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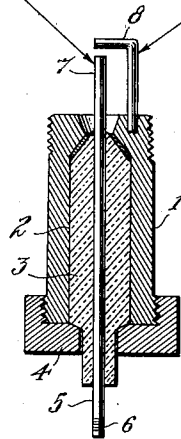
B. HOPPS

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SPARK PLUG

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ALLOY COMPRISING
RHODIUM AND AT LEAST 50% PLATINUM



INVENTOR
Bernard Hopps,
BY
Harry B. Rook,
ATTORNEY

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SPARK PLUG

Bernard Hopps, Rugby, England, assignor to
Baker & Company, Inc., a corporation of New
Jersey

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This invention relates in general to spark plugs and is directed particularly to an improvement in precious metal sparking plug electrodes. Sparking plug electrodes of platinum have been used heretofore in various applications such as in gasoline engines.

It is one object of my invention to produce a sparking plug electrode which shall consist primarily of platinum, but which shall have greater resistance to attack and erosion than platinum or alloys of platinum used heretofore.

It is another object of my invention to produce a sparking plug electrode which shall be not only more resistant to chemical attack but also of greater rigidity at high temperatures and which shall have a lower voltage gap, than electrodes of platinum or alloys of platinum heretofore known.

A further object of my invention is to produce spark plugs particularly for use in airplane gasoline engines, which shall have electrodes that possess great resistance to chemical attack, great resistance to oxidation, great rigidity, low electrical resistivity, and which will require lower voltage to produce a spark across a given gap than other electrodes.

I have found that these and other beneficial objects can be simply and effectively obtained by alloying rhodium with platinum. Sparking plug electrodes of platinum having rhodium alloyed thereto are extremely resistant to chemical attack and erosion and more so than electrodes of platinum or platinum alloys now in use. Such electrodes, according to my invention, have great rigidity and maintain great rigidity at high temperatures and do not bend or distort; they resist oxidation and erosion and have low electrical resistivity. Such electrodes furthermore provide a low voltage gap, i. e. require a lower voltage to produce a spark across a given gap than other electrodes.

According to my invention the sparking plug electrode consists of platinum with which rhodium has been alloyed. The alloy should always consist of a content of platinum relatively greater than the content of rhodium, the alloy comprising for instance not less than fifty percent (50%) platinum and, preferably, not less than seventy percent (70%) platinum. The alloy may also have a small content of other metals of the platinum group, i. e. osmium, ruthenium, iridium or palladium. While the alloy of my sparking electrodes thus consists of a major proportion of platinum and a minor proportion of rhodium, it may also contain a small quantity

of a metal or metals of the group comprising osmium, ruthenium, iridium and palladium. In particular my alloys will contain not in excess of about thirty percent (30%) rhodium, even small quantities such as two percent (2%) to five percent (5%) being sufficient to produce sparking plug electrodes having the desired improved properties; and the alloys may contain for instance up to about ten percent (10%) of at least one of the metals osmium, ruthenium, iridium and palladium, alloys containing even as small amount as one percent (1%) of such metals being accompanied by considerable advantages, particularly where the rhodium content does not exceed about twenty percent (20%). When such other metals are present the platinum content should still be in excess of fifty percent (50%) and preferably in excess of sixty percent (60%) or seventy percent (70%).

Platinum alloyed with ten percent (10%) rhodium will have a Brinell hardness of 165 when hard and of 90 when fully annealed at about 1000° C., a hardness which can be increased still further by the additional alloying therewith of at least one metal of the group comprising osmium, ruthenium, iridium and palladium. The same alloy consisting of ten percent (10%) rhodium, the remainder being platinum, has a melting point of 1820° C. and compares favorably with a melting point of 1810° C. for an alloy of platinum and twenty percent (20%) iridium and exceeds the melting point of 1780° C. for an alloy of platinum and ten percent (10%) iridium. The electrical resistivity at 1000° C. in terms of ohms/mil. ft. is 280 for an alloy of ninety percent (90%) platinum and ten percent (10%) rhodium, whereas it is 315 for an alloy of ninety percent (90%) platinum and ten percent (10%) iridium, and 355 for an alloy of eighty percent (80%) platinum and twenty percent (20%) iridium.

Sparking plug electrodes made of platinum alloyed with ten percent (10%) rhodium and other combinations within the scope of my invention and used in actual practice in airplane gasoline engines have shown a consistently better performance than electrodes of platinum or alloys of platinum containing iridium, and the like alloys. They have been found useful even in connection with doped gasolines. Such electrodes maintain their high strength and rigidity extremely well and have a low electrical resistivity. They require a lower voltage to produce a spark across a given gap than other electrodes, thus having a low voltage gap.

For the purpose of illustrating the inven-

tion, I have shown in the accompanying drawing an elementary spark plug embodying electrodes constructed in accordance with the invention.

The figure in the drawing is a transverse vertical sectional view through a spark plug.

The spark plug is shown as comprising a metallic body or casing 1 having a socket 2 in which is mounted an electrical insulating core 3 that is held in position in the body by a cap nut 4. A central electrode 5 is mounted in and extends longitudinally of the core 3 with one end 6 projecting from the core for attachment in an electric circuit, and the other end 7 projecting from the opposite end of the core and body 1 in spaced relation to an outer electrode 8 which is mounted on and electrically connected to the body or casing 1, whereby a spark gap is provided between the two electrodes.

In accordance with the invention, at least one, and preferably both, of the electrodes are formed of an alloy comprising rhodium and platinum as hereinbefore described.

Having thus described my invention, what I claim is:

1. A sparking plug electrode consisting of rhodium alloyed with platinum, the platinum constituting at least about fifty percent (50%) of the alloy.

2. A sparking plug electrode consisting of an alloy of rhodium and platinum in which the

rhodium content does not exceed about forty percent (40%) and the platinum content is not below about seventy percent (70%).

3. A sparking plug electrode comprising an alloy containing rhodium and platinum and including not in excess of about thirty percent (30%) rhodium, not less than fifty percent (50%) platinum and not in excess of about ten percent (10%) of at least one metal of the group comprising osmium, ruthenium, iridium and palladium.

4. A sparking plug electrode consisting of an alloy of rhodium and platinum containing up to twenty percent (20%) rhodium, the remainder being platinum.

5. A spark plug comprising a pair of electrodes electrically insulated from each other, wherein at least one electrode consists of an alloy of rhodium and platinum in which platinum constitutes at least fifty percent (50%) of the alloy.

6. A spark plug having an electrode comprising an alloy of rhodium and platinum wherein the rhodium content constitutes up to twenty percent (20%) of the alloy and the remainder is platinum.

7. A spark plug comprising a pair of electrodes electrically insulated from each other and each formed of an alloy containing rhodium and at least fifty percent (50%) of platinum.

BERNARD HOPPS.