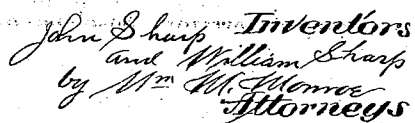


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UNITED STATES PATENT OFFICE.

JOHN SHARP AND WILLIAM SHARP, OF CLEVELAND, OHIO.

HIGH-TENSION SPARK-PLUG.

935,931.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JOHN SHARP and WILLIAM SHARP, citizens of the United States, and residents of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in High-Tension Spark-Plugs, of which we hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

The objects of the invention are to provide an improved form of sparking plug, for use in the explosion end of a gasoline or other explosion engine, whereby increased efficiency will be obtained in producing a spark under all conditions of foul gas and carbon producing vapors when exploded in the expansion chamber of the engine.

The sparking plug hereinafter described is adapted to be self cleansing, and is hollow to provide for admission of rarefied gas behind the sparking terminals, to enrich the spark and to prevent it from blowing out and also to provide chambers which will contain a body of gas which when ignited by the spark will shoot out into the body of gas in the cylinder, and insure its immediate explosion.

A further object obtained by the internal chambers is found in the opportunity thus afforded for heating the insulation of the inner terminal and its stem, and thus evaporating the moisture which often accumulates therein, especially when the insulation is composed of laminated sheets, compressed together.

Further objects of the invention are to provide protected terminals, which can not be bent or forced out of adjustment by rough usage and at the same time are capable of easy adjustment.

A further advantage is found in a hollow stem for the insulated central terminal, by means of which and the concentric form of the outer or ground terminal gasoline or other priming fluid can be directly injected into the body of the sparking plug and if necessary into the combustion chamber of the engine, thus simplifying the matter of starting the piston in a cold engine.

A further advantage found in the opportunity afforded for heating the spark plug, is the fatter spark obtained, since the arc will be stronger when passing through a heated medium. For this reason also less battery

power will be required to create a spark of predetermined volume.

The invention further comprises the forms of construction and combination and arrangement of parts and provides for the various requirements hereinafter described, shown in the accompanying drawings, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation of the improved sparking plug; Fig. 2 is a central longitudinal section therethrough; Fig. 3 is an elevation of the insulated or central terminal and its stem; Fig. 4 is a similar view of the same showing a modified form of terminal head or tip, provided with spiral openings; Fig. 5 is a plan view of the tip shown in Fig. 3; Fig. 6 is a plan view of the tip shown in Fig. 4; Fig. 7 is a longitudinal section of an expansion chamber at the outer end of the insulated stem of the inner terminal affording an increased supply of rarefied gas, and Figs. 8, 9, and 10 are modified forms of the exterior or ground terminal adapted to be attached to the body of the plug. Fig. 11 is a vertical section of the outer end of the stem showing a valve therefor.

It may be prefaced that since this plug is adapted for use with an alternating and high tension current, the terminals are called positive or negative or ground merely for convenience in description.

In these figures A is the metal body of the plug, screw threaded at B for attachment to the explosion end of the engine cylinder. This body is hollow and provided with a shoulder C against which the enlargement D formed in the cylindrical insulation E of the central metal stem F rests. A packing nut G threaded for adjustment in the threaded upper end of the body A, clamps the parts securely together. The lower portion of the insulation E is tapered at H, and the walls of the hollow body A are spaced therefrom so as to form a chamber within the body.

A metallic conical head or tip J terminates the inner end of the stem F and this is shown to be provided with slits K, K, which communicate with a central opening or chamber L in the tip, and the stem F is also hollow at M, therefore providing for an elongated chamber extending throughout the stem, and preferably closed by a removable screw plug N or valve N' at its upper extremity. The stem F and tip J are pref-

erably screwed together at O in such a manner as to provide a clamping shoulder P against which the insulation rests, which is sleeved over the stem. The upper end of the stem is shown to be externally screw threaded to receive the metallic clamping sleeves and nuts Q, R, and S. The tip J is tapered toward its lower end and has a terminal orifice T through which projects the terminal wire U which fits tightly therein, but can be forced outward or inward by hand or by means of a tool inserted in the hollow stem M. It must be held securely by friction so that in use no sudden jar will affect it, but will be capable of manual adjustment.

