June 11, 1929. G. R. HOFFMAN 1,717,034

SPARK PLUG

Filed March 31, 1925

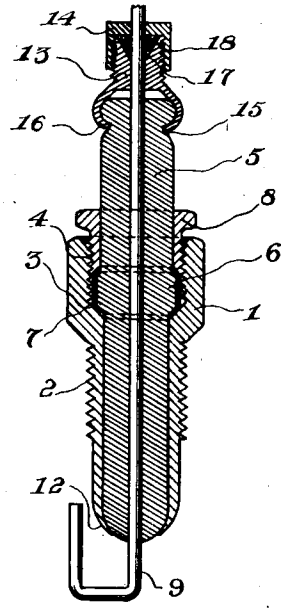


Fig. 1

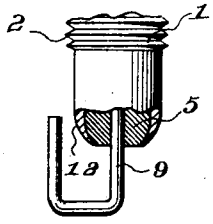


Fig. 3

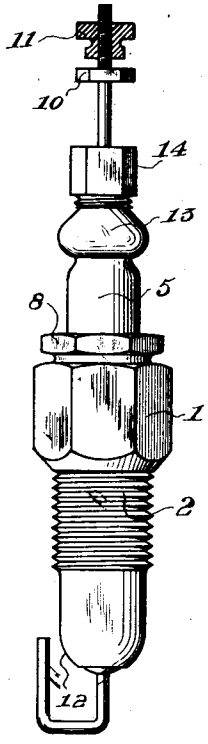


Fig. 2

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UNITED STATES PATENT OFFICE.

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SPARK PLUG.

Application filed March 31, 1925. Serial No. 19,687.

My invention relates to spark plugs of the type used in internal combustion engines. It has for its object the formation of a spark plug in which the end of the plug at which the spark is produced will be completely closed by the inner insulating core that carries the other electrode thereby preventing the deposit of carbon forming substances between the core and its encasing shell, and in which the ignition spark will be formed between the external wall of the shell constituting one electrode and the other electrode having its terminal or end lying opposite to and spaced from the external wall of the shell. It further consists in a spark plug having the electrode which passes through the insulating core formed with an end projected upwardly to lie opposite to the external wall of the other electrode to form the sparking gap between the upwardly projected electrode and external wall of the other electrode, one electrode being adjustable relative to the other to vary the sparking gap for efficiency in sparking. It also consists in a spark plug having an electrode slidable in the insulating core of the encasing shell and provided with improved means for securing the movable electrode to its adjustment in regulation of the spark gap.

To the accomplishment of the foregoing and such other objects as may hereinafter appear the invention consists in the features hereinafter described and then sought to be clearly defined by the claims, reference being had to the accompanying drawing forming a part hereof, and in which

Figure 1 is a vertical section through a spark plug embodying the invention;

Figure 2 is a side view thereof;

Fig. 3 shows a modified form of the lower shell, partly in section, with the lower end of its insulating core lying in substantially the same horizontal plane as the extreme end of the plug-shell instead of projecting below its plane as shown in the other figures.

In the drawing the numeral 1 designates a metal casing or shell of the plug screw threaded at 2 to adapt it to be screwed into the usual threaded opening in the cylinder head of an engine and forming the ground connection or one terminal or electrode of the plug, and is formed near its upper end with an enlarged bore or chamber 3 having internal threads 4. Within the shell 1 there is fitted a core 5 of suitable insulating material, for instance porcelain, which is formed with a shoulder or enlargement 6 by which it is supported in the shell, and a suitable packing 7 may encircle the enlargement. A screw threaded gland 8 is screwed into the chambered end of the shell and securely locks the insulated core therein. It will be observed that the core 5 completely closes the lower end of the shell 1 so that there is no opportunity for deposit of carbon forming material between the core and shell and thus efficient ignition will be maintained. It will also be observed from Figs. 1 and 2 that the lowermost portion of the wall of the shell passes under or beneath the end of the insulating core which is the preferred form as that insures the point of sparking being to one side of the joint between the core and shell which also tends to prevent gases or combustion products passing between the core and shell. Passing centrally through the insulating core is the electrode 9 which at its upper end is threaded and provided with the washer 10 and binding nut 11 between which will be clamped the electrical conductor (not shown) which receives and leads to the electrode 9 the current of that side of the ignition system. The electrode 9 has its lower end bent or projected upwardly so that its point will lie opposite to the external wall of the shell 1 as illustrated for example in Figs. 1 and 2 of the drawing and is spaced from the side of the shell so as to form the spark gap between the end of electrode 9 and the wall of the shell as the other electrode. It will be particularly observed that the spark is produced between the external wall of the shell and the electrode 9 to some degree removed from the joint between the shell and insulating core, and also at a point where the shell is completely closed by the core. This results in the absence of openings or pockets in which deposits might be formed and prevents fouling of the plug and insures its greater efficiency. It will be observed that the lower end of the plug-shell is curved or tapered inwardly in the direction of the lower end of the insulating core as indicated at 12 which adapts it to serve two functions, first, it permits any oil on the surface of the shell to flow to the extremity of the shell away from the point where the spark is formed thus affording a cleaner surface for forming the spark, and second, it makes possible increas-

