July 12, 1932. H. A. GEHRES 1,866,703

INTERNAL COMBUSTION ENGINE

Filed July 26, 1930

Fig. 1

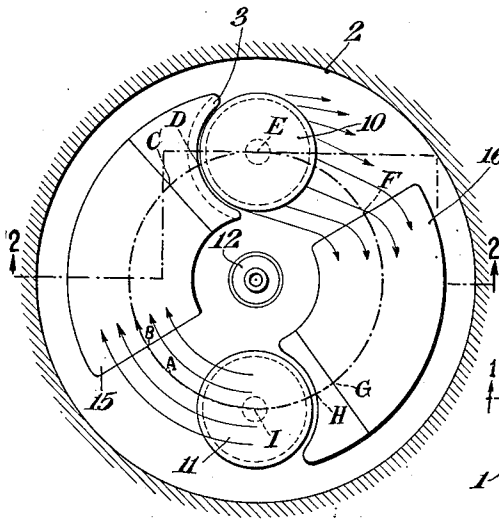


Fig. 2.

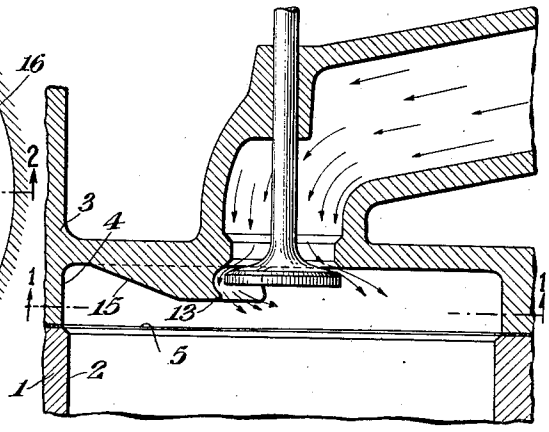


Fig. 3.

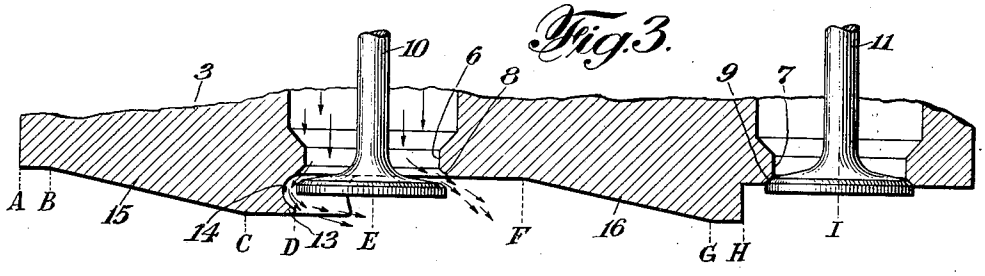
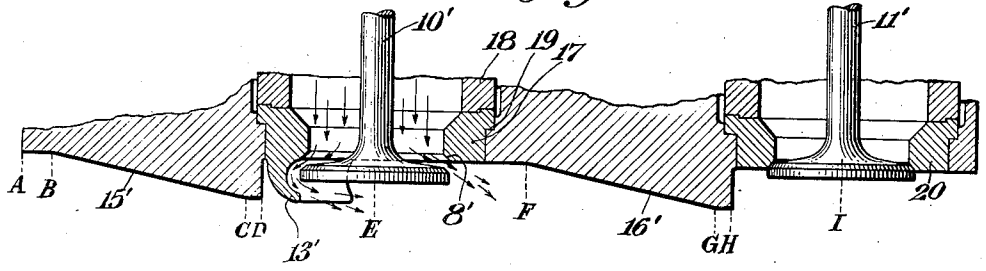


Fig. 4.



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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

Application filed July 26, 1930. Serial No. 470,877.

My invention relates to internal combustion engines, and is particularly adapted to such engines where the ignition is caused by the heat of compression, such as fuel injection engines of the Diesel type.

In internal combustion engines it is well known that it is desired to increase the speed of flame propagation and that this is greatly enhanced by turbulence of the combustion gases. However, this turbulence should be as uniform as possible and free from localized eddies.

Also in engines where fuel injection is used, as in the Diesel type the creation of turbulence serves the additional function of providing means for effectively and efficiently mixing the injection fuel with the amount of air necessary to produce the desired combustion mixture, whether the air and fuel are admitted to the combustion chamber together or separately.

Furthermore, in internal combustion engines in which any degree of turbulence is provided, solid particles, resulting as products of combustion, become lodged between the valve seats and valve member, thereby preventing proper closing of the valves and additionally resulting in pitting or scoring of the valve member and valve seat thereby causing loss of power; in some cases this being accelerated and proving extremely harmful and costly to operation and maintenance.