In the form of tip shown in Fig. 3 the sides of the tip will have sufficient spring action to hold it in place. The inner extremity of the metallic body is hollow and spaced from the metallic inner tip to form a chamber V and the body terminates in a hemispherical outer terminal W which is provided with a central orifice X, through which the inner terminal wire U projects, and stands flush with the outer terminal. The outer terminal X is provided with fine longitudinal slits Y, Y which serve to admit gas in a wire drawn condition to the chamber V, where it expands and becomes more rarefied and hence more explosive than the gas in the engine cylinder. A second rarefaction takes place as the gases pass through the fine slits K, K into the chamber formed within the hollow stem. The gases included within the chambers V and M explode instantaneously when the spark occurs, and are driven flaming violently into the expansion chamber of the engine, thus preventing any possibility of the failure of an explosion in the cylinder. The slits communicate with the central orifice, hence forming openings large enough to pass the flame. The inner portion Z of the body of the plug is externally tapered and terminated by the smooth rounded end of the terminal. This tapered portion of the body is adapted to extend into the explosion chamber of the engine, so as to be completely swept by the flame of the explosion, and hence cleaned thereby of soot or other foreign matter, the shape being such as to facilitate the cleansing thereof. An expansion M₂ of the hollow central stem permits of still greater rarefaction of the gas in the inner chamber and increases its volume when employed. Further important advantages in the accumulation of gas in the inner chamber V are found in the benefits resulting from the force of the explosion in cleaning out the external orifices, preventing bridging thereof by carbon, or deposits of other foreign matters thereon. The discharge from the inner chamber M and L also serves to cleanse the outer chamber. The central orifice X in the outer terminal is

circular and preferably countersunk at α , so as to provide an outer rim or edge toward which oil will run and thus prevent it from interfering with the free action of the spark between the terminals. These terminals may be made in several forms as shown in Figs. 8, 9 and 10 when slitted across the central opening as shown at Fig. 8. A further advantage is obtained in that the spark will travel or revolve from one of the segmental tips to another and thus save the terminal from disintegration.

In Fig. 10 a small nipple α' is shown screwed into the semi-globular tip. In Fig. 9 the semi-globular tip is screwed upon the tapered extremity. Small changes as these are included within the spirit of the invention.

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

1. In combination in a spark plug, a hollow metal body portion, screw threaded for insertion into an engine cylinder, a tapered inner extremity therefor, provided with a chamber, and a semi-globular terminal therefor projecting beyond said tapered extremity, the said terminal provided with a central countersunk orifice and with fine longitudinal slits, communicating with said chamber, and an inner terminal in said central orifice, a central stem connected with said inner terminal, and an insulation therefor, said stem and insulation secured within said hollow body.

2. In a spark plug, in combination, a hollow metal body, a projecting conical extremity for said body containing a gas chamber, and a rounded terminal therefor, said terminal provided with a central orifice and with narrow longitudinal slits, communicating with said chamber, a hollow stem therein, a metal tip therefor containing an inner chamber, and also having narrow slits in its walls, and spaced from the walls of said body, an insulation upon said stem and means for securing the same within the hollow metal body, a closure for the outer extremity of the stem, and a terminal wire secured adjustably in said metal tip.

3. A hollow stem for a spark plug, an insulation thereon, a hollow inner head or tip therefor, provided with narrow slits in its walls, a terminal wire, secured in said tip and projecting therefrom, a metal body for the plug, a projection therefrom, a circular terminal therefor adapted to encircle said wire, said terminal provided with a central orifice and with longitudinal narrow slits, the said metal tip being spaced from said body to form a chamber, communicating with the openings in said tip and circular terminal.

4. In a spark plug, a metal body, a circular terminal therefor, provided with a cen-

tral orifice and with marginal narrow slits, and with a chamber communicating therewith, a terminal wire located in said central orifice, a hollow stem in which said wire is adjustably supported, and an insulation for said central stem.

5. In a chambered spark plug, in combination, a metal chambered body, and a central chambered stem therein, an insulation for said central stem, a terminal wire slidably mounted in said chambered stem, a circular outer terminal for said metal body having a central orifice and slits in its walls communicating with the chamber in the metal body, the chambers in said stem and body being in communication with each other.

6. The combination with a chambered metal body of a circular terminal therefor, provided with a central orifice and with narrow longitudinal slits in its walls, the said orifice and slits communicating with said chamber and with each other the edges of said central orifice being externally countersunk substantially as described.

7. In combination in a spark plug, a cham-

bered body and a chambered inner stem therefor, an insulation separating said body and stem, a tip for said chambered stem provided with narrow openings communicating with the chamber in the body, a terminal for the body provided with a central opening and with narrow slits communicating with the chamber in said body, and a terminal for the said stem located in said orifice and secured to said tip.

8. The combination in a spark plug, of a chambered metal body, provided with a projecting terminal, having a central externally countersunk orifice, and with longitudinal slits communicating with said orifice, and an insulated terminal wire in said plug the extremity of which is centrally located in said central orifice.

In testimony whereof, we hereunto set our hands this 7th day of December 1908.

JOHN SHARP.

WILLIAM SHARP

In presence of—

WM. M. MONROE,

GEO. S. COLE.