A. CLARKE.

SPARK PLUG.

APPLICATION FILED MAY 29, 1908.

930,351.

Patented Aug. 10, 1909.

Fig. 1.

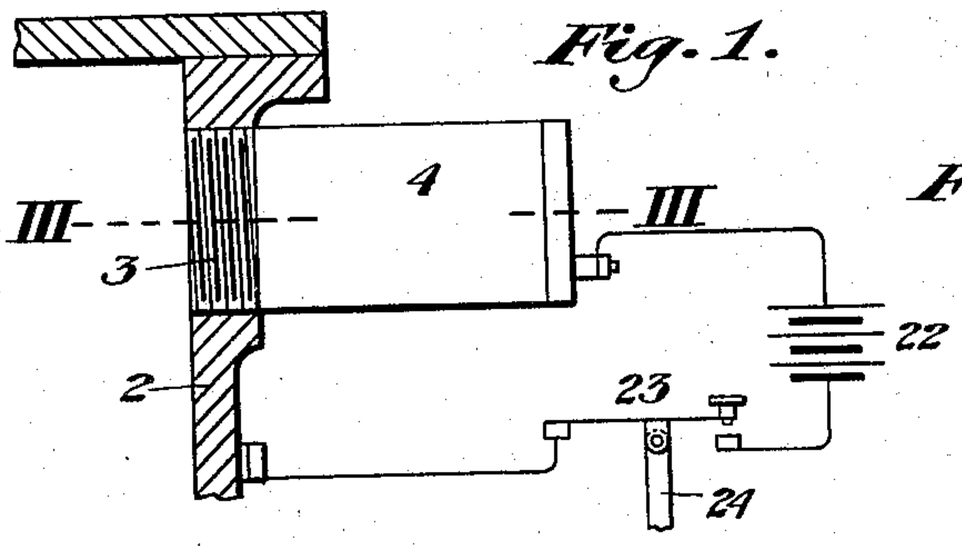
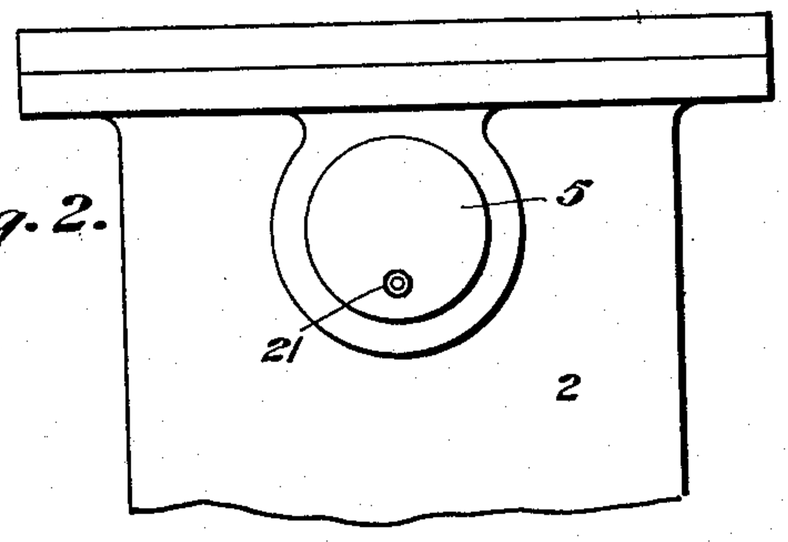


Fig. 2.



