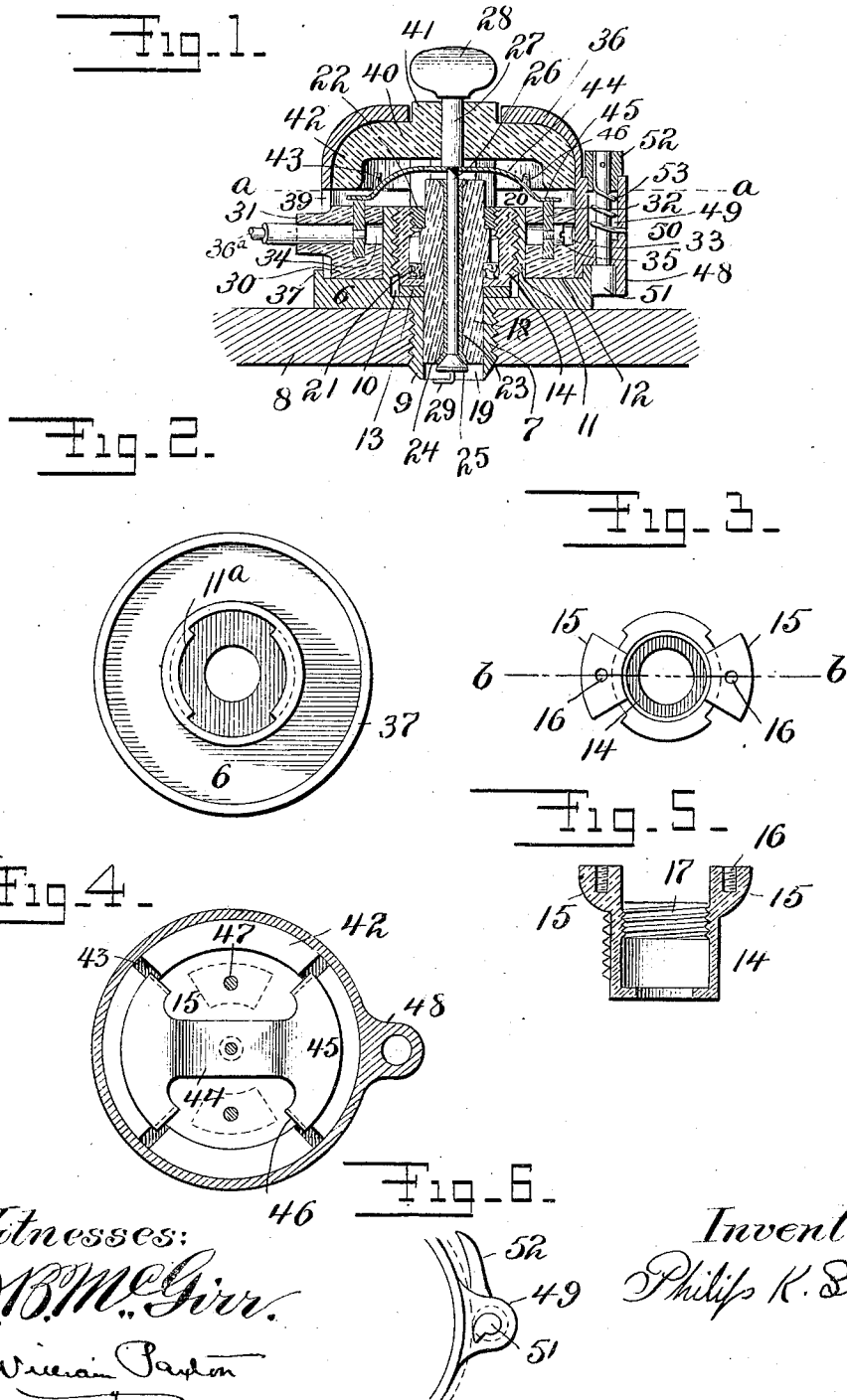


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SPARKING PLUG.
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Patented June 13, 1911.



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SPARKING PLUG.

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To all whom it may concern:

Be it known that I, PHILIP K. STERN, a citizen of the United States, residing in the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Sparking Plugs, of which the following is a specification.

My invention relates to sparking plugs for internal combustion or explosive engines, and pertains more particularly to that class of plugs known as the high tension or "jump-spark" type; the principal object of the invention being to improve the means providing for the quick removal and insertion of the electrode-carrying plug within the socket of the ignition chamber, whereby the insulating material may be cleaned without involving wire disconnection from the immediate source of electrical supply. In this particular, it may be well to here explain that in popular forms of electrical ignition devices of this class, one of the electrodes is carried by a plug of insulating material, which when in position, presents a pole carrying end, subject to deposits of carbon resulting from the combustion of the hydro-carbon mixture within the engine, such deposited carbon objectionably acting as a conductor to short circuit the current, and thereby operating to destroy the circuit interruption presented by the separated electrodes and consequently defeats the formation of an igniting spark between the same. The facility referred to, for the ready removal and cleaning of the plug, obviates any difficulty from this source.

