

June 19, 1934.

M. O'MARRA

1,963,801

SPARK PLUG

Filed March 14, 1933

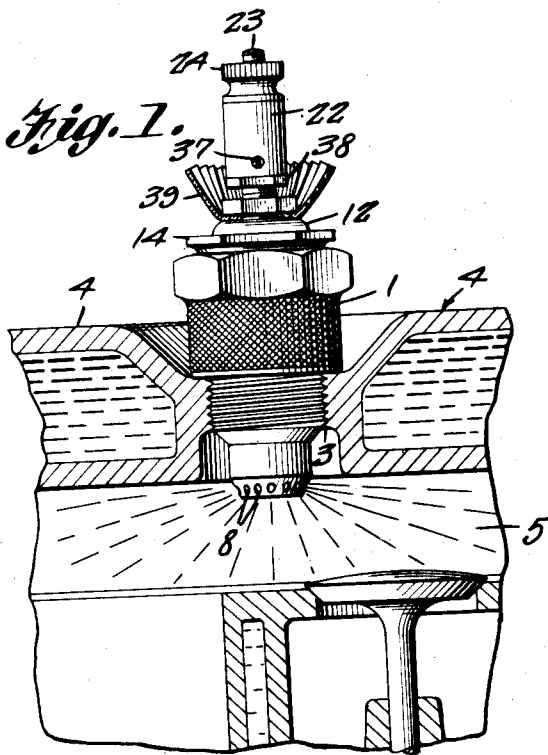
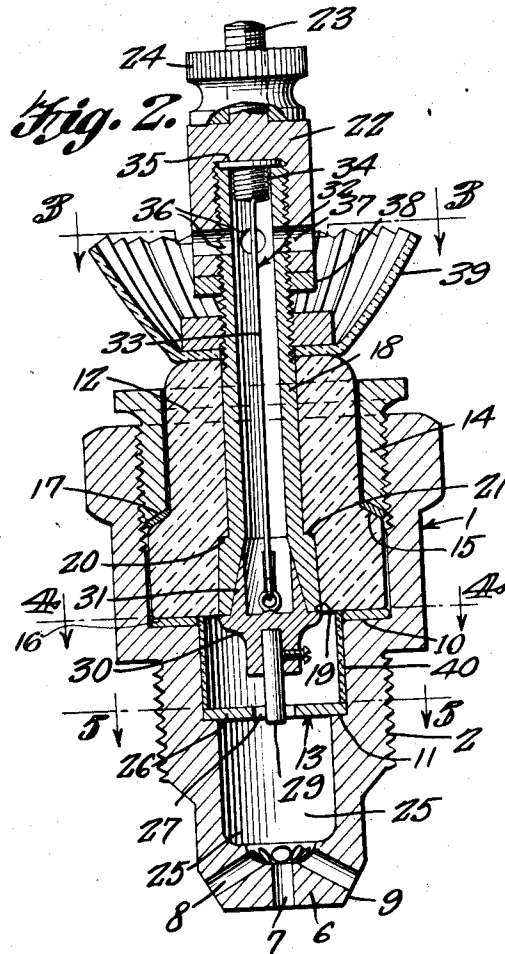


Fig. 3.

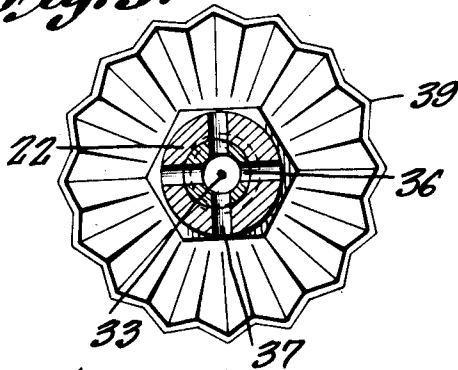


Fig. 4.

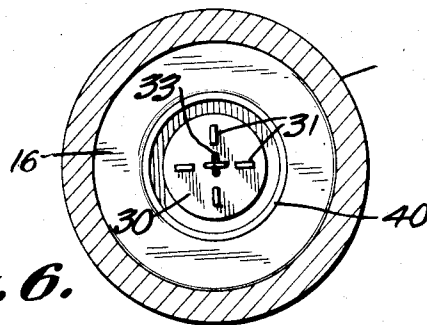


Fig. 5.

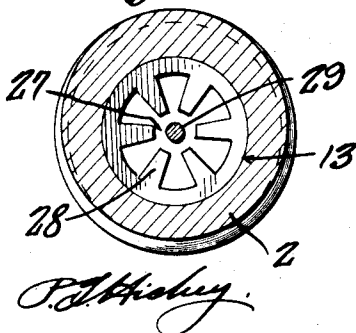
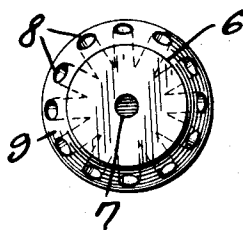


Fig. 6.



