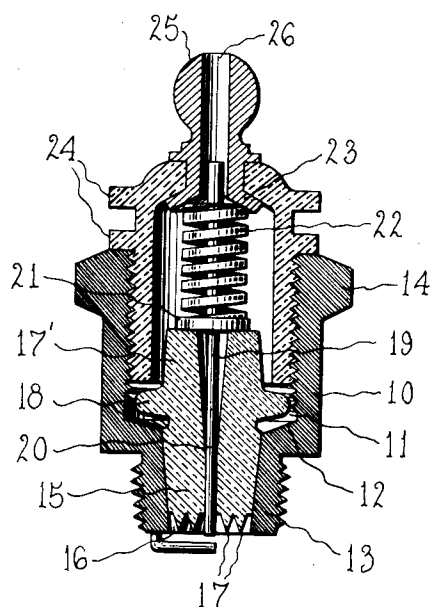


A. SCHMIDT.
SPARK PLUG.
APPLICATION FILED NOV. 8, 1918.

1,352,089.

Patented Sept. 7, 1920.



WITNESS:

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SPARK-PLUG.

1,352,089.

Specification of Letters Patent.

Patented Sept. 7, 1920.

Application filed November 8, 1918. Serial No. 261,702.

To all whom it may concern:

Be it known that I, ALBERT SCHMIDT, a citizen of the United States, and resident of Flint, Genesee county, State of Michigan, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a specification.

The invention relates to improvements in spark plugs as described in the present specification and illustrated in the accompanying drawings forming part of the same.

The objects of the invention are to devise a plug which shall be strong and durable and of simple construction, and wherein the electrode and insulator may be readily removed for inspection and cleaning, and which shall have the insulator of the strongest form and proportions and protected from concussion or fracture on all sides.

Another object of the invention is to devise a spark plug of the shortest possible length over-all.

Another object of the invention is to devise a spark plug which will have all parts thereof readily renewable or replaceable by other interchangeable parts.

Another object of the invention is to devise a spark plug in which the several interior parts thereof may be removed from the shell while the shell is positioned in a motor cylinder without removing the shell proper.

Another object of the invention is to devise a spark plug in which the terminal for connecting the wire thereto will be a unitary part of the outer portion of the plug.

Another object of the invention is to devise a spark plug of minimum weight.

Another object of the invention is to devise a plug in which the insulating element contained within the shell will be resiliently held to permit of a limited longitudinal movement in respect to the plug, and thereby accommodate any differences in diametrical proportions due to expansion and contraction of the associated parts.

Another important object of the invention is to secure the insulating member within the shell of the plug without the customary

clamping or construction wherein pressure is brought upon the insulator, thus minimizing the likelihood of fracture and coincidentally effecting a gas-tight seal between the insulator and the shell.

Other objects will clearly appear from the following description taken in connection with the accompanying drawing, which shows a vertical sectional view of the plug.

Referring to the drawing, 10 is the hollow metallic shell of the plug having the enlarged or chambered portion 11 at its upper end and an internal flange 12 between said enlarged portion and a reduced portion 13 at the lower end of the casing. The chambered portion 11, as also the reduced lower portion 13, has the walls thereof made comparatively thin, the necessary thickness of metal being greatly reduced as excessive rigidity is not required due to the peculiar arrangement and method of supporting of the insulator therein, as hereinafter described. The shell is formed as customary to receive a wrench as at 14. The enlarged chamber 11 of the shell is threaded throughout the interior periphery thereof and the reduced lower portion 13 is threaded on the outer periphery thereof to be threaded into a corresponding spark plug hole as customary.

The interior bore of the reduced lower portion of the shell is tapered toward the bottom thereof and ground to a finished surface to receive the correspondingly tapered insulator member 15 having the extreme lower end thereof reduced as at 16 to stand clear of the interior bore of the shell, and concentrically ridged on the end as at 17, said ridges providing a maximum surface distance from the center of the insulator member to the periphery thereof.

