

C. H. BRASELTON.
 SPARK PLUG AND PROCESS FOR MAKING THE SAME.
 APPLICATION FILED MAR. 5, 1915.

1,311,261.

Patented July 29, 1919.

3 SHEETS—SHEET 1.

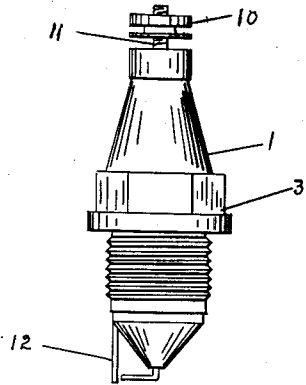


FIG. 1.

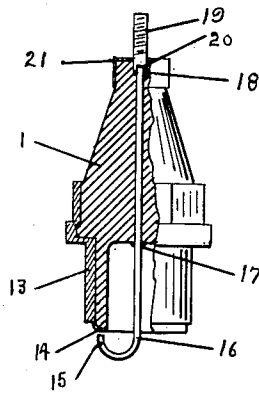


FIG. 3.

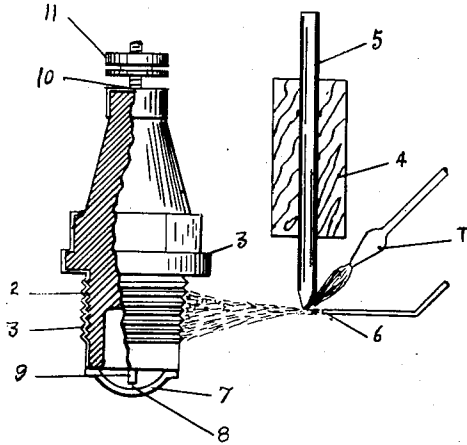


FIG. 2.

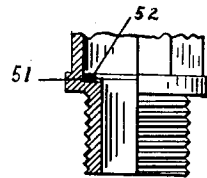


FIG. 16.

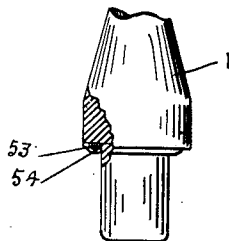


FIG. 17.

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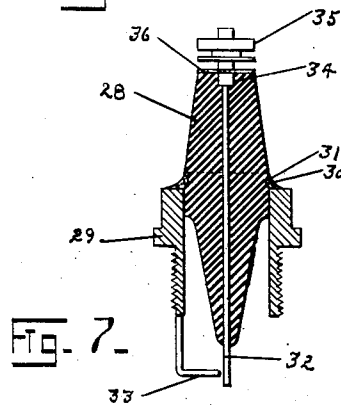
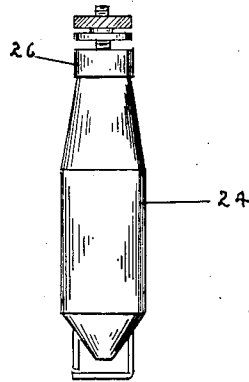
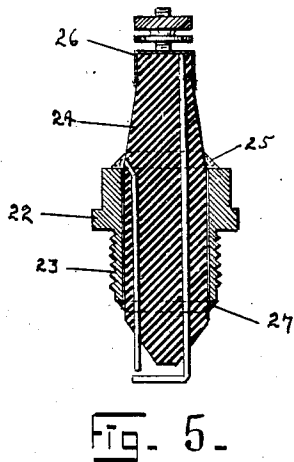
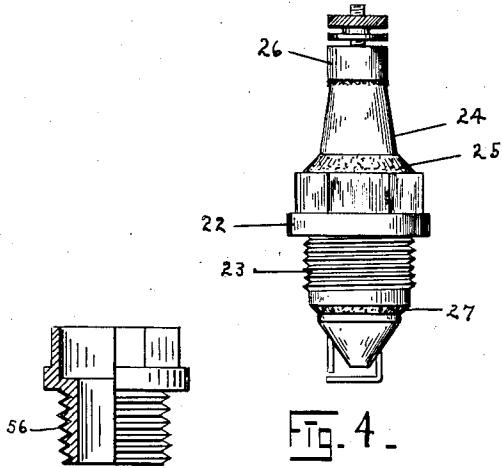
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

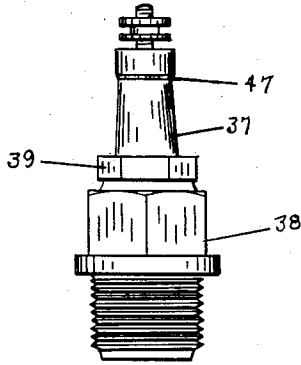


Fig. 8.

