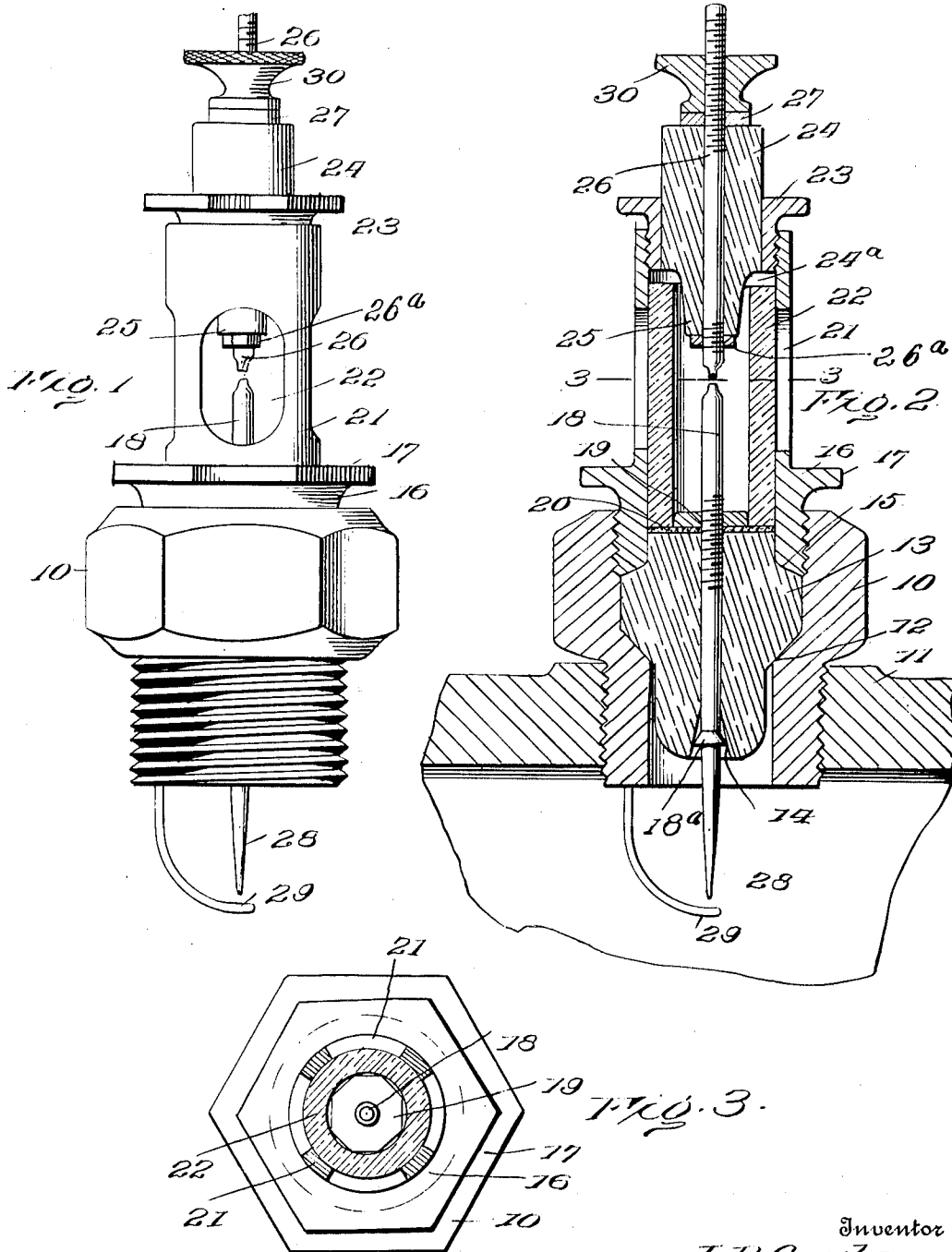


J. R. COYLE.
SPARK PLUG.
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Patented May 16, 1911.



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UNITED STATES PATENT OFFICE.

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SPARK-PLUG.

992,168.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES R. COYLE, citizen of the United States, residing at Huntsville, in the county of Madison and State of Alabama, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a specification.

This invention relates to an improved spark plug for use in conjunction with internal combustion engines, and has for an object to provide a sight feed spark plug, or a spark plug wherein the passage of the spark between the points of the electrodes may be ascertained without the removal of the plug from the engine cylinder.

The invention has for another object to provide a spark plug with a central electrode made in sections which are insulated from one another, and are insulated from the ground electrode so as to provide a double insulation against the short circuiting of the high tension circuit.

The invention essentially contemplates a spark plug with a working gap in the usual manner, and a detecting or observing gap formed adjacent the outer end of the plug and outside of the cylinder, the detecting gap being protected from dust, oil, and other foreign substances by a transparent tube. The plug is designed especially for use in locating trouble in a motor having a number of cylinders, wherein the observing gap shows at a glance if the ignition circuit is at fault, and if so, the location of the faulty cylinder. The observing gap is also employed in determining the volume of spark obtained in the spark gap and in adjusting the vibrators regulating the spark to obtain the best results with the minimum consumption of the battery current.