The general simplification and improvement in the adjustability and manipulation of the parts, are also important objects of the present improvements.

The several purposes noted, besides others, are attained by the novel construction subsequently described in detail and disclosed in the accompanying drawings, in which latter,—

Figure 1, is a central section of an electrical ignition device embodying my invention. Fig. 2, is an exterior or plan view of the socket or bushing which engages in the plug-opening of the ignition chamber. Fig. 3, is a plan view of the nut for carrying the insulating plug. Fig. 4, is an inverted sectional plan view of parts shown in Fig. 1, the section being taken in a plane slightly below the broken line *a, a* in said

figure, and certain portions omitted. Fig. 5, is a sectional view of the plug-carrying nut, the section being taken in the plane indicated by the dotted line *b, b*, Fig. 3. Fig. 6, is a detail view of the lock for securing the casing or housing.

Similar reference characters designate corresponding parts in the several figures where they occur.

The metallic socket or shell 6, forms one of a pair of pole terminals and has a threaded nipple 7, secured in the threaded opening of the wall 8, of the ignition or combustion chamber, the thread of the nipple being of such character as to adapt it to fit those of the opening therefor in any of the existing chambers provided with standard half inch gas-pipe threads. The inner end 9 of the nipple, projects within the chamber and constitutes one of the insulated electrical contact members or electrodes of the spark-gap points. The body or outer part of this socket or shell 6, is presented by a base which provides integrally the inner seating 10, the cylindrical interiorly threaded flange 11, and the outer annular shallow and slightly depressed bearing 12. The threads 11^a of the flange 11 are interrupted as indicated in Fig. 2. The interiorly threaded flange 11 projecting from the metallic socket or bushing 6 forms substantially an exterior metallic shell for the reception of a freely removable insulated unit, integrally formed and so disposed with respect to the spark gap electrode or terminal as to provide one of the electrical conductors therefor, which will appear more lucid by the following description of the removable insulated unit and the different component parts thereof.

A washer 13 of copper or any suitable resilient material rests upon the seating 10, and upon this washer bears the inner end forming a shoulder or flange of a chambered nut 14 having external threads adapted to engage those of the flange 11 and correspondingly interrupted, the relative arrangement of both series of interrupted threads being such that a quarter turn of the nut will suffice to effect a positive engagement of the same with the flange, while a movement to a similar extent in the reverse direction, will result in a disengagement, and permit the nut, by reason of the mutual interruptions to be bodily withdrawn from the

space within the flange. The nut or bushing 14 is provided at its upper part with lateral lugs 15 which occupy a plane above the body of the nut and are located at diametrically opposite points of the same. These lugs have vertical threaded recesses 16. The interior of the body portion of the nut is also screw threaded at its upper portion as indicated at 17 in Fig. 5.

A cylindrical porcelain plug 18, extends snugly through openings therefor in the bottom of the nut 14, washer 13, into the central passage presented by the nipple 7, the inner end 19 of said plug being shown in Fig. 1, as terminating slightly short of the inner projecting electrode portion 9, of said nipple. Intermediately on the plug 18 is an annular enlargement 20, providing a double shoulder between which and the bottom of the nut or bushing and within the chamber thereof, is interposed a gasket 21 composed of one or more packing rings of asbestos, whereby, upon the screwing-in of the collar or ring 22, the plug 18 would be forced by the shouldered or enlarged portion against the gasket 21 and thereby forcing the same into gas-tight engagement with the nut or bushing 14, thus effecting the packing of the plug 18 in gas tight relation by clamping the double shouldered plug together with the gasket between the bushing and the collar. The plug is forced down and confined within the nut by a threaded ring or collar 22 screw-threaded into the bushing 14 surrounding the same above the enlargement, bearing on the shoulder presented by the upper end of the latter, said ring being engaged with the threads 17 for this purpose, the threads being of such extent as will permit the ring to be screwed down to additionally depress the plug and increase the compression of the lower shoulder thereof on the gasket 21 to compensate for wear or shrinkage of the latter. Top openings in the ring 22, adapt it to be rotated by a key spanner.

Centrally within the double shouldered plug 18, is a small metal tube 23, which is cemented in position and extends longitudinally through the same, the plug having conical recesses at its extremities to permit the end portions 24 of the tube to be expanded to assume a corresponding shape, and positively secure said tube within the plug and permit the expanded inner end to constitute a metallic seat for the bearing of the small tapered head 25, which is ground in gas-tight connection therewith, and is carried at the inner extremity of a stem-electrode 26, extending through the tube 23, and beyond the outer end of the same, where it is provided with a cylindrical portion 27, terminating in a porcelain knob 28. The metallic bearing presented by the inner expanded end 24 of the tube,

permits the head to seat intimately against the same after the manner of a gas-tight valve, an effect not easily accomplished were the seating directly against porcelain as the granular character of the latter would preclude its being ground or glazed sufficiently uniform to afford such an intimate seating of the head as would prevent the passage of the gas under the high compression it undergoes within the engine. A bent finger 29, on the head 25 constitutes the other electrode of the spark gap points and is in proper relation to the electrode 9, to establish the circuit by the sparking-gap through said electrode 9.