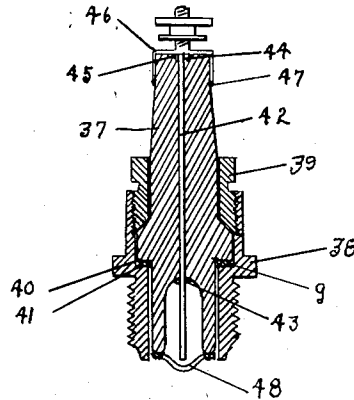


Fig. 9.

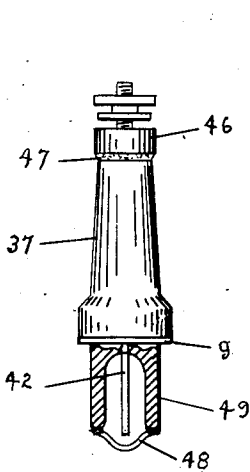


Fig. 10.

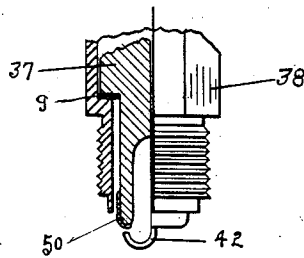


Fig. 15.

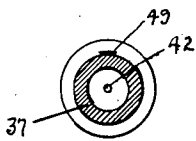


Fig. 12.

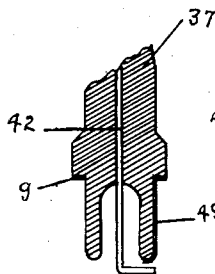


Fig. 13.

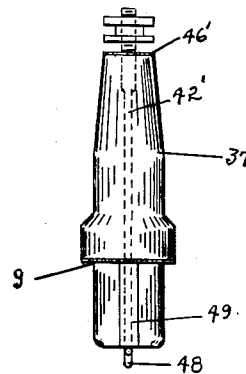


Fig. 11.

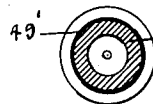


Fig. 14.

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UNITED STATES PATENT OFFICE.

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SPARK-PLUG AND PROCESS FOR MAKING THE SAME.

1,311,261.

Specification of Letters Patent.

Patented July 29, 1919.

Application filed March 5, 1915. Serial No. 12,359.

To all whom it may concern:

Be it known that I, CHESTER H. BRASELTON, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Spark-Plugs and Processes for Making the Same, of which I declare the following to be a full, clear, and exact description.

This invention relates to spark plugs and the processes for making the same. The inventions herein disclosed are specifically applied to spark plugs but some are capable of a broader application.

The spark plugs in this application are based upon an entirely new idea in spark plugs and processes of making the same. Being basic in this respect the disclosure in this application extends to various points of advantage in the construction of spark plugs and in the processes of manufacturing them. These include a novel gasket construction and process of making it, which in its broadest aspect is capable of application to other articles other than spark plugs; a novel process and construction in regard to securing the central electrode of a spark plug in place in the insulator in a gas tight manner; a novel construction and process as regards fastening a terminal cap on the upper end of the insulator in place on the same or in fact, if desired, eliminating the separate cap completely; a novel construction and process in regard to mounting a second electrode on the insulator so that when the insulator is assembled in place in the shell an electrical connection will exist between the second electrode on the insulator so that when the insulator is assembled in place in the shell an electrical connection will exist between the second electrode and the engine casing; a construction and process for providing an insulator with one or more electrodes with a metallic shell provided with threads for securing it into an engine cylinder; and a novel construction and process for practically providing a brittle substance with durable threads.

The above objects are accomplished through the employment of an idea of spraying material onto the surface by liquefying the material and breaking up the liquid into infinitesimal portions and depositing such portions upon the surface to be coated by blowing the liquid material by a

blast of gas under pressure against the surface to be coated to which it adheres so that a film of the material of any desired thickness is placed upon the material to be coated.

With the above and other incidental objects in view, my invention consists further in various details of processes and constructions more fully hereinafter described and pointed out in the appended claims.

In the drawings which accompany and form part of this specification;—

Figure 1. is a view of one form of spark plug made in accordance with this invention.

Fig. 2. is a view showing my novel method of making this spark plug.

Fig. 3. is a view of a different form of spark plug which may be made by my process, a metal shell being sprayed upon an insulator of any desired shape, the threads in the exterior of the lower end being cut in the metal after it is sprayed upon the insulator.

Fig. 4. shows a different form of spark plug in which the insulator is attached to a shell through the medium of sprayed material.

