Jan. 13, 1925. 1,523,069

R. HUGHES

SPARK PLUG

Filed Nov. 6, 1923

Fig. 1.

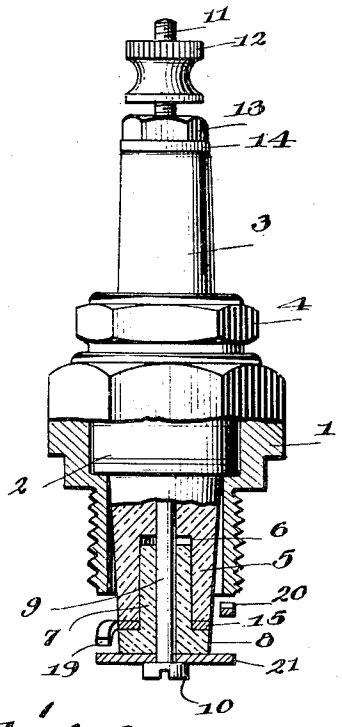


Fig. 2.

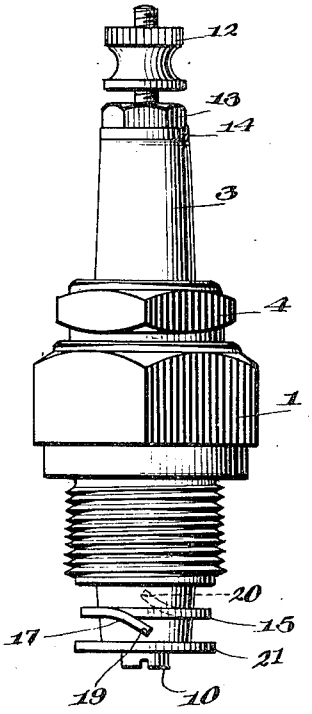


Fig. 3.

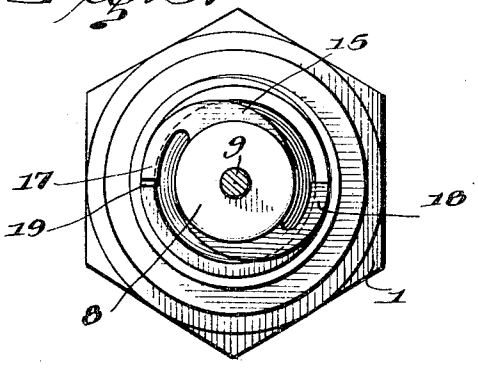
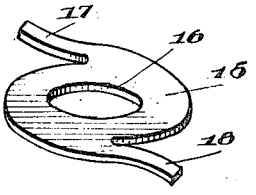


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT HUGHES, OF COLUMBUS, OHIO.

SPARK PLUG.

Application filed November 6, 1923. Serial No. 673,154.

To all whom it may concern:

Be it known that I, ROBERT HUGHES, a citizen of the United States of America, and resident of Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Spark Plugs, of which the following is a specification.

This invention relates to spark plugs adapted for use in internal combustion engines and has for its object the provision of a device which will produce a plurality of sparks in timed relation with the firing stroke of an engine.

Another object of the invention is the provision of a device for producing a plurality of sparks in the circuit of that portion of a spark plug which is adapted to be projected into the combustion chamber of an engine.

The invention further contemplates the use of an element forming an intermediary between the terminals of a spark plug for producing a plurality of distinct and independent spark gaps whereby secondary sparks produced between the intermediary and the ground element of the plug are greatly intensified.

A still further object of the invention is the provision of a spark plug having a plurality of spark gaps and in which the construction of the elements forming the gaps is of a rigid nature that the plug may be readily cleaned without readily disturbing the adjustment of the points.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawing forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is an elevation of a spark plug partly in section,

Figure 2 is an elevation of a spark plug constructed according to my invention,

Figure 3 is a horizontal section of my plug disclosing an intermediate member for causing a plurality of sparks.

Figure 4 is a view in perspective of a blank from which the intermediate member is formed.

Referring more particularly to the drawing, 1 designates a threaded body or metal shell adapted to be screwed into the usual threaded opening in the cylinder head of an engine and forming the ground connection or one of the terminals of the plug. A porcelain 2 is provided with the usual shoulders for supporting and maintaining the porcelain within the body 1 when the several members of the plug have been assembled. The porcelain has an exposed portion 3 extending beyond the shell 1 to receive a packing gland nut 4. This nut is screwed upon a threaded reduced end of the shell and seals the shell against the escape of gases from the cylinders of the engine and also locks the porcelain against displacement from said shell.

