No. 809,578. PATENTED JAN. 9, 1906.

W. OTTAWAY.

SPARKING PLUG.

APPLICATION FILED FEB. 15, 1904.

Fig. 1.

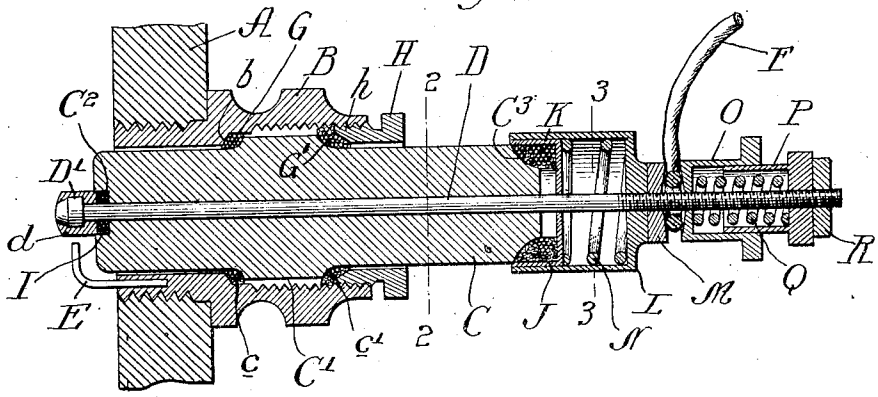


Fig. 2.

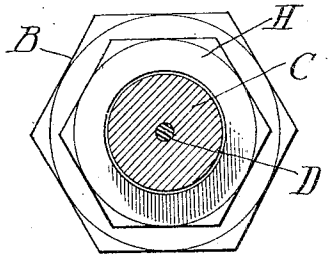
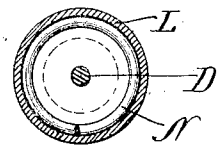


Fig. 3.



Witnesses:
Hal. Bennett
W. Hall.

Inventor:
William Ottaway,
By Poole & Bruce
his Attys

UNITED STATES PATENT OFFICE.

WILLIAM OTTAWAY, OF AURORA, ILLINOIS, ASSIGNOR TO AURORA AUTOMATIC MACHINERY COMPANY, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

SPARKING PLUG.

No. 809,578. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed February 15, 1904. Serial No. 193,606.

To all whom it may concern:

Be it known that I, WILLIAM OTTAWAY, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Sparking Plugs; and I do hereby declare that the following is a full, clear, and exact description thereof reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in sparking plugs for internal-combustion engines, the invention relating more especially to means for maintaining tight joints between the metal body of the plug and the insulating-sleeve, through which passes the stem or electric conductor which leads into the cylinder of the engine and between the said stem or conductor and said insulating-sleeve.

The invention also includes means for connecting with said stem the wire which forms part of the sparking circuit.

My invention is herein shown as applied to an igniting device of that kind in which the terminals of the conductors between which the sparks are produced are stationary with respect to each other or in which the sparking electrodes form part of an open circuit in which current for generating the spark is produced by an induction coil or dynamo, and said circuit is provided with circuit opening and closing means operated by moving parts of the engine.

The invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a view in central longitudinal section with sparking plug embodying my invention. Fig. 2 is a cross-section of the same, taken on line 2 2 of Fig. 1. Fig. 3 is a cross-section of the same, taken on line 3 3 of Fig. 1.

As shown in said drawings, A indicates a part of the wall of the power-cylinder of an explosive-engine, and B the tubular metal body portion of the sparking plug which is inserted within a screw-threaded hole in said wall A in the ordinary manner.

C indicates the insulating sleeve, tube, or plug, which passes through the metal body B and forms an insulating-support for the metal rod or stem D, which passes centrally through said sleeve or tube and forms a part of the conductor of the sparking circuit. Said rod D is provided at the inner end of the sleeve C with a head D′, which constitutes one sparking terminal of the igniting device. This head is shown as consisting of an integral enlargement on the stem, which is surrounded by a coating or covering *d* of German silver, platinum, or the like. The other sparking terminal is formed by a metal arm E, which is secured in the inner end of the tubular body B and the free end of which is bent toward and terminates near said head D′. Said arm E will usually be made of platinum. At its outer end the stem D is connected with a wire F, which leads to one of the terminals of an induction-coil or other current-generating device.

The insulating-sleeve C is secured in the tubular body B by a construction as follows: Said sleeve C is provided at its part which enters the body B with an annular enlargement C′, at the ends of which are formed shoulders *c c′*. The main part or body of the plug B is provided with a recess somewhat larger than the enlargement C′. At the inner end of said recess is formed an annular shoulder *b*, which when the sleeve is in place faces toward or comes opposite the shoulder *c* on the latter. The inner end of the sleeve C inside of the shoulder *c* is made somewhat smaller in diameter than the part of the body A which surrounds it, so that these parts are out of actual contact when the sleeve is inserted on the body. A packing-ring or gasket G, of asbestos, mineral wool, or other suitable material, is inserted between the shoulders *b c*. The outer end of said tubular body B is screw-threaded to receive a gland H, which is made of suitable interior diameter to receive the reduced part of the sleeve C outside of the shoulder *c′* without contact therewith. The inner end of said gland forms a shoulder which comes opposite and faces toward the said shoulder *c′*. A packing-ring or gasket G′, also of asbestos, mineral wool, or the like, is interposed between said shoulder *c′* and the shoulder *h* on the inner end of said gland H.