Fig. 5. is a vertical section through the plug of Fig. 4.

Fig. 6. is a view of the insulators of Figs. 4 and 5.

Fig. 7. is still another view in which the insulator is attached to the shell through the medium of sprayed material, the insulator being of a different form.

Fig. 8. is a view of a different form of spark plug.

Fig. 9. is a vertical section through the plug of Fig. 8.

Fig. 10. is a view of the insulator of Fig. 9, showing gasket material sprayed upon the seating shoulder of the insulator and conducting material may in the form of a ribbon or completely surrounding the insulator, be sprayed upon the lower end of the insulator. This view also shows an electrode wire sprayed fast to the lower end of the porcelain at its two ends, one end at least being preferably connected with the conducting material leading to the sprayed gasket.

Fig. 11. shows an elevation of the insulator of Fig. 10, at right angles, as it would appear with the conducting material on the lower end of the insulator being in the form of a ribbon.

Fig. 12. is a cross section on the line *a-a* of Fig. 11 looking in the direction of the arrow.

Fig. 13. shows a different form of sparking arrangement in which the center electrode is bent over the lower end of the conducting ribbon to form a spark gap at the side.

Fig. 14. is a cross section of the lower end of the insulator below the shoulder, of a case in which the conducting ribbon completely surrounds the insulator.

Fig. 15. shows the lower end of an insulator with a second electrode, in the form of a ring or band, sprayed thereon.

Fig. 16. shows a manner of attaching a fibrous gasket to the shoulder in the inside of the spark plug shell.

Fig. 17. shows a similar form of fibrous gasket attached to the insulator.

Fig. 18. shows a thread detail which may be used in connection with spark plug shells in which threads cut in harder metal are sprayed with a softer metal so as to obtain a better gas tight threaded connection.

My inventions are based upon the idea of spraying one material with another by heating the material to be sprayed with to liquefy it and then blowing the same into the form of a spray and against the surface to be coated. It is necessary that the substance to be covered be clean and preferably to an extent porous. I find it very easy to spray clean earthenware or glass which has a rough surface, and very well unglazed porcelain ware such as is commonly used in spark plug construction for insulators. The surfaces to be sprayed must of course be free from oil or grease. Such materials as well as metals can be readily sprayed with metal by heating the metal into the form of liquid drops and blowing same in the form of a spray against the clean surface to be sprayed. A coating thick as desired may be thus made on the material being sprayed by continuing the process for the required length of time. In this spraying operation the minute particles of material with which the substance is being coated seem to penetrate into all the tiny pores of the material being coated and to adhere to the same permanently and very firmly so that there is no air or gas passage between the surface sprayed upon and the layer of sprayed material. This operation is not limited to spraying non-metals with metals but one metal may be sprayed with another metal or a metal may be sprayed with a non-metal which may be reduced to a liquid form and blown upon the material to be sprayed. Or a non-metal may be sprayed with another non-metal. The spraying operation may be confined to small areas of a surface to be sprayed by coating or covering the areas exposed that are not desired to be sprayed

upon by removing material which will receive the useless spray. For example any area not supposed to be sprayed adjacent that which is to be sprayed may be protected from the spray by wool to which sprayed metal does not adhere owing probably to the inability to completely free the wool from oil or grease. In spraying or coating spark plug insulators on certain area only I first glaze the areas not to be coated, having the areas to be coated unglazed. Holding the insulator in the spray of material then will result in the unglazed areas being permanently and durably coated while the spraying material will not adhere to the glazed surfaces and is readily removed.

I make use of the just described process in various ways of advantage in the designing and constructing of spark plugs for internal combustion engines so as to improve their service and design, as well as cheapen their cost of manufacture. In Fig. 1, 1 is an insulator adapted for use in spark plugs which may be made of the usual porcelain or any other desired insulating material. This is made with any form of exterior desired and with threads cut in the insulator at the lower end. It was not a very practical proposition to provide, before my invention, insulators suitable for spark plug use with threads on their exterior for screwing into a threaded opening in an engine cylinder because the threads in the brittle insulator, while capable of being cut or molded, will not stand but will be broken and chipped so as to be unserviceable. It was also not very practical heretofore to engage the insulator directly with a wrench for screwing it in place owing to the brittle nature of the insulating material. I find it very practical, however, to do both of these by constructing the insulator with any desired exterior and with threads, by spraying or coating the surface of the insulator liable to be readily broken including the threaded part, with any desired metal, such as copper or brass, so as to form a metal sheath of any desired thickness over the surfaces to be protected. The contour of the threads in the insulating material before being sprayed will be reproduced in the outside surface of the sprayed sheath and very satisfactory results are secured and a very cheap construction as well, by this process. If desired the threaded part may be sprayed with a softer metal such as copper, than the other part, which may be any harder metal in order to provide a better gas tight connection at the threads. In spraying threaded or other areas where relatively accurate thickness should be preserved throughout the periphery, I preferably have the spray being blown upon the surface at a relatively constant speed and then rotate, preferably with a certain deter-

mined speed by machinery, the threaded member to be sprayed so that an even coating will be placed upon the threads or any rotating object throughout the periphery.