The portion 5 of the porcelain which normally is located in the combustion chamber of the engine is spaced from the inner wall of the shell 1 and is provided with a recess 6 into which is fitted the stem of a porcelain plug or insulating clamping member 7. Said member is provided with a shoulder 8 for a purpose which will be presently explained.

A central passage is formed longitudinally of the porcelain 2 and the clamping member 7 through which is inserted a terminal or electrode 9 having a slotted head 10 at its inner end and a threaded portion 11 at its outer end, upon which portion is screwed a binding nut 12 for locking the usual terminal of an ignition wire to an assembly nut 13. The nut is locked against a washer 14 which is in engagement with the upper end of the porcelain 2.

Between the lower recessed end of the porcelain 2 and the shoulder 8 of the clamping member 7 there is positioned an S-shaped plate or intermediate electrode 15 having a central perforation 16 through which is inserted the plug 7. The plate is provided with concentric arms 17 and 18. The free ends of the arms are bent in opposite directions to form respectively sparking electrode points 19 and 20. Electrode 19 is positioned to form a primary spark gap between a disk 21 clamped to the outer end of the shoulder 8 of the insulating member 7 by the head 10 of the conductor 9. The other electrode 20 is located in spaced relation with the lower end of the metal shell to form a secondary spark gap between the plate 15 and said shell.

When a current is passed through the conductor 9 in the usual manner, a spark will be formed at the gap between the disk 21 and the electrode 19 spaced from said disk, and a secondary spark of greater intensity will be produced at the gap between the elec-

trode 20 and the lower end of the metal shell. Thus two constant sparks are produced in the ignition circuit within the combustion chamber of the engine thereby providing for complete ignition of the combustible mixture which is productive of greater efficiency of an engine.

The extended spacing of the arms 17 and 18 in concentric relation with the periphery of the plate 15 prevents an accumulation of oil on these elements of the plug since the distance between the ears and the plate is adequate to permit the oil to escape.

The multiplicity of gaps in series create an intensity of sparking which will readily burn away oil thrown upon the points.

While I have shown two sparking electrodes, any number suitable for the purpose may be employed, in spaced relation with both the disk 21 and the lower end of the shell 1.

The plate 15 is made of some form of conducting metal and is insulated from the stem or conductor 9 by the insulating clamping member 7, and is therefore in series with the ignition circuit of the spark plug.

The metal of plate 15 is of such a character that the arms 17 and 18 may be bent at will in order to adjust their respective points 19 and 20 when necessary to maintain the proper spacing between said points and the adjacent conductors for producing efficient sparks.

I claim:—

1. A spark plug comprising a metal shell, a central conductor provided with a head at one end, a porcelain insulating the conductor from the shell and provided with a recess at its lower end, an insulating clamping member seated within the recess and provided with a shoulder, a metal plate having concentric lateral arms and clamped between one end of the porcelain and the shoulder of the insulating member, a metal disk secured on the outer end of the clamping member by the head on the central conductor, the ends of the arms of the plate being bent in opposite directions and spaced respectively from the disk and inner end of the shell.

2. A spark plug comprising a metal shell, a central conductor, a porcelain insulating the conductor from the shell and provided with a recess at its lower end, an insulating clamping member seated within the recess, a metal plate having concentric lateral arms and clamped between one end of the porcelain and the insulating member, a metal disc secured to the outer end of the clamping member and in contact with the central conductor, the ends of the arms of the plate being bent in opposite directions and spaced respectively from the disc to the inner end of the shell.

3. In a spark plug having a metal shell, an electrode, and a porcelain insulating the electrode from the shell, an intermediate conductor, means for insulating the conductor from the electrode and for clamping said conductor to the porcelain, a disc clamped to the insulating means and in contact with the electrode, said conductor being provided with arms at diametrically opposite points, the end of one arm being spaced from the disc, the end of the other arm being oppositely directed from the first mentioned arm and having an end spaced from the shell to form spark gaps in series with the circuit of the plug, said arms being located within a peripheral edge of the disc and lower end of the shell.

ROBERT HUGHES.