When the sleeve C is inserted in the body part B of the plug, together with the packing-

rings G G′, and the gland H is tightened, the said sleeve will be firmly held in the body part and tight joints will at the same time be formed between said sleeve and said body part. The said tubular part B and sleeve C being so arranged that they will be free from contact with each other, the sleeve will be supported in the tubular body solely by the packing-rings or gaskets G G′. This construction and arrangement of the parts serves to afford a strong and rigid support of the insulating-sleeve within the tubular metal body, while at the same time permitting the said body to freely expand and contract under the influence of heat and cold without liability of breaking the insulating-sleeve, which is usually made of porcelain or the like. By making the packing-rings or gaskets G G′ of asbestos or mineral wool, moreover, tight joints, which will be unaffected by heat, are provided between the insulating-sleeve and tubular body B, by which escape of gases and products of combustion from the interior of the cylinder is prevented.

Now referring to means shown for maintaining a tight joint between the stem D and the insulating-sleeve C these parts are made as follows: In the inner end of the sleeve C, surrounding the central aperture thereof, through which the stem D passes, is a cavity or recess C^2, in which is placed a gasket or packing-ring I, of abestos, mineral wool, or other suitable material. The shoulder formed on the stem by the inner end of the head D′ and the bottom of the cavity or recess C^2 form opposed surfaces or shoulders between which the packing-ring I is held or compressed under endwise tension on the rod. In other words, the longitudinal passage in the sleeve has an inwardly-facing shoulder and the stem an outwardly-facing shoulder, between which the packing is adapted to be clamped or compressed by outward tension on the stem. At the opposite or outer end of said insulating-sleeve C the same is provided with a metal cap J, the same having a tubular part which fits over and adapted to slide upon the end portion of said sleeve and a head which is apertured for the passage of the stem D. Between said cap J and the end of the sleeve is placed a packing-ring K, of asbestos, mineral wool, or the like, the end of the sleeve being preferably provided with an annular groove or rabbet C^3, adapted to receive and hold in place said packing-ring. Surrounding and sliding upon the cap J is a second cap L, the end wall or head of which, like that of the cap J, is provided with a central aperture for the passage of the stem D. Said stem D is screw-threaded on its outer end and is provided with a nut M, which is adapted to bear against the head of the outer or sliding cap L, so as to hold the same from outward movement on the stem. Between the caps K and L is located a spirally-coiled spring N. Said spring N exerts a constant pressure on the outer or sliding cap L, tending to hold the same in contact with the nut M and through its pressure on said nut to exert endwise tension on the stem D, by which the head D′ on the inner end of said stem is pressed or held closely in contact with the packing-ring I, thereby maintaining a tight joint between the said head D′ or the part of the stem adjacent thereto and the inner end of the insulating-sleeve. The tension of said spring N also tends to press or force the inner cap J toward the outer end of the insulating-sleeve and by compressing the packing-ring K to maintain a tight joint between said cap and the outer end of said insulating-sleeve. The interposition of the said packing-ring K at this point aids in forming a gas-tight joint between the stem and sleeve and also serves to give cushioned pressure on the outer end of the insulating-sleeve and to thereby prevent jarring or rattling of the parts under the shocks or jars to which the igniting device is subjected in the operation of an engine.

Devices are provided for connecting the wire F with the stem D, as follows: On said rod D outside of the nut M are placed two telescoping cups O and P, the end walls of which are apertured for the insertion of said rod D and which are adapted to move or slide freely on the rod. Inside of said cups O and P, between the end walls thereof, is located an expansively-acting spiral or coiled spring Q, the tension of which tends to separate or spread apart said cups. Upon the said rod D, outside of the outermost cup P, is placed a retaining-nut R. The end of the wire F is coiled about the rod D between the nut M and the inner end wall of the cup O, and when the nut R is placed upon the rod and tightened against the outer cup P the inner cup O, when the spring Q is placed under compression by the screwing up of said nut R, is pressed or forced toward the nut M, thus clamping or holding the end of the wire F by spring-pressure. Said spring Q is made of relatively stiff wire, so that when the nut R is tightened the cup O will act with considerable force or pressure against the end of the wire F. By this construction a good electrical connection between the wire and stem will be maintained, notwithstanding the jarring or vibration to which the parts may be subjected, it being obvious that any looseness of the parts will always be taken up by the resiliency of the spring Q.

It will of course be understood that telescopic cups O and P are applied merely for the purpose of inclosing or protecting the spring Q and that the same general result would be obtained by the employment of the spring Q in connection merely with a washer or circular disk corresponding with the inner end of the end wall of said cup O and adapt-

ed to act in opposition to the nut M to form with the latter clamping members between which the end of the wire F is firmly held by the action of said spring Q.

I claim as my invention—

A sparking plug comprising an insulating-sleeve, a stem which passes through the sleeve and is provided with a head at its inner end, a packing interposed between said head and an opposing surface or shoulder on said sleeve, a cap applied to the outer end of said sleeve, a second cap which slides on the first-named cap and the head of which is perforated for the passage of the said stem, a nut on the stem adapted to bear against said second cap, and a spring interposed between said caps and acting to exert endwise tension on said stem.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 8th day of February, A. D. 1904.

WILLIAM OTTAWAY.

Witnesses:
W. H PEASE,
J. SCHUSTER.