5 In Figs. 1 and 2 the metal sheath is indicated by the character 3, this being in the exterior form of a non-circle at the upper end to receive a wrench for use in screwing the plug into place in the threaded opening. 10 This sheath will take the form of the insulator inside if its surfaces are fed equally to the spray in the manner above described. In Fig. 2 the operation of spraying on the threaded insulator is shown. In this view 15 4 is a holding block for a rod 5 of copper or brass or in fact any material with which the insulator is to be sprayed. The lower end of the rod is adapted to be heated so that the material will form in drops at the lower end, 20 by a torch T, such as an oxy-hydrogen torch, adapted to give sufficient heat to melt the rod 5 at its lower end. As the drops are formed at the lower end of rod 5 they are broken up into the form of sprays and blown 25 in tiny particles against the surface to be sprayed by means of a blast of gas, such as nitrogen or air, issuing from the nozzle 6 under pressure with a speed depending upon the gas used and the material with which the object is to be coated. When the spray hits 30 the object to be coated it is driven into the pores thereof or the pores of the layer previously sprayed upon to which the tiny particles strongly adhere and in a way weld to the surface and to the adjacent particles in a firm bond. Continuing the operation increases the thickness of the sheath sprayed.

In Fig. 2 I show an electrode 7 fastened at its ends to the lower end of the insulator and electrically to the lower end of the 40 sprayed sheath 3 by a spraying operation. This electrode passes across the lower end of the insulator so as to form a spark gap 8 between its intermediate portion and the lower end of center electrode 9. The center electrode 9 runs longitudinally through the insulator and electrically connects, through a 45 terminal cap and stud 10, and binding nut 11, to a wire leading to one side of the battery. The other electrode 7 on the lower end of the insulator, through the metallic sheath 3, electrically connects with the engine casing and the ground back to the other side of 50 the battery or magneto. The spark plugs in Figs. 1 and 2 are similar with the exception of the electrode arrangements on the lower end in regard to which Fig. 1 differs from Fig. 2 just described by the substitution of a straight electrode wire 12 for the second 55 electrode instead of the electrode terminal 7 of Fig. 2. In this Fig. 1 the electrode 12 is of course merely a piece of wire attached to the metal sheath 3 of Fig. 1 by spraying.

In Fig. 3 I show a different way of permanently providing threads for insulating ma-

terial, this being done by having the insulating material unthreaded and provided with a sheath of metal, by spraying, after which threads may be cut in the sprayed sheath by any usual thread cutting operation. In this 70 form I preferably extend the sprayed sheath 13 around the lower end of the insulator at 14 at which point it will form one spark terminal between which and the opposing end 15 of a center electrode 16 a spark will pass 75 when the plug is in use.

In this form of Fig. 3, I further illustrate the center electrode 16 as being permanently secured in the insulator through the medium of sprayed material instead of the usual cementing operation. Thus I have shown a 80 film 17 of sprayed material connecting the surfaces of the electrode 16 and the adjacent surface of the insulator at the lower end of the insulator. This permanently attaches 85 the electrode 16 to the insulator and in a way preventing any possibility of leakage of compression from the engine through the insulator around the axial electrode 16. I have shown the upper end of this electrode 90 16 extending into a counterbored opening 17 in the upper end of the insulator. I have also shown a coating of metal sprayed upon the adjacent surfaces of the upper end of the electrode 16 and the bottom of the counterbored opening. This further insures a 95 gas tight connection of the center electrode with the insulator. I provide a terminal stud 19 with a recess 20 at its lower end adapted to fit over the upper end of the center electrode 16 and the exterior of the lower end of this stud 19 I preferably have non-circular to fit the preferred non-circular interior of the counterbore 17. This construction serves to prevent rotation of the terminal stud 19 when in place on the insulator. I fasten the terminal stud 19 firmly 105 in place by spraying a cap 21 of metal over the upper end of the insulator and connecting with the adjacent surface of the stud 19. This cap I make of sufficient thickness as to firmly support and hold the terminal stud 19 in place. A nut 11 similar to the one in Figs. 1 and 2 is of course used in connection with the terminal stud 19 to receive one end of the 115 battery or magneto wire.

