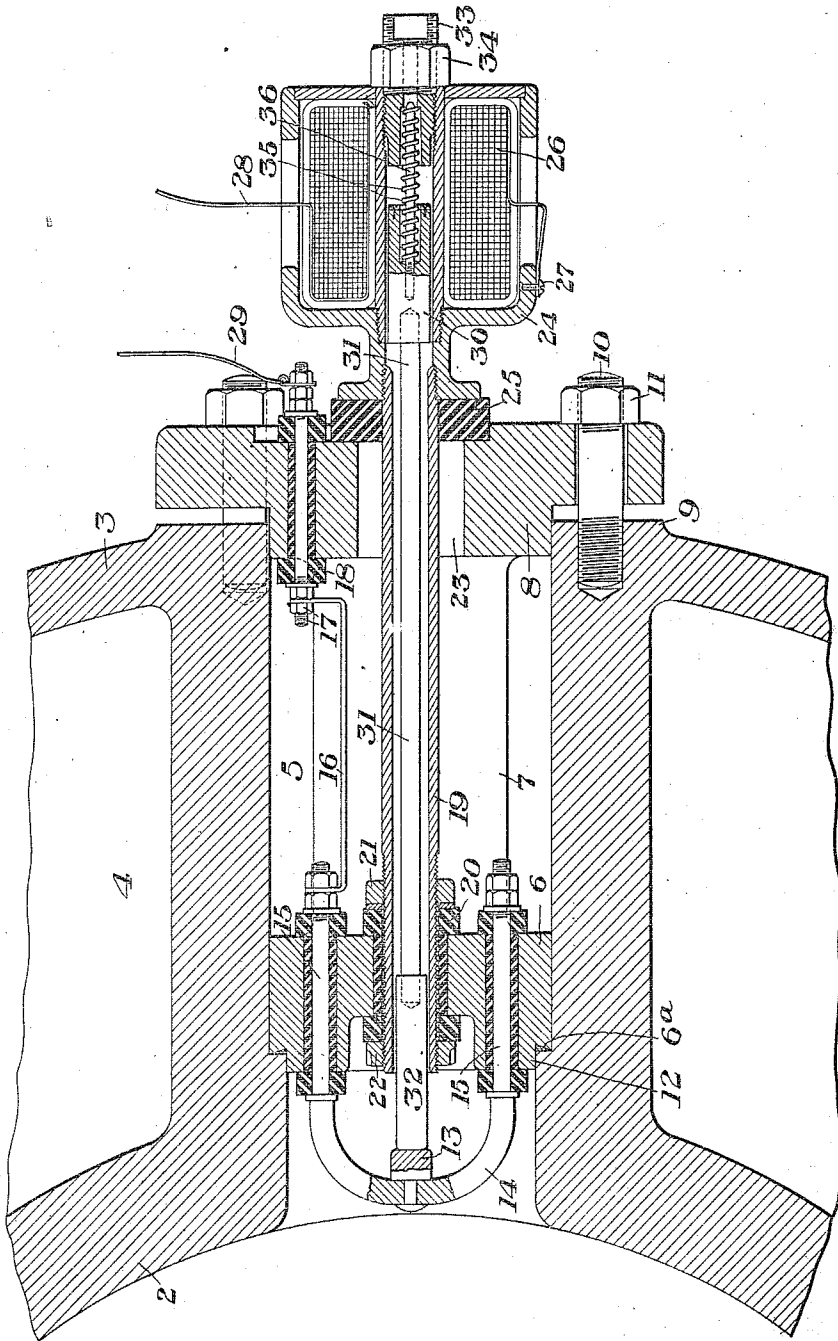


G. BAEHR.
 SPARK PLUG.
 APPLICATION FILED AUG. 24, 1909.

972,798.

Patented Oct. 18, 1910.



WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE BAEHR, OF McKEESPORT, PENNSYLVANIA.

SPARK-PLUG.

972,798.

Specification of Letters Patent.

Patented Oct. 18, 1910.

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To all whom it may concern:

Be it known that I, GEORGE BAEHR, of McKeesport, county of Allegheny, and State of Pennsylvania, have invented a new and useful Spark-Plug, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, in which the figure shows a longitudinal sectional side elevation of my improved spark-plug in position for use on the cylinder of a gas-engine.

My invention relates to the construction of spark plugs of the "make and break" type and more particularly relates to the larger sizes of such plugs used on gas engines in which blast furnace gases are employed as the motive fluid.