30 refers to an annulus of porcelain which in cross section is generally of the form indicated at the right in Fig. 1, and is provided at one side with a short neck 31. This annulus has a circular vertical slot for the reception of a thin vertical metal ring 32, projecting slightly above the top of the annulus, said ring forming the other one of the pair of pole terminals. The ring-receiving slot is intersected by horizontal openings 33, 34, the latter extending through the neck 31. The opening 33 admits of a small screw 35, being introduced to engage a threaded perforation therefor in that part of the ring spanning the opening, thereby securing the ring in position in the annulus. At the opposite side, the ring has a perforation registering with the passage extending through the neck so that one of the circuit wires 36, extending within said neck, can be electrically connected with the ring.

A metal case or housing 36, fits over the annulus 30 and parts within the same, and bears against the base 6, immediately within a circular marginal flange 37 of the latter, said flange serving to aid in the centering of the case when placing it in position. A slot 39 in the case, extending circumferentially around the same for over 90 degrees, provides for the passage of the neck 31 of the annulus, and admits of a limited rotation of the case or housing.

Snugly contained within the outer part of the case, is a porcelain dome 40, which rests upon the lugs 15 of the nut 14, and is provided with a short neck 41 occupying an opening in the case and centrally perforated for the reception of the cylindrical portion 27, of the stem-electrode. The inwardly extending annular flange 42 of the dome, has a series of notches 43, as shown in Figs. 1 and 4.

A member in the form of an arched leaf spring 44 is perforated for the passage of the outer projecting part of the stem-electrode and bears beneath the portion 27 thereof. The ends of this spring integrally carry horizontally curved extensions 45, the extremities 46 of which are bent to engage

the notches 43 and prevent the spring from turning relatively to the dome. The extensions 45 are in electrical contact with the upper edge of the ring 32, so as to constitute one pole of a bridging contact. Extended screws 47 tapped through the case and dome, at points each side of the spring, engage the threaded recesses 16 in the lugs 15 of the nut and serve to bind the case, dome and nut together.

48 refers to a longitudinally extending offset integrally formed on the case and provided with a recess 49 through which extends a small shaft 50, the inner projecting end of which, rigidly carries a small cam 51, while the outer end has secured thereto, a finger-operating lever 52. A torsional spring 53, surrounding the shaft within the recess, has one end engaged with the wall of the offset and the other secured to the lever 52 to normally hold said shaft for maintaining the cam in firm contact with the adjacent portion of the base 6 and thus lock the case to the latter. It will be observed by reference to Fig. 6, that the operative face of the cam is so disposed that any slight accidental tendency of the case to turn in a direction that would disturb the position of the plug 18 or its electrode, will cause the cam to more positively engage with the base and thus serve as an efficient lock for the case.

From the foregoing description, it will be easy to comprehend that with the parts arranged and adjusted as illustrated in Fig. 1, the arched spring 44 will serve to hold the conical head 25 in gas-tight contact with the metallic seat provided by the inner expanded end of the tube 7, and at the same time, said spring will maintain a proper electrical contact with the ring 32, connected with one of the circuit wires. With the head thus held, the bent finger 29, will coöperate with the nearest part of the inner projecting end 9, of the nipple 7 to insure the passage of the ignition spark. Should the condition be such as to interfere with the formation of the spark, the stem 26 may be readily manipulated by means of the knob 28 to turn the electrode 29 and shift the point on the portion 9, co-acting to produce the spark. This capability becomes specially important in view of the fact that the operative surface of the end 9 contains numerous irregularities, any one of the more prominent of which will coöperate with the electrode 29 when in its nearest position, to produce a spark, an effect not liable to be attained should that point of the end 9 by reason of the irregularity referred to, be more remote. The capacity for shifting the electrode 29, provides for the nice adjustment of the sparking point with due regard to the contingencies adverted to.

When the plug 18, requires cleaning, the

lever 52, can be moved by a finger of the same hand that grasps the case 36, to disengage the cam 51 from the base, and the case then given a quarter revolution which on account of the engagement of the screws 47 with the lugs of the nut 14, will effect a corresponding rotation of the latter sufficient to disengage its threads and permit the case, nut and plug to be bodily removed from the bushing. Obviously, the parts can be restored to their former engaged relation by an equally simple quarter revolution, and by the reengagement of the cam 51.

While the engaged interrupted threads of the flange 11 and nut 14, constitute a locking means for securing the plug 18 in position, the full quarter revolution of the nut will result in the jamming of its inner end against the washer 13, thus providing further locking provision for the same purpose.

