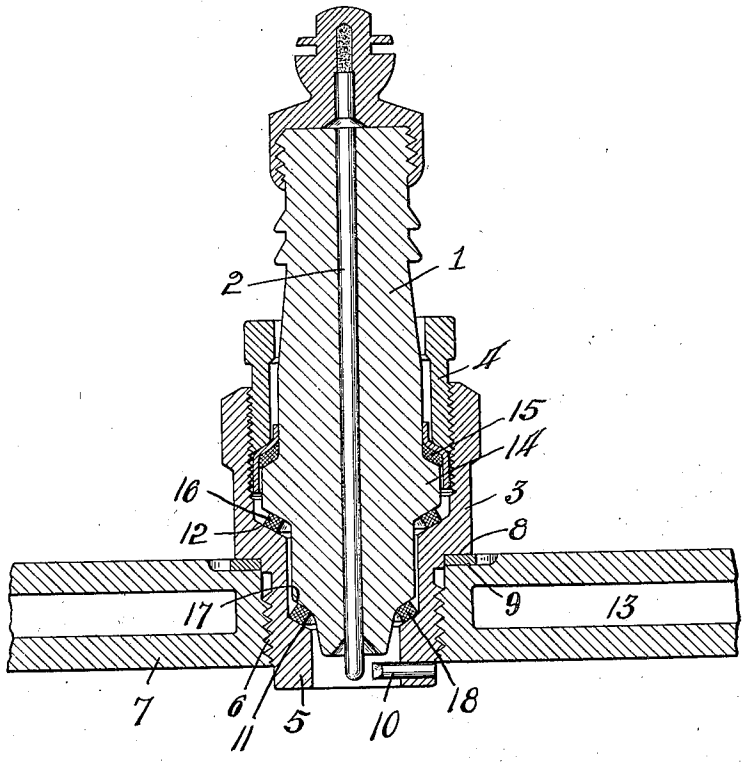
Nov. 16, 1926. 1,607,308

O. C. ROHDE

SPARK PLUG

Original Filed Sept. 8. 1923



Inventor

Otto C. Rohde.

By Owen Owen & Crampton,

Attorneys.

Patented Nov. 16, 1926. 1,607,308

UNITED STATES PATENT OFFICE.

OTTO C. ROHDE, OF TOLEDO, OHIO, ASSIGNOR TO CHAMPION SPARK PLUG COMPANY, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE.

SPARK PLUG.

Continuation of application Serial No. 661,593, filed September 8, 1923. This application filed January 28, 1925. Serial No. 5,354.

This invention relates to spark plugs for use in connection with internal combustion engines.

In the use of spark plugs the heat conditions to which subjected during use must be taken into consideration, and spark plugs which would be suitable for high speed engines, such as used in aeroplanes and racing automobiles, might not be suitable for road or warming-up work, and spark plugs suitable for racing engines when operated on paved or plank raceways might not be suitable for dirt raceways, and the spark plugs used for either of these conditions would not be suitable for warming-up and regular road work. The reasons for this is that in each case different heat conditions are present and a plug, which for high speed work would not become fouled with oil and at the same time would run sufficiently cool to prevent preignition, would ordinarily run too hot for other running conditions and cause trouble. For instance, a plug used in connection with ordinary road work must have provision for conducting the heat away from the inner or firing end of the insulator sufficiently fast to prevent preignition and at the same time the core must be left sufficiently hot to avoid accumulation of oily or carbonaceous deposits. The same plug ordinarily would not be suitable for higher speed work where more extreme heat conditions are present, for in such case the greater heat would not be conducted away from the inner end of the core sufficiently fast to prevent preignition and the consequent troubles.

The different heat conditions customarily met with in ordinary practice for racing, road and other work may be referred to as high, medium and low, each requiring a different heat conducting condition in a plug than the others.

The object of my invention is the provision of a spark plug adapted for all three of said conditions of use by merely changing the location of the insulator seating gasket or gaskets thereof.

This application is filed as a continuation of my former application S. N. 661,593, filed Sept. 8, 1923.

The invention is fully described in the following specification, and while it is capable of embodiment in different forms, one embodiment thereof is illustrated in the accompanying drawings, which is a central longitudinal section of spark plug embodying the invention.

Referring to the drawing, 1 designates the customary insulator of a spark plug, which insulator carries the center electrode 2 and is mounted in a carrying shell 3 in which it is firmly secured in seated relation by a gland nut 4 or in any other suitable manner, as well understood in the art. The shell 3 is provided with the customary lower reduced end 5 having the external threads 6 to adapt it to be threaded into the spark plug receiving opening of a cylinder 7, and above the threads the enlarged portion of a shell is provided with a shoulder 8 forming a seat for the usual cylinder wall gasket 9. 10 designates the customary side electrode carried by the shell 3.

The shell 3, for the purpose of invention, has its interior wall of stepped form to provide two longitudinally spaced gasket seats 11 and 12, the former being disposed near the inner end of the shell opposite the threads 6 and the water chamber 13 of the cylinder wall, and the latter (seat 12) being disposed within the enlarged portion of the shell at the outer side of the cylinder seating shoulder 8 thereof. These seats are of annular form and preferably, but not necessarily, tapered as shown.

