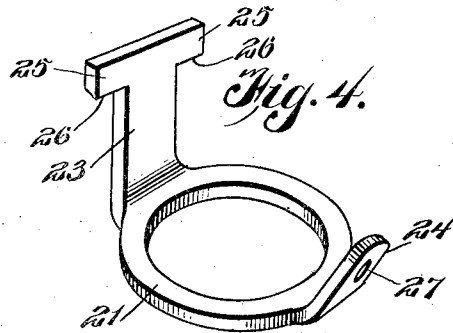
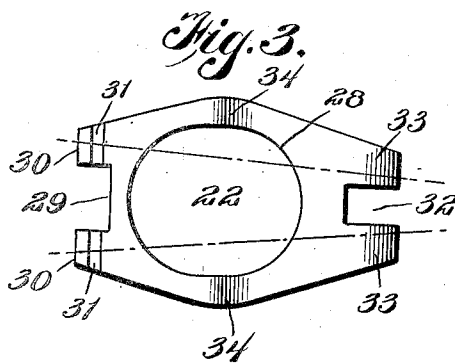
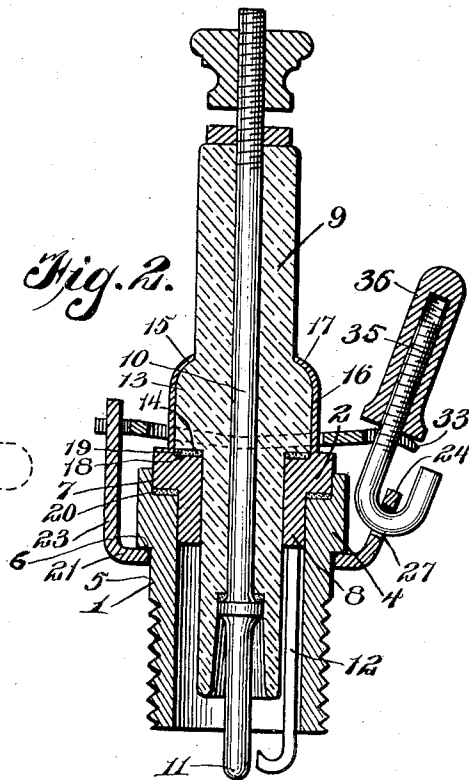
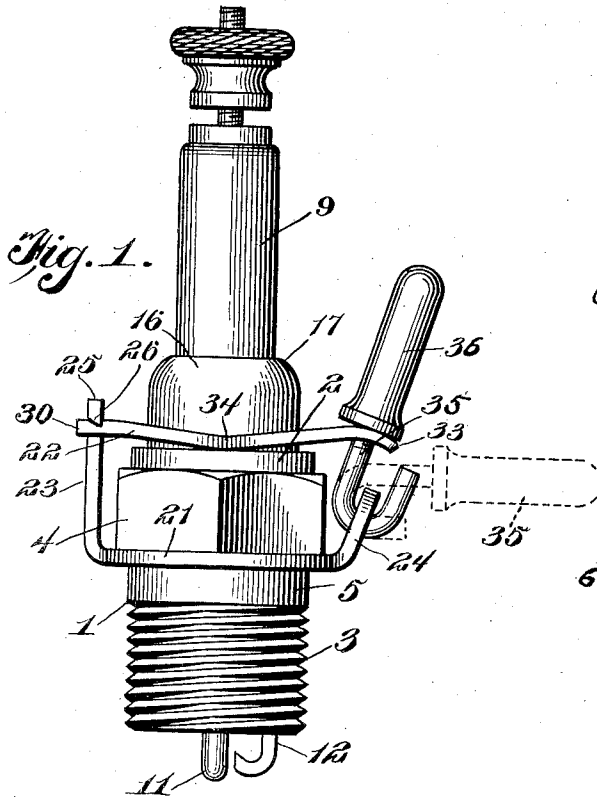


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SPARK PLUG.
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SPARK-PLUG.

