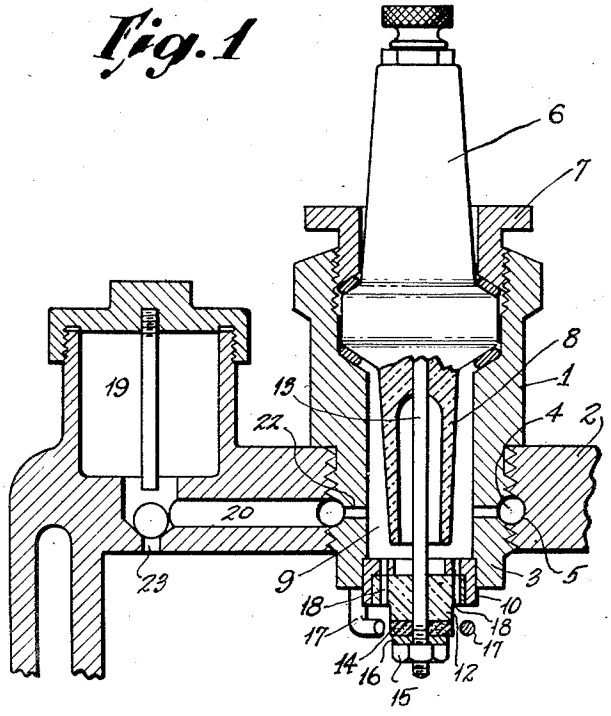
April 15, 1930. W. McELROY 1,754,796

METHOD OF AND APPARATUS FOR KEEPING SPARK PLUGS CLEAN

Filed Dec. 31, 1928 2 Sheets-Sheet 1

Fig. 1



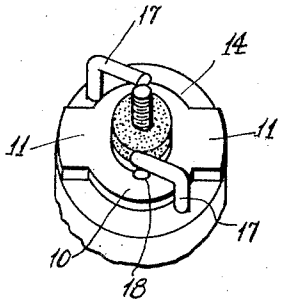
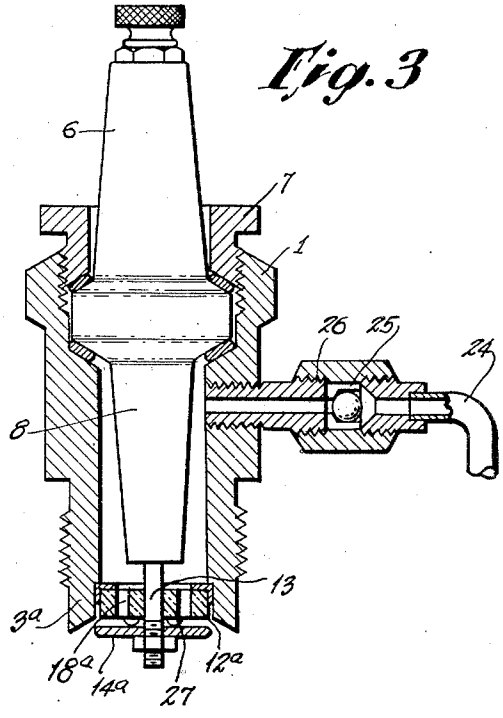


Fig. 2

Fig. 3



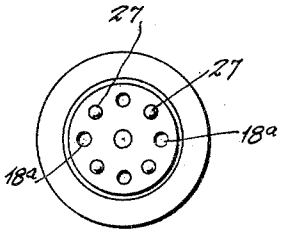


Fig. 4

INVENTOR
William McElroy
BY Cornelius Gabrielsen
ATTORNEYS.

