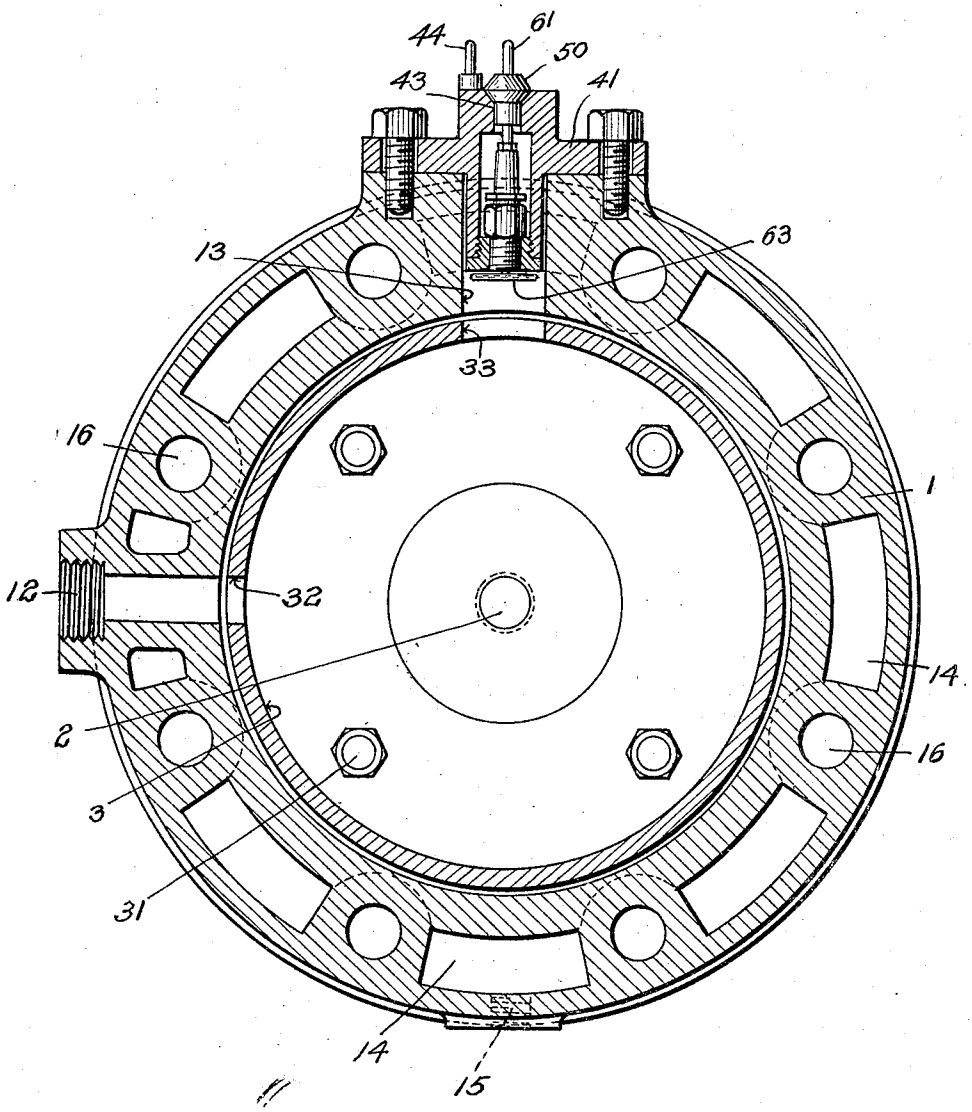
March 23, 1926. 1,577,483

F. B. MORRISON

STARTING PLUG FOR INTERNAL COMBUSTION ENGINES

Filed July 3, 1925 2 Sheets-Sheet 1

FIG. I.



INVENTOR

WITNESSES

J. Hebel Bradley.
Percy a. Engelbert.

Frank B. Morrison
by Christy and Christy
his attorneys

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FIG. II.