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To all whom it may concern:

Be it known that I, WILFRED B. GODDARD, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Spark-Plugs, of which the following is a specification.

This invention relates to spark plugs for internal combustion engines, and one of its objects is to provide a construction by which the central core and electrodes may be readily separated for cleaning and reassembled without the use of tools, the construction also being such that, when the core is removed, both the adjusted electrodes, as well as the surfaces of the porcelain core which are subject to accumulations of soot and carbon, will be exposed, intact and in adjustment, ready to be cleaned and reassembled.

A further object of the invention is to provide a fastening means for holding the parts assembled, that is adapted to connect the parts securely against any possibility of casual displacement, while permitting of their convenient disconnection when desired, and, further, that is adjustable to allow for any thickness of packing to be set between the core and body and also to take care of the necessary wear from use as well as the irregularity of interchangeable parts which may be renewed from time to time.

A still further object is to provide a means whereby the fastening or locking device may be turned into the most convenient operating position after the body of the plug has been properly secured in the motor, and to provide a plug in which there are no ground joints or fittings liable to render the use of interchangeable parts impracticable, and which is adapted for the use of interchangeable parts in a practical, reliable and efficient manner.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a side elevation of a spark

plug embodying my invention, showing in dotted lines the releasing position of the latch.

Fig. 2 is a vertical section through the plug.

Fig. 3 is a top plan view of the movable clamping member of the fastening means.

Fig. 4 is a perspective view of the relatively stationary member of the fastening means.

In the practical embodiment of my invention I provide a spark plug comprising a casing consisting of a socket member 1 and a bushing or sleeve member 2. The socket member 1 is threaded at its inner end, as shown at 3, for insertion into the plug receiving opening in an engine cylinder, and is provided at its outer end with an angular head or enlargement 4 adapted for the application of a wrench or other suitable tool used in threading the socket member into and out of the cylinder opening. The socket member 1 is provided with a smooth-surfaced cylindrical portion 5 between the threaded surface 3 and the base or inner edge of the head 4; the said base or inner edge of the head 4 forming an annular shoulder 6.

The head portion 4 of the socket member 1 is formed at its outer end with an annular recess 7 to receive the body portion of the bushing or sleeve member 2, which bushing or sleeve member is provided with a reduced portion 8 at its inner end which fits within the bore of the socket member 1, whereby the bushing or sleeve member is detachably fitted within the socket member.

The bushing or sleeve member 2 is bored for the passage of the inner end of the porcelain or other insulating core 9 through which extends the central electrode 10, having its inner end or terminal 11 arranged in spaced relation to the terminal of the grounded electrode 12, which is directly fixed to and carried by the reduced portion 8 of the bushing or sleeve member 2.

The core 9 is provided with an intermediate expanded portion 13 forming inner and outer shoulders 14 and 15, and arranged

to embrace such expanded portion of the core is a retaining collar 16 extending from the outer end of the bushing or sleeve member 2, said collar having its outer edge turned to form a flange 17 engaging the shoulder 15. The inner shoulder 14 of the plug is arranged adjacent to and in line with a countersink or recess 18 formed in the body of the bushing or sleeve 2, which countersink or recess receives a gasket 19 of copper, brass or other suitable material, and which tightly seals the joint between the core and member 2 against the escape of the compressed gases. A similar gasket or packing ring 20 is disposed between the underside of the body portion of the member 2 and the bottom wall of the recess 7 of the member 1, to tightly seal the joint between said members when the bushing or sleeve member is fitted in position. It will thus be seen that the core and both electrodes, which are supported in properly adjusted position with relation to each other, are carried by the bushing or sleeve member 2 and are detachably connected to the socket member 1, whereby the bushing or sleeve member, core and electrodes form a unit adapted to be fitted in and removed from the socket member in a ready and convenient manner. It will therefore be evident that upon the removal of the bushing or sleeve member 2 the core and the two electrodes will be exposed so that the surfaces thereof on which carbon or soot has been deposited may be readily and conveniently cleaned, the points or terminals of the electrodes properly set or adjusted with relation to each other when occasion requires, and any slight repairs made to maintain the working parts of the spark core in proper operating condition.

