Nov. 30, 1937. G. M. BROWNING 2,100,320

SPARK PLUG

Original Filed Nov. 16, 1934

Fig:1.

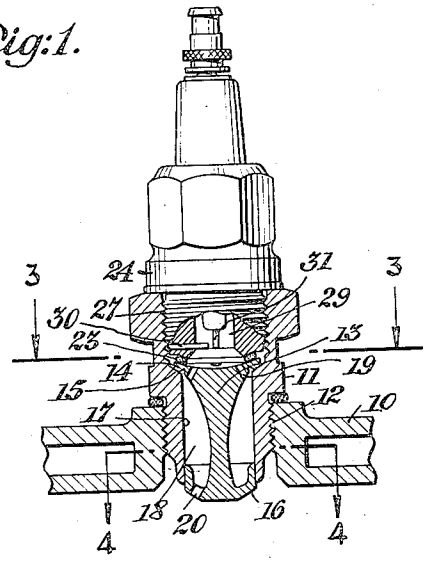


Fig:2.

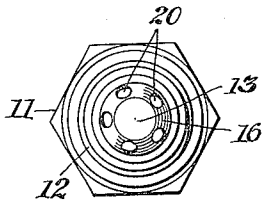


Fig:4.

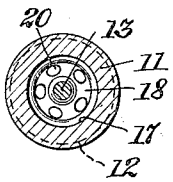


Fig:3.

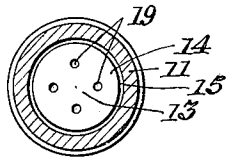


Fig:5.

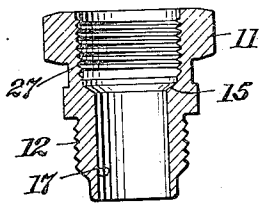


Fig:7.

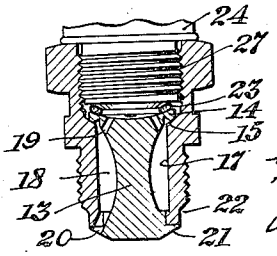
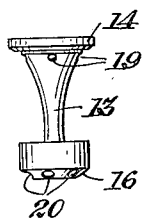


Fig:6.



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SPARK PLUG

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Application November 16, 1934, Serial No. 753,328
Renewed February 25, 1937

12 Claims. (Cl. 123—169)

My invention relates to internal combustion engines.

The principal object of my invention is to provide means comprising a spark plug and a casing having a chamber formed therein to provide in combination, an ignition chamber and a flame generating chamber in which the ignited gases will expand and issue therefrom in a plurality of flaming jets so directed by the outlet passages leading from the flame generating chamber as to penetrate the fuel gas mixture in the cylinder in diverse directions to cause instant ignition thruout the mass and thereby causing complete combustion of the fuel, thus increasing the power and economy of the engines in which the same is used.

A further object is to provide a construction that will operate at all times without danger of preignition of the fuel gases by reason of overheating the ignition device.

A further object is to provide a construction that may be made at a low cost and durable under high temperature.

Referring to the drawing which forms a part of this specification:

Fig. 1 is a vertical sectional view of my device showing it attached to the head of an engine cylinder by screw threads in the usual manner of attaching a spark-plug thereto, with a spark-plug held in co-operative position thereon.

Fig. 2 is an inverted plan view disclosing the lower end of the casing of the flame generating chamber, hereinafter referred to as the compression chamber.

Fig. 3 is a cross section taken on line 3—3 of Figure 1.

Fig. 4 is a cross section taken on line 4—4 of Figure 1.

Fig. 5 is a vertical sectional view of the casing of the compression chamber shown in Figure 1.

Fig. 6 is an exterior view of a central member formed with a laterally extending flange at each end to form a chamber with openings in its upper end flange leading to the chamber formed in the spark-plug, and openings in the lower flange leading to the engine cylinder.

Fig. 7 is a vertical sectional view of the casing showing a modified form of construction in which the lower flange extends laterally under the lower end of the casing and the openings are formed partly in the casing and partly in the flange, substantially as illustrated.

10 indicates the upper end of an internal combustion motor and 11 is a casing secured thereto by a thread 12. The casing may be formed integral with the head of the cylinder if desired, but for convenience in making and marketing I prefer to make it as a separate article of manufacture as illustrated in the drawing.

13 indicates a central member hereinafter called a core, which is circular in cross section and is provided with a thin flange-shaped top 14 the outer circular edge of which rests on the annular shoulder 15 of the casing, and forms a wall of the chamber 18.

The lower end of the core is formed with a laterally extending flange 16 which carries an upwardly extending circular band portion the outer surface of which fits in friction tight relation with the inner wall 17 of the compression chamber 18, and its lower end forms a wall of the chamber 18.

19 indicates a number of small circular passages, usually four, spaced apart at equal distances from each other in the flange 14 and the axis of each passage being formed at an angle to the vertical in the direction of the ignition points of the spark-plug held in adjusted position relative to said flange.

20 indicates a number of orifices formed in the lower flange 16, each of which is relatively larger in diameter than that of the passages 19, using five of such orifices the diameter of each is about two and one half times that of the diameter of each of the passages, and they extend at an angle to the vertical axis thru the casing as illustrated.

The lower end of the device extends thru the head of the cylinder just far enough to clear the under side of the head so that the flaming jets therefrom will expand in contact with the adjacent surfaces of the cylinder head and thru the gas mixture to the wall of the cylinder.

