

May 8, 1923.

1,454,549

E. N. LIGHTFOOT

IGNITION DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 24, 1917

Fig. 1.

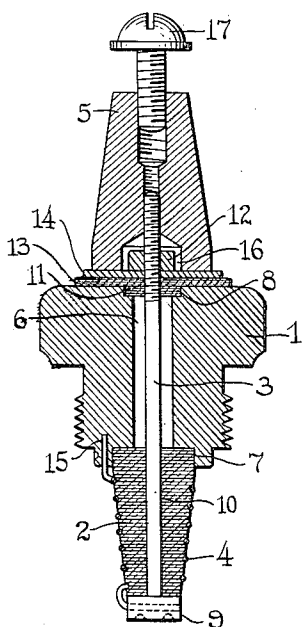


Fig. 2.

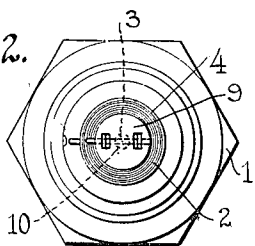
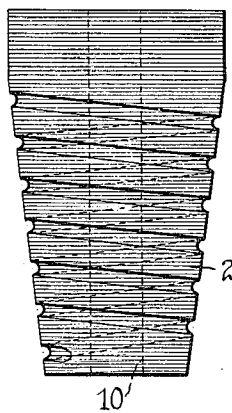


Fig. 3.



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UNITED STATES PATENT OFFICE.

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IGNITION DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed October 24, 1917. Serial No. 198,197.

To all whom it may concern:

Be it known that I, EDWIN N. LIGHTFOOT, a citizen of the United States, residing at New York, in the county of Bronx and State of New York, have invented new and useful Improvements in Ignition Devices for Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to ignition devices for internal combustion engines, and while not limited thereto, is particularly applicable to heavy oil engines designed to develop only moderate compressions and therefore requiring, particularly during starting, some ignition means other than the heat incident to combustion chamber pressure.

Since the ordinary high tension spark gap plug employed in gasoline engines to explode the more or less volatile charges there encountered does not develop sufficient heat for the ignition of heavy oil fuels, it has heretofore been proposed to ignite the compressed charge, in engines of the character stated, by means of a resistance wire located within the combustion chamber. The heretofore proposed resistance devices, however, have not proven wholly satisfactory in practice, owing to rapid deterioration of the parts subjected to the destructive conditions which obtain within the combustion chamber.

The present invention has among its objects to provide an ignition device for the foregoing and other purposes wherein deterioration of the parts subjected to detrimental conditions is greatly retarded and wherein the active parts are arranged for more efficient operation.

Other objects and advantages will hereinafter appear.

In the accompanying drawing,

Figure 1 is a longitudinal sectional view of an embodiment of the invention;

Fig. 2 is an end thereof; while

Fig. 3 is an enlarged fragmentary view thereof.

Referring to the drawing, the same discloses an ignition plug comprising in general a shouldered plug body 1 to be screwed within a combustion chamber wall, an insulating support 2 clamped to the inner end of said body by means of a bolt 3 insulated

from the latter, and a resistance member 4 coiled spirally about said support and having its opposite ends anchored to said body and said bolt respectively, together with terminal means for said bolt including a conductive cap 5 electrically connected therewith and insulated from the body.

In practice one end of the resistance coil may be connected through the cap 5 with a storage battery or other source of low voltage current, the other end of said coil being grounded. Current thus passing through said coil raises the temperature thereof to a degree sufficient for igniting the combustible charge in contact therewith.

More particularly the plug body 1 is provided with a longitudinal bore 6 of materially larger diameter than that of the bolt 3 and is counterbored at its opposite ends to form sockets 7 and 8. One end of the support 2 is adapted to fit snugly within the socket 7, its opposite end being engaged by a head 9 on the bolt 3, said bolt extending through a bore 10 in said support and through the bore 6 of said body and being spaced from the latter at one end by the support 2 and at the opposite end by an insulating washer 11 located within the socket 8. A nut 12 is screwed upon said bolt for clamping the aforementioned parts together. Also, to insulate said nut from the body 1 and to prevent the escape of hot gases through the bore 6 an insulating washer 13 and a suitable metallic washer 14 are interposed between said nut and said body.