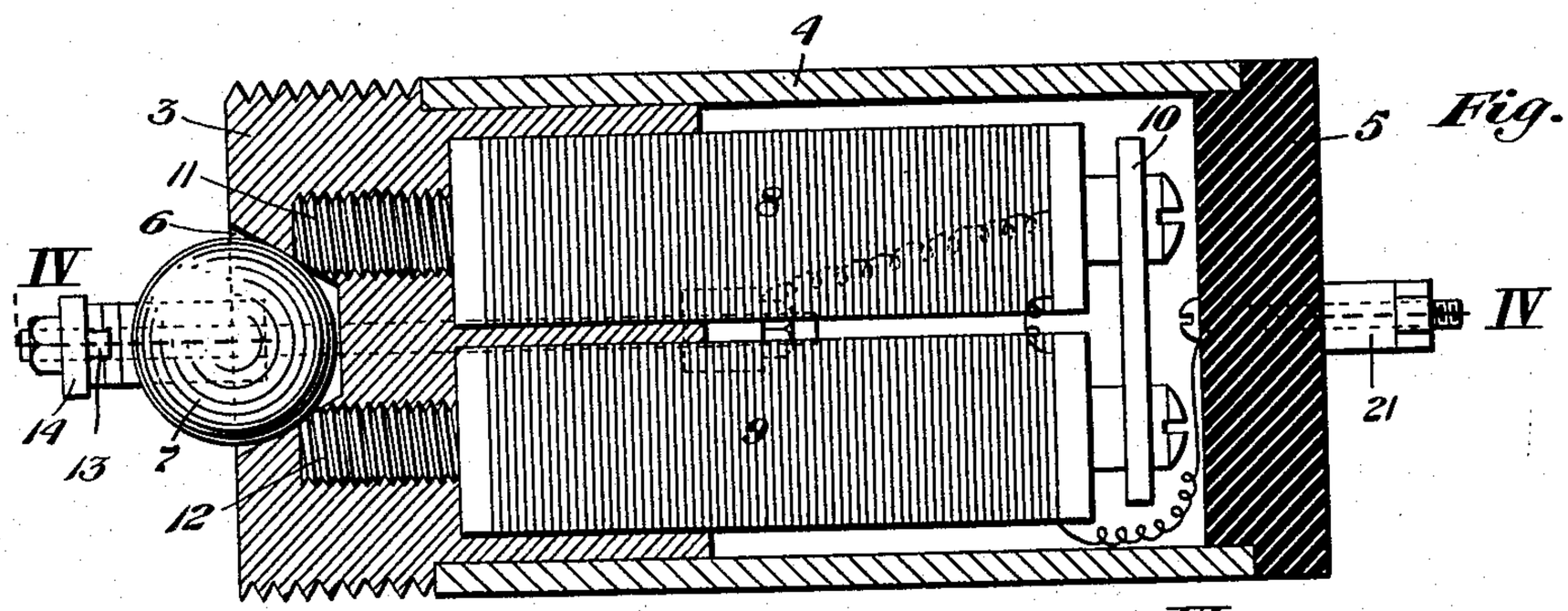


Fig. 3.