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WITNESS:

UNITED STATES PATENT OFFICE

1,963,801

SPARK PLUG

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Application March 14, 1933, Serial No. 660,745

5 Claims. (Cl. 123—169)

This invention relates to spark plugs for internal combustion engines and has for the primary object, the provision of a device of the above stated character which will thoroughly and completely ignite the entire amount of fuel under compression in the cylinder of an engine to increase the power of the latter to a maximum and permit an auxiliary supply of air to be admitted to the fuel of the engine through the spark plug so as to reduce the consumption of fuel to a maximum.

Another object is the provision of an ignition chamber in the body of a spark plug and in communication with the explosion chamber of the engine by a series of ports and confining within the ignition chamber the electrodes so that the compressed fuel of the engine may enter the ignition chamber and be ignited by a series of electrical arcs produced by the electrodes and readily escape through the ports over a wide area of the explosion chamber to ignite and burn completely the entire amount of fuel in the explosion chamber.

A further object of this invention is the provision of one of the electrodes of the spark plug providing a valve to admit air through the spark plug to the explosion chamber of the engine during the suction stroke of the latter.

A still further object of this invention is the provision of means for regulating the flow of air through the spark plug to the explosion chamber of the engine.

With these and other objects in view this invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawing, in which

Figure 1 is a fragmentary vertical sectional view illustrating an engine with the spark plug applied thereto and constructed in accordance with my invention.

Figure 2 is a vertical sectional view illustrating the spark plug.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a sectional view taken on the line 5—5 of Figure 2.

Figure 6 is an end view illustrating the series of ports or passages for establishing communication between the ignition chamber and the body

of the spark plug and the explosion chamber of the engine.

Referring in detail to the drawing, the numeral 1 indicates the body of the spark plug reduced and screw threaded, as shown at 2, for threaded connection with the spark plug opening 3 of the engine 4, the latter having the usual explosion chamber 5. The extension 2 of the body 1 is closed by a wall 6 having formed therein an intermediate port or passage 7 and a series of radially extending ports or passages 8. The ports or passages 8 establish communication between the interior of the extension 2 of the body 1 and the explosion chamber 5. The wall 6 is beveled, as shown at 9, where the ports or passages 8 open outwardly through the end wall 6 to aid in preventing accumulation of carbon thereon and to permit a better distribution of the burning fuel from the interior of the extension to the explosion chamber 5 so that the burning fuel may cover approximately the entire area of the explosion chamber.

Formed within the body 1 and the extension 2 thereof are annular shoulders 10 and 11, the shoulder 10 forming a seat for an insulator 12 while the shoulder 11 provides a seat for an electrode 13. The insulator 12 extends out of the body 1 and is retained in engagement with the shoulder 10 by an externally threaded sleeve 14 having threaded connection with the body and bearing upon a shoulder 15 of the insulator. Gaskets 16 and 17 are interposed between the insulator and the shoulder 10 and the sleeve 14 and the shoulder 15 to establish leak-proof connection between the insulator and the body. The insulator is provided with a bore in which is mounted a metallic sleeve 18, the inner end of which is enlarged to form a valve seat 19 and a shoulder 20 to abut a shoulder 21 formed in the walls of the bore of the insulator. The sleeve 18 extends exteriorly of the insulator and is externally threaded. A cap 22 is threaded to the sleeve 18 and carries a binding post 23 on which is threaded a clamping nut 24 to permit an electrical conductor to be firmly secured to the cap.

Between the inner end of the insulator 12 and the end wall 6 is an ignition chamber 25, located within the extension 2 of the body 1 with the electrode 13 positioned intermediate the ends of the chamber 25. The electrode 13 is in the form of a metallic disc 26 resting on the shoulder 11 and provided with a centrally located opening 27. A plurality of tapering prongs 28 are located within the opening 27 and form an integral part of the disc 26 having their free ends spaced about

an electrode 29 which extends through the opening 27 to provide a series of spark gaps between the electrodes. The electrode 29 is detachably secured to a valve 30 adapted to have engagement with the seat 19 of the sleeve 18. A plurality of guides 31 are carried by the valve and extend into the bore of the sleeve or the enlarged end thereof to guide the movement of the valve towards and from the seat during the operation of the device. A tension means 34 normally retains the valve 30 in engagement with the seat 19 and consists of a rod 32 secured to the valve and having a portion thereof formed into a contractile spring 34 formed integrally with an anchoring cap 25 interposed between the end of the sleeve 18 and the cap 22. The sleeve 18 is provided with oppositely arranged openings 36 alining with openings 37 in the cap 22 to place the ignition chamber 25 in communication with the atmosphere when the valve 30 is unseated. By adjusting the cap 22 on the sleeve the flow of air into the ignition chamber may be regulated and the cap may be locked in any of its adjusted positions on the sleeve by a lock nut 38 threaded to the sleeve and bearing against the cap.

An insulating shield 39 is wound on the sleeve 18 and bears against the insulator and is of substantially cup-shape with the walls corrugated for the purpose of preventing electricity from the conductor connected to the cap jumping to any of the metallic parts of the spark plug. The shield 39 is held in engagement with the insulator 12 by a nut threaded to the tube.

The electrode 13 is held against the shoulder 11 by a sleeve 40 interposed between said electrode and the inner end of the insulator.