April 15, 1930. W. M°ELROY 1,754,796

METHOD OF AND APPARATUS FOR KEEPING SPARK PLUGS CLEAN

Filed Dec. 31, 1928 2 Sheets-Sheet 2

Fig. 5

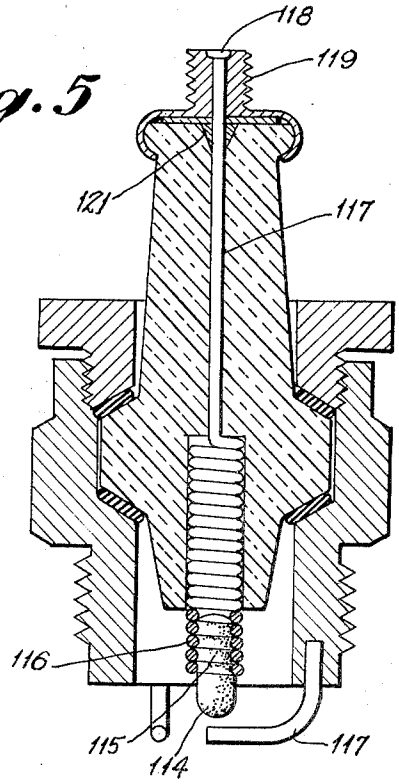
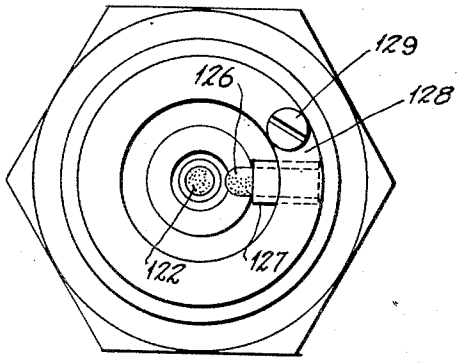


Fig. 8



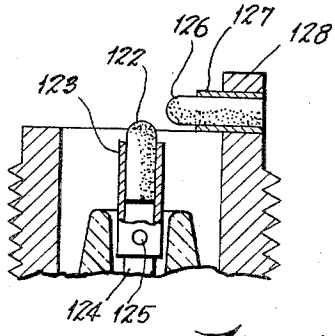


Fig. 7

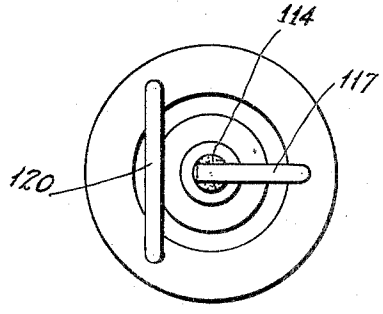


Fig. 6

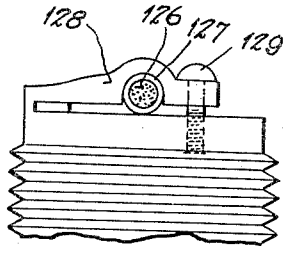


Fig. 9

INVENTOR.
William McElroy
BY Cornelius Falkenberg
ATTORNEYS.

Patented Apr. 15, 1930 1,754,796

UNITED STATES PATENT OFFICE

WILLIAM McELROY, OF BROOKLYN, NEW YORK

METHOD OF AND APPARATUS FOR KEEPING SPARK PLUGS CLEAN

Application filed December 31, 1928. Serial No. 329,616.

This invention relates to a method of and apparatus for keeping spark plugs clean and for more particularly keeping the plugs clean at the spark gap, where it is not uncommon for oil and carbon to accumulate and cause short circuiting of the plug or failure of the same to ignite the explosive charge.

The method underlying the present invention may be carried out by apparatus associated either directly with the plug or with the engine structure in cooperation with the plug, but in any event, the underlying principle is the same and consists, generally speaking, in directing jets of gaseous fluid through the spark gap or gaps of the plug in a manner to produce a scouring action thereon of sufficient intensity to preclude the lodging of oil or carbon particles upon the electrodes of the plug and thus insure full efficiency of the plug at all times.

In practically carrying out the invention, the lower end of the plug, i. e., the end thereof which projects into the cylinder is closed and sealed except for one or more passages through which gaseous fluid is adapted to pass into and out of the plug chamber. This passage or passages are so disposed that they will cause jets of air to flow either directly or by way of a baffle, across the gap of the plug to produce the scouring action to which I have referred.

Gaseous fluid, which I will hereinafter term an aeriform fluid, is adapted to exist from the plug chamber through these passages to produce the jets referred to. The pressure necessary to accomplish this result may be obtained through a compression of gaseous fuel within the cylinder or may be obtained from an external source, but in either case, the result is that the aeriform jets will keep the plug clean and efficient at all times.

