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A. HOLSTEN.

SPARK PLUG.

APPLICATION FILED DEC. 2, 1904.

Fig. 1.

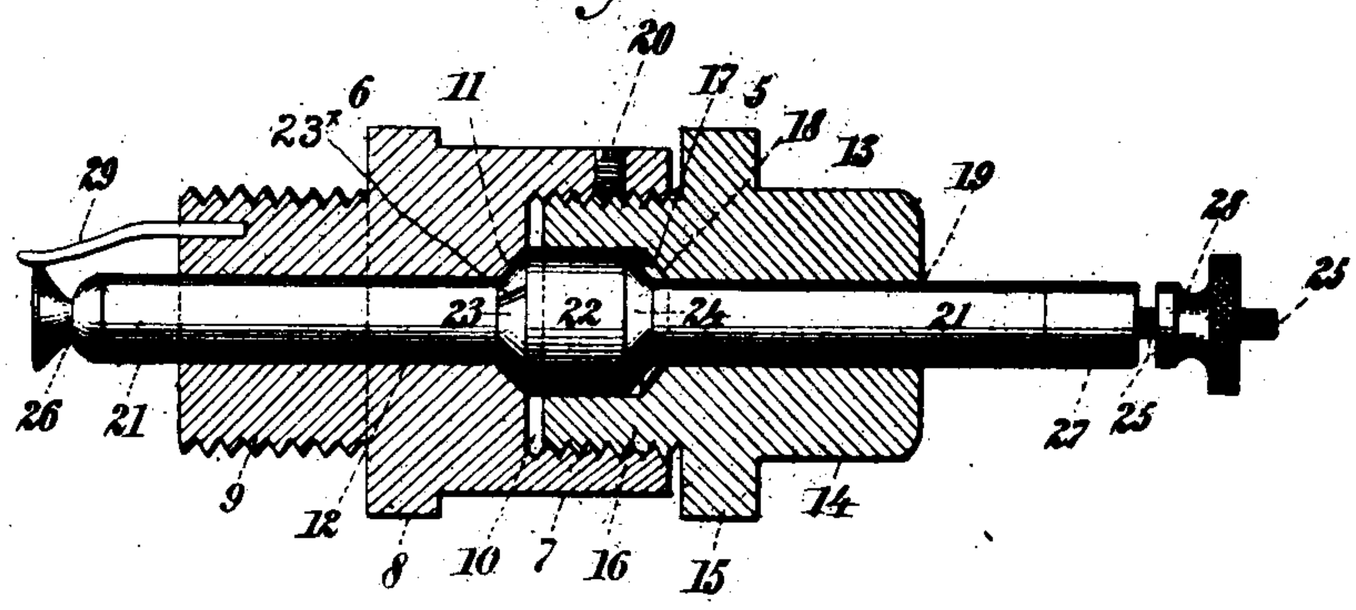


Fig. 2.