The object of my invention is to provide a spark plug of the "make and break" type having novel means for actuating the relatively movable electrodes in making and breaking contact between the electrodes to form sparks and means by which the electrodes are confined entirely within a chamber opening into the interior of the gas engine cylinder, while the electrode actuating mechanism is excluded from the high temperatures developed in the gas engine cylinder and necessarily in this chamber during the operation of the gas engines.

Another object of the invention is to provide a spark plug having improved means by which it is easily and quickly replaced in position upon the gas engine and in which the parts are easily accessible in making repairs and the weight of the apparatus is greatly reduced.

In the drawings 2 represents the inner wall and 3 the outer wall of a gas engine cylinder having a water jacket 4. Counter-bored openings 5 are provided at suitable locations on the cylinder to form chambers communicating with the interior of the cylinder in which spark plugs are located when in use. Obviously provision can be made on the gas engine cylinder to use one or any number of spark plugs found necessary or desirable. Projecting into the opening 5 in the cylinder is a circular flange 6 which is connected, as shown, by integral spreaders or arms 7 with an outer flange 8. The outer flange 8 is removably secured to the boss 9 on the engine cylinder and is held in place by means of the studs or bolts 10 and nuts 11. The flange 6 is provided on its inner surface with a

reduced portion 12 which projects into the smaller diameter of the counter-bored opening 5, so as to form a seat with the shoulder forming the counter-bore, for the flange 6. Asbestos rope or similar heat resisting material is placed between the adjacent faces of the flange 6 and shoulder in the counter-bore to form a packing 6^a and prevent leakage of the gases from the interior of the cylinder into the chamber 5 beyond the flange 6.

The stationary electrode 13 is secured to or formed integral on the U-shaped bolt 14, which is provided with reduced portions 15, projecting through suitable openings in the flange 6. Suitable insulated material is placed in the openings in the flange 6 to insulate the U-shaped bolt 14 from the flange 6 and one or the other of the threaded ends of the U-shaped bolt is used to form a binding post to which one end of a copper ribbon 16 or other conductor is secured. The other end of the ribbon 16 is secured to one end of the bolt 17 which is secured in and is insulated by fiber 18 or other suitable insulating material, from the flange 8. As shown in the drawings, a tubular casing 19 is secured at one end in the flange 6, being insulated by means of fiber or other insulating material from contact with the flange 6. The inner end of the casing 19 is screw threaded and is provided with adjusting nuts 21 and 22 by which it is adjustably held in position on the flange 6. The casing 19 extends through the chamber 5 and projects through a central opening 23 in the outer flange 8 of the spark plug and on the outer end of the casing 19 is secured the shield 24 of the solenoid coil by which the movable electrode of the apparatus is actuated. The shield 24 is provided with internal screw threads by which it is adjustably secured to the casing 19 and the washer 25, formed of fiber or other suitable insulating material, is placed between the end of the shield 24 and the outer surface of the flange 8 to insulate the shield 24 from the flange 8.

A solenoid coil 26 is secured in the shield 24 and one end of the winding is secured by the cap screw 27 to the shield 24. The other end 28 of the winding of the coil 26 and the conductor 29 which is secured to the outer end of the bolt 17, are connected through a suitable timing device with a battery or other source of electrical energy. As shown, the current used to energize the coil 26 is

also employed to form a spark. Within the opening extending through the coil 26 is the solenoid core 30 which is connected by a rod 31 with the movable contact 32, the inner end of the contact 32 being in engagement with the stationary contact 13 on the bolt 14. The opening in the coil 26 to which the solenoid core extends is closed by means of the screw threaded plug 33 which is adjustably secured therein and is held in its adjusted positions by the lock nut 34. A helical spring 35 on the rod or pin 36 is placed between the ends of the plug 33 and the solenoid core to assist in moving the movable contact 32 into engagement with the stationary contact 13.