In Fig. 4 I show a spark plug of a little different design made up of two main pieces; an outer metallic shell 22 threaded at 23 for attachment into an engine cylinder and an 120 insulator 24. These two parts may be of any desired design and I permanently connect them together by spraying their adjacent surfaces at one point by a layer of spray 25 which securely fastens the two main 125 pieces together in a gas tight manner. In this form of Figs. 4, 5 and 6 I have shown the insulator carrying both electrode wires which it may or may not do, one running completely through the insulator and the 130

other only part way terminating at the surface of the insulator to be sprayed upon in fastening the insulator in the shell. In this form I have shown the upper end of the longer electrode in electrical connection with a terminal cap 26 of the usual construction adapted for receiving connection with a battery or magneto wire in the usual manner. This terminal cap arrangement may be of the usual type or may be different and placed upon the upper end of the insulator by means of a spraying operation in a manner similar to that I have illustrated and described in connection with Fig. 3. In these figures I have shown the lower end of the insulator connected with the lower end of the shell by ring 27 of sprayed material and both the rings 25 and 27 may be used to connect the insulator and shell or either of them as desired, one being sufficient.

In Fig. 7 I show a slightly different form of insulator 28 adapted to be permanently secured to a shell 29 by means of a sprayed ring 30 connecting the adjacent surfaces of the shell and insulator. In this form I have a peripheral groove 31 in the insulator where the spray is to be applied so as to form a stronger connection between the insulator and the shell as regards longitudinal displacement. In this figure, 32 is a second electrode running longitudinally through the insulator. I preferably have this electrode of a larger diameter at its upper end to fill a counterbore 34 in the insulator. The extreme end of the electrode being threaded to receive a nut 35, I fasten the electrode in place and to the insulator by spraying a coating 36 of metal on the upper surface of the insulator and against the periphery of the large portion of the electrode.

In Figs. 9, 10, 11, 12, and 13 I show a different type of spark plug, generally of the design well known on the market in which an insulator 37 is adapted to be secured in a shell 38 by means of a screw bushing 39 screwing into threads in the inside of the shell so as to carry the insulator down and bring its downwardly facing shoulder 40 against the upwardly facing shoulder 41 on the inside of the shell. Usually a gasket of separate construction is provided between these two contacting surfaces to eliminate or reduce leakage of compression from the engine. I eliminate this separate gasket by spraying the shoulder on the insulator with a soft metal such as copper so as to, in effect, make the soft copper gasket a part of the insulator. I leave this seating shoulder on the insulator, which is to be sprayed with soft copper, unglazed so as to better receive and hold the soft copper which thus being permanently attached to the insulator still effectively serves as a soft copper gasket between the two surfaces in that there is but one passage for gas from the cylinder between the

insulator and the shell, whereas there would be two if a separate gasket were placed between the insulator and the shell seats, a passage on the upper surface of the gasket and a passage on the lower surface. This considerably reduces the possibility of leakage of compression at the seat between the insulator and the shell. The shells are usually formed of steel and I still further may improve the joint at their seat by spraying on top of the shoulder in the shell and the copper on the insulator expanding equally with the heat, reduces considerably any danger of leaking when the plug is at different temperatures of operation.

The insulator of this form is shown provided with the usual central electrode 42 running longitudinally through the insulator. Instead of cementing this in place as is usual, I have shown it permanently fastened to the insulator in a gas tight manner by a coating of spray 43 around it where it protrudes from the lower end of the insulator and a similar coating 44 around the upper end of the electrode and filling a counterbore 45 in the upper end of the insulator. A terminal cap 46 is placed upon the upper end of the insulator this being provided with the usual terminal stud and nut for receiving one end of a battery or magneto wire. I permanently fasten the cap 46 in place on the insulator by spraying a layer 47 of brass or copper on the surfaces of the insulator and the metal cap where they meet so as to permanently connect the peripheries of the insulator and cap in an absolutely gas tight manner. Of course the cap 46 may be dispensed with as a separate piece the terminal stud being a part of the central electrode or projecting into the insulator to touch the central electrode, this terminal stud being fastened in place by a layer of copper or brass sprayed upon the upper end of the insulator and in contact with the periphery of the terminal stud as shown in Fig. 11.

