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SPARK PLUG

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Fig. 1

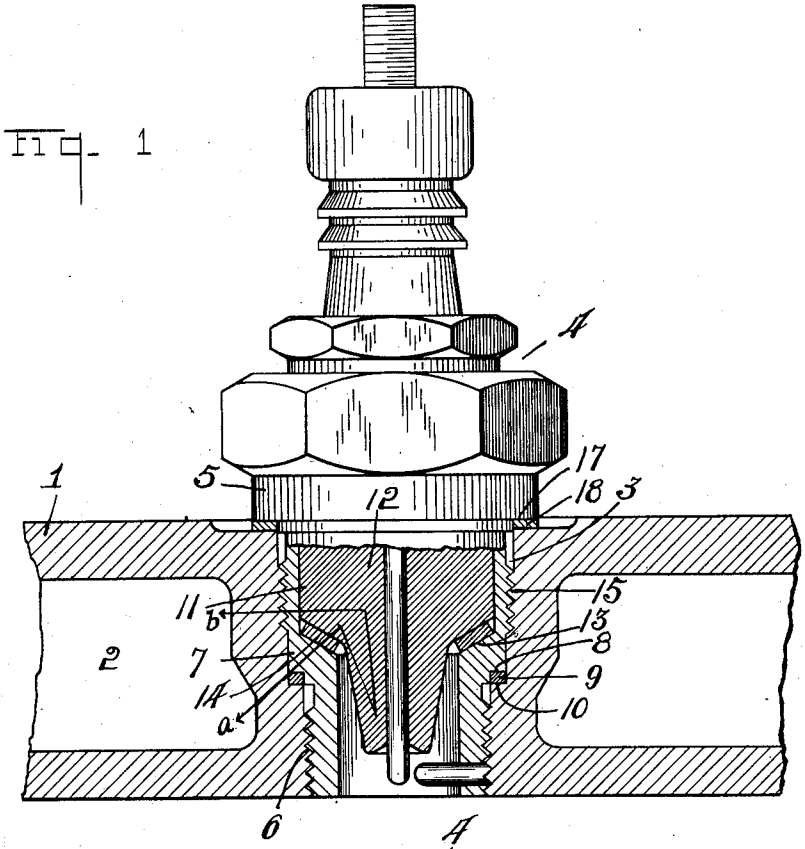
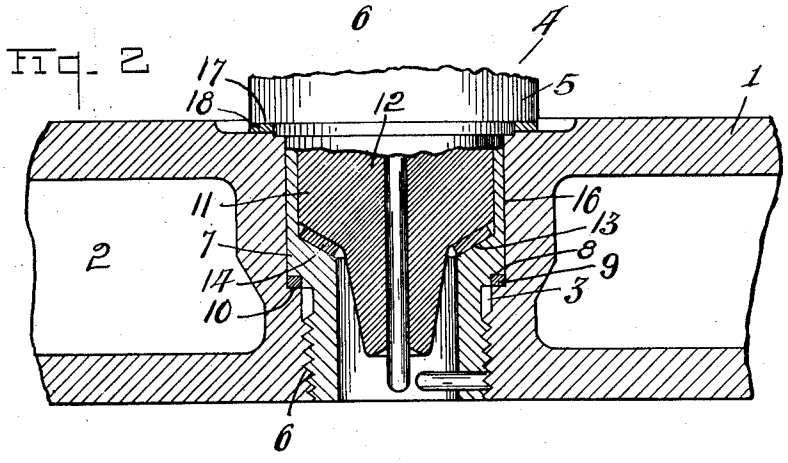


Fig. 2



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UNITED STATES PATENT OFFICE.

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SPARK PLUG.

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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 are not ordinarily suitable for road or warming up work, and spark plugs suitable for racing engines when operated on paved or plank raceways are not ordinarily suitable for dirt raceways, and the spark plugs used for either of these conditions are not 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 operating 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 high 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 all consequent troubles.

The different heat conditions usually 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.

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

Another object of the invention is to provide a seat for the spark plug within the cylinder receiving opening and to provide intimate contact between the spark plug shell and cylinder opening wall at opposite side of such seat to facilitate conduction of heat from the plug to the cooling jacket of the cylinder.

The invention is fully described in the following specification and is illustrated in the accompanying drawings, in which,—

Figure 1 is a fragmentary sectional view of an engine cylinder with a spark plug mounted in an opening therein and partially in section, and illustrating one form of the invention, and Fig. 2 is a similar view with the spark plug partly broken away and illustrating a ground fit instead of a threaded engagement between the large portion of the spark plug shell and the cylinder wall.

Referring to the drawings, 1 designates the cylinder wall of an internal combustion engine having the circulating space 2 for water or other cooling fluid and having the spark plug receiving opening 3 therein.

The spark plug 4 has its shell 5 provided at its inner end with the customary thread 6 for threading into the cylinder wall opening 3, such threading taking place, in the present instance, at the inner end of the opening. At the rear of the threads 6 the portion of the shell which enters the cylinder opening 3 has the enlargement 7 for fitting into the enlarged outer end portion of the cylinder opening 3. The enlargement 7 of the spark plug shell forms a shoulder 8 adapted to seat, through an interposed gasket 9, on a shoulder 10 formed in the cylinder opening by reducing the inner end portion thereof to receive the small or reduced inner end portion of the shell. The enlarged portion 7 of the shell is the part thereof which receives the enlarged shoulder portion 11 of the insulator core 12 and which forms a seat 13 at its inner lower end for the insulator enlargement, a gasket 14 being disposed therebetween.