For the purpose of holding the electrode carrying section of the plug in detachable connection with the socket member 1, a fastening means is provided comprising clamping members 21 and 22. The clamping member 21 is in the form of a ring or annular body which snugly but loosely embraces the smooth-surfaced portion 5 of the socket member 1, between the inner shoulder of the head or socket member and the wall of the cylinder to which the plug is applied, and which is provided at diametrically opposite sides, respectively, with an outwardly extending arm 23 and an outwardly extending ear 24. The arm 23 extends outwardly approximately at right angles to the ring 21 and is formed with a T-head, providing terminal laterally extending retaining lugs 25 having their inner surfaces 26 beveled to form retaining edges, while the ear 24 is formed with an opening 27 for a purpose hereinafter described.

The clamping member 22 is in the form

of a clamping lever, said member being formed with an opening 28, whereby it is adapted to loosely embrace the expanded portion of the core and the collar 16 and to bear upon the shoulder at the base of the collar formed by the outer surface of the body of the bushing member 2. The member 22 is bifurcated at one end to form a central recess 29 and lateral pivot ears or projections 30, said ears or projections 30 being provided with transverse grooves or notches 31 to receive the lower edges 26 of the lugs 25 of the clamping member 21. The edges 26 are beveled, as described, and the rear walls of the grooves 31 are similarly shaped to adapt the lever 22 to have pivotal motion on the lugs 25, and to permit the said bifurcated end of the lever 22 to be readily engaged with and disengaged from the lugs 25. The opposite end of the lever 22 is also bifurcated to provide an opening or recess 32 and lugs 33 for cooperation with a fastening or locking member, hereinafter described. As shown, the lever 22 is approximately V-shaped in longitudinal section, having its end portions extending outwardly in opposite directions at a diverging angle, the said ends projecting at the transverse center of the lever so as to provide V-shaped bearing portions 34 adapting the lever to rock or tilt upon the outer surfaces of the bushing or sleeve member 2.

The clamping members are adapted to be fastened or locked in clamping position by means of a fastening or locking device comprising a bolt 35 threaded at one end to receive a nut 36 and having its opposite end hooked for pivotal engagement with the opening 27 in the ear 24. The bolt is thus pivotally mounted so that it may be swung into and out of engagement with the recess 32, to adapt the nut 36 to be engaged with the lugs 33 to clamp the clamping members in applied position. As shown, the base of the nut 36 is made comparatively broad to bear firmly on the surfaces of the lugs 33, which are longitudinally curved for a cam binding action, whereby the nut and bolt when in locking position will be held securely against liability of casual displacement from jolts or vibrations.

In the process of assembling the parts of the spark plug, assuming the socket member 1 to have been fitted within the engine cylinder and the clamping member 21 to have been placed in position, the bushing or sleeve member 2 and the core or electrodes carried thereby are applied by inserting the member 2 within the outer end of the member 1, as clearly illustrated in Fig. 2. The lever member 21 is then placed in position and its lugs 30 fitted into engagement with the arm 23 and lugs 25, after which the swing bolt 35 is swung up-

