H. M. CROWTHER.

SPARK PLUG.

APPLICATION FILED DEC. 4, 1919.

1,363,843. Patented Dec. 28, 1920.

Fig. 1

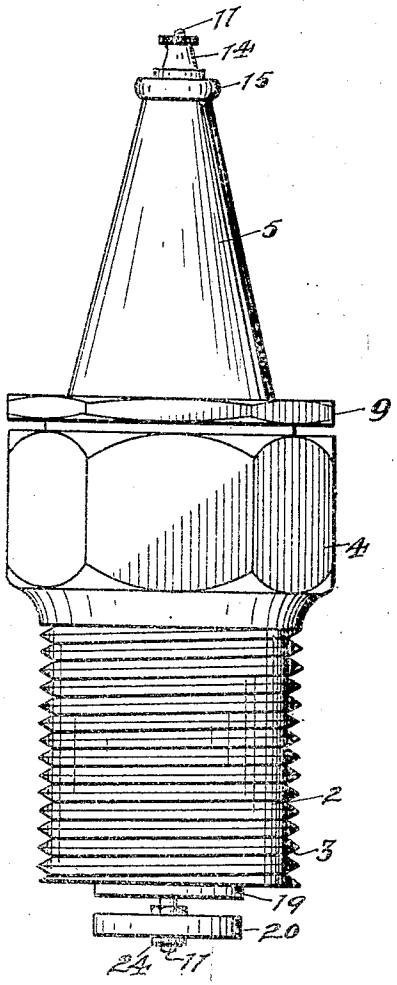



Fig. 2

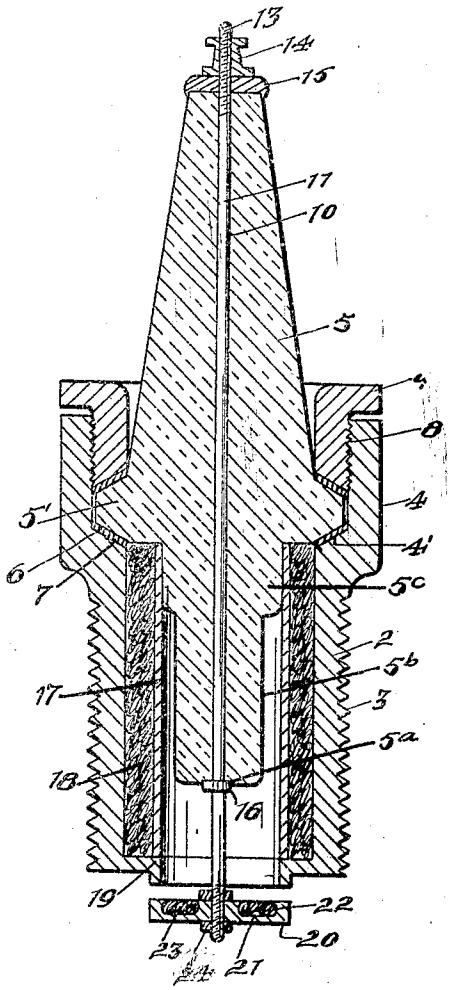
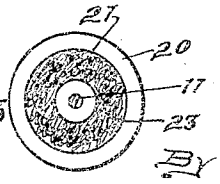



Fig. 3




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# UNITED STATES PATENT OFFICE.

HENRY M. CROWTHER, OF KINGMAN, ARIZONA.

## SPARK-PLUG.

1,363,843. Specification of Letters Patent. Patented Dec. 28, 1920.

Application filed December 4, 1919. Serial No. 342,505.

*To all whom it may concern:*

Be it known that I, HENRY M. CROWTHER, a citizen of the United States, residing at Kingman, in the county of Mohave and State of Arizona, have invented new and useful Improvements in Spark-Plugs, of which the following is a specification.

This invention relates to ignition apparatus for internal combustion engines and particularly to spark plugs.

As is well known internal combustion engines having a plurality of cylinders, one or more of the cylinders when the engine is idle after having been run contains fresh unexploded mixture of fuel, and it is the object of the present invention to provide a spark plug that will facilitate the starting of the engine by the ready ignition of the thus unexploded or unconsumed charge; and a further object is to provide a spark plug in which the core is protected from being coated with oil from the interior of the chamber; and further to provide a spark plug in which a relatively high degree of heat will be maintained in close proximity to the usual core of the plug so that the combustible fuel and products of combustion as carbon or soot will be completely consumed.

The invention consists of the construction and details an embodiment of which is illustrated in the accompanying drawings and described and claimed herein.

Figure 1 is a side elevation of the improved spark plug.

Fig. 2 is a central longitudinal section through the plug.

Fig. 3 is a plan view of the detached fuel holding element.