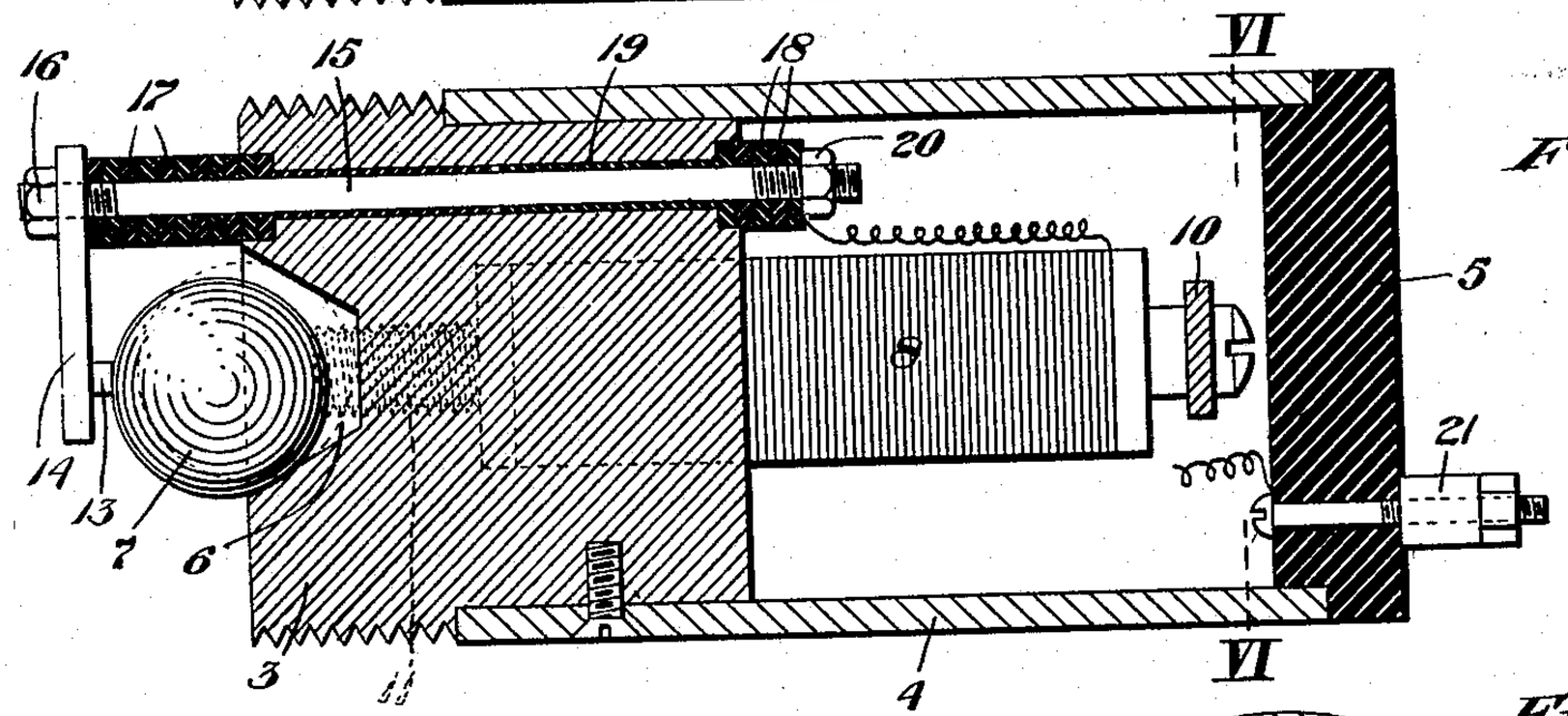


Fig. 4.

Fig. 5.

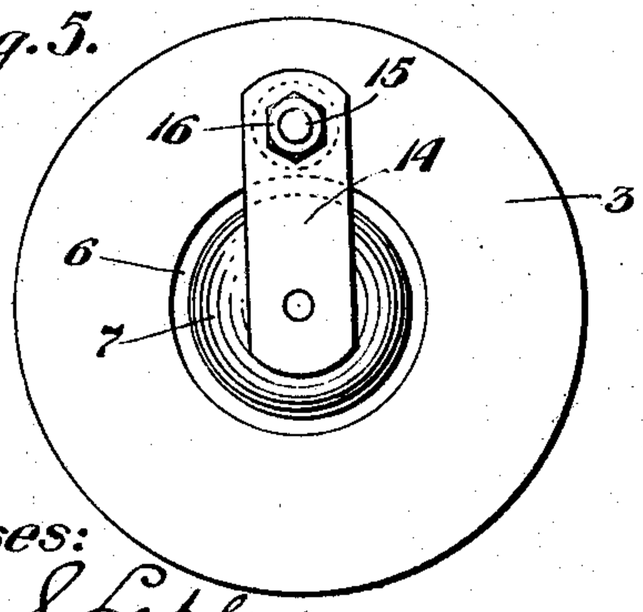
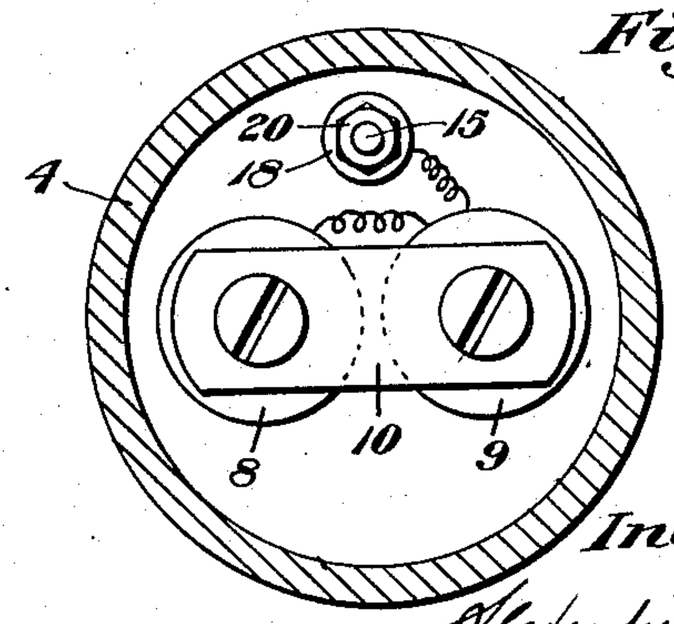


Fig. 6.