I shall hereinafter occasionally refer to the freely removable parts, to wit, the nut 14, plug 18 and stem-electrode 26 taken together, as an electrode plug, and the stem-electrode 26 as that of a stem, an electrode carrying stem, or an electrode or movable electrode and the inner end 9 of the nipple 7 as a stationary, a fixed electrode, or simply as an electrode, and the spring 44 as another electrode in accordance with the sense in which they are employed.

The novel electrical sparking device is highly efficient, can be operated, adjusted and removed in a quick and convenient manner, and is readily adapted for repair parts. There are other capabilities and advantages that have become obvious from the preceding detailed description and are therefore believed not to require further explanation.

I do not wish to be understood as limiting myself to the particular construction and arrangement of electrical igniting device shown and described, but reserve the right to such modifications and changes as are fairly within the spirit of my invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In an electric sparking plug, the combination with an exterior metallic shell forming one of the electric conductors, of a bushing screwthreaded into the exterior shell and formed with an annular shoulder on its inner wall, a clamping collar screwthreaded into the top of the bushing, a double shouldered plug of insulating material clamped between the bushing and collar and carrying the other conductor and suitable packing rings interposed between the shoulder of the plug and the bushing, the bushing forming with the insulating plug and conductor, a removable unit of the sparking plug.

2. In an electric sparking plug, the combination with an exterior metallic shell forming one of the conductors, of a bushing screwthreaded to the exterior shell and
5 formed with an annular shoulder on its inner wall, a clamping collar screwthreaded to said bushing, a double shouldered plug of insulating material clamped between the bushing and collar and carrying the other
10 conductor, the bushing forming with the insulating plug and conductor, a removable unit of the sparking plug.

3. In a sparking plug, the combination with an exterior metallic shell forming one
15 of the electric conductors, of a bushing screwthreaded to the shell, an insulator plug adapted to be carried by the bushing, means for securing the bushing to the insulator plug whereby the same constitute an independent unit, said securing means being independent of the shell, and an electrode carried by the insulator plug.

4. In an electric sparking device, the combination with a metallic shell forming one
25 of the electric conductors, of a bushing threaded to said shell and carrying an insulator, an electrode extending through the insulator forming with the bushing and insulator a removable unit, and a spark point
30 carried by the said unit and forming the inner end of the electrode, the body of the insulator extending beyond the end of the bushing a distance greater than the distance of the spark gap between the said point and
35 shell.

5. In an electric sparking plug, the combination of a metallic shell forming one of the electric conductors, of a bushing screwthreaded to said shell and carrying an insulator, a metallic tube carried by said insulator, a conductor carried by said metallic tube having at its inner end a fixed spark gap between it and the adjacent portion of said metallic shell or metallic extension
40 therefrom, external means for changing the position of the fixed spark gap by a rotary movement of said conductor, the bushing forming with the insulator, metallic tube and conductor, a removable unit of the
50 sparking plug.

6. In an electric sparking plug, the combination of a metallic shell forming one of the electric conductors, a bushing screwthreaded to said shell and carrying an insulator, a conductor carried by said insulator, the bushing forming with the insulator and conductor, a removable unit of the sparking plug, a second insulator supported by an extension from said metallic shell and carrying a second electric conductor provided with means for attachment to the current supplying wire, means for securing an electrical connection between the exterior end of the conductor carried by said first
65 mentioned insulator and the conductor carried

by the second mentioned insulator to which the current supplying wire is attached, upon the positioning of the bushing carrying the first mentioned insulator and its conductor as a unit, the arrangement being such that the said unit can be removed from said metallic shell without disconnecting the current supplying wire.

7. In an electric sparking plug, the combination with a metallic shell forming one
75 of the conductors, of a bushing screwthreaded to said shell and carrying an insulator, a metallic tube carried by said insulator, a normally stationary conductor carried by said metallic tube, having a fixed spark gap
80 at its inner end between it and an adjacent conductor, and external means for changing the position of the fixed spark gap by means of a rotary movement of the conductor.

8. In an electrical ignition device, the combination with a socket, of a plug of insulating material adapted for free insertion in said socket and containing an electrode, provision for securing said plug by a movement independent of that attending the free insertion thereof, a contact member insulated from the socket member, and a member associated with the electrode adapted to contact electrically against said contact member by the positioning of the plug.

9. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a plug of insulating material having a metallic seating at its inner end,
100 said plug adapted for free insertion in said socket and containing an electrode terminating in an inner head, a member associated with said electrode for maintaining said head gas tight, against the seating, and for electrically bearing against said contact member upon the positioning of the plug, and provision for securing said plug by a movement independent of that attending the free insertion thereof.

10. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a plug of insulating material having a metallic seating at its inner end, said plug adapted for free insertion in said socket and containing a revolvable electrode, projecting at its outer end and terminating in an inner head, a member associated with said electrode for maintaining said head gas tight against the seating, and for electrically bearing against said contact member upon the positioning of the plug, and provision for securing said plug by a movement independent of that attending the free insertion thereof.

11. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a plug of insulating material adapted for free insertion in said socket, and containing an electrode, a member car-
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ried by said electrode for electrically bearing against said contact member upon the positioning of the plug, provision for engaging said plug by a movement independent of that attending its free insertion, and a lock for resisting the disengagement of the plug.

12. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a bushing carrying a plug of insulating material adapted for free insertion in said socket and containing an electrode, a member carried by the latter for electrically bearing against said contact member, upon the positioning of the plug, provision for engaging the plug by a movement of the bushing independent of that attending the plug-insertion, and a lock for holding said bushing against a disengagement movement.

13. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a nut adapted for free insertion therein, a plug of insulating material to which said nut is secured and containing an electrode, a member carried by said electrode for electrically bearing against said contact member upon the positioning of the nut accompanied by the plug and its electrode, and provision for engaging said nut by a movement independent of that attending the free insertion of the plug.

14. In an electrical ignition device, the combination with a socket and an annulus having a contact, of a case, a nut and electrode-plug connected together, said nut adapted for free insertion in the socket, a member connected to the electrode-plug for electrically bearing upon said contact member, upon the positioning of the nut, and provision for engaging said nut by a movement independent of that attending the free insertion of the plug.

15. In an electrical ignition device, the combination with a socket and a contact member, of a case, a nut and an electrode-plug connected together, said nut adapted for free insertion in the socket, a member connected to the electrode-plug for electrically bearing on said contact member upon the positioning of the nut, provision for engaging the latter by a movement independent of that attending its free insertion, and a lock externally on the case for resisting the disengagement of the nut.

16. In an electrical ignition device, a chambered socket, a nut within said chamber and an asbestos packing bottomed therein, said socket and nut provided with mutually engaging means adapted to be disengaged upon a relative partial rotation between the socket and nut, an insulating plug having a shouldered portion clamped within said nut against said packing, and an electrode carried by said plug.

17. In an electrical ignition device, a chambered socket and a yielding metal washer bottomed therein, a nut within said chamber and bearing on said washer, said socket and nut provided with mutually engaging means adapted to be disengaged upon a relative partial rotation between the socket and nut, a non-combustible fibrous washer within the nut, an insulating plug having a shouldered portion clamped within said nut against said fibrous washer, and an electrode carried by said plug.

18. In an electric sparking plug, the combination with a metallic shell forming one of the electric conductors of a bushing screw threaded to said shell and carrying an insulating plug or sleeve, a conductor carried by said insulator, means whereby the bushing with the parts carried thereby may be inserted into and withdrawn from the shell by a straight movement longitudinally of the shell and whereby the same may be secured or released by a partial revolution relative to the shell and means for rotating the shell, the said means comprising a casing for said shell and bushing.

19. In an electric sparking plug, the combination with a metallic shell forming one of the electric conductors of a bushing screw threaded to the shell and carrying a plug of insulating material, the bushing forming with the insulator and plug a removable unit of the sparking plug, and a casing secured to and inclosing the shell and bushing.

20. In an electric sparking plug, the combination with a metallic shell forming one of the electric conductors, of a bushing screw threaded to the shell and carrying a plug of insulating material, a conductor carried by said insulating plug, the bushing forming with the insulator and conductor a removable unit of the sparking plug, and a casing for the shell and bushing, the said casing being secured to the bushing and constituting a lever or handle for removing the bushing.

21. In an electric sparking plug, the combination with a metallic shell forming one of the electric conductors of a bushing screw threaded to the shell and carrying a plug of insulating material, a conductor carried by said insulating plug, the bushing forming with the insulator and conductor a removable unit of the sparking plug, and a casing secured to said bushing, and independently secured to the shell.

22. In an electric sparking plug, the combination with a metallic shell forming one of the conductors, of a bushing screw threaded to the shell and carrying a plug of insulating material and a conductor carried by said insulating plug, the bushing forming with the insulator and conductor a removable unit of the sparking plug, a casing secured to the bushing and constituting

ing a lever or handle for adjusting the same, and means on the shell for securing the casing in position.

23. In an electrical sparking plug, a socket
5 provided with an external insulated electrical connection for one of the circuit wires, an interlocking insulated removable electrode within the socket in circuit with the insulated connection, and carried by a stem,
10 said electrical connection being permanently connected with said sparking plug, said removable electrode being provided with means for freely inserting the same into said socket, and conversely for the free un-
15 locking and withdrawal of the same from said socket, and means carried by the stem for establishing an electrical communication with said external electrical connection and the circuit wire therefor, upon the insertion
20 of said electrode within said socket and locking the same thereto.