The support 2 comprises a substantially cylindrical body of insulating and heat absorbing material exteriorly provided with a spiral groove substantially semicircular in cross section and extending several times about said support to receive the resistance coil 4. Said support is also preferably tapered toward its inner end to facilitate access by the combustible material to all portions of the coil. In practice the support may be composed of separate layers or washers of mica suitably shaped and clamped together by the bolt 3 and for this purpose the head 9 of said bolt is provided of the same diameter as the co-operation portion of the support in order that said washers may be firmly secured throughout their radial extent.

One end of the coil 4 is firmly anchored

within a socket 15 in the body 1 while the other end is preferably inserted within a transverse opening in the head 9 of bolt 3, the material of said head being thereafter depressed to clamp said end firmly and permanently therewithin.

The bolt 3 preferably extends beyond the nut 12 to receive the cap 5 which is screwed upon such projecting portion and abuts the washer 14, being counterbored at 16 to afford space for said nut, while a suitable terminal screw 17 is provided at the outer end of said cap.

By the foregoing construction a positive mechanical support for the entire length of the resistance heating coil is provided whereby distortion or fracture thereof due to the high temperature of the combustion chamber is prevented. The insulating support also serves, by absorbing the flash heat incident to explosion of the charges, to prevent undue fluctuations in the temperature of the supported coil, thus prolonging the service of the latter.

While the support has been described as composed of mica, it is obvious that other substances having similar insulating and heat absorbing properties may be substituted and that the support may be constructed integral in cases where the character of the material permits.

What I claim as new and desire to secure by Letters Patent is:

1. An ignition plug for heavy oil engines comprising a plug body having a single bore and being counterbored to provide a socket, a hollow insulating and heat absorbing support seated in said socket and comprising a plurality of superposed annular laminae, a terminally threaded bolt of lesser diameter than said bore extending through said plug body and said support and having a head located beyond the latter and of a diameter not less than that of the adjacent portion of the same, said support serving to space said bolt from the interior of said plug body, means co-operating with the threaded end of said bolt for clamping said laminae firmly against said plug body and an ignition element coiled about said support and terminally secured to said plug body and said bolt for connection with a source of current.

2. An ignition plug for heavy oil engines comprising a nipple to be screwed within a wall of the engine, an ignition coil carried by said nipple within the engine and adapted when energized to maintain itself at a temperature suitable for ignition of a heavy oil fuel mixture, an insulating member ca-

pable of withstanding high temperatures clamped to said nipple interiorly of said coil for mechanically supporting the latter and minimizing variations in the temperature thereof to thereby render said coil capable of withstanding the heat incident to heavy oil engine operation, and means to prevent the escape of highly compressed gas through said nipple, comprising a conductive cap to be secured upon said nipple to provide a terminal connection for said element, said cap co-operating with the adjacent end of said nipple to form a substantially gas tight joint.

3. An ignition plug for heavy oil engines, comprising a plug body having a single bore and being counterbored at either end to provide a pair of opposed sockets, a hollow insulating and heat absorbing support seated in one of said sockets and comprising a plurality of superposed annular laminae of graduated diameters for tapering the exterior of said support, a terminally threaded bolt of lesser diameter than the bore of said plug body extending there-through and through said support and provided therebeyond with a head of a diameter not less than that of the adjacent portion of said support, the latter serving to space said bolt from the interior of said plug body at one end, insulating means located within the other of said sockets for similarly spacing said bolt from the other end of said plug body, a nut co-operating with the threaded portion of said bolt for clamping said laminae together and for clamping the assembled support against said plug body, an ignition element coiled about said support and terminally secured to provide for connection with a source of current, and means independent of said nut for preventing the escape of compressed gas along said bore.

4. An ignition plug for heavy oil engines comprising in combination, a bored plug body having a socket, an insulating member mounted in said socket, a conductive bolt extending within said member and said body for clamping the same together, said bolt being insulated from said body, an ignition element coiled about said member for mechanical support and terminally connected to said body and said bolt respectively, and a conductive cap secured to the outer end of said bolt and co-operating with said body to form a substantially gas tight joint.

In witness whereof, I have hereunto subscribed my name.

EDWIN N. LIGHTFOOT.