The correspondingly tapered portion 15 of the insulator member fits the corresponding interior taper of the reduced lower portion of the shell as hereinbefore mentioned, and said insulator extends above the reduced lower portion of the shell into the interior of the enlarged upper chamber as at 17', a circumferential flange 18 being arranged about said upwardly extending por-

tion whereby the surface distance from the top of the tapered surface of the insulator to the top proper of said insulator is of a maximum distance for the length over-all.

5 The insulator 15 has a central bore 19 tapered slightly from the top thereof to the bottom, said bore receiving the electrode 20, the reduced lower end of which extends the proper distance through the center bore 19
10 of the insulator to provide a protruding spark point end. The electrode 20 has a flange 21 intermediate of the length thereof, said flange having a smoothly finished under surface resting upon and forming a
15 seal joint with the correspondingly finished upper end of the insulator. It will be understood that a gasket of any suitable kind may be employed at this joint if desired.

A spiral spring 22 of substantial form is
20 fitted over the upper end of the electrode 20 and pressed downwardly by a dome member 23 in order to keep the electrode and insulator properly seated within the shell.

The dome member 23 is threaded on the
25 outer periphery thereof and fits into the corresponding thread on the interior of the enlarged upper chamber of the shell, said dome member further having the peripheral
30 flanges 24 to increase the surface distance thereof. A terminal 25 is secured in the top of the dome member 23, preferably by molding the dome thereabout, and has the central orifice 26 therethrough into which the
35 upper end of the electrode may enter and the lower end of the terminal 25 is conical in form and contacts with the upper end of the spiral spring 22, through which the upper end of the electrode extends and which
40 upper end serves to properly position and retain the spiral spring in place as it is compressed by screwing the dome into the upper part of the shell.

The terminal 25 is obviously made of metal, while the dome member 23 is made
45 from an insulating material such, for example, as from a phenol condensation product.

The spark plug as hereinbefore described has many advantages due to its peculiar construction and arrangement of parts, and such
50 advantages are of benefit both in manufacture and use.

From a manufacturing standpoint, comparatively little material is needed, not only
55 for the steel shell but also for the insulator, and the electrode and dome. Furthermore, all parts have a minimum amount of work thereon and in general are inexpensive and the completed plug is of minimum weight.
60 The surfaces where finished for sealing purposes are resiliently seated, whereby proper sealing contact of the parts is readily obtained without severe clamping strains.

In service it is very important that the
65 respective parts as assembled shall have a

limited freedom of movement to accommodate the differences in expansion and contraction as they are heated and cooled, that is, the shell will expand and contract with
70 a coefficient different to that of the insulator, and the parts where their surfaces are adjoining one another must therefore move one in relation to the other. This is provided for by the tapered ground joint which
75 will permit of slight longitudinal movement one in relation to the other, especially when the parts are held by the coiled spring in the resilient manner described. The same remarks apply with reference to the center
80 electrode and the insulator as the seal occurs at the upper end of the insulator and the electrode where it extends therethrough is free to expand and contract in relation to the insulator.

The insulator arranged as it is and resiliently held in position in the lower end
85 of the shell is entirely protected from the effects of any vibration or jars which might occur at the outer end of the plug, as at the
90 terminal.

The several parts of the plug are particularly formed as hereinbefore described to
95 give a maximum surface distance for the over-all length at all places where the high-tension current would likely short-circuit or jump at places other than the proper
100 sparking point.

The terminal of the plug is an integral part with the dome and cannot become
105 loosened or lost.

It will of course be understood that the arrangement of parts in or about the proportions shown are practical, and actual
110 tests have shown that a spring such as that described and illustrated is sufficiently strong to hold the central electrode and insulator in their respective positions against the force of compression or explosion in a
115 motor cylinder as such compression or explosion pressure is against a comparatively small area when the exposed end of the insulator is considered, and in no case is it
120 sufficient to move the insulator or central electrode from its seat when held by the spring as shown and described.

It will be obvious to those skilled in the art that various changes and modifications
125 may be made in the invention without departing from the spirit and scope thereof, and I do not wish to be confined to the form as shown and described except as pointed out in the accompanying claims.

