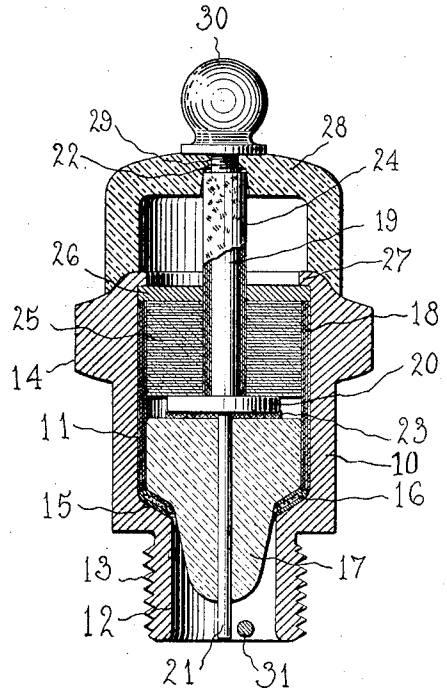
A. CHAMPION AND A. SCHMIDT.

SPARK PLUG.

APPLICATION FILED SEPT. 25, 1918.

1,375,079. **Patented Apr. 19, 1921.**



WITNESS:

Arthur F. Draper

INVENTORS

Albert Champion

Albert Schmidt

BY Lloyd Blackwood

ATTORNEY.

UNITED STATES PATENT OFFICE.

ALBERT CHAMPION AND ALBERT SCHMIDT, OF FLINT, MICHIGAN, ASSIGNORS TO CHAMPION IGNITION COMPANY, OF FLINT, MICHIGAN, A CORPORATION OF MICHIGAN.

SPARK-PLUG.

1,375,079. Specification of Letters Patent. Patented Apr. 19, 1921.

Application filed September 25, 1918. Serial No. 255,582.

To all whom it may concern:

Be it known that we, ALBERT CHAMPION and ALBERT SCHMIDT, citizens of the United States, both residents of Flint, Genesee county, State of Michigan, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a specification.

The invention relates to improvements in spark plugs as described in the present specification and illustrated in the accompanying drawing that forms part thereof.

One of the objects of the invention is to devise a spark plug which will be of simple construction and durable in operation.

Another object of the invention is to devise a spark plug which shall have the electrode exposed to the products of combustion effectively insulated by a fireproof insulator, which shall be further protected and cushioned from fracture due to any vibration or shock.

Another object of the invention is to devise a spark plug, the parts of which can be readily assembled and clamped together as a unit with a feeling of assurance that the several insulator parts are in perfect condition.

Another object of the invention is to devise a spark plug having the central or sparking electrode properly proportioned to conduct heat from the firing end and to further provide a proper insulation and sealing means for said electrode and surrounding parts.

Another object of the invention is to devise a spark plug in which the several insulator parts may be made of simple form and readily assembled.

These and other objects will more clearly appear from the following description taken in connection with the accompanying drawing.

The drawing shows a vertical sectional view of the spark plug.

Referring to the drawing, 10 is the shell of the spark plug, which may be of any desired construction and shown as of the usual form, having the upper portion thereof forming an insulator chamber with the interior bore 11 and the lower part thereof forming a firing chamber with the interior bore 12, the exterior of the firing chamber being threaded as at 13 and the exterior of the insulator chamber being formed with an extending portion, as at 14, to receive a wrench.

The interior bore of the shell, where the chamber 11 is reduced to the chamber 12, is formed with the gasket seat 15 on which a gasket 16 formed of mica or other suitable material is placed preparatory to seating thereon the insulator 17, said insulator 17 being protected around the sides thereof by a cylinder of mica 18 which forms a lining for the insulator chamber 11.

A central electrode 19 is provided as customary, said electrode having the laterally extending flange 20 formed intermediate its length and the lower end 21 extending downwardly through the insulator 17, the upper end 22 of said electrode being enlarged in diameter and threaded as customary to receive a terminal nut hereinafter described.

The electrode 19 between the flange 20 and the top of the insulator 17 is provided with a gasket or suitable compression washer 23, and also has the upper end thereof covered with the mica tube 24.

The space in the insulator chamber 11 above the flange 20 of the electrode 19 is filled with mica washers 25, and covered with a follower plate 26 formed of metal and clamped firmly in position by any suitable means, that shown in the drawing being the flange 27 turned over the plate from the upper edge of the shell 10.

The shell 10 is capped by a dome member 28, having a central orifice 29 therethrough through which the electrode 19 extends, the terminal nut 30 being threaded onto the end of the electrode and firmly holding the dome 28 in position.

The operation of the plug whereby a spark is caused to jump between the terminals formed by the extreme lower end of the lower part 21 of the central electrode 19 and another electrode as 31 extending from the shell, will of course be well understood, and it is particularly desired to point out the peculiar nesting of the insulator element 17 in the shell.

It has been shown in actual practice that mica forms an excellent insulator for the high tension current used in spark plugs, but when the mica is subjected to the heat and fire of the combustible gases within the

firing chamber, the same deteriorates and becomes much less efficient, if not entirely defective. It has therefore been found preferable to use a good grade of porcelain, though when porcelain is used the disadvantage of fracture through vibration or shock becomes a problem, and it is the object of the present invention to overcome all difficulties in this connection.