In order to provide the insulator with both sparking points so that if the invention is applied to a quick detachable spark plug that the insulator when removed will carry both points for cleaning and adjustment I may fasten the second electrode on the lower end of the insulator by placing the electrode 48 in place against the lower end of the insulator and spraying over its exposed surface and the adjacent surface of the insulator. This firmly secures the second electrode to the lower end of the insulator. I prefer to connect this so attached second electrode to the sprayed gasket on the insulator shoulder by coating the outer surface of the insulator between the second electrode and the sprayed shoulder with a conductor. This need not extend completely around the periphery of the insulator but may take the form of a ribbon 49 shown most clearly in

Fig. 11. This being of sufficient current capacity to connect the second electrode with the sprayed copper gasket on the insulator, which, when the insulator is in place, is in engagement with the shell which is grounded through the engine to the other side of the battery or magneto. In Fig. 14 I have shown a section of the lower end of the insulator as it would appear if instead of a ribbon 49 only, the conducting material was sprayed so as to cover the whole lower surface of the insulator exterior. This would prevent any oil-soaking of the insulator from passage of oil from the outside of the insulator into the insulating material through the outer periphery wall of the insulator.

In Fig. 15, 50 is a band of sprayed metal on the lower end of the insulator and in this form I have eliminated the electrical connection between this second electrode and the sprayed gasket on the insulator and propose that this second electrode will make an electrical connection with the inside of the spark plug shell wall by jumping across the small gap between the exterior of this electrode ring or band and the inside of the shell. The main spark occurs between the bent end of the central electrode and the lower surface of this second electrode ring. By interposing this second sparking gap between the second electrode and the inside of the shell it is claimed by many that a sharper and better igniting spark results at the main sparking point.

In Fig. 16, I show a manner of attaching an asbestos or other non-metallic gasket to the shoulder on the inside of the shell. This is accomplished by merely placing a ring 51 of asbestos or other packing in place on the inside shoulder of the shell and covering the packing by a coating 52 of soft copper which extends to, at its edges, and connects with, the inside surface of the shell. This form of gasket construction is very effective in that none of the fibrous packing is exposed but is confined and kept completely surrounded with metal so that it cannot become oil soaked or easily damaged in use. This construction provides a yielding gasket which in some ways and for some uses, is preferable to an entirely metal gasket such as of soft copper.

In Fig. 17, I show a similar form of gasket construction with the exception that the fibrous gasket is secured to and confined against the shoulder on the insulator by a spray or coating of soft copper or other desired metal. Of course similar provisions of gaskets may be made on both the contacting seats of the insulator and the shell if desired. These forms of gasket constructions are of course not limited to spark plug use but are equally of value elsewhere as regards their broader aspect, yet being particularly advantageous in spark plug use owing

to the complete protection of the fibrous gasket material from heat, flame or oil.

In Fig. 18, I have shown a thread detail of exceptional value in spark plug construction in which the usual steel threads of the spark plug shell are coated with a soft copper, brass, or similar material, so as to form a more efficient gas tight connection between the threaded members.

While I have described various details of processes and construction I do not mean to confine my protection to the same as various changes may occur to those skilled in the art coming within the principle of my invention. I have shown and described applications of my invention as applied to spark plugs for internal combustion engines but I do not mean to limit my protection to this application wherever the inventions in a broader aspect are new. For example, the details of gasket construction and manufacture which I have herein shown and described and which are particularly advantageous and patentable in a spark plug sense, I believe to be new in a broader sense and patentable in this broader aspect as well. The same is true as regards the effective threading of an insulating body which it has been impractical to thread before my invention of protecting the threads by sprayed metal, and of the spraying of metal upon an insulator or other brittle substances and cutting the threads thereafter.

In the above description wherever I have spoken or referred to spraying portions of my plug it is necessary that the surfaces to be coated be clean for example by sand blasting or any other effective way of cleaning the surfaces. Furthermore, when spraying the insulating material such as porcelain in carrying out my invention the surfaces to be sprayed should be left unglazed. If these precautions are taken a durable effective bond will be provided between the surface sprayed upon and the material with which it is sprayed so that they will adhere to any ordinary usage and in such a way as to prevent any passage of gas or air between them at their points of engagement. In order to prevent an area from being sprayed adjacent one desired to be sprayed if it be an insulator the area not desired to be sprayed if glazed will not retain the sprayed material. Or interposing some other collecting medium to shield the area not to be sprayed serves the same purpose. Covering an area not to be coated with wool is a very effective shield from the spray for it, as stated above, will not retain the material sprayed upon it. Rapidly rotating an object to be sprayed on its periphery while exposed to the spray will insure a relatively even coating of the material over the periphery of the object.