The enlarged portion 7 of the shell has intimate contact with the wall of the cylinder opening either by threading as shown at 15 in Fig. 1 or by providing a close or ground fit as shown at 16 in Fig. 2 between the same. In both cases the intimate points of contact of both the small inner end portion of the shell and the enlargement 7 thereof with the wall of the cylinder opening are opposite the fluid circulating space 2 of the cylinder, thereby facilitating the radiation of heat from the shell into the cooling fluid of the cylinder.

With the spark plugs now in use, so far as I am aware, a single gasket or seating point between the shell and cylinder open-

ing is provided and the portion of the spark plug shell without such seating point is not in intimate contact with the cylinder, so that it is necessary for the heat, in passing from the inner or firing end of the insulator, to take a long course, approximately as indicated by the arrow line *a*, which is through or in close proximity to the highly heated inner end portion of the shell, so that the passage of heat therethrough from the core is found to be very reluctant. By providing a point of intimate contact between the cylinder opening and shell, which point is opposite both the enlarged portion of the insulator and the cooling space of the cylinder and which is disposed without the highly heated inner end porton of the shell, the heat in passing from the firing end of the insulator takes a shorter and more direct course to the cooling fluid of the cylinder, as indicated by the arrow line *b*. The advantage of having the inner or small end portion of the shell in intimate contact with the cylinder opening at the inner side of the gasket 9 is to provide a direct path for the passage of the heat from the exposed inner end portion of the shell to the cooling fluid so that the heat from such highly heated portion of the shell will not pass up the shell to the point where the radiating heat of the insulator passes therethrough and thereby interfere with the dissipation of the heat from the insulator to the cooling fluid. In other words, it is found very advantageous in practice to provide a separate path of radiation of heat from the inner highly heated end portion of the spark plug shell to the cooling fluid from the path of radiation of the heat from the insulator to such fluid.

It is also found very advantageous in practice to provide two longitudinally spaced gasket seats for the shell and cylinder so that the shouldered seating of the shell against the cylinder can be effected in adjacent relation to the inner end of the shell, or in remote relation thereto, or at both points to take care of various heat conditions arising from different uses to which the engines carrying the spark plugs are subjected. For instance, it is found that if the engine is to be used for high speed racing purposes where a high heat is generated in the firing end of the plug, the best results are obtained by providing both the inner and the outer shouldered seating contact between the spark plug shell and cylinder opening as the heat dissipation from the firing end of the insulator through both said shouldered seats is sufficiently fast to prevent preignition and at the same time leaves the inner exposed end portion of the insulator sufficiently hot to prevent fouling by the accumulation of oily or carbonaceous deposits. This is found to be true even if the intimate contact between the enlarged portion 7 of the shell and the cylinder wall is omitted, although it is found in some cases that better results are obtained by using both. If the engine is used under conditions where the heat generated is comparatively low, the outer or more remote seating contact of the shell against the cylinder is alone employed, thereby preventing such a rapid dissipation of the heat from the spark plug to the cylinder wall and at the same time permitting the inner end of the insulator to remain sufficiently hot as to prevent fouling. Such a use is present when a racing car is used for ordinary road work, as for instance, in driving it to and from the track or to and from the loading platform. If, however, the car is being used under conditions wherein a medium, as distinguished from either a high or a low heat condition, is present, such for instance, as in warming up preparatory to racing, then the inner shouldered point of seating contact of the shell with the cylinder is alone employed.

The inner shouldered point of contact of the shell with the cylinder is taken care of through the gasket 9, and the outer shouldered point of contact of the shell with the cylinder is taken care of by providing an outer shoulder 17 on the shell adapted to seat through an interposed gasket 18, in the present instance, on the outer marginal end portion of the cylinder opening wall. If the spark plug is to be subjected to high heat conditions both the outer gasket 18 and inner gasket 9 are used so that seating takes place between both shoulders 8 and 17 and the cylinder wall. If the outer gasket 18 alone is desired to be used, the inner gasket 9 is removed to prevent seating between the shoulders 8 and 10, and if the inner gasket 9 alone is desired to be used the outer gasket 18 is removed. It will be understood that the gaskets may be used either with or without the intimate contacting of the enlarged portion 7 of the shell with the cylinder wall, and that in some cases where very extreme heat conditions are encountered it is preferable to employ such intimate point of connection between the side of the shell and the wall of the cylinder opening in addition to using the point of connection through the gasket 9.

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 combination a cylinder having a spark plug receiving opening therein with two longitudinally spaced gasket seats, and a spark plug for mounting in said opening

having two seats complemental to the cylinder opening seats and either or both adapted to have gasket seating contact with the corresponding seat of the opening.

2. A spark plug having two longitudinally spaced side cylinder wall contacting portions for heat dissipating purposes, and having two gasket seats for end thrust seating engagement with the cylinder wall through interposed gaskets, one seat being located between and the other without said contacting portions, said seats being capable of alternate or conjoint use to cooperate with the side contacts to dissipate heat to an associated cylinder as the heat conditions may require.

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

OTTO C. ROHDE.