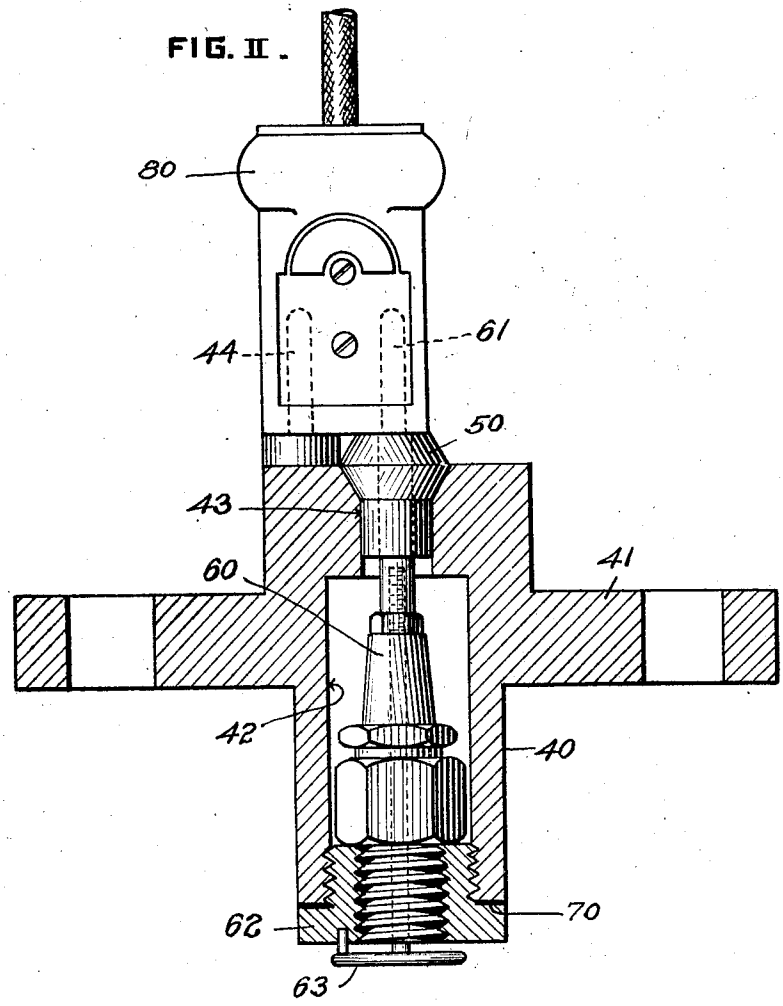
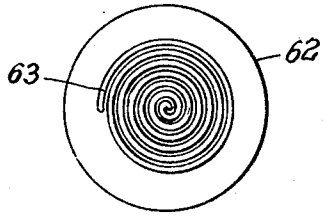


FIG. III.



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Patented Mar. 23, 1926. 1,577,483

UNITED STATES PATENT OFFICE.

FRANK B. MORRISON, OF MARION, OHIO, ASSIGNOR TO THE POWER MANUFACTURING COMPANY, OF MARION, OHIO, A CORPORATION OF OHIO.

STARTING PLUG FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 3, 1925. Serial No. 41,343.

To all whom it may concern:

Be it known that I, FRANK B. MORRISON, residing at Marion, in the county of Marion and State of Ohio, a citizen of the United States, have invented or discovered certain new and useful Improvements in Starting Plugs for Internal-Combustion Engines, of which improvements the following is a specification.

My invention relates to the ignition of the charge of an internal combustion engine, and consists in an ignition device of simple construction, readily accessible for purposes of maintenance and repair, and effective to the end in view. It is an ignition device of the class which includes a hot element, by contact with which the engine charge is ignited. I have developed it and shall describe it as an initial ignition device, for an engine of the character shown and described in Letters Patent of the United States, No. 1,500,464, granted July 8, 1924, on the application of Frank B. Morrison. It will, however, be understood that the ignition device is of general applicability, and that its use as an initial ignition device, as distinguished from a continuously operating ignition device, is merely accidental to the service required of it in the particular engine chosen for purposes of illustration.

