A. E. WATTS.

SPARK PLUG.

APPLICATION FILED DEC. 6, 1919.

1,375,807. Patented Apr. 26, 1921.

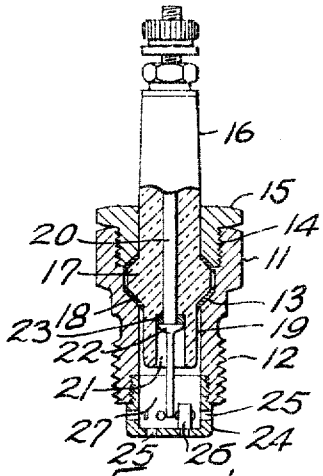


FIG. 1

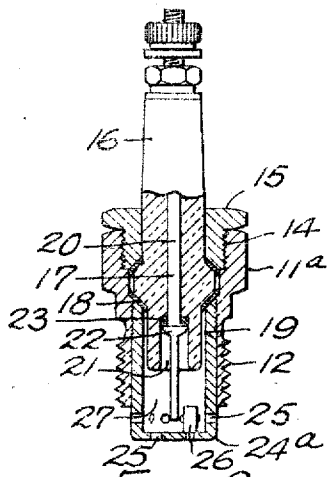


FIG. 2

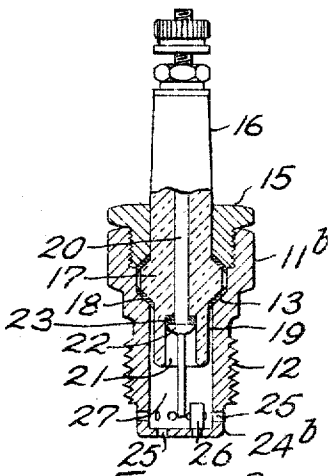


FIG. 3

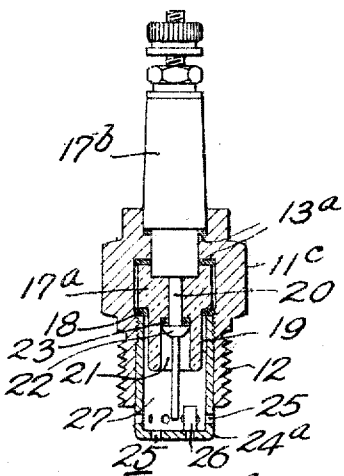


FIG. 4

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SPARK-PLUG.

1,375,807. Specification of Letters Patent. Patented Apr. 26, 1921.

Application filed December 6, 1919. Serial No. 343,029.

To all whom it may concern:

Be it known that I, ALBERT E. WATTS, a subject of the King of Great Britain, and resident of the town of Dorval, in the Province of Quebec and Dominion of Canada, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a full, clear, and exact description.

This invention relates to improvements in spark plugs and the object of the invention is to provide a plug which will not become fouled with soot.

A further object is to provide a plug of simple and inexpensive design and great durability and efficiency.

The device consists briefly of a body carrying an insulator through which passes an electric conducting stem terminating in a sparking point. The lower end of the body incloses the lower end of the insulator and the sparking point and is perforated to admit gas. The insulator may be held in place in the usual manner or by means of the lower end of the plug which may be formed separate from the body thereof.

In the drawings which illustrate the invention:—

Figures 1, 2, 3 and 4 are vertical sectional views illustrating various modifications of the construction.

Referring to the drawings, and more particularly to Fig. 1, 11 designates a tubular body having an externally threaded portion 12 adapted to screw into an engine cylinder. The bore of the body is shouldered at 13 and internally threaded at 14 above the shoulder to receive a nut 15. The insulator 16 is provided, intermediate its ends, with an enlargement 17 which rests upon the shoulder or seat 13 of the body and is engaged by the nut 15 to hold the insulator in place. The engaging surfaces of the insulator, body and nut are preferably frusto-conical and washers 18 of asbestos or the like are provided to cushion the insulator and to form gas-tight joints. Below the enlargement 17 the diameter of the insulator is somewhat less than the bore of the body so that an air cap 19 is formed to assist in preventing short-circuiting of the plug. An electric conducting stem 20 passes through the body, suitable arrangements being made to prevent gas leakage around the stem such as the provision of a recess 21 in the lower end of the insulator between the bottom of which, and a collar 22 on the stem, a gasket 23 may be compressed. The lower end of the stem projects beyond the insulator and serves as a sparking point. The lower end of the body is internally threaded to receive a cap 24 which is provided on its end and curved surface with apertures 25. The cap carries one or more internally projecting sparking points 26. The cap incloses the lower end of the insulator and stem, as will be clearly seen, and forms a chamber 27 around the tips of the sparking points communicating with the cylinder through the apertures 25.