Wherever in the carrying out of these

inventions a metal coating is applied, I may use any desirable metal. For example, where sprayed metal is to form one of the sparking terminals, I prefer to use a metal desirable for an electrode. I have in mind spraying nickel or an alloy of nickel for the sprayed electrodes herein described. Of course I may use steel or other metallic conducting material. Furthermore I may use a separate piece for the electrode and merely attach it by spraying to the insulator.

I obtain very desirable results from spraying the surface of the lower end of the insulator, which projects into the engine for exposure to oil or heat with glass which gives me a very good oil resisting coating for the insulator. I may as well coat any other portion of the insulator with glass as well where an electrical insulating material is desired for the protective covering. By doing this the insulator can be left wholly unglazed and a coating of glass sprayed on for a glaze wherever desired by the spraying operation. Particularly is this desirable for that portion of the lower end of the insulator between the two electrodes such as the inside of the recess in the lower end of the insulator.

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

1. The process of making spark plugs comprising depositing a metallic sheath upon a body formed out of insulating material by liquefying a relatively soft metal, atomizing said liquefied metal and projecting said atomized metal upon said body by a blast of gas and forming screw threads in a portion of said metallic sheath.

2. The process of making spark plugs comprising forming screw threads on a portion of a body formed out of insulating material, and depositing a metallic sheath upon said body, including the threaded portions thereof, by liquefying a relatively soft metal, atomizing said liquefied metal and projecting said atomized metal upon said body by a blast of gas.

3. The process of making spark plugs comprising depositing a metallic sheath upon those portions of a body formed out of insulating material which are adapted to contact with metallic surfaces, by liquefying a relatively soft metal, atomizing said liquefied metal and projecting said atomized metal upon said body by a blast of gas.

4. The process of threading a member of relatively brittle material comprising the depositing of a metallic sheath upon said member by liquefying a relatively soft metal, atomizing said liquefied metal and projecting said atomized metal on the member by a blast of gas and cutting screw threads in said metallic sheath.

5. The process of threading a member of

relatively brittle material comprising the forming of screw threads on said member and the depositing of a metallic sheath upon said threaded portion by liquefying a relatively soft metal, atomizing said liquefied metal and projecting said atomized metal on the member by a blast of gas.

6. In a spark plug, the combination of a body of insulating material, a sheath of relatively soft metal deposited on said body by liquefying said metal, atomizing said liquefied metal and projecting said atomized metal on the body by a blast of gas, and screw threads formed in said sheath.

7. In a spark plug, the combination of a body of insulating material, a portion of said body being provided with screw threads, and a sheath of relatively soft metal deposited on said body, including the threaded portion, by liquefying said metal, atomizing said liquefied metal and projecting said atomized metal on said body by a blast of gas.

8. In a spark plug, the combination of a body of insulating material having portions, which are adapted to contact with metallic surfaces, coated with a sheath of relatively soft metal by liquefying said metal, atomizing said liquefied metal and projecting said atomized metal upon the body by a blast of gas.

9. A threaded member comprising a body of relatively brittle material and a sheath of relatively soft metal deposited on said body by liquefying said metal, atomizing said liquefied metal and projecting said atomized metal on said body by a blast of gas, said sheath being provided with screw threads.

10. A threaded member comprising a body of relatively brittle material, provided with screw threads, and a sheath of relatively soft metal deposited on the threaded portion of said body by liquefying the metal, atomizing said liquefied metal and projecting said atomized metal on the body by a blast of gas.

11. The process of making spark plugs comprising the forming of a body of insulating material provided with a longitudinal passage, inserting an electrode in said passage, and depositing a sealing material against the surface of the electrode and the adjacent surface of the body by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas.

12. The process of making spark plugs comprising the positioning of an electrode in the desired relation to a body of insulating material and depositing sealing material upon the adjacent surfaces of the body and the electrode by liquefying said material, atomizing said liquefied material

and projecting said atomized material upon said surfaces by a blast of gas.

13. In a spark plug, the combination of a body of insulating material provided with a longitudinal passage therein, an electrode disposed in said passage and sealing material deposited on the adjacent surfaces of said body and said electrode by liquefying said material, atomizing said liquefied material and projecting said atomized material upon said surfaces by a blast of gas.

14. In a spark plug, the combination of a body of insulating material and an electrode secured to said body by sealing material deposited on the adjacent surfaces of said body and said electrode by liquefying said material, atomizing said liquefied material and projecting said atomized material upon said surfaces by a blast of gas.

15. The process of making spark plugs comprising securing a central electrode in a body formed out of insulating material and provided with a shoulder, depositing a relatively soft metal on said shoulder, depositing electrically conductive material on said body from a point adjacent the end of said electrode to said shoulder by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas, and inserting said body in a metal shell provided with an internal seat with said shoulder engaging said internal seat.