In the accompanying drawings, Fig. I is a view in transverse section through the cylinder of an internal combustion engine of the type indicated and having my invention applied to it. The plane of section is adjacent the end of the cylinder and cuts through the walls of that element of the structure which, in the manufacturer's understanding of the term, is the "head" of the cylinder. In this figure the ignition device in which my invention centers, is shown in side elevation. Fig. II is a view to larger scale, showing the ignition device alone. Fig. III is a view in end elevation of the structure of Fig. II.

The head 1 of the cylinder of an internal combustion engine, is ported axially at 2, for the introduction of a nozzle (not shown), through which fuel such as oil may be sprayed. It is further ported peripherally at 12, for the introduction into the cylinder of air admitted by an air starting valve, and at 13, for the application of the ignition device in which my present invention centers. The head is adapted to be water-cooled, as is indicated by the spaces 14 and the seat 15 for pipe connection. Holes 16 indicate means for uniting the head with the walls of the cylinder.

A firing-bowl 3, such as that described in the Morrison patent (mentioned above), is by screws 31 secured in place within the head. The firing bowl is at its periphery ported at 32 and 33, to afford free communication through ports 12 and 13 to the cylinder chamber.

Coming particularly to the ignition device in which my invention centers, it is carried by the cylinder head 1, in the port 13. The general arrangement is indicated in Fig. I, and the minute construction in Fig. II. The device includes a body 40 of conducting material, conveniently in the form of a cylindrical stock, and provided with an outstanding flange 41, by which it may be bolted to place upon the cylinder head, as shown in Fig. I, with the stock 40 extending within the port 13. The stock 40 is formed with an interior bore, and preferably this bore is in part of larger diameter 42, opening inward, and in part of smaller diameter 43, opening outward. In the outwardly opening and smaller portion of the bore is set a bushing 50 of non-conducting material, such as kaolin. The inwardly opening and larger portion of the bore is internally screw-threaded.

An essentially cylindrical body 60 of insulating material, such as porcelain, carries extending axially through it, and in fixed position within it, a rod 61, of conductiong material.

The body 60 carries externally, and also in fixed position upon it, a collar 62 of conducting material. The collar 62 is externally screw-threaded, and by such means the body 60 with the parts which it carries is removably secured in the bore in the stock 40, in the position shown in Fig. II. The stock 40 and the collar 62 are provided with suitably disposed opposing surfaces, between which a gasket 70 of conducting material, copper, for instance, may be secured, to form an hermetically tight joint. The rod 61 of conducting material is of such length that, when the body 60 is secured in place within the stock, it will extend outwardly through the bushing 50 and beyond, to constitute one of a pair of contact-posts. A

companion contact-post 44 is borne by and is in electrical continuity with the body of stock 40. The rod 61 at its inner end extends beyond the inner face of body 60 and there is prolonged in a loop whose further end is made electrically continuous with the collar 62 of conducting material, already described. The loop conveniently takes the form of the spiral 63, and it is of such material that, carrying current from the source of supply, as presently to be described, it will become heated to high temperature, and a temperature such as to ignite an engine charge coming into contact upon it. The materials chosen and the proportions will be such that the high temperature attained will preferably be attained in the spiral 63 alone. The rod 61 throughout its longitudinal extent will not be so extremely heated. A suitable material for the loop 63 is an alloy of chromium and nickel, which bears the commercial name nichrome.

It will be observed in Fig. II that the body 60 with its collar 62, is the body of a standard spark-plug, familiar in the industry, adapted to this particular and extraordinary service. By so adapting the structure of my invention to materials available, I make it possible to practice the invention at relatively small expense.