In Fig. 2 the body 11^a is without any shoulder 13 and the cap 24^a extends farther up in the body than in Fig. 1 and forms at its upper end a seat for the insulator. The nut 15 being unnecessary in this form for the insertion of the insulator it may be omitted as shown. In other respects the construction of the plug is the same as that previously described.

In Fig. 3 the plug shown differs only from the construction shown in Fig. 1 in that the cap 24^b is an integral part of the body 11^b.

In Figs. 1, 2 and 3 the insulator has been shown as a one-piece device while in Fig. 4 it is constructed in two parts 17^a and 17^b. The body 11^c is provided with a pair of seats 13^a upon which the insulator parts rest and to which they are screwed by the the stem 20. It will thus be seen that the body is held in compression between the two insulator parts. As a further precaution the cap 24^a may extend sufficiently far into the body to hold the lower insulator part 17^a against falling into the engine cylinder if it breaks or if the stem should become disconnected.

Obviously many minor modifications may be made in the structure without departing from the spirit of the invention.

The operation is extremely simple. When gas is compressed in the engine cylinder a portion thereof flows through the apertures 25 into the chamber 27 and when the ignition circuit is completed this small charge of gas is exploded and a jet of flame emerges from each of the openings 25 into the gas surrounding the plug. The result is a simultaneous ignition of the gas in all parts of the compression chamber. The jets of flame are projected to all parts of the compression chamber and ignition of the gas takes

place simultaneously at a dozen or more points instead of at a single point as when an ordinary spark plug is used. The ignition is slightly more rapid but, what is more important, it is absolutely certain so that misfires with either very poor or very rich mixtures are entirely avoided. Another very important service performed by the perforated body end is that of excluding carbon and oil from the lower end of the plug proper. The apertures 25 are some distance apart so that the area of the outer cap surface is considerably greater than the combined area of the apertures. Soot formed in the compression chamber will lodge on the outer surface of the cap and practically none will pass through the apertures 25. Any soot which lodges in the apertures is blown out by the flame jets at the next ignition. This device is particularly effective in an engine which is over-lubricated or which is burning oil from the base. It has been demonstrated that a plug constructed according to this invention will, under the above conditions, remain operative at least ten times as long as an ordinary plug. In a properly running engine with proper mixture a plug according to this invention should not require cleaning during its lifetime.

Having thus described my invention, what I claim is:—

1. A spark plug comprising a hollow body having the bore thereof restricted adjacent to the upper end of the body to provide an inwardly extending flange, an outer insulator having its lower end thereof engaged against the upper face of said flange and reduced to extend past the flange and to provide a shoulder encircling the reduced portion and supported on the flange, a second insulator contained within said body having one end enlarged and abutting the opposite face of the flange and recessed to snugly receive the reduced portion of the outer insulator, said enlarged end forming a shoulder facing the lower end of the bore, an electrode passing through said insulators and provided with means for clamping the same against the opposite faces of the flange, a removable apertured cap closing the lower end of the body and extending into the bore of the body to bear against the shoulder of the inner insulator to hold the same against escape through the bottom of the body, said cap forming in conjunction with the lower end of said inner insulator a primary explosion chamber and sparking points carried by the insulator and cap approaching one another within said chamber.

2. A spark plug comprising a hollow body having the bore thereof restricted to provide an inwardly extending flange, insulators engaging opposite sides of said flange and provided with abutting portions meeting in a plane out of line with the planes containing the opposite sides of the flange, and electrodes carried respectively by the body and said insulators.

In witness whereof I have hereunto set my hand.

ALBERT E. WATTS.