For a full understanding of the invention reference is to be had to the following description and accompanying drawing, in which:—

Figure 1 is a side elevation of the improved spark plug. Fig. 2 is a vertical section through the same as applied to an internal combustion cylinder. Fig. 3 is a transverse section on the line 3—3 of Fig. 2.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawing by the same reference characters.

Referring to the drawing in which is disclosed an embodiment of the improved spark plug, the numeral 10 designates the ground electrode consisting of a metal cup which is reduced and externally threaded at its lower end to engage in threaded relation through the metal of the cylinder 11. The cup 10 is provided with an annular shoulder 12 midway of its ends and extending inwardly at its point of reduction. A lower barrel section 13, formed from porcelain or a like insulating material, corresponding in profile to the form of the interior of the cup 10, is inserted through the upper open end of the cup and seated upon the shoulder 12. The lower barrel section 13 is longitudinally and centrally apertured, the aperture flaring at the lower end of the barrel section 13 as at 14. The barrel section is provided with an annular shoulder 15 adjacent its upper end to receive a retaining ring 16 which is disposed in threaded relation within the upper end of the cup 10. The ring 16 is provided with a knurled flange 17 for the reception of a suitable tool for tightening the ring within the cup and to thereby rigidly hold the lower barrel section 13 within the cup. The lower section 18 of the central electrode is fitted snugly through the central aperture in the barrel section 13 and is retained in position by a binding nut 19 which is disposed in threaded relation about the upper end of the electrode section 18. A flaring shoulder 18^a is carried upon the lower end of the section 18 and engages with the flaring end 14 of the lower barrel section 13. A washer 20, formed preferably from asbestos or other insulating material, is disposed between the upper end of the barrel section 13 and the nut 19.

The binding ring 16 is provided with an upstanding tubular casing 21 provided with lateral openings to admit of the observance of the upper end of the electrode section 18. Within the casing 21 a transparent tube 22 is disposed, the same preferably comprising a glass tube, resting at its lower end upon the asbestos washer 20 and about the electrode section 18. The upper end of the casing 21 is internally threaded to receive an upper binding ring 23 which engages about an upper barrel section 24. The barrel section 24 is formed from porcelain or a like

insulating material. The upper barrel section 24 is provided with an annular flange 24^a extending outwardly from the lower end thereof to receive the lower extremity of the binding ring 23 in order to retain the barrel section 24 therein. The barrel section 24 carries a tapering boss 25 which approaches the upper extremity of the electrode section 18. The barrel section 24 is centrally and longitudinally apertured, the opening extending through the boss 25 to snugly receive therethrough an upper electrode section 26. A retaining nut 26^a is disposed in threaded relation upon the lower end of the electrode 26 and against the boss 25.

A binding nut 27 is disposed in threaded relation over the upper end of the electrode section 26 and rests upon the upper extremity of the barrel section 24 to retain the electrode 26 from moving downwardly into contact with the lower section 18. The meeting extremities of the sections 18 and 26 of the electrode are spaced apart to form a gap for the reception of a spark therethrough during the operation of the plug. The lower extremity of the section 18 of the electrode terminates in a point 28 which is preferably formed by reducing the electrode 18 and which is spaced at a slight distance above a curved point 29 carried upon the lower extremity of the cup 10. The upper electrode section 26 is provided with a knurled thumb-nut 30 to receive therebeneath the end of a conductor which is in the form of a wire, or the like, to connect the central electrode to one side of the high-tension circuit.

The improved plug, as can be seen from its construction, is adapted for use wherein one side of the high-tension circuit is grounded in the cylinder 11 of the engine.

In the operation of the plug the current passes through the cylinder 11 into the cup 10 and to the point 29. It bridges the gap between the point 29 and the point 28 and passes upwardly through the electrode section 18. The current bridges the second gap which is formed within the transparent tube 22 and between the spaced extremities of the central electrode where it passes

through the upper section 26 of the electrode to the conductor.

As the tubular casing 21 is provided with lateral openings, and a transparent tube 22 is positioned about the adjacent and spaced extremities of the central electrode, the passage of the spark within the gap can be observed by the operator.

Should the points 28 and 29 be choked or coated with carbonized residue and prevent the passage of the current between the points and thereby render the plug inoperative, such action can be detected through the tube 22 by the reduction in the volume of spark passing through the gap between the electrode sections 18 and 26.

It will of course be understood that spark plugs constructed as above described, may be made in any size to fit into the cylinders of engines used.

Having thus described the invention what is claimed as new is:—

A spark plug including a metal cup for engagement through the cylinder of an internal combustion engine and having an annular shoulder midway of its ends and within the inner wall thereof, a lower barrel section engaging in the cup and having a corresponding shoulder for supporting the barrel section, a retaining ring disposed in threaded engagement within the upper end of the cup and against the lower barrel section and having a circular casing extending above the ring, with lateral openings, a transparent tube arranged within the casing and seating upon the upper end of the lower barrel section, an upper binding ring threaded in the upper end of the casing, a second barrel section carried through the upper binding ring and projecting into the transparent tube, and central electrode sections carried in the barrel sections and having their adjacent ends spaced apart centrally within the tube.

In testimony whereof, I affix my signature in presence of two witnesses.

JAMES R. COYLE. [L. S.]

Witnesses:

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E. J. MITCHELL.