An object of this invention is to provide means for obtaining the above desired characteristics and for obviating the above disadvantages.

The invention consists in the novel features, arrangements and combinations of parts embodied by way of example in the apparatus hereinafter described, as illustrating preferred forms of the invention, and the invention will be more particularly pointed out in the appended claims.

Other objects, features and advantages of the invention will appear from the following specification and claims taken in connection with the accompanying drawing, in which

Fig. 1 is a view looking upwardly, as indicated by the arrows 1—1 in Fig. 2 and showing the arrangement of the valves and related structure of the cylinder head;

Fig. 2 is a section in elevation, taken at 2—2 of Fig. 1;

Fig. 3 is a developed section in elevation taken along the cutting circle A—B—C—D—E—F—G—H—I of Fig. 1; and

Fig. 4 is a view similar to Fig. 3 showing a modification.

Referring to the drawing illustrating a present preferred form of the invention, a cylinder is designated as 1 and is provided with a cylinder bore 2. A cylinder head 3 is suitably attached thereto and is provided with a base 4 in cooperative registration with the bore 2; and a suitable cylinder head gasket such as 5 may be provided if desired. Intake and exhaust valve openings 6 and 7 respectively are provided in the cylinder head, and as shown in Figs. 1, 2 and 3 are integral therewith and are provided respectively with valve seats 8 and 9. Intake and exhaust valve members 10 and 11 are respectively provided for cooperative seating engagement with said valve seats and are adapted to be opened and closed in operative timed relation, as is well understood by those skilled in the art.

Since the present embodiment of the invention illustrates an engine of the fuel injection type, a suitable fuel injection means is more or less diagrammatically illustrated as 12, and while this is illustrated as a central injection plug valve, it is to be understood, as will be obvious to those skilled in the art, that other forms of fuel injection are contemplated as falling within the scope of the embodiment illustrated.

Extending inwardly of the combustion space is a shroud 13 (Figs. 1, 2 and 3). This shroud is positioned contiguous to and lying on one side of the valve opening 6 and projects inwardly of the combustion chamber preferably beyond the innermost point of the valve member 10 when the valve is in open position. The shroud extends circumferentially of the valve opening less than half of the circumference thereof and is hollowed out as indicated at 14 so as to provide for a full valve opening between the shroud and

the valve member 10. It will be seen from Fig. 3 that the shroud permits a free passage for the intake gas, which in the present embodiment is air, and serves to deflect the intake gas in a direction in general tangential to the cylinder bore and downwardly in the combustion chamber; the valve member 10 and its cooperating valve seat 8 and the shroud 13 serving jointly to direct the intake gas in a direction transverse of the axis of the valve member 10 and in general tangentially and downwardly in the combustion chamber; thereby serving to set up a whirling motion of the gases within the combustion chamber. This causes an increased and improved atomization of the combustion mixture and accordingly serves to homogeneously disperse the injected fuel entering through the injection means 12 so as to produce an explosive mixture in which the particles of fuel are finely dispersed, while at the same time creating the desired turbulence to speed up flame propagation. It will be noted in this connection that the shroud provides for a circumferential and unrestricted valve opening, which is an important feature.

A ramp 15 (Figs. 1, 2 and 3) is provided intermediate the valves and is inclined inwardly of the combustion chamber as from B to C, the point C being preferably at the same level as the innermost projection of the shroud 13. In the embodiment shown in Figs. 1, 2 and 3 the ramp 15 and the shroud 13 are formed integral with the cylinder head. The ramp is in arcuate form and serves to direct the whirling gases away from the intake valve and to thereby prevent the solid products of combustion from being deposited between the valve 10 and seat 8. Diametrically opposite the ramp 15 is a similar ramp 16 also positioned intermediate the valves and inclined inwardly of the combustion space from the point F to the point G; the point G being disposed in the same level as the point C of ramp 15 and extending inwardly of the combustion chamber beyond the lowermost point of the valve member 11 when the exhaust valve is in open position. Similarly the ramp 16 serves to deflect the whirling gases in the combustion chamber downwardly and prevents the solid products of combustion from becoming lodged between the valve member 11 and its cooperating seat 9. In the present embodiment the rise of each of the ramps is completed in about 70° of arc, although this of course may be varied as will be well understood by those skilled in the art.

It will thus be seen that all of the air entering the inlet valve from the ramp side is constrained to flow in the same direction as air entering from the opposite side, and accordingly all of the air entering the inlet valve in any position on the circumference serves to produce within the combustion chamber a rotary whirling action devoid of eddies. Also the particular form of ramps employed is such as to interpose the least possible resistance to the rotary flow or whirling action of the air over the gradual incline of the ramp surfaces.