By reference to Figure 2 it will be seen that it is a simple matter to remove the electrodes 13 and 39 by simply removing the insulator 12 from the body 1 and the sleeve 40 and this permits the electrodes to be readily replaced when worn by new electrodes, consequently rendering the spark plug fit for further use and thereby permit the successful employment or use of the spark plug over a long period of time.

In operation, during the compression stroke of the engine to compress the fuel within the explosion chamber, some of the fuel enters the ignition chamber 25 and when the electricity arcs between the electrodes this fuel is ignited and escapes through the ports 7 and 8 over a large area of the explosion chamber 5, thoroughly and completely igniting all of the fuel so as to produce maximum power to the engine. The fuel surging into the ignition chamber and passing therefrom in a burning condition prevents the accumulation of carbon between the electrodes thereby reducing the possibility of the electrodes becoming foul to a minimum. During the suction stroke of the engine, the valve 30 unseats admitting air through the spark plug to the explosion chamber for mixing with the incoming fuel. This additional supply of air to the explosion chamber and the complete burning of the fuel provides maximum power with a minimum consumption of fuel. It is to be understood that the valve seats automatically during the compression stroke of the engine through the aid of the tension means 34.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction combination and arrangement of parts may be made without departing from the spirit and scope of my invention, as claimed.

Having described the invention, I claim:

1. A spark plug comprising a body having an ignition chamber and a plurality of radially arranged passages to establish communication between the ignition chamber and the explosion chamber of an engine, an insulator carried by the body, a metallic tube carried by the insulator and having one end in communication with the atmosphere and its opposite end formed to provide a valve seat in the ignition chamber, a self-seating valve to engage the seat for closing and opening the ignition chamber to the atmosphere, spaced electrodes carried by the body and the valve and providing a series of spark gaps and movable relative to each other and maintaining the size of the spark gaps the same during the movements of the electrodes relative to each other, and means for connecting an electrical conductor to the tube and for regulating the flow of air through the tube to the ignition chamber.

2. A spark plug comprising a body having one end closed, an insulator mounted in the body and forming between itself and the closed end of the body an ignition chamber, said closed end of the body having a series of angularly related passages to communicate the ignition chamber with an explosion chamber of an engine, an electrode carried by the body and having a plurality of spaced portions with their free ends defining an opening, an electrode extending through the opening and spaced from the ends of the portions of said first electrode to provide a series of spark gaps between said electrodes, a metallic sleeve carried by the insulator and having one end in communication with the atmosphere and its opposite end formed to provide a valve seat in the ignition chamber, a valve to engage said seat and having the second-named electrode detachably connected thereto, spring means between the tube and the valve to urge the latter in engagement with the seat, and means for connecting an electrical conductor to the tube.

3. A spark plug comprising a body having one end closed, an insulator mounted in the body and forming between itself and the closed end of the body an ignition chamber, said closed end of the body having a series of angularly related passages to communicate the ignition chamber with an explosion chamber of an engine, an electrode carried by the body and having a plurality of spaced portions with their free ends defining an opening, an electrode extending through the opening and spaced from the ends of the portions of said first electrode to provide a series of spark gaps between said electrodes, a metallic sleeve carried by the insulator and having one end in communication with the atmosphere and its opposite end formed to provide a valve seat in the ignition chamber, a valve to engage said seat and having the second-named electrode detachably connected thereto, spring means between the tube and the valve to urge the latter in engagement with the seat, and a cap adjustably secured to the tube for regulating the flow of air through the tube to the ignition chamber and for connecting an electrical conductor to the tube.

4. A spark plug comprising a body having one end closed, an insulator mounted in the body and forming between itself and the closed end of the body an ignition chamber, said closed end of the body having a series of angularly related passages to communicate the ignition chamber with an explosion chamber of an engine, an electrode carried by the body and having a plurality of spaced portions with their free ends defining an

opening, an electrode extending through the opening and spaced from the ends of the portions of said first electrode to provide a series of spark gaps between said electrodes, a metallic sleeve 5 carried by the insulator and having one end in communication with the atmosphere and its opposite end formed to provide a valve seat in the ignition chamber, a valve to engage said seat and having the second-named electrode detachably 10 connected thereto, spring means between the tube and the valve to urge the latter in engagement with the seat, a cap adjustably secured to the tube for regulating the flow of air through the tube to the ignition chamber and for connecting an electrical conductor to the tube, and 15 a substantially cup-shaped insulating shield mounted on the tube and against the insulator.

5. A spark plug comprising a body having one end closed, an insulator removably mounted in 20 said body and cooperating with the latter and the closed end thereof in forming an ignition chamber, said closed end of the body having a series of spaced and radially extending passages and a centrally located passage, said passages 80 establishing communication between the ignition chamber and an explosion chamber of an engine, a metallic tube carried by the insulator and having a seat, a valve to engage the seat, an electrode 85 carried by the valve, an electrode carried by the body, spring means between the valve and the tube to seat the valve, guides between the valve and tube, said tube having ports, a cap having ports threaded to the tube for establishing communication between the atmosphere and the ignition 90 chamber and capable of regulating the flow of air to the ignition chamber and to connect an electrical conductor to the tube.

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