The insulator 1 is provided intermediate its ends with the customary enlargement 14 which forms a shoulder at its upper or outer side for a gasket 15 against which the thrust of the gland nut 4 or other holding means is exerted, and forms a shoulder at its lower or inner side opposed to the shoulder 12 of the shell and adapted to bear against a gasket 16 on the shoulder 12. In this respect the insulator and its manner of mounting in the shell is the same as in ordinary practice. The inner end of the insulator 1 is reduced to provide a second shoulder 17 thereon which is inwardly spaced from the enlargement 14 and adapted to seat through an interposed gasket 18 on the shell shoulder 11.

In the illustrated embodiment of the invention, I have merely taken a spark plug of the standard type wherein the lower or inner gasket seat was disposed at the inner end of the enlargement 14, and bored or otherwise formed the shell to dispose the lower gasket seat at the point 11. The form

of the insulator was accordingly changed to provide the lower gasket engaging shoulder at the point 17, which is very much closer to the lower end of the insulator than with the old type.

If this spark plug is to be used under extreme heat conditions, the gasket 18 is used between the seats 11 and 17 and the outer gasket 16 is used also. Gasket 18 provides a substantially direct passage for the heat from the inner end of the insulator to the cooling fluid of the cylinder, as such gasket is disposed directly opposite the cooling fluid, and gasket 16 supplements the cooling to some extent. If the use is such that a comparatively cool running condition is present within the engine cylinders, the lower gasket 18 is removed and the gasket 16 alone used. This materially retards the heat conduction from the inner end of the core to the cooling water in the cylinder as it is necessary for the heat to pass up the insulator to the gasket 16 and then down through the shell to the cylinder wall. If the use is such that the spark plug would run too cool if both gaskets were used and would run too hot if the gasket 16 alone were used, then gasket 16 is removed and gasket 18 is employed to take care of the medium heat condition.

It is evident that I have provided a spark plug which is adapted to have its gaskets changed to meet three different heat conditions, which are practically all of the conditions to which a spark plug may be subjected. These different heat conditions may probably best be illustrated in connection with engines on racing cars. When the car is being driven in a race, it is usually subjected to the highest heat condition, and in such case gaskets 16 and 18 are both used. If the car is being used for ordinary roadwork, as for instance in driving it to and from the track or to and from the loading platform, the gasket 18 is removed and the gasket 16 alone used. If the car is being used under conditions wherein a medium heat condition is present, such for instance as for warming-up preparatory to racing or when the car in racing is being driven on a dirt raceway as distinguished from a paved or planked raceway, then gasket 16 is removed and gasket 18 alone used.

It is thus evident that I have provided a plug which is adapted for all three heat conditions to which an engine may ordinarily be subjected by merely inserting gaskets in one or the other, or both, places provided therefor, as the condition of use may require. This avoids the necessity of carrying different sets of spark plugs, each adapted for a certain heat condition, and enables the other set to be used for all purposes.

I wish it understood that my invention is not limited to any specific arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

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

1. In a spark plug, a shell having an externally threaded cylinder engaging portion, and an insulator having two inwardly facing shoulders, one near its inner end for seating in the shell opposite its cylinder engaging portion and one for seating in the shell in outwardly spaced relation to the inner one and at the opposite side of the external shoulder.

2. In a spark plug, a shell having an external gasket seat and two internal gasket seats, one below and one above the external seat, and an insulator within the shell adapted to seat through an interposed gasket on either or both internal seats to vary the speed of heat conductivity from the firing end of the insulator.

3. A spark plug having a shell with a threaded inner end portion for threading into a cylinder opening and with an inwardly facing external shoulder at the outer end of the threaded portion and an outwardly facing internal shoulder within the threaded portion, and an insulator having a part shouldered inwardly against said internal shell shoulder and a small end projecting inwardly from said shouldered part in spaced relation to the shell wall.

4. A spark plug having a shell with a threaded inner end portion for threading into a cylinder opening and with an inwardly facing external shoulder at the outer end of the threaded portion for seating against a cylinder in which mounted, and having an outwardly facing internal shoulder at each side of the external shoulder, and an insulator having its inner end portion stepped to provide successive inwardly facing shoulders for seating against the respective internal shoulders of the shell, the insulator having a small end portion projecting inwardly from its smaller shoulder in spaced relation to the inner end portion of the shell.

5. A spark plug having a shell with an inner threaded end portion for threading into the cylinder opening and with an external cylinder-contacting shoulder and also having two outwardly facing internal shoulders, the inner one being within the threaded portion of the shell and the outer one being at the opposite side of the external shoulder to said inner internal shoulder, and an insulator having a stepped inner end portion forming two longitudinally spaced gasket seats, one for gasket engagement with the outer internal shoulder of the shell to permit a slow conduction of heat from the insulator to the shell when used in a relatively slow running engine, the other for

gasket engagement with the inner internal shoulder of the shell for effecting a more rapid conduction of heat from the insulator to the shell when used in a faster running engine than that first referred to, and both insulator shoulders being adapted for gasket seating engagement with the respective internal shoulders of the shell when extreme heat conditions are present in a running of the associated engine.

In testimony whereof, I have hereunto signed my name to this specification.

OTTO C. ROHDE.