

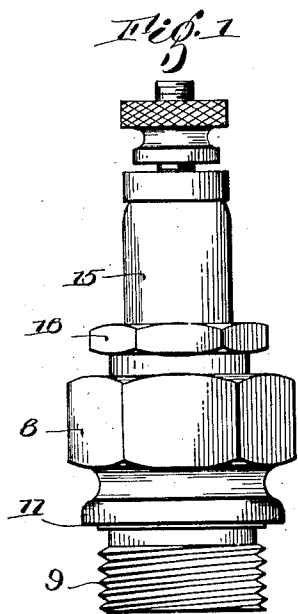
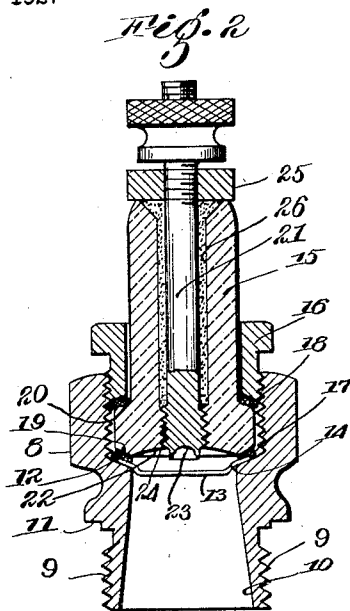
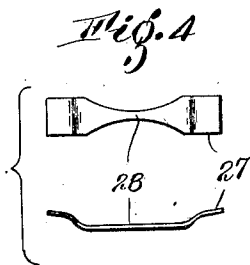
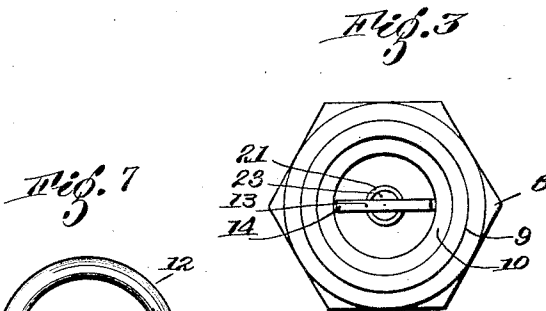
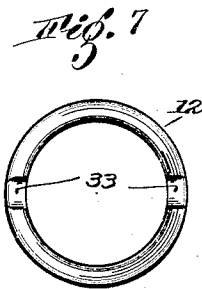
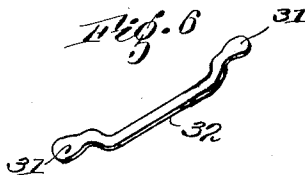
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P. J. GRIFFIN

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SPARK PLUG

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UNITED STATES PATENT OFFICE.

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SPARK PLUG.

Application filed December 24, 1927. Serial No. 242,314.

This invention relates to spark plugs for internal combustion engines and has for its principal purpose the provision of an improved plug of simple and economical construction in which the elements are so disposed with respect to the engine cylinder and in relation to the plug body that the tendency of the electrodes to become fused or fouled at the spark gap is largely obviated.

Other objects reside in the several novel features of construction hereafter described and defined in the appended claims, and particularly in the provision of a base chamber which is adapted to increase the cylinder space whereby to afford more immediate and complete combustion of the cylinder charge.

Preferred embodiments of the invention are illustrated in the accompanying drawings, in which:

Fig. 1 is an elevation of the improved spark plug;

Fig. 2 is a vertical section through the plug of Fig. 1;

Fig. 3 is a bottom view of the device;

Figs. 4, 5 and 6 are detail views illustrating optional forms of a removable electrode shown in Fig. 2; and

Fig. 7 is an enlarged bottom view of a modified form of the lower gasket of Fig. 2.

The spark plug body consists of a metal shell 8 having the usual exterior screw threads 9 adapted to engage the screw threads of the cylinder opening and preferably having a bore 10 tapering outwardly toward the base of the plug to provide a thin wall near the bottom of the plug and an open interior chamber of considerable size, and consequently affording a larger space for accumulation of gaseous mixture. The shell 8 also has an annular shoulder 11 adapted to force the customary gasket into gas-tight engagement with the outer face of the cylinder when the plug is applied in the usual manner.

It will be observed that the tapered bore 10 extends into the shell beyond said shoulder 11; that the spark gap is positioned near the inner end of said tapered bore at the extreme upper end of the shell chamber; and that the threaded portion of the shell is of relatively short length so that the base of the

plug will not extend beyond the inner wall of the cylinder. An unobstructed gas chamber which is considerably larger than has been heretofore provided is accordingly afforded by these features of construction and a more immediate and complete combustion of the cylinder charge is assured.

At the inner end of the tapered bore 10, an outwardly flaring interior annular shoulder 12 provides a seat for the ends of a removable electrode 13 which may be dropped into the shell from its open top and which is preferably formed with shoulders 14, adjacent its ends, to ensure proper and automatic seating on said shoulder 12. The base of an insulating member 15 of porcelain or other suitable material is received within the outer or upper end of the shell and is secured by a follower nut or gland 16, gaskets 17 and 18 being provided beneath and above annular shoulders 19 and 20, respectively formed on said base. The member 15 carries a central conductor 21 preferably of brass or copperized steel having its inner end terminating adjacent the base of member 15 which may be recessed as at 22 (Fig. 2), and having its outer end projecting beyond the insulating member and serving as a terminal post for the feed wire. The base of the conductor 21 may also be recessed at 23 to provide a peripheral ridge in spark-gap relation to the electrode 13. The elements of the spark plug are so arranged that, when the porcelain 15 is tightly seated, the spark gap between the conductor and the electrode is approximately 3/64 inches.

