Sept. 15, 1936. E. W. MITCHEL 2,054,134

SPARK PLUG

Filed Dec. 19, 1935

Fig. 1.

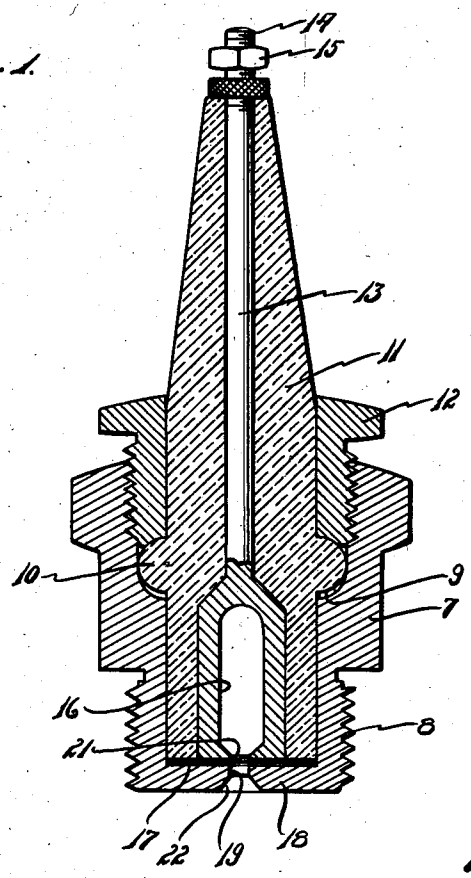


Fig. 2.

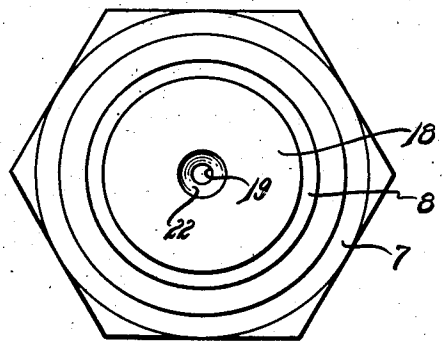
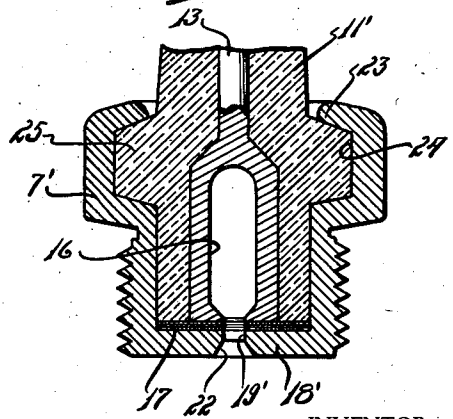


Fig. 3.



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SPARK PLUG

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6 Claims. (Cl. 123—169)

My invention relates to a new and useful improvement in a spark plug and has for its object the provision of a spark plug which will be simple in structure, economical of manufacture, durable, easily and quickly assembled, compact and highly efficient in use.

Another object of the invention is the provision of a spark plug having an electrode provided with a circular opening, the edge of which serves as a sparking point, thus providing an infinite number of points which may serve as sparking points.

Another object of the invention is the provision of a spark plug so constructed and arranged so as to provide with the cylinder chamber a pair of explosion chambers, one of the chambers being in the cylinder and the other in the pocket formed in the plug so that the sparking takes place directly across a column of compressed gases, thus adding to the efficiency of the spark plug in itself and to the efficiency of the engines.

Another object of the invention is the provision of a spark plug so constructed and arranged that it will maintain itself in a clean condition and free from carbon.

Other objects will appear hereinafter.

The invention consists in the combination and arrangement of parts hereinafter described and claimed.

The invention will be best understood by a reference to the accompanying drawing which forms a part of this specification, and in which,

Fig. 1 is a longitudinal, sectional, central view of the invention.

Fig. 2 is a top plan view of the invention.

Fig. 3 is a fragmentary, longitudinal, central, sectional view of a slightly modified form of the invention.

As shown in the drawing, the invention comprises a metallic shell 7 having the threaded portion 8 which threads into an opening formed in the engine head. This shell 7 is tubular and is enlarged as at 9 to provide clearance for the peripheral rib 10 formed on the insulating shell 11. A jam nut 12 threads into the upper end of the shell 7 and engages against the rib 10 to force the insulating shell 11 inwardly of the shell 7 and prevent its removal therefrom so as to lock the parts in assembled relation. A metallic electrode 13 projects through the insulating core or shell 11 and is provided on its upper end with the threaded stem 14 for the reception of the binding nut 15 whereby electrical contact may be made with a wire. The lower end of the electrode is provided with a centrally arranged inwardly projecting pocket 16 which opens through the constricted neck or passageway 21. It will be noted that the electrode at the pocket bearing end terminates flush with the corresponding end of the insulating shell or core 11. Insulating washers 17, formed from mica or the like, serve to separate the end of the electrode 13 and the end of the insulating shell 11 from the inwardly turned end 18 of the shell 7. This shell 7 is formed cup-shaped and the inwardly turned end 18, referred to, is the bottom of the cup-shaped structure and through this bottom is formed the opening 19 which is of the same diameter as the constricted portion 21 and which registers therewith. A corresponding opening is formed through the washers 17, which, as stated, are preferably formed from mica, although any other suitable insulating material may be used. The outer end of the opening 19 is flared as at 22 to provide a Venturi effect.