Witnesses:

Chas. S. Lepley.

Henry Sens.

Inventor:

Alexander Clarke

by C. M. Clarke

his attorney.

UNITED STATES PATENT OFFICE.

ALEXANDER CLARKE, OF FOLSOM, WEST VIRGINIA, ASSIGNOR TO SOUTH PENN OIL COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

SPARK-PLUG.

No. 930,351. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed May 29, 1908. Serial No. 435,630.

To all whom it may concern:

Be it known that I, ALEXANDER CLARKE, a citizen of the United States, residing at Folsom, in the county of Wetzel and State of West Virginia, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention refers to improvements in spark plugs for explosive engines and has for its object to provide a simple efficient device for the purpose of positively making an ignition spark in the explosive chamber of a gas engine or for any other desired purpose, and is constructed and operated in the manner hereinafter described.

Referring to the drawings, Figure 1 is a view of the device in elevation, shown in position with relation to the explosion chamber and indicating the actuating circuit and its make-and-break mechanism. Fig. 2 is an end view of the device in Fig. 1. Fig. 3 is a vertical sectional view on an enlarged scale indicated by the line III. III. of Fig. 1. Fig. 4 is a horizontal sectional view indicated by the line IV. IV. of Fig. 3. Fig. 5 is a rear view in elevation of the device. Fig. 6 is a transverse sectional view on the line VI. VI. of Fig. 4.

2 represents the shell or casing of the explosion chamber of a gas engine or other mechanism in the interior of which it is desired to produce a spark for combustion of the inclosed gases, into which is inserted by any suitable means, as by screw threads, the base 3 of my device. A cylindrical shell 4 is incorporated with the base 3, said shell being closed at the outer end by an end cover 5 of any suitable insulating material, as fiber.

The base 3 is of some non-magnetic metal and is provided at its inner end with a tapered socket 6 adapted to form a seating cavity for the loosely mounted ball 7 when the magnets or coils 8, 9, are energized. The socket 6 is inclosed within outwardly diverging walls, so that in any position in which the device is mounted, the ball 7 will fall by gravity away from said cavity.

The coils 8, 9, of the magnet are made in any suitable manner by means of a sufficient number of turns of suitable insulated wire wound upon spools of insulating material, having its cores at the outer end connected by a yoke 10, while the inner ends of the cores 11, 12, are screw-threaded.

As shown, the inner bases of the coils are set into the base 3 for some distance and threaded terminals 11, 12, are tapped into the base and extend into and at each side of the cavity 6, as clearly shown in Fig. 3.

Outwardly beyond the cavity 6 is located the contact point 13 of platinum or any suitable conducting material, said point being mounted sufficiently beyond the cavity 6 to permit of a limited amount of free movement of the ball as indicated in Figs. 3 and 4 respectively. The contact point 13 is mounted in a conducting arm 14 extending inwardly from the end of a conducting rod 15 passing longitudinally through base 3, the arm 14 being held by nut 16 or any other suitable means.

Rod 15 performs the double function of providing a rigid contact point support and also that of a conductor for the current and is mounted within the base 3 with any suitable insulation, as washers 17, 18, at each end, and also if desired an intervening tube or tubes 19, or in any other suitable manner to give the desired results. If preferred, however, the insulation 19 may be omitted, the rod 15 being held centrally within its hole by the end insulations, said hole being sufficiently large to prevent short circuiting.

The coils 8, 9, are electrically connected, while one of the coils is connected with the inner end of rod 15 by securing nut 20, the other coil being connected with an outer binding post 21. Said binding post is connected with any source of electric supply as a battery 22, the other terminal being grounded as by connection with the engine frame 2, as shown in Fig. 1 and being provided with any suitable make-and-break mechanism or switch 23 adapted to be operated to open or close the circuit by means of any suitable connection 24 co-acting with the engine itself to produce the spark at the desired time.

