injection engines and I do not, therefore, intend to in any way limit my invention to asperating engines.

What I claim is:

1. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and defining with the piston, when raised, a shielded area, a combustible gas intake passage opening into the combustion chamber, an inlet valve overlying the cylinder area and controlling said passage, a burned gas exhaust passage, and an exhaust valve in said shielded area controlling the exhaust passage.

2. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and forming with the piston, when raised, a shielded area, and combustible gas inlet and burned gas exhaust valves overlying the cylinder area, the inlet valve being in said combustion chamber and the exhaust valve being in said shielded area.

3. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and forming with the piston, when raised, a shielded area, and overhead combustible gas inlet and burned gas exhaust valves overlying the cylinder area, the exhaust valve being in said shielded area.

4. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber of approximately semi-circular shape at its lower end and overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and disposed close thereto, the head having a combustible gas inlet passage opening into said combustion chamber and a burned gas exhaust passage opening through the overlying portion of said head, and inlet and exhaust valves mounted in the head and controlling said passages.

5. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber of approximately semi-circular shape at its lower end and overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and disposed close thereto, the head having a combustible gas inlet passage opening into said combustion chamber and a burned gas exhaust passage opening through the overlying portion of said head, an inlet valve mounted in the head and controlling the inlet passage, and an exhaust valve seating in the under face of the head at the inner end of the exhaust passage.

6. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a flat under face overlying a portion of the cylinder area, said head being provided with a combustion chamber overlying another portion of the cylinder area, the head having a combustible gas inlet passage opening into said combustion chamber and a burned gas exhaust passage opening through the flat under face of the head, an inlet valve controlling said inlet passage, and an exhaust valve seating in the under face of the head at the inner end of the exhaust passage, the combustion chamber being of approximately semi-circular shape at its lower end with its outer wall curved and in substantial register with the wall of the corresponding portion of the cylinder.

7. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, said head having a portion overlying the remainder of the cylinder area and disposed close thereto, the head having a burned gas exhaust passage opening through the overlying portion of said head, a combustible gas inlet passage opening into said combustion chamber, inlet and exhaust valves mounted in the head, and spark ignition means in said combustion chamber and in the path of the incoming charge.

8. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, a combustible gas inlet passage opening into the upper end of the combustion chamber, an inlet valve controlling said passage and overlying the cylinder area, spark ignition means in the combustion chamber remote from the lower end thereof and in the path of the incoming charge, a burned gas exhaust passage, and an exhaust valve controlling said exhaust passage and overlying the cylinder area.

9. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber opening into the cylinder, combustible gas inlet and burned gas exhaust passages opening into said combustion chamber and directly into the cylinder, respectively, inlet and exhaust valves controlling said passages and overlying the cylinder area, the inlet valve being at the top of said combustion chamber, and spark ignition means in said combustion chamber.

10. In an internal combustion engine, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber opening into the cylinder, combustible gas inlet and burned gas exhaust passages opening into said combustion chamber and directly into the cylinder, respectively, inlet and exhaust valves controlling said passages and overlying the cylinder area, the inlet valve being at the top of said combustion chamber, and spark ignition means in said combustion chamber and in the path of the incoming charge.

11. In combination in an internal combustion engine of the aspiration type, a cylinder, a piston reciprocating in the cylinder, a head having a combustion chamber overlying a portion of the cylinder area, the head also having a wall at the lower end of the combustion chamber and overlying the remainder of the cylinder area, said wall defining with the piston, when the latter is in its position of maximum compression, a shielded area ineffective for combustion and the combustion chamber constituting all of the effective combustion space when said piston is in said position of maximum compression, a passage opening into the combustion chamber, a passage opening through said overlying wall of the head and exterior of the combustion chamber, overhead valves controlling said passages, one of the valves being within the combustion chamber and the other valve having its under face substantially flush with the under face of said wall, said other valve being exterior of the combustion chamber and within said shielded area, and spark means for igniting the fuel charge in the combustion chamber.

In witness whereof, I hereunto subscribe my name this 15th day of August, 1928.

HARRY L. HORNING.