It will be noted that the interior of the shell is entirely lined with either mica or gasket material for sealing purposes, and that the porcelain which is exposed to the heat and fire of the combustion gases and forms the insulation for the lower and sparking end of the central electrode is comparatively very short and of block form to withstand all vibrations or shocks which will be received.

The insulator is further cushioned by the gasket or washer 23 and all the clamping action for securing the parts firmly together is directly received by the follower plate 26 and transmitted through the pile of mica discs 25 so that the lower and all-important insulating member 17 is held with a degree of resiliency sufficient to keep it whole and gastight.

The pile of mica discs is also the only efficient means for filling the space between the upper part of the central electrode and the shell as the upper end of the electrode is made comparatively large to properly conduct heat away from the lower sparking end and this large electrode will not permit sufficient space for the use of a material such as porcelain and have the same sufficiently strong to properly sustain the necessary sealing pressures.

It will of course be understood that the mica cylinder 18 prevents any short-circuiting of the current from the flange 20 to the shell 10, and likewise the mica tube 24 prevents any short-circuiting from the electrode to the nearest point of the shell as at the flange 27.

The dome 28 as described is a desirable finish for the upper part of the plug though it will of course be understood that the same is not necessary to a successful operation of the plug.

It will be obvious to those skilled in the art that many modifications and changes may be made without departing from the spirit and scope of the invention.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:—

1. A spark plug comprising a shell, a central electrode, a porcelain insulator tip supported within the lower portion of said shell about the sparking end of said electrode, a mica insulator filling the space within said shell above said porcelain insulator and the upper end of which lies below the upper end of said shell, and means for retaining place within said insulators and said electrode in said shell.

2. A spark plug comprising a shell, a central electrode, a porcelain insulator tip supported in said shell about the sparking end of said electrode, a mica insulator filling within said shell above said porcelain insulator, a metal follower plate within said shell above said mica, and means for retaining said follower plate, said insulators and said electrode in said shell.

3. A spark plug comprising a shell, a central electrode, a porcelain insulator tip supported in said shell about the sparking end of said electrode, a mica insulator filling within said shell above said porcelain insulator, and a metal follower plate within said shell above said mica and pressed upon by an inturned flange of said shell to compress said mica and porcelain insulators firmly into position in said shell.

4. A spark plug comprising a shell having a tubular lining of insulating material, a central electrode having a tubular covering of insulating material, an insulator tip supported within the lower portion of said shell about the sparking end of said electrode, a second insulator filling the space within said shell above said first mentioned insulator and the upper end of which lies below the upper end of said shell, and means for retaining place within said insulators and said electrode in said shell.

5. In a spark plug, an electrode having a tube of mica about the upper end and a porcelain insulator tip about the lower end thereof, a mica insulator body located above said porcelain insulator and surrounding said mica tube, and a cylinder of mica inclosing said mica and porcelain insulators.

6. In a spark plug, an electrode having a lateral flange intermediate the length thereof dividing the same into an upper end and a sparking end, a tube of insulating material about the upper end and a porcelain insulator tip about the sparking end of said electrode, a second insulator located above said porcelain insulator and surrounding said tube and between which two insulators said flange lies, and a cylinder of insulating material inclosing said two insulators and said flange.

7. In a device of the class described, in combination, a metallic shell having a bore therethrough opening into a fire chamber, a fire proof sparking point insulator element fitting said bore and closing the same at the fire chamber end, a non-fracturable insulator arranged in said bore and located above said fire proof insulator and terminating below the upper end of said shell, and an electrode extending through passages provided in said two insulators.

8. In a device of the class described, in

combination, a metallic shell having a bore therethrough opening into a fire chamber, a fire proof sparking point insulator element fitting said bore and closing the same at the fire chamber end, a non-fracturable insulator arranged in said bore and located above said fire proof insulator and terminating below the upper end of said shell, an electrode extending through passages provided in said two insulators, and a dome surrounding the upper end of said electrode and through which said upper end extends, and the lower end of which dome abuts against the upper end of said shell.

9. A spark plug comprising a shell having an insulator chamber and a fire chamber of reduced cross section, a cylinder of mica lining said insulator chamber, a fire proof sparking point insulator fitted in said insulator chamber and projecting into said fire chamber, an electrode having a lateral flange intermediate the length thereof abutting said fire proof insulator and a sparking end extending therethrough into said fire chamber, a tube of mica inclosing the upper end of said electrode, a body of non-fracturable insulating material filling said insulator chamber between said tube and cylinder and retained therein in a compressed state, and a dome member capping said shell and having a central orifice through which said electrode extends.

10. In a spark plug, an electrode having the lower end thereof insulated by a fire proof insulator and the upper end thereof insulated by a non-fracturable insulator, said insulators being both surrounded by a non-fracturable insulating member which is in contact with a metallic supporting element.

11. A spark plug comprising a hollow metallic shell, an insulator of comparatively high heat resisting qualities supported in said shell adjacent the lower end thereof, a central electrode supported in said insulator and having a comparatively large upper portion, and an insulator filling of non-fracturable material compressed into the space between the upper end of said electrode and said shell and which insulator filling terminates below the upper end of said shell.

In testimony whereof, we affix our signatures.

ALBERT CHAMPION.
ALBERT SCHMIDT.