The cubic capacity of the chamber 18 may be governed by the diameter of the core which is gradually reduced in diameter from the flanges toward the middle, and its heat conductivity is also governed.

The core acts as a heat exchanger, being heated by the burning gases and cooled by the fresh mixture, thus preheating the fresh mixture as it flows to the terminals of the spark-plug and causing easy ignition thereof, and at the same time reducing the temperature of the metal adjacent the terminals and thus preventing preignition of the fuel.

Referring to Figure 7, the outer edge of the flange is spun over the lower end of the casing as illustrated at 21 and the orifices are drilled thru the flange and casing thereafter. An annular groove 22 is formed in the lower end of the

casing to reduce the heat conductivity from the flange to the wall of the casing.

I have found that the use of a gasket 23 of asbestos encased in a thin sheathing of copper, serves to restrict the flow of heat to said terminals, and also serves to effect a tight joint between the lower end of the spark-plug 24 and the upper end of the casing is provided with a thread 27 to hold said plug in position.

When the spark-plug is fixed in the casing as illustrated, an ignition chamber 29 is formed, the lower wall of which is formed by the adjacent end of the upper flange, and the electrical terminals of the spark-plug are located near the bottom of said chamber and are indicated by 30 and 31 respectively.

As constructed in accordance with Figure 1, the core and its flanges containing all of the drilled passages, may be quickly assembled or separated for inspection, or for cleaning if necessary.

From the foregoing description the operation of the device may be readily understood.

On the inhalation stroke of the engine, the fuel mixture is drawn into the cylinder and at the same time the greater part of the products of combustion remaining in the chamber of the spark plug is withdrawn therefrom, but a part remains which is practically pure carbon dioxide.

On the compression stroke of the piston, a portion of the fuel mixture is forced thru the orifices and flows thru the compression chamber in which it absorbs heat from the pillar and expands to some degree by reason thereof, and it then flows thru the small passages in jets of high velocity and cleans the ignition points while mixing with the carbon dioxide remaining in the ignition chamber.

Due to the carbon dioxide remaining in the ignition chamber, a smaller amount of combustible gas is admitted therein than that of its cubic capacity, but enough is admitted instantly to ignite and burn when the spark is generated and the flame, flowing under pressure thru the small passages, instantly ignites and burns the fuel in the expansion chamber which contains pure fuel gas only. The fuel gas in the compression chamber, being ignited on practically all sides of the chamber, burns instantly and the expanded flaming gases are projected thru the restricting orifices at a high velocity and penetrate the entire mass of fuel gas in the cylinder of the engine, thus igniting the mixture while at the same time the mixture is more intimately mixed by the flaming jets, thus causing more complete and rapid burning of the fuel and thereby increasing the power of the engine as well as its economy of operation since no carbon monoxide is generated, and also because less heat is transmitted thru the walls of the cylinder.

Since the walls of the cylinders are kept relatively cool, the lubrication is maintained with a relatively small amount of lubricant and the engine cylinders wear much longer without change of dimensions.

Having thus described my invention, I claim as new:

1. An ignition device of the character described comprising a casing the upper end of which is provided with means for holding a spark-plug, formed with a chamber in said casing having upper and lower transverse walls, the upper end wall of which is provided with a passage for gas and the lower end wall thereof having a passage for gas of relatively large area.

2. As stated in claim 1, together with a central core extending from the upper end wall to the lower end wall.

3. An ignition device of the character described comprising a casing having a lower transverse wall, a spark-plug held in the upper end thereof, said casing formed with a chamber the upper end wall of which is located adjacent the lower end of said plug, said wall having a passage for gas, and the lower end wall of said chamber having a passage for gas of relatively large area to that of said upper passage.

4. As stated in claim 3, together with, said lower passage extending at an angle to the vertical axis of said casing.

5. An ignition device of the character described comprising a casing the upper end of which is provided with means for holding a spark-plug, said casing formed with a chamber the upper end wall of which is provided with a plurality of passages for gas and the lower end wall of which is provided with a plurality of relatively large passages for gas.

6. As stated in claim 5, together with, a central core extending from the upper end wall to the lower end wall of said casing to serve as a heat exchanger.

7. An ignition device of the character described comprising a casing, a spark-plug held in the upper end thereof, said casing formed with a chamber the upper end wall of which is located adjacent the lower end of said spark-plug, thereby forming an ignition chamber; said upper end wall having a passage for gas leading from said ignition chamber to the chamber in the casing; the lower end wall of said chamber having a passage of large area compared with that of said upper passage, and a central core formed integral with the upper and lower end walls of said chamber and of less area in cross section between its ends.

8. As stated in claim 7, together with, said core and end walls of said chamber being held in separable relation to the side walls thereof.

9. A device of the character described comprising a casing having a chamber formed therein provided with an opening in one transverse end wall thereof to serve as a passage for gas, and having an opening in the opposite transverse end wall of relatively large area, and a central core supported in said chamber to serve as a heat exchanger.

10. As stated in claim 9, together with, said core being formed integral with one of said end walls.

11. A device of the character described comprising a casing having a chamber formed therein provided with a plurality of small passages in the upper end wall thereof extending therethru, and having a plurality of passages formed in the lower end wall of relatively large area, all of said passages extending at an angle to the vertical axis thru said casing from the periphery toward the centre thereof.

12. As stated in claim 11, together with, and a central core formed integral with one of said end walls to serve as a heat exchanger.

GEORGE M. BROWNING.