To the pair of contact-posts 44, 61 a socket 80 of familiar structure may be removably applied, and thus electric current, from a suitable source may be caused to traverse the spiral 63, or, as it may be termed, the "glow coil," to heat it for the purpose intended. The ignition device being applied to the cylinder of an engine, in the position shown in Fig. I, when the engine is to be started, the socket 80 is applied to the contact-posts, and the glow coil 63 is heated. When then a charge is introduced within the cylinder, by means with which my invention is not concerned, the introduced charge, coming into contact upon the hot coil 63, will be ignited. Successive explosions within the cylinder will presently bring the firing-bowl 3 to ignition-affording temperature. Accordingly, after the engine has made four or five revolutions the socket 80 may be pulled off from the contact-posts, and thereafter in the further operation of the engine the firing-bowl 3 will be the efficient charge-firing means.

In the particular application of the invention which I here show and describe, and which, as already I have intimated, is an engine for relatively heavy oil, the nozzle introduced through the orifice 2 in the cylinder head will be so particularly arranged as to direct its jet in part upon the glow coil 63, as well as upon the inner surface of the firing bowl 3.

The ignition device of my invention is applicable to a low-compression engine, and when used on a low-compression engine, starting may be effected almost instantaneously, and with such ease as hitherto has been enjoyed only in the use of high-compression engines.

The use of the removable plug in heating the ignition device, makes the fact at all times manifest, whether or not electrical contacts are closed. Herein is provision, to guard against prolonged use of electric current. This is advantageous, both because of immediate economy, and because fire hazard is diminished.

The shape of the glow coil is such that a large area of heated metal is exposed to the spray of oil, and therein lies assurance, that the engine will start, without fear of failure.

The construction is such that the body 60 with the parts which it carries may be removed as a unit from the stock 40. The glow coil, which is the perishable element of the assembly may then be removed and replaced. It will not be necessary to replace the whole. The so repaired member may then be returned to its place. And this may be done with the greatest facility.

It will be observed that the parts are so proportioned that around the seated body 60 and between it and the walls of the bore 42 within the stock, is an open space. This space affords heat insulation, and protects the body 60 and the remoter portion of the stem 61 from the heat which otherwise would be imparted to them from the cylinder head, whose walls are, in the continued operation of the engine, highly heated by the combustion within.

Reference to Fig. I of the drawings will show that the glow coil 63 does not extend into the cylinder chamber proper, but is withdrawn for a considerable distance, within the port 13 through the cylinder head. The effect is that the glow coil is shielded and protected from the intensest heat of the explosion of a cylinder charge, and its life is accordingly prolonged.

Since the device, and especially the parts which require more frequent replacement, are standard articles of the industry, the whole is inexpensive, replacement is easily effected. This in addition to the fact that the device is durable and efficient.

I claim as my invention:

1. A firing device for an internal-combustion engine consisting, in combination with an engine cylinder with ported wall, of a stock of conducting material applicable to and removable from such cylinder and when applied closing the port in the cylinder wall, said stock being formed with an internal bore of larger diameter inwardly and of smaller diameter outwardly, a bushing of insulating material within the outer and smaller portion of said bore, a perforate block of insulating material provided with a

collar of conducting material and by such collar removably united in screw-threaded engagement with the wall of the bore in said stock in the larger and inner portion thereof, a rod of conducting material extending through said bushing and through said block of insulating material, and an ignition affording member arranged between and in electric continuity with said rod at its inner end and the said collar upon said block.

2. A firing device for an internal-combustion engine consisting, in combination with an engine cylinder with ported wall, of a stock of conducting material applicable to and removable from the engine cylinder and when applied closing the port in the wall thereof, said stock being formed with an internal bore, and being provided at its outer end with a contact post, a perforated block of insulating material provided with a collar of conducting material, and by such collar removably united in screw-threaded engagement with the wall of the bore of said stock, a rod of conducting material extending through said block and when the parts are in place constituting at its outer end a contact-post, companion to the contact-post above named, and adapted, jointly with its companion, to enter the socket of an electrical transmission line, and an ignition imparting device arranged between and in electric continuity with the said rod at its inner end and the said collar upon said block.

In testimony whereof I have hereunto set my hand.

FRANK B. MORRISON.