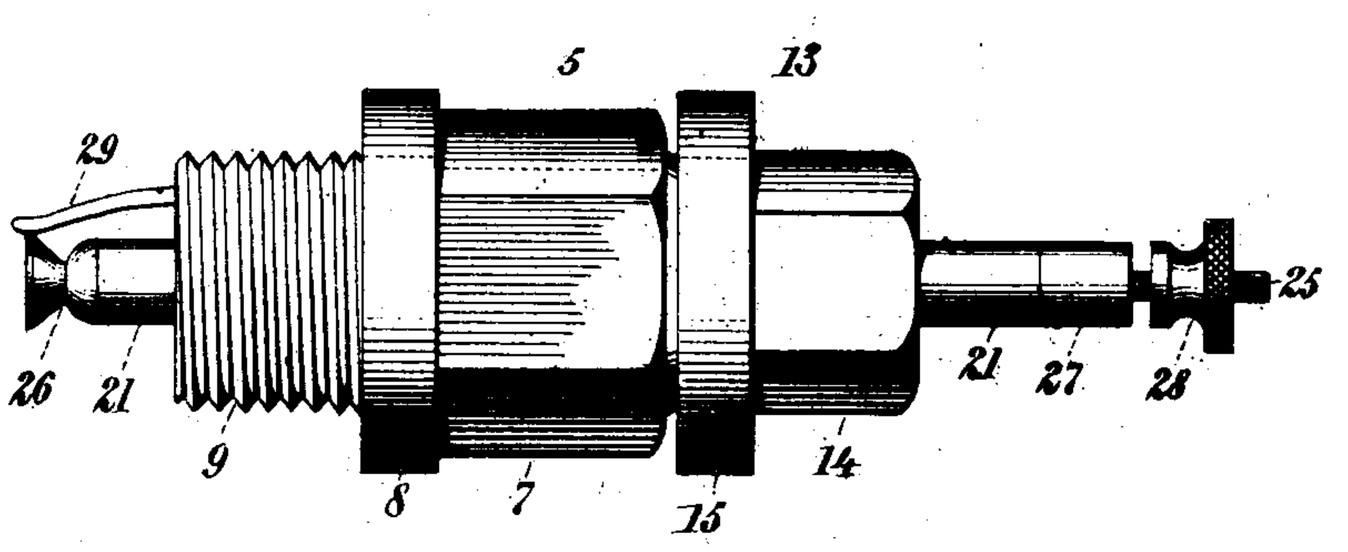
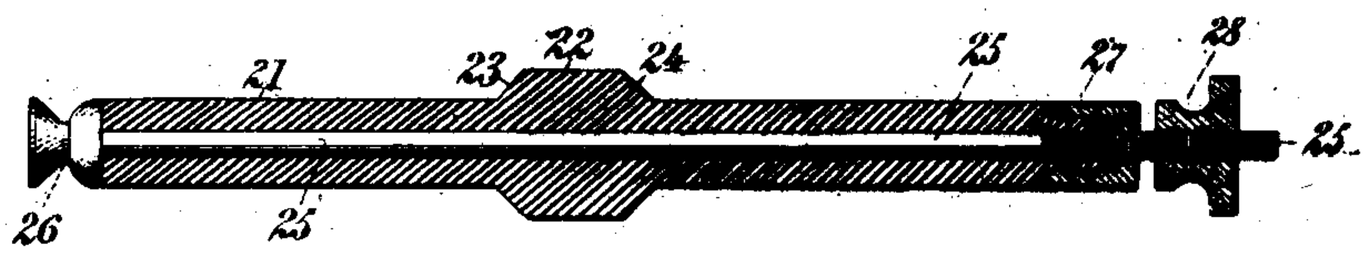


Fig. 3.



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SPARK-PLUG.

No. 869,865. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed December 2, 1904. Serial No. 235,143.

To all whom it may concern:

Be it known that I, ALFRED HOLSTEN, a citizen of the United States, residing at the city of New York, borough of Brooklyn, Kings county, in the State of New York, have invented certain new and Useful Improvements in Spark-Plugs, of which the following is a full, clear, and exact specification.

My invention relates to improvements in means for igniting the charge of explosive engines, and the same has for its object more particularly to provide a simple, reliable and efficient spark plug which may be readily applied to the engine, and permit of easy adjustment of the spark.

A further object of the said invention is to provide a spark plug which will not smut or corrode, be positive in its operation, and thus increase the efficiency of the motor.

To the accomplishment of these objects my invention consists in the novel details of construction and in the combination, connection and arrangement of parts hereinafter more fully described, and then pointed out in the claims.

In the accompanying drawings forming part of this specification, wherein like numerals of reference indicate like parts, Figure 1 is a central, longitudinal sectional view illustrating a spark plug constructed according to and embodying my invention; Fig. 2 is a side view of the same, and Fig. 3 is a central, longitudinal section showing the construction of one of the contact-members and connected parts.

In said drawings 5 designates the apparatus as a whole comprising the plug 6 having the nut-shaped body-portion 7, a rim or flange 8 at its base, and a screw-threaded projection 9 upon its under side whereby the plug may be secured into the cylinder of an engine. The body-portion 7 of the plug is provided with a recess 10 having screw-threads therein, and at the center of the base of said recess 10 is arranged a conical valve seat 11 from which extends outwardly a bore 12. 13 denotes a cap or cover for the recessed portion of said plug 6; said cap or cover 13 having a nut-shaped head 14, a rim or flange 15 at its base, and a projecting portion 16 at its under side provided upon its outer surface with screw-threads adapted to engage the screw-threads upon the inner surface of the plug 6. The inner or screw-threaded projecting portion 16 of the cap is provided with a recess 17, which terminates at its base in a conical valve seat 18 (corresponding with the conical valve seat 11 in the plug) from which valve seat 18 extends a bore 19 passing entirely through the nut-shaped head 14 of the cap or cover 13.