24. In an electrical ignition device, a chambered socket, an insulated electrical connection for one of the circuit wires, ex-
25 ternal to said socket, a plug within the latter and countersunk at its inner end, an electrode stem carried by said plug and having at its inner end a finger and a head said finger having its bearing in said head, and
30 a metal member on said stem maintaining the head thereof in intimate bearing in the countersink, said metal member also being in circuit contact with the external insulated connection, said plug and said electrode
35 adapted to be withdrawn from the chamber independently of the wire attachment to the insulated electrical connection.

25. In an electrical ignition device, a plug of insulating material having a recessed inner end, a metal tube within said plug and having an expanded inner end forming a seating and an enlarged outer end for securing the tube and for retaining said seating intimately within the plug-recess, and an
45 electrode within said tube and provided with a head maintained in gas-tight bearing within said seating.

26. In an electrical ignition device, a plug of insulating material having recessed ends, a metal tube cemented within said plug and having its end portions expanded to bear in said recesses, the inner end portion forming a seating, and an electrode within the tube and provided with a head maintained in
55 gas-tight bearing within said seating.

27. In an electrical ignition device, a relatively stationary electrode having an extended curved sparking-surface, a plug of insulating material having a recessed inner end, a metal tube within said plug and having an expanded inner end forming a seating, and a laterally turned outer end for securing the tube and for retaining said seating intimately within the plug recess, and
65 an electrode revolvably mounted within said

tube and provided with a head maintained in gas-tight bearing within the seating, and having a finger disposed radially relative to the said stationary electrode.

28. In an electrical ignition device, a relatively stationary electrode having an extended curved sparking-surface, a plug of insulating material having a recessed inner end, a metal tube within said plug and having an expanded inner end and forming a seating, and a laterally turned outer end for securing the tube and for retaining said seating intimately within the plug-recess, an electrode revolvable within the seating and provided with a head having a finger disposed radially relative to said stationary electrode, and a spring for maintaining said head in gas-tight bearing within the seating.

29. In an electrical sparking plug, a chambered socket provided with an interrupted screw thread, an external insulated electrical connection for one of the wires leading to said socket; a nut in the latter; a plug within said nut within the latter, said nut provided with an interrupted thread corresponding to the socket, a stem within the plug and a casing therefor, said plug being in electrical circuit with the said insulated connection, the plug and contained electrode being adapted upon a partial rotation of the nut, to be withdrawn from the chamber independently of the wire attachment to the insulated connection and means between the casing and the electrode for effecting a gas-tight connection.

30. In an electrical ignition device, a chambered socket and an insulating plug therein, said socket and plug provided with mutually engaging means adapted to be disengaged upon a relative partial rotation between the socket and the plug, a metallic tube within the same, an electrode within the tube, and an externally located lock engaging a fixed part and adapted upon a partial rotation to become unlocked and permit the disengagement of the plug and its contained electrode and their removal from the socket.

31. In an electrical ignition device, a chambered socket with a resilient metal washer bottom therein, and a nut within said chamber and bearing on the washer, said socket and nut provided with mutually engaging means adapted to be disengaged upon a relative partial rotation between the socket and nut, an insulating plug secured to said nut and containing an electrode, and an externally located lock engaging a fixed part and adapted upon a partial rotation to become unlocked and permit the disengagement of the plug and its electrode and their removal from the socket.

32. In an electrical ignition device, a chambered socket, an insulated plug therein and containing an electrode, a case or hous-

ing masking the chambered portion of the socket and plug therein and connected with the latter, said case or housing having a lock engaging a fixed part and adapted when unlocked to permit the conjoint removal of the plug, its electrode and the case or housing.

33. In an electric ignition device, a chambered socket and an insulating plug therein containing an electrode, said socket and plug provided with mutually engaging means adapted to be disengaged upon a partial rotation between the socket and plug, a case or housing masking the chambered portion of the socket and plug therein and connected with the latter, said case or housing having a lock engaging a fixed part and adapted when unlocked to permit the disengagement of the plug from the socket, and the conjoint removal of said plug, its electrode and the case or housing.

34. In an electrical ignition device, a chambered socket, an insulated electrical connection for one of the circuit wires, external to said socket, an insulating plug within the latter, said socket and plug provided with mutually engaging means adapted to be disengaged upon a partial rotation between the socket and plug, an electrode in the plug and in circuit with said insulated electrical connection, a case or housing masking the chambered portion of the socket and plug therein, said case or housing having a lock engaging a fixed part and adapted when unlocked to permit the disengagement of the plug from the socket and the conjoint removal of the plug, its electrode, and the case or housing independent of the wire attachment to the insulated electrical connection.

35. In an electrical ignition device, a chambered socket and insulating plug containing an electrode, an insulated electrical connection for one of the circuit wires, external to said socket, and a case or housing masking the insulated electrical connection, the chambered portion of the socket and plug; said case or housing provided with engaging means adapted upon a partial rotation of the case or housing to permit its withdrawal conjointly with the plug and its electrode independent of the wire attachment to the insulated electrical connection.