Instead of being baked in the porcelain in accordance with usual practice, the conductor 21 is preferably detachably secured within the axially bored porcelain by means of cooperating screw threads 24 at the bases of the members, and a lock nut 25 which screws on the terminal post and engages the outer end of the porcelain member. A sealing compound or paste 26 is preferably employed between the conductor and the porcelain, including the screw-threaded portions thereof, to ensure a gas-tight union. Such an arrangement allows the parts to be readily assembled and interchanged when necessary, and per-

mits the utilization of a larger sized conductor than has been heretofore provided.

The removable electrode 13, which constitutes one of the features of this invention, may be made of nickel steel or other suitable metal and may be formed in a variety of shapes, as indicated by Figs. 4, 5 and 6. The device of Fig. 4 has relatively broad, flat and substantially rectangular ends 27 and a downwardly bent central portion which is formed with a constricted neck 28; that of Fig. 5 has its ends integral with a flat ring 29 and its depressed, central portion 30 narrow and straight-sided; while the preferred form shown in perspective in Fig. 6 has flat, rounded ends 31 and a straight-sided central portion 32 whose width is no greater than the ends. In each case, the electrode has the spaced shoulders 13 of Fig. 2, which ensure proper, radial seating of the electrode on shoulder 12 and which also serve to provide proper clearance between the central portion thereof and the base end of conductor 21. It is obvious however that, for some purposes of the invention, the electrode may be substantially flat or may assume a shape different from those suggested herein as most suitable. In case a free-ended electrode is used, such as shown in Figs. 4 or 6, the gasket 17 which rests upon the ends of the electrodes and upon shell shoulder 12, may have diametrically disposed recesses 33 in its bottom side to accommodate said ends.

The use and electrical operation of the spark plug in an internal combustion engine, whereby the current passes through the conductor 21 and jumps the spark gap to the electrode 13 which is grounded through contact with shell 8 to the cylinder block (or passes in the opposite direction), is well understood. It will be found that the spark produced by this plug, which occurs between the thin peripheral ridge surrounding the recess 23 and either or both edges of the electrode 13, is admirably adapted effectively to ignite the gaseous mixture accumulated within the shell chamber.

A spark plug constructed as above described not only affords economies in construction and assembly and permits ready replacement of its component elements, but also eliminates to a large degree the tendency of the electrodes to fuse or to be carbonized or otherwise befouled by the presence of oil in the charge. The non-fusing feature is particularly important when the plugs are used in air-cooled engines which run at a relatively higher temperature than water-cooled engines, and the advantages of the improved plug are particularly adapted to ensure the efficient and long-continued operation of airplane engines in which the fusing of a spark plug is not an infrequent occurrence and often entails disastrous results.

The prevalent fusing tendency of the plugs of air-cooled engines is overcome by this invention, first, because of the provision of the large and unobstructed chamber at the base of the shell and the location of the electrodes at the top of the chamber, and second, because the electrodes are so disposed that they are positioned in the upper region of the plug and hence exterior to the engine cylinder. The first of these novel features ensures a rapid diffusion of exploded charge away from the electrodes owing to the fact that the hot gases can not circulate behind the electrodes; and the second feature removes the electrodes from within the cylinder walls where the heat is most intense and permits them to be rapidly cooled by heat radiation at the exposed portion of the plug. These features furthermore render the porcelain insulating member less liable to crack or break from excessive heat.

It should be understood that the details of construction herein described may be varied to suit particular uses without departing from the essence of this invention as defined in the following claims.

I claim:

1. A spark plug comprising a shell having an interior annular shoulder intermediate its ends, a removable electrode consisting of a metallic bar having its ends resting upon the upper face of said annular shoulder and having its central portion extending across the bore of the shell, said bar having shoulders between its central portion and its respective ends whereby the bar will be radially seated within the shell, a gasket seated upon said shoulder and upon the ends of the electrode, a detachable insulating member secured within the upper end of the shell and having its base bearing upon said gasket, and a removable conductor passing axially through the insulating member and secured therein, the base of the conductor having spark-gap relation with the central portion of the electrode.

2. A spark plug comprising a shell having an interior annular shoulder intermediate its upper and lower ends, a substantially rigid removable ground electrode extending across the bore of the shell intermediate said annular shoulder and the lower end of the shell, said electrode having shouldered ends seating upon said shell shoulder, an insulating member secured within the upper end of the shell, and a conductor fixed axially within the insulating member, the base of the conductor having spark-gap relation with said bar electrode.

3. A spark plug comprising a shell having an interior annular shoulder intermediate its upper and lower ends, an open chamber within the lower portion of the shell extending from said annular shoulder to the base of the

shell, a substantially rigid removable bar electrode extending across the chamber, said electrode having shouldered ends seating upon said shell shoulder, an insulating member secured within the upper end of the shell, and a conductor fixed axially within the insulating member and having its base disposed at the lowermost end of said member and in spark-gap relation with the central portion of the electrode. 10

Signed by me at Boston, Massachusetts,
this 7th day of December, 1927.

PATRICK J. GRIFFIN.