20 denotes a screw arranged in the side of the body portion of the plug 6, and impinging upon the threaded portion 16 of the cap 13 whereby to secure the said parts to their adjusted positions. Arranged within said plug 6 and cap 13 is disposed a contact member consisting of a rod or stem 21 the ends of which are supported and adapted to work within the bores 12 and 19 arranged in the plug and cap respectively; said rod or stem 21 having an enlarged intermediate portion 22 from the opposite ends of which extend conical valves 23, 24 which are adapted to seat upon the valve seats 11, 18 in the recesses 10, 17 respectively of the plug 6 and cap 13, while the intermediate portion 22 fits closely into and is adapted to work within the recess 17 of cap 13, and $23^{\times}$ denotes a longitudinal recess provided in the valve 23. The said rod or stem 21 is made of any suitable insulating material capable of resisting heat, and has arranged therein a metal rod or conductor 25 having a contact head 26 at its inner end, and its outer end screw-threaded and provided with a head 27 whereby the said rod may be secured in said insulating rod or stem 21, and above said head is disposed a binding nut 28. From the inner end of the screw-threaded portion of the plug 6 extends a contact 29 which is adapted to contact and coöperate with the head 26 on the inner end of the stem 21.

The operation of the apparatus is as follows: As the piston of the engine moves outward and draws in the explosive charge, the stem 21 will be caused to move inward, the valve 23 to seat upon its seat 11, but before the same can fully seat a small quantity of air will be drawn into and through the plug between the stem 21 and the opening 19 of the cap, and pass the valve 24, thence between the enlarged intermediate portion 22 and the socket 10, between the stem 21 and the opening 12 in the plug 6, and after the valve 23 has seated a small quantity of air will continue to be drawn into the cylinder through the recess $23^{\times}$ in the valve 23, thereby serving to remove any dead gas which may accumulate or collect adjacent to the contact terminals 26, 29 at the inner end of said plug, and at the same time with the said inward movement of the stem 21 the head 26 thereof will be caused to wipe against the contact-finger 29 and thus insure bright, clean surfaces for the spark. With the outward movement of the stem 21 the valve 24 will be caused to seat upon the seat 18, and remain seated during the exploding and exhausting movements of the piston, and thus prevent the escape of the burned or exploded gases from the cylinder whereupon the operation first described will be again repeated.

It will be observed that in my improved apparatus the one contact member is rigid while the other is carried upon a reciprocating member, the movement of which may be controlled by the adjusting means arranged upon said apparatus wholly without the engine cylinder, and that due to the mobility of said reciprocating member the chances for soot and other matter to settle thereon are obviated and a positive sparking of the plug insured whenever the circuit

closing device arranged to operate without the cylinder closes the electric circuit.

Without limiting myself to the details of invention which may be varied within the scope of the patent, what I claim and desire to secure by Letters Patent is:—

1. A spark plug comprising a socket member, a contact electrode thereon, an insulated member arranged within said plug and adapted for reciprocation therein, oppositely closing valves arranged upon said insulated member, and a contact electrode carried by said insulated member, substantially as specified.

2. A spark plug comprising a socket member, a contact electrode thereon, a member arranged within said plug and adapted for movement therein, oppositely-closing valves arranged upon said member, a contact electrode carried by said valved member, and means for regulating the movement of said valved member, substantially as specified.

3. A spark plug comprising a socket member, a contact electrode thereon, a member arranged within said plug and adapted for reciprocation therein, oppositely-closing valves arranged upon said member, a contact electrode carried by said valved member, and means for regulating the reciprocation of said valved member, substantially as specified.

4. A spark plug comprising a socket member, a contact electrode thereon, a member arranged within said plug and adapted for reciprocation therein, oppositely-closing valves arranged upon said member, a contact electrode carried by said valved member, means for regulating the reciprocation of said valved member, and means for securing said regulating means to its adjusted position, substantially as specified.