When the plug constructed as shown in Fig. 1 is assembled the jam nut 12 will serve to press the end of the insulating shell 11 and the electrode 13 tightly against insulating washers 17 and clamp them against the inwardly turned portion or bottom 18 of the metallic shell 7.

It is obvious that by increasing or diminishing the number of the insulating washers 17, a variation of the spark gap is made. In this manner the plug may be adjusted for use in engines of variable pressures. Experience has shown that the higher the compression attained in the engine, the smaller should be the spark gap. In use the sparking will take place between the surface of the opening 19 and the end, at the inner surface, of the constricted portion 21 and since this constricted portion or passage 21 is formed parallel in cross section, a multiplicity of sparking points is thus provided. Once the plug is assembled with the proper number of washers so that the proper adjustment of the spark gap has been made, the plug will have a constant sparking gap as there will be no relative movement of the separated sparking points due to expansion or contraction as is the case where a wire prong is projected outwardly from the metallic shell or where a central wire electrode is used. Furthermore, because of the multiplicity of sparking points, wear and pitting is practically obviated.

It will also be obvious that as the engine moves on to the compression stroke, the compressed gas will be forced through the constricted passage 21 into the pocket 16 and when the

sparking takes effect, the gas in this pocket will be exploded and likewise the gas in the opening 19 and the passage 21 will be exploded, thus communicating with the gas in the cylinder. In this manner I have provided a spark plug which produces, in conjunction with the cylinder, a pair of exploding chambers, the cylinder serving as one exploding chamber and the pocket 16 as the other exploding chamber. As the exploding takes place, the gas in the pocket 16 will be violently expelled through the constricted passage 21 and because of the flared outer side of the opening 19 a Venturi effect in the movement of the gas is present. As this exploded gas is forced outwardly through the passage 21, it will serve to effect a cleaning of the sparking points, thus maintaining the plug free from carbon. This cleaning is further effected by the movement of the gases into the passage 16 on the exhaust stroke and out of the passage 16 on the intake stroke and again into the passage 16 on the compression stroke. There is, therefore, a constant "washing" of the constricted passage 21 and the opening 19 by means of the moving gases. With spark plugs as now commonly used, the cleaning of the points depends almost entirely upon heat whereas in the present spark plug the high heat is not required for cleaning purposes. It is also believed obvious that the diameter of the constricted portion 21 may be varied with spark plugs operating under different conditions and the depth of the pocket 16 may also be varied, a larger pocket 16 being desirable on lower compressions.

In Fig. 3, I have illustrated the invention used in a manner in which the shell 7' is turned inwardly as at 23 at its upper end to provide the channel 24. The insulating shell or core 11' is molded in the shell 7' so that there is thus provided a molded shoulder 25 which engages in the channel 24. This construction renders it possible to form the shell 7' in a very economical manner and preferably by a stamping process. It is also apparent that the machine work on the shell 7' is considerably reduced over that required for the shell 7 illustrated in Fig. 1. The spark plug in all other respects is possessed of the same structural detail and of the same advantages as enumerated for the form shown in Fig. 1.

While I have illustrated and described the preferred form of construction, I do not wish to limit myself to the precise details of structure shown, but desire to avail myself of such modifications and variations as may come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A spark plug of the class described, comprising: a shell; an insulating member mounted in said shell; an electrode projecting through said insulating member and terminating flush with one end thereof; an inwardly turned portion on the inner end of said shell; and insulating means positioned on said inwardly turned portion and spacing the same from the end of said electrode.

2. A spark plug of the class described, comprising: a shell; an insulating member mounted in said shell; an electrode projecting through said insulating member and terminating flush with one end thereof; an inwardly turned portion on the inner end of said shell; and insulating means positioned on said inwardly turned portion and spacing the same from the end of said electrode, said electrode having an axially directed pocket formed in said end.

3. A spark plug of the class described, comprising: a cup-shaped shell having an opening formed centrally in its bottom; an insulating core projected into said shell; an electrode extending through said core and terminating at its inner end flush with the end of said insulating member; layers of insulation on said bottom having openings formed therethrough registering with the opening in said bottom and spacing said electrode from said bottom.

4. A spark plug of the class described, comprising: a cup-shaped shell having an opening formed centrally in its bottom; an insulating core projected into said shell; an electrode extending through said core and terminating at its inner end flush with the end of said insulating member; layers of insulation on said bottom having openings formed therethrough registering with the opening in said bottom and spacing said electrode from said bottom, said electrode having an axially extending pocket formed therein registering with the openings in said insulating members and said bottom.

5. A spark plug of the class described, comprising: a cup-shaped shell having an opening formed centrally in its bottom; an insulating core projected into said shell; an electrode extending through said core and terminating at its inner end flush with the end of said insulating member; insulation positioned between said bottom and the end of said electrode for spacing the same from said bottom, said insulation having an opening formed therethrough registering with the opening in said bottom, said electrode having an axially extending pocket formed therein and terminating with a constricted outlet passage registering with the openings in said bottom.

6. A spark plug of the class described, comprising: a cup-shaped shell having an opening formed centrally in its bottom; an insulating core projected into said shell; an electrode extending through said core and terminating at its inner end flush with the end of said insulating member; insulation positioned between said bottom and the end of said electrode for spacing the same from said bottom, said insulation having an opening formed therethrough registering with the opening in said bottom, said electrode having an axially extending pocket formed therein and terminating with a constricted outlet passage registering with the openings in said bottom, the outer end of the opening in said bottom being flared outwardly to provide a Venturi effect.

EDWARD W. MITCHEL.