An important feature of the present invention consists in the employment of a carborundum electrode at one terminal of a spark gap. Prolonged study and experimentation have convinced me that carborundum possesses unexpected advantages when used in this connection. It will not accumulate soot deposits and oil is immediately burned away therefrom. It will outlast any form of metal electrode of which I know and it is relatively cheap and easily installed. Moreover, the installation may be such as to permit the carborundum points to be renewed. The inherent resistance of carborundum to the passage of electric current proves advantageous when used in this connection and the resulting spark at the gap is particularly efficient in the firing of explosive charges. The best results are obtainable in spark plugs when both electrodes are of the carborundum material, though very satisfactory results are attainable if only one electrode is of such material.

The invention embodies further features and advantages, which will be hereinafter more fully described and will be apparent from the accompanying drawings and the appended claims.

The accompanying drawings illustrate different practical embodiments of the invention, but the constructions therein shown are to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a fragmental section through the cylinder head and plug of a construction embodying the present invention.

Figure 2 is an underneath plan view of the plug shown in Figure 1.

Figure 3 is a central section of a slightly modified form of plug.

Figure 4 is an underneath plan view of the plug shown in Figure 3.

Figure 5 is a cross section of a modified form of plug embodying the present invention.

Figure 6 is an underneath plan view of the plug of Figure 5.

Figure 7 shows the lower end of a further modified form of construction in central section.

Figure 8 is an end view of the plug of Figure 7.

Figure 9 is a side elevation of such plug.

In the construction of Figure 1, the plug is shown as embodying a shell 1 screwed into the cylinder head 2 of an engine. The shell is provided with a threaded shank 3 and, as shown, the shank is formed with a circumferential channel 4 adapted to register with a similar channel 5 formed in the tapped hole in the cylinder head. The porcelain of the plug is designated 6. It may be clamped to the shell by a clamping nut 7 or may be secured therein in any other usual manner. The porcelain is substantially conventional but the skirt 8 of the porcelain is somewhat smaller than usual, so as to provide a rather large plug chamber 9 adapted to serve as a reservoir or cushion space for residual aeriform fluid. Into the lower end of the plug chamber 9 is fitted a metal thimble 10 in the form of a shell and this thimble has laterally extending arms 11 which are set into the recess in the lower end of the shank 3 of the plug, so that the thimble is mounted against rotation and also against radial shifting.

Fitted into the thimble is a porcelain stopper 12 having therethrough a central hole through which the central electrode 13 of the plug is adapted to extend. A carborundum disk 14 seats on the inner side of the porcelain stopper and a nut 15 is screwed on to the central electrode and acts through a lock washer 16 to secure the thimble, stopper and disk 14 in position. The disk 14 constitutes, in effect, the central electrode of the plug. The grounded electrodes 17, two of which are shown, are mounted on the shell and extend into proper spaced relation to the sides of the disk 14, as shown in Fig. 2, wherein the lock washer 16 and nut 15 are removed in the interest of clearness.

Extending through the porcelain stopper in alined relation with the gaps between the central and grounded electrodes are passages 18 which open communication between the plug chamber 9 and the interior of the cylinder of the engine, so that when the piston in the engine cylinder moves on its compression stroke, it will force aeriform fluid through the passages 18 into the plug chamber 19 and as the charge is subsequently fired in the cylinder, this pressure in the chamber 9 will be relatively high.

As the piston descends and the exhaust valves are opened, the pressure in the cylinder will be equally relieved and the pressure in the chamber 9 being considerable, there will be a strong rush of aeriform fluid through the passages 18 with consequent scouring jets of such fluid at the gaps of the plug. These jets will be directed through the gap and upon contiguous portions of the sparking points and will serve to keep these parts clean and free from oil and carbon deposits. It is to be noted that the chamber 9 of the plug will never be entirely freed from aeriform fluid and consequently, during the operation of the engine, there will be a constant surging of fluid back and forth through the passages 18 with the consequent scouring action described. Furthermore, the residual aeriform fluid in the chamber 9 will have a pronounced cushioning effect upon the inflow and outflow of gases through the passages 18 which will render the operation more efficient.