wardly into the recess 32 and the nut 36 tightened to engage the lugs 33, whereby the electrode carrying member of the spark plug will be applied to the supporting member 1 thereof in a secure manner. The nut 36 thus being initially set it is simply necessary in all subsequent clamping actions to swing the bolt into engaging position, as the nut will ride upon and bind against the cam faces of the lugs 33, the lugs yielding and being placed under spring tension for a secure binding pressure against the nut. Also it will be evident that whenever it is desired to disconnect the core and electrodes for the purpose of cleaning, adjusting or repairing the same, it is simply necessary to swing the bolt 35 outwardly with sufficient force (the spring lugs yielding in this action) to free the bolt, and then to tilt the lever 22 out of engagement with the lugs 25, whereupon the core and electrodes may be readily and conveniently removed with the member 2, exposing the surfaces thereof for the removal of carbon or other deposits, or to conveniently permit of adjustments or repairs being made. An important advantage incident to my construction in securing ready assembly and disassembly, without liability of loss or displacement of any of the parts of the plug, is that the plug structure *per se* is reduced substantially to two main parts, to wit, the socket or supporting member 1, and the bushing or electrode carrying member 2, thus securing maximum simplicity of construction as well as economy of manufacture, with less liability of damage or injury to any of the working parts in assembling or disassembling the same.

It will be evident that when the nut 36 is adjusted to draw the clamping devices in engagement with the sections of the plug the end of the lever engaging the arm 23 will pull outward on said arm, while the bolt 35 will pull outward on the lug 24, thus drawing the clamping member 21 into engagement with the outer shoulder of the bushing 2, thereby firmly clamping the elements together. In the clamping action described, it will be understood that the clamping member 22 will be put under stress or strain, and that under such stress or strain it has a tendency to straighten out to a flat condition and to tilt upon the portions 34, as a result of which a firm binding action is obtained and at the same time the clamping member 22 is adapted to adjust itself to any irregularities which may occur in the seating of the bushing 2, due to the use of different thicknesses or kinds of gaskets 20, or to any slight malformation of the parts as a result of warping or other causes. By this means a tight clamping and sealing connection between the members 1 and 2

will be secured, notwithstanding any variations of the kind noted which may exist, and the clamping device is also adjustable to compensate for wear, slight damage to parts, or slight irregularities which may exist in the use of interchangeable parts, thus providing a spark plug in which interchangeable parts may be employed in a convenient and practical manner. In applying and removing the lever 22 it is apparent that such lever may be slipped into and out of position on and off the outer end of the core 9. As set forth, the clamping members 21 and 22 are loosely mounted on the socket 1 and bushing 2, so that the clamping members may be turned or revolved upon the spark plug to dispose the fastening or locking device in any convenient position for use, and as circumstances may require in the application of the spark plug to different motors.

It will be observed that the socket 1 forms a body housing for the electrode carrying member 2, which member 2 consists of a metallic band embracing and permanently fixed to the core 9, which core and band respectively carry the central electrode 10 and the grounded electrode 12, making the spark plug as a whole, with the exception of the clamping means, a two-part device, insuring simplicity of construction, economy of manufacture, and ease of operation in assembling and disassembling the parts.

Having thus fully described my invention, I claim:

1. A spark plug comprising a socket section, a bushing section detachably connected therewith and carrying an insulated core and electrodes, a clamping member independent of and engaging the socket section, a cooperating clamping member detachably connected with the first named clamping member and engaging the bushing section, and a fastening detachably coupling said clamping members.

2. A spark plug comprising a socket member, a bushing member detachably connected therewith and carrying an insulated core and electrodes applicable and removable therewith as a unit, a clamping member independent of and engaging the socket member, a clamping lever engaging the bushing member and detachably connected at one end with the first named clamping member, and a fastening detachably coupling the opposite end of the second named clamping member with the first named clamping member for drawing said clamping members together to hold said socket and bushing sections connected.

3. A spark plug comprising a socket member, a bushing member detachably fitted therein, an insulated core carried by the bushing member, electrodes carried by the

bushing member and core, said bushing, core and electrodes being permanently united for application and removal from the socket member as a unit, a clamping member engaging the socket member; a co-acting clamping member engaging the bushing and detachably and pivotally connected at one end with the first named clamping member, and a fastening means detachably connecting the opposite ends of said clamping members and operable to exert a variable lever pressure upon the second named clamping member.