In Fig. 4 a modification is shown in which a removable member 17 is provided with an intake valve seat 8′ and a shroud 13′ is formed integral therewith; this modification providing means for inserting and removing the valve seat and shroud for replacement or servicing as required. The removable valve seat member 17 may be held in position in any desired manner, such for example as by means of the valve cage 18 which holds the member 17 rigidly seated as at 19. Similarly a removable valve seat member 20 is provided for the exhaust valve and is similarly held in position. Corresponding parts of the structure in Fig. 4 are designated by the same numerals utilized in connection with Fig. 3 with the addition of the suffix prime (′); it being understood that the position and construction of the ramps 15′ and 16′ of Fig. 4 are similar in all respects to those illustrated in Fig. 3, with the exception of the modifications above described.

Having thus described my invention with particularity with reference to its preferred form, and having illustrated one modification thereof, it will be obvious to those skilled in the art, after understanding my invention, that other changes and modifications may be made therein without departing from the spirit and scope of my invention, and I aim in the appended claims to cover such changes and modifications as are within the scope of the invention.

What I claim is:

1. In an internal combustion engine of the class described, having a valve seat, a valve member cooperating with said seat, a shroud projecting inwardly of the combustion chamber and disposed at one side of said valve seat and adapted to direct the intake gas passing through the valve transversely toward the opposite side of said valve seat, said shroud affording substantially full valve opening space between it and the valve member when the latter is in open position.

2. In an internal combustion engine of the class described, having a cylinder head and a valve seat, a valve member cooperating with said seat, means projecting inwardly from said cylinder head for setting up a whirl of the gases within the cylinder, and an inclined ramp adjacent said valve seat adapted to guide the whirling stream of gases away from the valve seat.

3. In an internal combustion engine of the class described, having a cylinder head and a valve seat, a valve member cooperating with said seat, means projecting inwardly from said cylinder head for setting up a

whirl of the gases within the cylinder and for shielding said valve seat from said whirling stream of gases.

4. In an internal combustion engine of the class described the combination of, a combustion chamber having an intake valve opening, a valve member for closing said opening, and a shroud contiguous to said opening and extending circumferentially for a part only of the distance around said opening and projecting into the said combustion chamber, said opening, said valve and said shroud being so formed and positioned as to provide a free circumferential path for intake gas and to deflect said gas in a direction generally tangential to the said combustion chamber to thereby cause a whirling movement of the combustion gases.

5. In an internal combustion engine of the class described the combination of, a combustion chamber having an intake valve opening, a valve member for closing said opening, a shroud contiguous to said opening and extending circumferentially for a part only of the distance around said opening and projecting into the said combustion chamber, said opening, said valve and said shroud being so formed and positioned as to provide a free circumferential path for intake gas and to deflect said gas in a direction generally tangential to the said combustion chamber to thereby cause a whirling movement of the combustion gases, and a ramp extending in the direction of said whirl and inclined inwardly of said combustion chamber to a point approximately at the level of the innermost end of said shroud and terminating contiguous thereto.

6. In an internal combustion engine of the class described the combination of, a removable valve seat member having a valve opening and provided with a shroud rigidly formed therewith and projecting inwardly of the combustion chamber and disposed at one side of said valve seat, a valve member cooperating with said seat, said shroud being so formed and positioned as to afford substantially full valve opening space between it and the valve member when the latter is in open position.

7. In an internal combustion engine of the class described, having an inlet valve seat and an exhaust valve seat, an inlet valve member and an exhaust valve member cooperating respectively with said seats, means for setting up a whirl of the gases within the cylinder, a ramp positioned intermediate the inlet and exhaust openings and inclined inwardly of the combustion chamber in the direction of said whirl with the innermost end of said ramp lying adjacent to said exhaust opening, and a second ramp positioned intermediate said exhaust and inlet openings and inclined inwardly of the combustion chamber to adjacent the inlet valve opening.

8. In an internal combustion engine of the class described the combination of, a cylinder head, having valve openings formed in diametrically opposite sides thereof, valve members cooperating respectively with said valve openings, diametrically opposed ramps positioned in said cylinder head and located respectively intermediate said valve openings, said ramps each being inclined inwardly from said cylinder head in the same circumferential direction and the innermost portions of said ramps terminating adjacent respective valve openings, and means for causing a whirling motion of the combustion gases in the general direction of the inward inclination of said ramps.

In testimony whereof I have signed my name to this specification.

HEWITT A. GEHRES.