36. In an electrical ignition device, a chambered socket and an insulating plug therein containing an electrode, said socket and plug provided with mutually engaging means adapted to be disengaged upon a relative partial rotation between said socket and plug, an insulated electrical connection for one of the circuit wires, external to said socket, and a case or housing masking the insulated electrical connection, the chambered portion of the socket and plug; said case or housing provided with engaging

means adapted upon a partial rotation of the case or housing to effect the disengagement of the plug from the socket, and the conjoint withdrawal of the plug, its electrode and the case or housing independently of the wire attachment to the insulated electrical connection.

37. In an electrical ignition device, a chambered socket and an insulating plug therein containing an electrode, an insulated electrical connection for one of the circuit wires, external to said socket, a circuit contact-making member connected to said electrode, a case or housing masking the chambered portion of the socket, plug therein, electrode and its circuit-making member; and engaging means for the case or housing adapted when disengaged to permit the conjoint withdrawal of the plug, electrode, its contact member, and the case or housing independently of the wire attachment to the insulated electrical connection.

38. In an electrical ignition device, the combination with a socket having an insulated electrical contact, of an insulating plug adapted for said socket and containing an electrode, an insulating dome through which the electrode extends, having an inner recess and connected to said plug, and a member carried by said electrode within the dome recess and adapted to be brought in electrical bearing against said contact by the positioning of the plug.

39. In an electrical ignition device, the combination with a socket having an insulated electrical contact, of an insulating plug adapted for free insertion in said socket and containing an electrode, means for securing said plug by a movement independent of that attending the free insertion thereof, an insulating dome connected to said plug, and having an inner recess, an electrode carried by the plug and extending through said dome, and a member carried by said electrode within the dome recess and adapted to be brought in electrical bearing against said contact by the positioning of the plug.

40. In an electrical sparking plug, the combination with a socket and a relatively stationary electrode, of an insulating plug adapted for free insertion and withdrawal from said socket having a depressed metallic seating at its inner end and a revolvable spring retracted head bearing against said seat and provided with the other electrode.

41. In an electrical sparking plug, the combination with a socket and a relatively stationary electrode, of an insulating plug adapted for free insertion and withdrawal from said socket, having a depressed metallic seating at its inner end, a head bearing in said seat and provided with the other electrode, and a revolvable spring seated stem connected with the head and extending

through the plug to permit of the adjustment of the electrode while the plug is positioned.

42. In an electrical sparking plug, the combination with a socket and a fixed electrode, of an insulating plug containing a movable electrode carrying stem and adapted for free insertion in said socket and for free withdrawal therefrom, a lock coacting between the two for securing the said socket and said plug, an insulating dome through which the stem extends, and a spring engaging the latter and the insulating dome.

43. In an electrical ignition device, the combination with one electrode, of a plug containing a metal tube retained by expanded ends, and an electrode-carrying stem within said tube and having an inner head maintained in gas-tight seating within the inner expanded end.

44. In an electrical sparking plug, the combination with a socket and fixed electrode, of an insulating plug carried by the socket and adapted to free insertion therein, a lock for securing the plug to the socket, an electrode carried by the plug, a circuit wire connection for the plug-electrode adapted to permit of the removal of the plug and the electrode independently of said wire connection and without disconnection of said wire, and a case connected with said plug having a slot for the passage of the circuit wire and permitting the turning of the case for the engagement or disengagement of the same, together with the plug and its electrode.

45. In an electrical ignition device, the combination with an electrode, of a plug, containing a movable electrode-carrying stem extending beyond the outer end thereof and provided with an insulating knob, circuit contacts at opposite sides and external to the plug; and a leaf spring engaging the stem and adapted for bearing against the circuit contacts upon the positioning of the plug.

46. In an electrical ignition device, the combination with an electrode, of a plug containing an electrode-carrying stem, contacts at opposite sides and external to the plug, and a leaf spring engaging said stem for supporting the latter in position and adapted for bearing against the contacts upon the positioning of the plug.

47. In an electrical ignition device, the combination with an electrode, of a plug, an electrode-carrying stem, an insulated metal circuit-ring surrounding the plug, and a leaf spring engaging the stem and adapted for bearing against the ring upon the positioning of the plug.

48. In an electrical ignition device, the combination with an electrode, of a plug, containing an electrode-carrying stem, an insulated detachable circuit-ring surround-

ing the plug, and a leaf spring engaging the stem and adapted for bearing against the ring upon the positioning of the plug.

49. In an electrical ignition device, the combination with a socket base and electrode, of a plug containing an electrode-carrying stem, an insulating annulus mounted on said base around the plug and provided with a circuit contact member, and a leaf spring engaging said stem and bearing against the contact.

