A. DE CLAIRMONT.

SPARK PLUG.

APPLICATION FILED SEPT. 13, 1919.

1,381,167. Patented June 14, 1921.

Fig. 1.

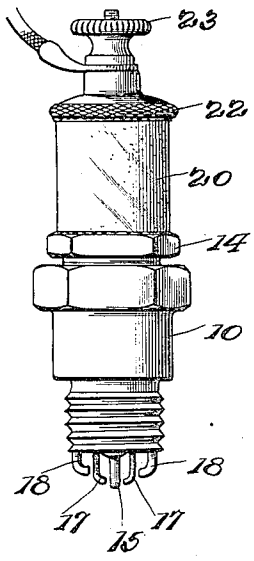


Fig. 3.

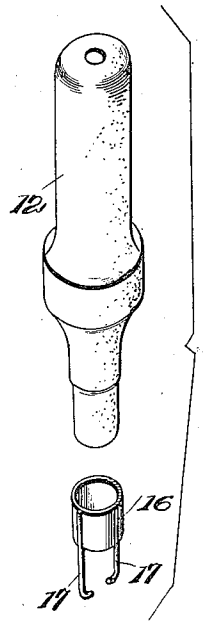


Fig. 2.

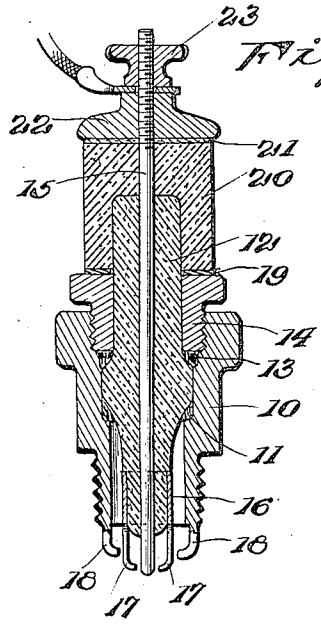
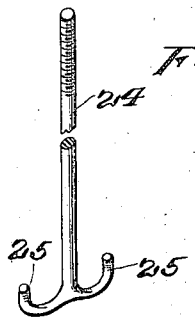


Fig. 4.



Inventor.
A. deClairmont.
by Lacey & Lacey.
his Atty's

UNITED STATES PATENT OFFICE.

ADOLFO DE CLAIRMONT, OF TOLEDO, OHIO, ASSIGNOR TO THE CARBO-GAS COMPANY, OF TOLEDO, OHIO.

SPARK-PLUG.

1,381,167. Specification of Letters Patent. Patented June 14, 1921.

Application filed September 13, 1919. Serial No. 323,630.

To all whom it may concern:

Be it known that I, ADOLFO DE CLAIRMONT, citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, 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 internal combustion engines and has as one of its principal objects to provide an efficient type of plug employing primary and secondary spark gaps to the end that a multiple spark will be had upon the passage of current through the plug.

The invention has as a further object to provide a plug of this character which will in effect provide a compound plug so that should the ground electrodes become short circuited a spark will still be given off between the main and intermediate electrodes of the plug.

A further object of the invention in this connection is to provide a plug wherein the intermediate electrode will be carried by a condenser employed and wherein the condenser will be mounted directly upon the porcelain insulator of the plug.

A still further object of the invention is to provide a plug which will not leak compression.

And the invention has as a still further object to provide a plug employing a cap for sealing a portion of the insulator so as to prevent leakage around the insulator and wherein said cap will also serve as a protector for the upper portion of the insulator.

Other and incidental objects will appear hereinafter.

In the drawings:

Figure 1 is a side elevation of my improved spark plug,

Fig. 2 is a vertical sectional view taken centrally through the device,

Fig. 3 is a detail perspective view of the porcelain insulator and intermediate electrode employed, these parts being shown disassembled, and

Fig. 4 is a detail perspective view of a slightly modified form of main electrode.

In carrying the invention into effect, I employ a metal shell 10 threaded at its lower end portion for engagement in the spark plug orifice of an engine cylinder and provided at its upper end with the usual wrench receiving enlargement. Internally the shell is formed with an annular shoulder upon which is seated an appropriate gasket 11 and resting upon this gasket is the main insulator 12 of the plug, enlarged intermediate of its ends to snugly fit within the shell while the lower end portion of the insulator is reduced and terminates adjacent the lower end of the shell. The insulator may be formed of porcelain or other approved material. Surrounding the insulator above the enlargement thereon is a gasket 13 similar to the gasket 11 and threaded into the upper end portion of the shell to coact with the former gasket is a nut 14 provided at its upper end with a wrench receiving flange. The insulator will thus be removably held upon the shell.