The operation is as follows:—When the circuit is closed by switch 23 and the coils are energized, the ball 7 will be attracted by the terminals 11, 12, in the manner of an arma-

ture by the magnetism set up in the cores, and will be drawn into the receptacle 6 and away from point 13, against which it rests in normal position. The breaking of the circuit from said point through the ball to base 3 will produce the spark, and as soon as the current is again broken by contact 23, the ball will fall back to its original position, again making contact with base 3 and point 13. This operation may be continued as long or as rapidly as is necessary to produce the desired frequency of sparking, depending on the mechanism controlling the make-and-break mechanism 23.

The advantages resulting from the invention are, that any desired number of sparks per second of great heat intensity are produced with a minimum current consumption; the spherical shape of the armature ball results in constant turning and change of its position, thereby presenting a different surface of contact for each operation and greatly lengthening the life and resulting service; all springs are avoided, the device will operate equally well in any position, and may be inverted vertically, ball down, with the same results.

The spark plug is wholly self-contained; the coils form their own spark; it is absolutely gas-tight and well suited to the requirements of gas engine practice, and all formation of carbon on or about the moving elements is avoided.

By reason of the insulation the high temperatures and pressure encountered in gas engine practice will not affect it. It is capable of the highest efficiency and endurance, due to its construction, the small number of parts, and lightness of the ball 7.

The device is comparatively simple and cheap in construction, not liable to get out of order and requires little or no attention or adjustment. The invention may be changed or varied by the skilled mechanic in different features of construction or details, but all such changes are to be considered as within the scope of the following claims.

What I claim is:

1. A spark plug consisting of a base having a continuously annular outwardly flaring tapered socket, a retaining point and a supporting device therefor mounted in the base and constituting an electrical conductor, a ball armature loosely mounted in the socket and normally retained partly within the socket by said point, and means for magnetically attracting the ball away from said contact point into the socket, substantially as set forth.

2. A spark plug consisting of a base having a continuously annular outwardly flaring tapered socket, a retaining point and a supporting device therefor mounted in the base and constituting an electrical conductor, a ball armature loosely mounted in the socket and normally retained partly within the socket by said point, magnetic coils arranged to attract the ball backwardly from the contact point into the socket, and a circuit connection between said supporting device for said point and said coils, substantially as set forth.

3. A spark plug consisting of a base having a tapered socket, magnetizing coils having their cores terminating at opposite inner sides of said socket, a retaining point located outwardly beyond said socket and electrically connected with said coils, and an armature ball loosely mounted between said socket and point, substantially as set forth.

4. A spark plug consisting of a base having a tapered socket, magnetizing coils having their cores terminating at opposite inner sides of said socket, a retaining point located outwardly beyond said socket and electrically connected with said coils, by a supporting rod passing through the base, and an armature ball loosely mounted between said socket and point, substantially as set forth.

5. A spark plug consisting of a base having a tapered socket, magnetizing coils having their cores terminating at opposite inner sides of said socket, a retaining point located outwardly beyond said socket and electrically connected with said coils by a supporting rod passing through the base and insulated therefrom, and an armature ball loosely mounted between said socket and point, substantially as set forth.

6. A spark plug consisting of a base having a tapered socket, magnetizing coils having their cores terminating at opposite inner sides of said socket, a retaining point located outwardly beyond said socket and electrically connected with said coils, an armature ball loosely mounted between said socket and point, and an outer inclosing case secured on the base, substantially as set forth.

7. A spark plug consisting of a base having a tapered socket, magnetizing coils having their cores terminating at opposite inner sides of said socket, a retaining point located outwardly beyond said socket and electrically connected with said coils, an armature ball loosely mounted between said socket and point, and an outer inclosing case secured on the base provided with an insulating end cap having a binding post, substantially as set forth.

8. The combination with an explosive engine, of a spark plug consisting of a base extending into the explosion chamber having a tapered socket and a retaining point, magnetizing coils extending beyond the base and having their cores arranged at opposite inner sides of said socket, and an armature ball loosely mounted between the socket and said point, substantially as set forth.

9. The combination with an explosive engine, of a spark plug consisting of a base ex-

tending into the explosion chamber having a tapered socket and a retaining point, magnetizing coils extending beyond the base and having their cores arranged at opposite inner sides of said socket, and an armature ball loosely mounted between the socket and said point, with means for making and breaking a circuit through the coils in conformity with the desired operation of the engine, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER CLARKE.

Witnesses:

WILLIAM B. CLARKE,

WILLIAM I. KAUFMAN.