4. A spark plug comprising a socket member, a bushing member detachably fitted in the socket member, a core and electrodes carried by the bushing member, clamping elements engaging the socket and bushing members for drawing the same together, said clamping elements being rotatable for adjustment on said parts, and a fastening for connecting and drawing said clamping elements together.

5. A spark plug comprising a socket member, a bushing member detachably fitted within the socket member and carrying a core and electrodes, a clamping element engaging and rotatable on the socket member, a second clamping element engaging and rotatable on the bushing member, and a fastening for engaging and drawing said elements together.

6. A spark plug comprising a socket member, a bushing member detachably fitted within the socket member, a core and electrodes carried by the bushing member, a clamping element embracing the socket member and having a T-shaped head at one side forming retaining lugs and a perforated ear at its opposite side, a second clamping member tiltably engaging the bushing member and having a bifurcated portion at one end forming a recess and lugs detachably and pivotally engaging said T-shaped head, and a fastening engaging the perforated ear of the first named clamping member and adjustably engaging with the opposite end of the second named clamping member for connecting and drawing said clamping member together.

7. A spark plug comprising a socket member, a bushing member detachably fitted within the socket member and carrying a core and insulated electrodes, said bushing, core and electrodes being permanently connected and forming a unit applicable to and removable from the socket member, a clamping member rotatably mounted upon the socket member, a second clamping member rotatably mounted upon the bushing member and detachably and pivotally connected at one end with one end of the first named clamping member, and a fastening means detachably connecting the opposite

ends of said clamping members and operable for exerting variable clamping pressures thereon.

8. A spark plug comprising a metal housing, an insulated core, a central electrode carried by the core, a metal ring permanently fastened to and embracing the core and carrying a grounded electrode, said ring being detachably fitted within the metal housing, cooperating clamping elements upon the housing and ring for detachably coupling the same, and means for connecting and exerting a variable lever pressure upon said clamping elements.

9. A spark plug comprising a metal housing, a removable insulated core carrying a central electrode, a metal band permanently embracing the core and carrying a grounded electrode, said band being detachably fitted within the metal housing, a clamping element rotatable upon the housing, a cooperating clamping element rotatable upon the band and removable therefrom, and detachably connected with the first named clamping element, and means for detachably connecting and drawing said clamping elements together.

10. A spark plug comprising a casing consisting of only two essential parts, to wit, a socket member, and a single piece core and electrode carrying member, said member non-detachably embracing the core, co-acting insulated electrodes carried by the electrode carrying member, and a fastening means for holding said members detachably assembled.

11. A spark plug comprising a socket member having a shoulder, a bushing detachably fitted within the socket member and having a shoulder, a core permanently embraced by and extending through the bushing, an electrode carried by the core, an electrode carried by the bushing, said bushing, core and electrodes constituting a unit applicable to and removable from the socket member, a clamping member bearing against the shoulder of the socket member and rotatably adjusted upon said socket member, a second clamping member detachably and pivotally engaging the first named clamping member and rotatably engaging the bushing, and means detachably connecting said clamping members and adjusting the same to hold the said socket member and electrode unit assembled.

12. In a spark plug, a socket member, a core fitted in the said socket member, a clamp comprising cooperating clamping members and a fastening therefor for holding said parts detachably united, said elements of the clamp being rotatable as a unit upon the plug to dispose the fastening at any point about the circumference of the plug.

13. In combination, a plug comprising a core formed of insulating material, an enlargement upon said core intermediate the ends thereof and extending entirely around the same, the said enlargement at one end forming a rounded shoulder and an angular shoulder at its opposite end, a sleeve inclosing said core and engaged at one end with said angular shoulder, a retaining collar formed integral with said sleeve and shrunk upon said enlargement, the end of said collar being shaped round and closely fitted upon said rounded shoulder, a socket member to receive said sleeve, cooperating shoulders on said socket member and sleeve, electrodes carried by said sleeve and core, and means for holding said sleeve in said socket member.

In testimony whereof I affix by signature.
WILFRED B. GODDARD.