In order to produce a greater reservoir for aeriform fluid, I have shown the cylinder head 2 in Fig. 1 as provided with a supplementary reservoir 19, from which a passage 20 leads to the channel 5, and passages 22 are formed through the shank of the plug. A valved passage 23 also leads from the interior of the cylinder to the supplemental reservoir 19.

Thus when the pressure in the cylinder is greater than the pressure in the reservoir or plug chamber, aeriform fluid will pass through the valve passage 23 and be stored in the reservoir 19, but when the pressure drops in the cylinder, the pressure in the reservoir 19 will act through the passages 20 and 22 to augment the pressure in the plug chamber 9 in order to produce a stronger and more prolonged jet action.

In the construction of Figures 3 and 4, the pressure in the plug is augmented from any suitable source and is communicated through a conduit 24 having therein a check valve 25 which acts only in one direction being precluded by a pin 26 from seating in a rearwardly direction.

The plug structure of Fig. 3 is very similar to that of Figure 1, except that instead of employing grounded electrodes 17, the lower end of the shell 3^a of the plug serves as the grounded electrode, while the central electrode is in the form of a carborundum disk 14^a which also serves the purpose of a baffle. The porcelain stopper 12^a is provided on its under side with small bosses 27 to space the disk 14^a from the face of the porcelain, so that when aeriform fluid passes outwardly through the passages 18^a, it will be deflected in an outward radial direction by the disk 14^a and fanned out around the entire periphery of this disk to produce a scouring action upon those portions of the shell and disk which are adjacent one another and which constitute the gap of the plug.

My research and experiments relative to carborundum has led to the discovery that carborundum is of unusually high efficiency when used as a terminal of a spark gap. Such a gap may be formed between two electrodes of carborundum or between electrodes one of which is metal and the other of which is carborundum.

In Figs. 5 to 9, I have shown plug construc-

tion particularly adapted for use with carborundum electrodes. Figures 5 and 6 only the central electrode is of carborundum, while in Figures 7 to 9, both electrodes are carborundum. By reference to Figs. 5 and 6, it will be noted that the grounded electrode 17 is of usual conventional type. The central electrode, however, is in the form of a carborundum plug 114, a portion of which is provided with a helical channel 115 which is screwed into the end of a coil spring 116 provided at its other end with a shank 117, which extends through the porcelain and is riveted over as at 118 at the upper end of the binding post 119 of the plug. This manner of mounting the carborundum 114 is a convenient and inexpensive arrangement and it supports the carborundum in a non-rigid manner. A guard wire 120 is shown with this construction so as to guard the carborundum against striking anything and breaking when the plug is removed. A suitable gasket 121 precludes leakage around the shank 117.

In the plug of Figures 7 to 9, the central electrode is in the form of a cylindrical piece of carborundum 122 carried by a sleeve 123 which is mounted on a rod 124 extending to and secured to the binding post of the plug. A small vent hole 125 is formed in the sleeve so that gases entrapped behind the carborundum may escape in order that excess pressure will not be built up in back of the carborundum. The grounded electrode is in the form of a cylindrical piece of carborundum 126 mounted in a sleeve 127 which is clamped in place by the clamping jaw 128 acted upon by the clamping screw 129. This arrangement allows of longitudinal adjustment of the grounded electrode and of replacement when desired.

In carrying out the present invention, the carborundum may be made in a solid piece and clamped in place or may be secured in place by a suitable cement or may be made in the form of granules embedded in a suitable cement and applied as in the form of paste to metal electrodes without departing from this invention.

My experiments with carborundum have shown that carbon will not lodge upon it and that it will retain its efficiency indefinitely. It is, in fact, practically indestructible and will not wear away as metal will at the spark gap. It operates with high efficiency to give an unusually hot spark.

The foregoing detailed description sets forth the invention in its preferred, practical form, but the invention is to be understood as fully commensurate with the appended claims.

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

1. A spark plug, the central gap electrode of which is carborundum.

2. A spark gap across which an electric arc is adapted to pass comprising spaced apart electrodes at least one of which is carborundum.

3. A spark plug embodying insulated and grounded electrodes spaced apart and of carborundum.

4. A sparking gap, across which an electric arc is adapted to pass, and which gap embodies carborundum terminals.

In testimony whereof I have signed the foregoing specification.

WILLIAM McELROY.