16. The process of making spark plugs comprising securing a central electrode in a body formed out of insulating material, depositing electrically conductive material on said body at a point adjacent the end of said electrode by liquefying said material, atomizing said liquefied material, and projecting said atomized material on said body by a blast of gas, and inserting said body in a metal shell with said electrically conductive material in proximity to said metal shell.

17. The process of making spark plugs comprising securing a central electrode in a body of insulating material and depositing electrically conductive material on said body at a point adjacent the end of said electrode by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas.

18. In a spark plug, the combination of a body of insulating material provided with a shoulder, a layer of metal on said shoulder, a central electrode secured in said body, a deposit of electrically conductive material on said body extending from a point adjacent the end of said electrode to said shoulder and deposited thereon by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas, and a metallic

shell having an internal seat in which said body is inserted with said shoulder engaging said seat.

19. In a spark plug, the combination of a body of insulating material, a central electrode secured in said body, a metallic shell in which said body is inserted and a deposit of electrically conductive material on said body extending from a point in proximity to the end of said electrode to a point adjacent said shell and deposited thereon by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas.

20. In a spark plug, the combination of a body of insulating material, a central electrode secured therein, and a deposit of electrically conductive material on said body, at a point adjacent the end of said electrode, deposited thereon by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas.

21. The process of making spark plugs comprising the securing of a central electrode in a body formed of insulating material and the depositing of a sheath of electrically conductive material over the top of said body and in contact with said electrode by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas.

22. The process of making spark plugs comprising the fitting of a metallic cap over the top of a body of insulating material and securing said cap to said body by depositing sealing material on the adjacent surfaces of said cap and body by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas.

23. In a spark plug, the combination of a body of insulating material, a central electrode secured therein, and a terminal cap comprising a coating of electrically conductive material deposited on the top of said body and in contact with said electrode by liquefying said material, atomizing said liquefied material and projecting said atomized material on said body by a blast of gas.

24. In a spark plug, the combination of a body of insulating material, a metal terminal cap fitting over the top of said body and a deposit of sealing material on the adjacent surfaces of said cap and body deposited thereon by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas.

25. The process of making spark plugs comprising the positioning of a body of insulating material in a metal shell and securing said body in position by sealing material deposited on the adjacent surfaces of said

shell and body by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas.

5 26. In a spark plug, the combination of a metal shell, a body of insulating material disposed within said shell and sealing material deposited on the adjacent surfaces of said shell and body by liquefying said material, atomizing said liquefied material and
10 projecting said atomized material on said surfaces by a blast of gas.

27. The process of making spark plugs comprising depositing a layer of relatively
15 soft metal on the shoulder of a body of insulating material by liquefying said metal, atomizing said liquefied metal and projecting said atomized metal on said shoulder by a blast of gas, and inserting said body in
20 a metal shell provided with an internal seat with said shoulder engaging said seat.

28. The process of making spark plugs comprising the forming of a body of insulating material provided with a shoulder, placing a layer of gasket material on the internal
25 seat of a metal shell, fixing said gasket material in place by depositing a layer of sealing material on the surface of the gasket material and the adjacent surface of the metal
30 shell by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas, and inserting said body in said shell with the shoulder engaging said gasket
35 material to make a gas tight joint.

29. In a spark plug, the combination of a body of insulating material provided with a shoulder, a layer of relatively soft metal

deposited on said shoulder by liquefying said metal, atomizing said liquefied metal and
40 projecting said atomized metal on said shoulder by a blast of gas, and a metal shell provided with an internal seat cooperating with said shoulder.

30. In a spark plug, the combination of a
45 body of insulating material provided with a shoulder, a metal shell provided with an internal seat, a layer of gasket material disposed on said seat and a layer of sealing material deposited on the surface of said
50 gasket material and the adjacent surface of said shell by liquefying said material, atomizing said liquefied material and projecting said atomized material on said surfaces by a blast of gas, said shoulder cooperating
55 with said gasket to form a gas tight joint.

31. The process of making spark plugs comprising the coating of a portion of the insulator body with an oil-resisting material by liquefying said material, atomizing said
60 liquefied material and projecting said atomized material on the surface to be coated by a blast of gas.

32. In a spark plug, the combination of a body of insulating material and a coating of
65 oil-resisting material deposited on a portion of said body by liquefying said material, atomizing said liquefied material and projecting said atomized material on the surface to be coated by a blast of gas.
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In testimony whereof I affix my signature in the presence of two witnesses.

CHESTER H. BRASELTON.

Witnesses:

G. T. HEINZ,
R. B. MUNDAY.