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

1. A spark plug comprising a shell having a center bore, a central electrode, an insulator surrounding said electrode and fitting within the inner bore of said shell, and a spring surrounding said electrode and act-
135

ing upon said insulator for retaining said insulator in place within said shell.

2. A spark plug comprising a shell having a center bore tapered toward the lower end thereof, a central electrode, an insulator supporting said electrode and fitting the inner bore of said shell, and means located within said shell for resiliently retaining said insulator in said shell.

3. A spark plug comprising a shell having a center bore tapered toward the lower end thereof, a central electrode, an insulator supporting said electrode and fitting the inner bore of said shell, and a single spring for resiliently retaining both said insulator and said electrode in said shell.

4. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode, and a spring located within the upper chamber of said shell and acting upon said insulator to hold it in place in the lower insulator portion of said shell.

5. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode and having a lateral flange extending therefrom and located within said upper chamber and out of contact with the interior thereof, and a dome member secured on said shell acting to retain said insulator in place within the lower insulator portion of said shell.

6. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode and having a lateral flange extending therefrom in said upper chamber, a dome member secured on said shell, and means for resiliently retaining said insulator therein.

7. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode and having a lateral flange extending therefrom in said upper chamber, a dome member secured on said shell, and means coacting with said dome for resiliently retaining said insulator therein.

8. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode and having a lateral flange extending therefrom in said upper chamber, and a dome member of dielectric material having laterally extending flanges secured on said shell and retaining said insulator therein.

9. A spark plug comprising a shell having an upper chamber portion and a lower insulator portion, a central electrode, an insulator fitting the lower portion of said shell and supporting said electrode and having a lateral flange extending therefrom in said upper chamber, a dome member of dielectric material having laterally extending flanges secured on said shell and which dome acts to retain said insulator in place in said shell, and a terminal member carried by said dome and electrically connected with said electrode.

10. A spark plug comprising a relatively thin shell member having an upper chamber and a reduced tapered lower bore, an insulator having the lower part thereof correspondingly formed and fitting the bore of said shell and extending upwardly into said shell chamber and having a central orifice, an electrode having a flange intermediate the length thereof and the lower end fitting said insulator orifice, a dome member secured on said shell, and a coil spring fitted between said dome member and said electrode flange.

11. A spark plug comprising a relatively thin shell member having an upper chamber and a reduced tapered lower bore, an insulator having the lower part thereof correspondingly formed and fitting the bore of said shell and extending upwardly into said shell chamber and having a lateral flange thereabout and a central orifice, an electrode having a flange intermediate the length thereof and the lower end fitting said insulator orifice, a dome member secured on said shell, and a coil spring fitted between said dome member and said electrode flange.

12. A spark plug comprising a relatively thin shell member having an upper chamber and a reduced tapered lower bore, an insulator having the lower part thereof correspondingly formed and fitting the bore of said shell and extending upwardly into said shell chamber and having a central orifice, an electrode having a flange intermediate the length thereof and the lower end fitting said insulator orifice, a dome member threaded into the upper end of said shell about said insulator, and resilient means for retaining said insulator in said shell.

13. A spark plug comprising a relatively thin shell member having an upper chamber and a reduced tapered lower bore, an insulator having the lower part thereof correspondingly formed and fitting the bore of said shell and extending upwardly into said shell chamber and having a central orifice, an electrode having a flange intermediate the length thereof and the lower end fitting said insulator orifice, a dome member secured on said shell, a terminal member secured in said dome and having a central orifice into which the upper end of said elec-

trode extends, and a spiral spring fitting said electrode between the flange thereof and said terminal member.

14. A spark plug comprising a shell, an
5 insulator nested in said shell, an electrode
nested in said insulator, and a dome mem-
ber carried by said shell, and resilient means

for retaining intermediate said dome and
said insulator and electrode and through
which said dome acts to hold both said in- 10
sulator and electrode in assembled relation
with said shell.

In testimony whereof I affix my signature.

ALBERT SCHMIDT.