

A. SCHMIDT.
SPARK PLUG.
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1,230,795.

Patented June 19, 1917.

Fig. 1.

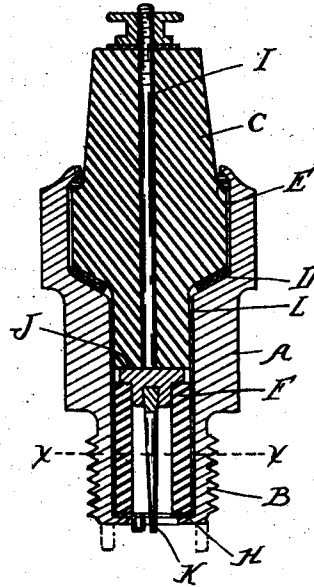
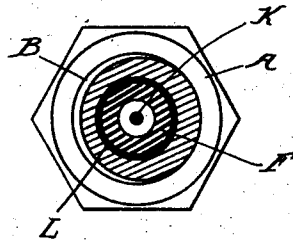


Fig. 2.



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SPARK-PLUG.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALBERT SCHMIDT, a citizen of the Republic of France, residing at Flint, in the county of Genesee and State of Michigan, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to spark plugs designed for use in connection with high-speed internal combustion engines, and it is the object of the invention to obtain a construction which will withstand the high temperature. There are two difficulties to be overcome in the manufacture of spark plugs for the use described; first, to maintain the insulation so as to avoid short circuiting, and second, to dissipate the heat so as to avoid pre-ignition. Where the heat is not too high electrical insulation is best obtained by an extended insulator surface between the electrode and the casing. Inasmuch, however, as the insulator is a comparatively poor conductor of heat this extended surface when used in high-speed engines often rises in temperature to the pre-ignition point. Again, where the insulator is exposed to great differences of temperature it frequently becomes cracked, resulting in short circuiting.

With the present invention, the insulator is so constructed and arranged as to provide for rapid dissipation of its heat and also to obtain a maximum length of insulating surface between the insulated electrode and the grounded electrode with the minimum amount of surface exposed to the heat. Provision is also made for avoiding unequal heating of integral parts of the insulator so as to avoid fracture.

In the drawings:

Figure 1 is a longitudinal section through a spark plug embodying my invention; and

Fig. 2 is a cross-section on line $x-x$ of Fig. 1.

A is the metallic casing provided with the usual threaded nipple B for engagement with the engine casing. C is an insulator arranged within this casing and forming a gas-tight joint therewith, preferably by fashioning the metal of the case while hot to bear against opposed shoulders E and D on the insulator.

Instead of extending the insulator C so as to project beyond the casing A into the explosion chamber, it is limited in length to less than the case and a complementary insulator F is arranged at its inner end. The latter is exposed to the heat of explosion, but as it is a separate member from the insulator C fracturing, due to unequal heating, is avoided. The member F is preferably in the form of a cylinder fitting within the casing A, its inner surface being spaced from the electrode which extends axially there-through. The inner end of the casing A is fashioned to bear against the inner end of the insulator F, and to form a gas-tight seal, preferably by the interposition of a gasket H, while the opposite end of the insulator is also provided with a gas-tight seal as described later. Thus the heat which is being imparted to the insulator is restricted to the contact of the inner cylindrical surface with the combustion gases, while the larger outer surface is in heat-conducting relation to the metallic casing A, and therefore provides a path for the dissipation of heat.

To assist in the dissipation of the heat, a metallic bearing is preferably arranged at the end of the insulator sleeve F which is adjacent to the insulator C, which bearing is in heat-conducting relation to the electrode I passing through the insulator C. As shown, this bearing J is formed of a member which is separate from the electrode I but is in contact therewith, and to this member J the extension electrode K is secured. This arrangement has the advantage of permitting independent movement of the inner insulator and electrode K, which lessens the danger of fracture. The joint between the bearing J and the insulator F is gas-tight due to lapping. The gap between the insulators is bridged by an insulator bushing L, preferably formed of mica, which surrounds the inner end portion of the insulator C and also lies between the insulator F and the casing A.

With the construction as described, in use, the electrode K and the inner face of the insulator F are exposed to the high temperature of the combustion gases. The electrode is preferably formed of a material which will stand this temperature, and the insulator by reason of its large heat-dissipating

surface and relatively small surface exposed to the heat, will be maintained at a temperature below the ignition.

What I claim as my invention is:

1. In a spark plug, the combination with the outer casing, of a two-part insulator therein, the inner part being annular, means for forming a gas-tight seal at opposite ends of said inner part, permitting movement thereof in relation to said outer part, and an electrode extending through the space within said inner part, having an electrical connection extending outward through said outer part.

2. In a spark plug, the combination with an outer casing, of an insulator therein formed in two parts, the outer part being fixed in position relative to said casing and the inner part being annular, an electrode passing through the space within said annular part and having an enlargement extending between said inner and outer parts, means for forming a gas-tight seal at opposite ends of said annular part, and an electrical connection through said electrode passing through said outer part.

3. In a spark plug, the combination with an insulator formed in separate outer and inner parts, the inner part being annular, of a casing embracing and clamping the outer part and surrounding said inner part, the inner end of said casing overlapping the inner end of said annular part, an electrode extending through the space in said annular part and having electrical connection passing through said outer part, and means for forming a gas-tight seal at opposite ends of said annular part.

4. In a spark plug, the combination of an insulator formed in separate outer and inner parts, the inner part being annular, a casing embracing and having a locking engagement with said outer part and surrounding said inner part, the inner end of said casing overlapping the inner end of said inner annular part, an electrode passing through the space within said annular part and having an enlargement lying between said part and the outer part, means for forming a gas-tight seal at opposite ends of said annular part, and an insulator bridging the

gap between said inner and outer parts and lying between the same and said outer casing.

5. In a spark plug, the combination of an insulator formed in separate outer and inner parts, the inner part being annular, a casing embracing and fixedly secured to said outer part, surrounding said inner part, the inner end of said casing overlapping the inner end of said annular part, an electrode extending through said annular part and having an enlargement lying between said inner and outer parts, means for forming a gas-tight seal at opposite ends of said annular part, and an electrical conductor passing through said outer part in electrical contact with but mechanically separate from said electrode to permit independent movement of said inner and outer parts.

6. In a spark plug, the combination with a casing, an insulator individually clamped therein and an electrode passing through said insulator, of an inner insulator member in the form of a hollow cylinder surrounded by said outer casing and surrounding said electrode, and means for forming a gas-tight seal at opposite ends of said cylindrical insulator.

7. In a spark plug, the combination with a casing having opposed shoulders, an insulator clamped between said shoulders and an electrode passing through said insulator, of an inner insulator separate from said first-mentioned insulator surrounded by said casing and surrounding said electrode, said inner insulator being movable relative to said first-mentioned insulator.

8. In a spark plug, the combination with an insulator, an electrode passing through said insulator and a casing embracing and fixedly securing said insulator therein, of an insulator separate from said first-mentioned insulator surrounded by said casing and surrounding said electrode, said inner insulator being movable relative to said first-mentioned insulator and means upon said casing for retaining said separate insulator in position.

In testimony whereof I affix my signature.

ALBERT SCHMIDT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."