ing or decreasing the space across which the spark will jump by adjustment of the electrode 9 by which its projected end will be nearer to or farther from the external surface of wall of the shell which forms one of the electrodes as it will be observed that upon lowering the electrode 9 will stand at a greater distance from the shell depending on the extent of its movement, whereas in an upper movement it will approach nearer to the sparking point of the shell, and in the various adjustments of the electrode there will be no opportunity for matter to lodge and accumulate so as to bridge the sparking gap and interfere with the efficiency of the plug; it also allows for a more accurate adjustment of the sparking gap with the minimum of movement of the electrode 9 as will be obvious from an inspection of Figs. 1 and 2 of the drawing. While it is preferred to have the extreme end of the insulating core made convex and to project slightly below the extreme end of the wall of the shell as illustrated in Figs. 1 and 2 of the drawing, the end may be flat and terminate in the same plane with the extreme end of the shell as illustrated in Figure 3.

For the purpose of securing the electrode 9 in its different adjustments, the upper end of the insulating core 5 is provided with a head 13 of suitable material, as metal, which is formed with a central opening or bore for the passage of the electrode and threaded externally to receive a clamping cap or nut 14 perforated for the passage of the electrode and threaded interiorly so as to be screwed onto the head. This head is attached to the insulating core preferably by forming an annular groove 15 in the body of the core and spinning or otherwise projecting a depending portion 16 of the head into the groove as illustrated in Fig. 1 of the drawing. The top or upper face of this head is formed with a cavity 17, preferably of tapering formation, to receive a compressible filler 18, preferably particles of copper, so that upon screwing down the hollow nut or cap the filler substance in the cavity 17 will be caused to grip the electrode so as to hold it to its adjustment. Upon unscrewing the cap the filler substance will loosen its grip on the electrode so that the latter may be moved longitudinally for changing the position of the projected end of the electrode in relation to the plug shell to change or vary the spark gap.

A spark plug formed as described possess the several advantages which have been specified for it and is most efficient in operation and application. Changes in some of the parts may be made without departing from the essential features specified, and some may be changed or omitted without affecting the functioning of the other parts, or departing from the features sought to be defined in the appended claims.

Having described my invention and set forth its merits what I claim is:—

1. A spark plug comprising a shell, an insulating core in the shell, and a rotative and longitudinally adjustable electrode extending through the core and having its spark end projected to lie above the lower end of the shell, externally of its wall, to form a spark-gap between the projected end of the electrode and external wall of the shell, the core effectively sealing the lower end of the spark plug against the entrance of carbon into the lower end of the shell.

2. A spark plug comprising a shell, an insulating core in the shell, the lower portion of the shell being externally converged and projected inwardly over a portion of the core, and an adjustable electrode extending through the core and having its end projected to lie above the lower end of the core and shell and externally of the wall of the shell at one side of its converging portion whereby to form a variable spark-gap between the projected end of the electrode and external wall of the shell.

3. A spark plug comprising a shell, an insulating core in the shell, the lower portion of the shell being projected with a downward convergence over the lower portion of the core to form an external converging side face to the shell, the core extending below the terminal lower edge of the shell, and a slidable electrode within the core and having its spark end projected to lie above the lower end of the shell, externally of its wall, opposite to the converging face thereof, to form a spark gap between the projected end of the electrode and external wall of the shell, and adapted to vary the spark gap by adjustment of the electrode relatively to the externally converging portion of the shell.

In testimony whereof I affix my signature.

GLENN R. HOFFMAN.