5. A spark plug comprising a socket member, a contact electrode thereon, a member arranged within said spark plug and adapted to move freely therein, oppositely-closing valves arranged upon said member, a contact electrode carried by said member and insulated from said plug, and means for securing said valved member within said plug, substantially as specified.

6. A spark plug comprising a socket member, a contact electrode thereon, a member arranged within said plug and adapted to move freely therein, oppositely-closing valves arranged upon said member adapted to seat within said plug under influence of the motor piston in each direction, a contact electrode carried by said member, and means for securing said member within said plug, substantially as specified.

7. A spark plug comprising a socket member, a contact electrode thereon, a cap for said socket member, a member arranged partly within and partly without said socket member and cap, a contact electrode carried by said member, oppositely operating valves arranged upon said member, and means for securing said cap in position upon said plug, substantially as specified.

8. A spark plug comprising a socket member, a contact electrode thereon, a valve seat in said socket member, a bore extending therefrom, a cap for said plug having a valve seat, and a bore extending therefrom in line with the one in the socket member, an insulated stem arranged within said bores having oppositely operating valves adapted to seat upon the seats aforesaid, and a contact electrode carried by said stem, substantially as specified.

9. A spark plug comprising a socket member, a contact electrode therefor, a recess in said socket member, a cap adapted to be fitted into said recess, a member arranged to work within said socket member, said member having an enlarged portion disposed within the recess of said plug, and provided with oppositely operating valves, and a contact electrode carried by said member, substantially as specified.

10. A spark plug comprising a socket member, a contact electrode thereon, a recess in said socket member, a cap having a recess therein adapted to be fitted into the recess of said socket member, a member arranged partly within and partly without said socket member, said member having an enlarged portion adapted to work within the recess in said socket member and cap, oppositely operating valves arranged upon said member, and a contact electrode carried by said member adapted for coöperation with the contact electrode first mentioned, substantially as specified.

11. A spark plug comprising a socket member, a contact electrode thereon, a recess in said socket member, a valve seat at the base thereof, an adjustable cap having a recess therein, and a valve seat at the base thereof adapted to be fitted into the recess in said socket member, a reciprocating member arranged partly within and partly without said socket member and cap having an enlarged intermediate portion provided at its ends with oppositely operating valves adapted to seat upon the seats in said socket member and cap, and a contact electrode carried by said reciprocating member, but insulated therefrom, adapted for cooperation with the contact electrode first mentioned, substantially as specified.

12. A spark plug comprising a socket member, a contact electrode at the base thereof, a recess in said socket member, a valve seat at the base thereof and an adjustable cap adapted to be fitted into the recess in said socket member, said cap having a recess therein and a valve seat at the base thereof, means for securing said cap to its adjusted position, a reciprocating stem arranged partly within, and partly without said socket member and cap, having an enlarged intermediate portion provided with valves at its opposite ends adapted to seat upon the valve seats in said socket member and cap, a contact electrode carried by said reciprocating member at its inner end, but insulated therefrom, adapted for coöperation with the contact electrode of the socket member, and an attaching device arranged upon the outer end of said stem, substantially as specified.

13. A spark plug comprising a socket member, a contact finger projecting from the inner end thereof, a recess in the outer end of said socket member, screw threads upon the inner surface, and a conical valve seat at the base of said recess, a bore extending from said conical valve seat to the inner end of said socket member, a cap having an exteriorly-threaded portion extending from its under side adapted to engage the screw-threads upon the inner surface of the recess in the socket member, said cap having a recess therein and a conical valve seat at the base thereof, a bore extending from said conical valve seat to the top of said cap, a screw extending through the side of the socket member adapted to engage the portion of the cap therein, a stem of insulating material arranged partly within and partly without the bores in said socket member and cap having therefor an enlarged intermediate portion arranged to work within the recess in said socket member and cap, and provided with conical valves at its opposite ends, a contact head carried upon said reciprocating member at its inner end adapted for coöperation with the contact finger on the socket member, a conductor arranged within the stem having one end connected with the contact head and its other end projecting beyond the outer end of said stem, and provided with an attaching device, substantially as specified.

Signed at the city of New York, in the county and State of New York, this twenty-eighth day of November, nineteen hundred and four.

ALFRED HOLSTEN.

Witnesses:
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