The illustrated embodiment of the invention includes the usual hollow plug 2 threaded as at 3 on its lower exterior portion to be threaded in the usual aperture in the engine cylinder; the upper end of the plug being formed with wrench receiving faces 4 so that the plug can be screwed tightly home. The upper end of the plug is enlarged so as to receive the usual porcelain or other core 5 which has a central enlarged body portion 5′ with opposite faces beveled as at 6 and upon which are placed a suitable packing material indicated at 7 the lower packing resting upon a seat 4′ in the head of the plug, and the packing members being compressed when the plug 5 has been inserted by turning downwardly into the threaded bore 8 of the plug a follower or gland 9 through which the upwardly extending portion of the plug 5 projects.

The core is provided with a longitudinal passage way 10 of sufficient diameter to suitably receive a conductor rod 11 the upper end of which is threaded as at 13 to take a binding nut 14 by which the usual lead wire, not shown, may be clamped upon the core to make an electrical contact with the terminal rod 11; in this case the nut 14 being movable toward a cap or end piece 15 mounted on the upper end of the plug 5.

The terminal rod 11 is provided adjacent its lower end with a collar or shoulder 16 designed to be drawn upwardly into abutting engagement with the lower end of the core 5 when the binding nut 14 is turned down and comprises the inserted terminal of the wire or lead. The lower end of the core 5 may be countersunk or rabbeted as at $5^a$ to make a seat for the shoulder 16 so that play of the rod 11 may be eliminated in the core and to cover the aperture.

The core is shown as having its lower end reduced as at $5^b$ and having an enlarged portion $5^c$ just below the enlarged body 5′. Around the enlargement $5^c$ there is placed a metallic tube or cylinder 17 upon which is formed a jacket 18 of refractory character as of mica, this substantially filling the space existing between the inner surface of the lower portion of the plug body 2 and the shell 17 with the result that while it effectually prevents the radiation of heat of combustion into the material of the spark plug at the same time reserves a high degree of heat in the shell or sleeve 17, with the result that combustible gas and products of combustion are fully consumed and the deposit of carbon or soot on the core within the shell 17 eliminated or largely reduced. The lower end of the shell 17 is shown as supported upon an inwardly extending annular seat or flange 19 formed on the lower end of the core 2; the shell being forced forwardly down into contact with the shoulder by pressure of the gland 9 as it is screwed in.

One of the important features of the present invention is to provide means in a spark plug for facilitating the starting of an engine by the ready ignition of an unconsumed charge therein even while the motor may be cold, and to that end I have pro-

vided a device including an agent or material that will absorb a quantity of the unconsumed gas in the chamber and hold it in close proximity to the spark gap or gaps of the spark plug.

As here shown there is mounted on the lower end of the contacting rod 11 a chambered device in the form of a disk 20 of suitable proportions and preferably having a diameter substantially equal to the diameter of the adjacent lower end and inner edge of the bottom of the spark plug 2.

The device comprises, preferably, a disk in the upper face of which is an annular groove 21 forming a chamber with overturned or inwardly directed opposite edges 22 whereby to firmly retain an inserted filler of packing of any material, preferably, of a highly refractory property and that will absorb gases obtaining in the cylinder of an engine; such material as asbestos being found especially serviceable and is indicated at 23. The lower end of the terminal rod 11 is preferably threaded and the disk 20 may be passed loosely on the threaded end or threaded thereon and its position nicely determined by inner and outer lock nuts 24 by which it will be securely held in desired spaced relation below the approximate face and inner edge of the spark plug 2.

From the above it will be seen that when current is turned into the spark plug and a spark produced at the space existing between the terminals of the plug the presence of the unexploded or consumed fuel as retained in the absorbent material 23 results in the instant ignition of the charge of fuel in the cylinder even though the engine may be cold.

Again it will be seen that by the use of a disk 20 as a terminal substantially covering the bore of the spark plug opening, the access of oil used in lubricating the parts will be substantially prevented and the exposed surface of the core and interior surface of the spark plug kept clean of oil. Further the gaseous fuel and other combustible particles that may be found in the chamber within the sleeve 17 can be completely consumed during the operation of the motor because of the high degree of heat retained by the inner sleeve 17.

Various changes may be made without departing from the spirit of my invention as claimed.

I claim:

1. A spark plug having a central bore, a plug mounted in the bore, a heat retaining sleeve concentrically spaced between the surface of the core and the bore surface of the plug, and a refractory lining between the sleeve and the bore wall.

2. A spark plug having a central bore, a plug mounted in the bore, a heat retaining sleeve concentrically spaced between the surface of the core and the bore of the plug, a refractory lining between the sleeve and the bore wall, and a flat disk adjacent the lower end of the said plug, having a diameter slightly larger than the diameter of the said sleeve therein.

In testimony whereof I have signed my name to this specification.

HENRY M. CROWTHER.