50. In an electrical ignition device, the combination with a socket base and electrode, of a plug containing an electrode-carrying stem, an insulating annulus mounted on said base and having a circular vertical recess, a circuit ring movably secured in said recess and presenting a contact surface, and a leaf spring engaging said stem and bearing on said surface.

51. In an electrical ignition device, the combination with a socket base and electrode, the former having a flange, of a plug secured within the base and containing an electrode-carrying stem, an insulating annulus mounted in said base and having a circuit contact member and a leaf spring engaging said stem, and bearing on said contact member.

52. In an electrical ignition device, the combination with a socket base and electrode, of a plug containing an electrode-carrying stem, an insulating annulus mounted on said base and having a circular recess, a ring secured within said recess, a circuit wire connecting with the ring, and an electrical connection between the latter and the stem.

53. In an electrical ignition device, the combination with a socket base and electrode, of a plug containing an electrode-carrying stem, an insulating annulus mounted on said base and having a circular vertical recess intersected by lateral openings, a ring within said recess and retained by a screw in one of said openings, a circuit wire within the other opening and connecting with the ring, and an electrical connection between the latter and the stem.

54. In an electrical ignition device, the combination with a socket and fixed electrode, of a plug containing an electrode-carrying movable stem, a case and insulating dome through which said stem extends, and means for securing said plug, dome and case in position.

55. In an electrical ignition device, the combination with a socket and fixed electrode, of a plug containing a movable electrode-carrying stem, an insulating dome through which the stem extends, and a leaf spring engaging the latter and the insulating dome.

56. In an electrical ignition device, the combination with a socket and fixed elec-

trode, of a plug containing a movable electrode-carrying stem, an insulating dome through which the stem extends, a curved circuit contact, and a leaf spring engaging the stem and dome, and bearing on the contact member.

57. In an electrical ignition device, the combination with a socket and fixed electrode, of a plug containing an electrode-carrying stem, an insulating dome with which the stem engages, said dome having a recessed flange, a curved contact member and a leaf spring engaging the stem and having a horizontal bearing on said member.

58. In an electrical ignition device, the combination with a socket and fixed electrode, of an electrode carrying plug of insulating material, and a case for masking the plug and having a shaft carrying a cam normally engaged with a fixed part independent of the case, and provided with a finger lever.

59. In an electrical ignition device, the combination with a socket and fixed electrode, of a plug of insulating material for said socket, an electrode carried by said plug, a circuit wire connection for the plug electrode adapted to permit the removal of said plug and electrode independent of said wire connection and without disconnection of said wire, and a case connected with said plug and having a slot for the passage of the circuit wire and permitting the turning of the case to permit the engagement or disengagement of the same together with the plug and its electrode.

60. An electrical ignition device, comprising a plug and socket relatively separable and insulated, and mutually presenting spark gap points for disruptive discharge, the plug provided with means for being locked and secured in position in the socket, and bridging electrical contact members for completing the circuit through the spark-gap, together with means for varying the position of the spark-gap.

61. In an electrical sparking plug, the combination with an exterior metallic shell, forming one of the electric conductors, of a bushing disposed within the exterior shell the same being provided with a shoulder, a double shouldered plug of insulating material clamped within the bushing, suitable packing rings interposed between the shoulders on the plug and the bushing, and an exterior cap secured to the shell for secur-

ing the plug thereto, the bushing and cap forming with the insulating plug a removable unit of the sparking plug.

62. In an electrical sparking plug, the combination with an exterior metallic shell, forming one of the electric conductors, of a shouldered perforated plug of insulating material, an end thereof presenting a metallic surface, a headed stem passing through the plug and forming the other electric conductor, an exterior perforated dome of insulating material, means for forcing the head of the stem into engagement with the corresponding metallic surface of the plug, and means carried at the opposite end of the said stem for bearing against the said dome.

63. In an electric sparking plug, the combination with an exterior metallic shell, forming one of the electric conductors, of a shouldered perforated plug of insulating material, the inner end thereof presenting a metallic surface a headed stem passing through the plug and forming the other electric conductor, a bushing secured to the shell, a packing ring between the bushing and the shoulder of the plug, an exterior perforated dome of insulating material carried by the stem, means for forcing the head of the stem into engagement with the corresponding metallic surface of the plug, and a knob carried at the opposite end of said stem for bearing against the said dome.

64. In a spark plug for explosive engines, the combination with a threaded nipple adapted to be inserted in the wall of the engine and having an interrupted threaded outer part, of a shouldered insulator having an electrode extending therethrough carrying a sparking terminal at its lower end, and a locking member embracing the insulator having a part resting against said shoulder and having an interrupted thread complementary to that of the nipple adapted to engage therewith, and laterally extending means for partially turning the locking member whereby the insulator can be secured to and released from the nipple upon a partial turn of the locking member.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

PHILIP K. STERN.

Witnesses:

WILLIAM PAXTON,
M. BLUMER.