The insulator 12 carries a main electrode 15 extending axially through the insulator and cemented or otherwise secured thereto. At its lower end portion the main electrode projects somewhat below the lower end of the insulator while at its upper end portion the electrode is extended to project considerably above the insulator. Mounted upon the lower end portion of the insulator is a condenser 16. This condenser is in the nature of a metal ferrule which is snugly fitted around the lower end portion of the insulator to be suitably secured thereto, the condenser lying wholly within the lower end portion of the shell and confronting the inner wall thereof in spaced parallel relation. Depending from the condenser are oppositely disposed intermediate electrodes 17. As will be observed, these intermediate electrodes are arranged to confront the lower end of the main electrode and extending downwardly and inwardly from the lower edge of the shell to coöperate with the intermediate electrodes are ground electrodes 18.

Seated upon the upper end of the nut 14 around the insulator 12 is a gasket 19 and snugly fitting over the upper end portion of the insulator to seat against this gasket is a sealing cap 20 for the insulator. This cap may also be formed of porcelain or other suitable insulating material and freely receives the main electrode 15 therethrough. Upon the upper end of the cap is arranged a gasket 21 similar to the gasket 19 and threaded upon the main electrode to seat against the former

gasket is a nut 22 adjustable for tightly clamping the cap over the upper end portion of the insulator and forming a sealed joint between the cap and nut 14 at the gasket 19 as well as a sealed joint between the nut and the cap at the gasket 21. Thus, it will be seen, the cap will materially lessen the tendency toward leakage of cylinder compression around the insulator 12 and, in fact, under ordinary conditions, should render the plug practically leak proof at this point. Furthermore, particular attention is directed to the fact that the cap will serve as a protector for the upper end portion of the insulator. As is well known, spark plug insulators are very often cracked or broken off by a blow from a wrench or other tool when the tool happens to slip during the operation of removing a plug. As will be seen, the cap 20, would, in the present instance, receive such a blow and under normal circumstances will prevent breaking of the insulator. Should the cap itself become broken, it may be readily replaced and at less expense than would be involved in renewing the insulator with the parts permanently attached thereto. Threaded upon the upper end portion of the main electrode to confront the nut 22 is a thumb nut 23 which may, as suggested in the drawings, be employed in the usual manner for connecting a conductor with the main electrode.

As will now be readily understood in view of the previous description, when a circuit is closed to the plug, current will flow through the main electrode 15 and will then jump to the intermediate electrodes 17 of the condenser 16, thus providing a spark at each of the gaps between the main electrode and the intermediate electrodes. From the intermediate electrodes the current will, of course, coincidently jump to the ground electrodes 18 so that a spark will also be formed at each of the gaps between the intermediate and the ground electrodes. I accordingly provide a plug which, under normal conditions, will produce a multiple spark and will accordingly insure proper ignition. In this connection, particular attention is directed to the fact that when the current jumps from the main electrode 15 to the intermediate electrodes 17, current will flow into the condenser 16 to be stored therein. As will be appreciated, the condenser will consequently, under ordinary conditions, be constantly charged for thus insuring the generation of what is generally termed a hot spark between the intermediate and ground electrodes when additional current is supplied to the condenser from the main electrode 15. Further, it is to be noted in connection with this condenser that I provide a plug which is, in effect, a compound plug. Upon the formation of a short circuit between the main electrode and the condenser or the intermediate electrodes, a spark will, nevertheless, be formed between the intermediate electrodes and the ground electrodes. Similarly, should a short circuit be formed between the condenser and shell or between the intermediate electrodes and the ground electrodes, a spark will, nevertheless, be produced at each of the gaps between the main electrode and the intermediate electrodes. I accordingly provide a plug which will be particularly free from the common fault of short circuiting.

In Fig. 4 I have illustrated a slightly modified form of main electrode. In this figure the main electrode is indicated at 24 and this electrode is, at its lower end, formed with oppositely directed sparking points 25. As will be seen, when this electrode is employed in lieu of the electrode 15 of the preferred construction, a spark will be formed between each of the sparking points 25 and the intermediate electrodes of the condenser.

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

In a spark plug, the combination of a shell having a ground electrode depending from the lower end thereof, an insulator fitting through the shell, a main electrode carried by the insulator, and a metallic band snugly fitting around the lower end portion of the insulator wholly within the lines of the shell and next to the inner wall thereof in spaced relation to said wall to define an intermediate air gap between the band and the shell throughout the length of the band, there being an intermediate electrode depending from said band to coöperate with the main and ground electrodes below the lower end of the shell.

In testimony whereof I affix my signature.

ADOLFO de CLAIRMONT, M. D. [L. S.]