In the operation of the apparatus, the parts forming the spark plug are assembled together and the assembled plug is then placed into position in the opening or chamber 5 in the gas engine cylinder. It will be noted that the contacting ends of the electrodes project in the chamber 5 until closely adjacent to the interior of the gas cylinder, while not entering the cylinder. The nuts 11 on the bolts 10 are then adjusted to secure the flanges 6 and 8 in the position shown, the packing 6^a being placed in position before the spark plug is inserted in the opening 5. The ends of the conductors 28 and 29 are connected to a timing apparatus which may be of any known type and which will be connected to a source of electrical current. When the engine is started in operation the timing apparatus, at a predetermined point in the stroke of the piston will complete the circuit and allow current to pass through the coil 26, the coil shield 24 and through the core 30 and rod 31 into the electrode 32 to the electrode 13, the bolt 14, the conductor 16 and bolt 17 to the conductor 29 and in this way complete the circuit. When the circuit is completed the coil 26 is energized and the solenoid core 30 is caused to lift or move so as to break the contact between the electrodes 13 and 32. When this occurs an arc results which ignites an explosive charge in the gas engine cylinder. When the circuit is broken by movement of the electrode 32, the coil 26 is deenergized and the electrode 32 will then move forwardly under the influence of the spring 35 or by gravity in cases where the apparatus is placed vertically on the gas engine cylinder until it is again in contact with the electrode 13 in position to again complete a circuit and cause another spark when the current is again completed by the timer. The above operations are then repeated when the circuit is completed by the timing mechanism of the engine.

From the foregoing description it will be apparent that the body of the present plug is made up of the flanges or heads 6 and 8 connected by the tube 19; the fixed electrode

13 being carried by the inner head 6 or end of the plug at the outer side thereof, with the movable electrode 32 working through the opening in the inner head with which the tube 19 communicates, while the means for actuating the movable electrode 32 is the solenoid 26 supported by the outer end or head 8 of the plug entirely at the outer side thereof, connection between the movable core 30 of the solenoid and the movable electrode 32 being had by means of the rod 31. By this construction and arrangement, the body of the plug is interposed between the fixed electrode, where the spark is produced, and the solenoid, whereby the latter is effectually protected against damage by burned gases.

Instead of connecting a single circuit to the electrodes through the coil, two circuits may be employed, one to energize the coil, and the other to supply current for causing the spark.

The advantages of my invention will be appreciated by those skilled in the art. By my improved construction, the use of a movable electrode which is partly within and partly without a chamber communicating with the interior of the gas engine cylinder is avoided. The necessity of maintaining a packed joint around the moving parts and the difficulty met with in maintaining a tight joint in the presence of the high pressures and temperatures present in gas engine cylinders are avoided and removed.

Modifications in the construction and arrangement of the parts may be made without departing from my invention. The distance between the flanges 6 and 8 will be governed by the distance between the inner and the outer surfaces of the gas engine cylinder wall and, in some cases this distance will be such that the spreaders 7 connecting the flanges 6 and 8 will be unnecessary. The construction of the electrodes and of the apparatus for securing the electrodes in place may be modified and other changes may be made within the scope of my broader claims.

I consider myself the first to construct a "make and break" spark plug having electrode actuating mechanism which is entirely beyond and is excluded from contact with the gases employed in the engine cylinder and a spark plug which does not employ a sliding connection, partly within and partly without the engine cylinder or a chamber in communication with the interior of the gas engine cylinder and I intend to claim such construction broadly.

I claim:

1. A spark device for gas engine cylinders including inner and outer heads provided with aligned openings, a fixed electrode carried by the inner head, a movable electrode working in the opening in the inner

head, a solenoid carried by the outer head and lying at the outer side thereof, and means cooperating with the solenoid and the movable electrode for actuating the latter and passing through the opening in the outer head, substantially as described.

2. A spark device for gas engine cylinders including inner and outer heads provided with alined openings, arms connecting the heads, a fixed electrode carried by the inner head at the outer side thereof, a movable electrode working in the opening in the inner head, an electric connection upon the outer head, a conductor leading from the connection to the fixed electrode, a solenoid carried by the outer head at the outer side thereof, a solenoid casing to which one terminal of the solenoid is connected, a solenoid core, and a rod of conducting material extending through the opening in the outer head and connected at opposite ends with the solenoid core and the movable electrode respectively, substantially as described.

3. The combination with an explosive cylinder having a spark chamber communicating with the interior of the cylinder, of inner and outer heads fitted to the chamber, the inner head having an opening, a fixed

electrode carried by the inner head between the latter and the interior of the cylinder, a movable electrode working in the opening in the inner head, and electrically controlled means carried by the outer head for actuating the movable electrode, substantially as described.

4. The combination with an explosive cylinder having a spark chamber communicating with the interior of the cylinder, of inner and outer heads fitted to the chamber and provided with alined openings, a fixed electrode carried by the inner head between the latter and the interior of the cylinder, a movable electrode working in the opening in the inner head, and electrically controlled means carried by the outer head and disposed entirely at the outer side thereof for actuating the movable electrode through the opening in the outer head, substantially as described.

In testimony whereof, I have hereunto set my hand.

GEO. BAEHR.

Witnesses:

JOHN FOX,
C. W. GILCHRIST.