

C. H. THORDARSON.
HIGH POTENTIAL SPARK COIL.
APPLICATION FILED DEC. 23, 1907.

899,634.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

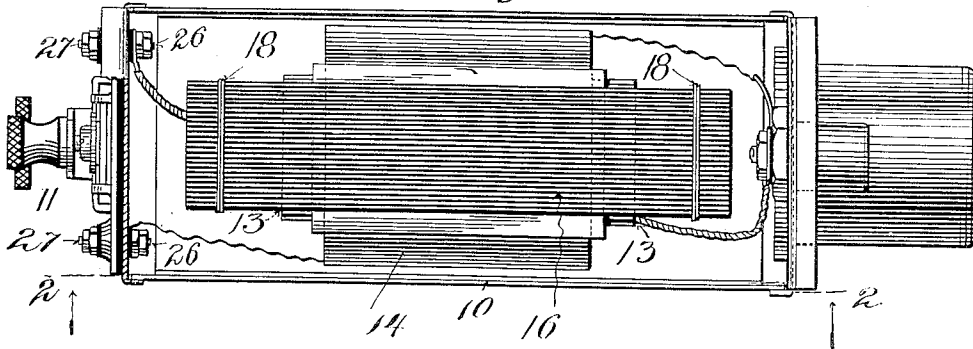


Fig. 2.

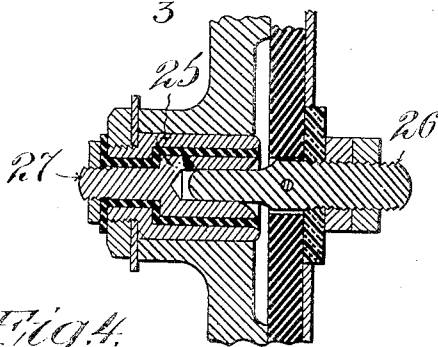
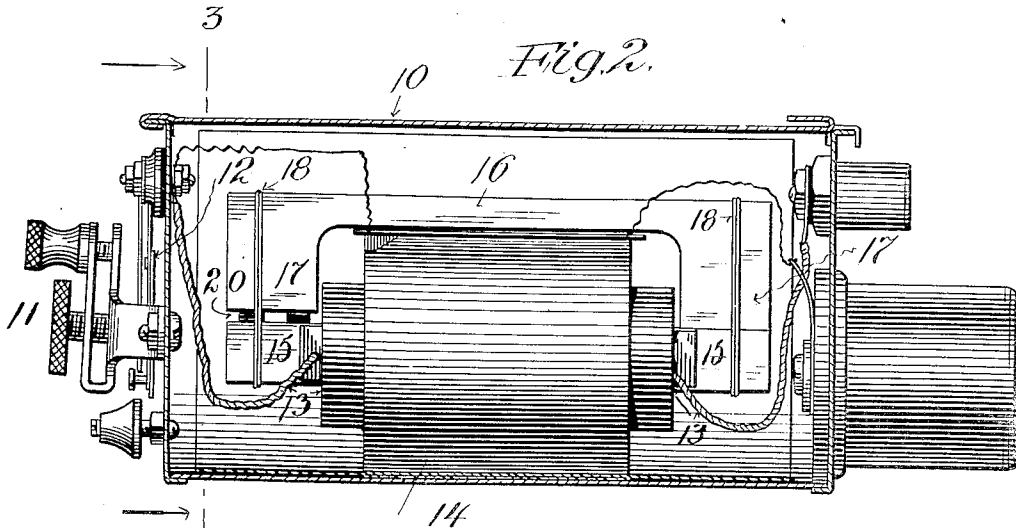


Fig. 4.

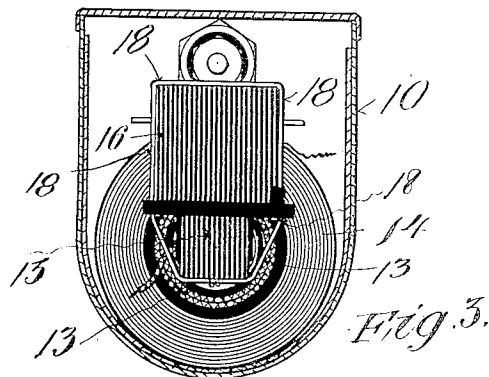


Fig. 3.

Witnesses:
C. M. Benjamin
Joseph Klein.

Inventor
Chester H. Thordarson
By his Attorney
Samuel E. Marby

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2 SHEETS—SHEET 2.

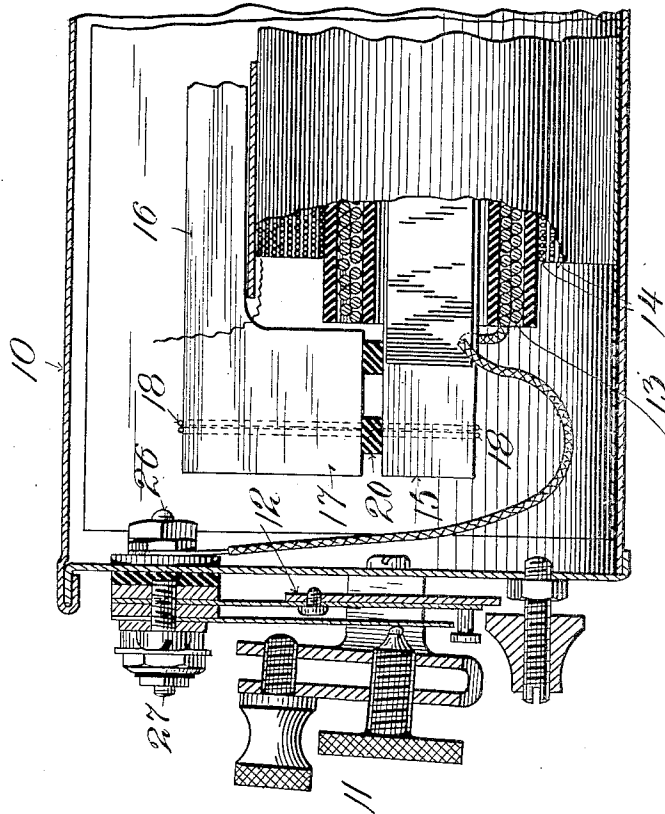


Fig. 6.

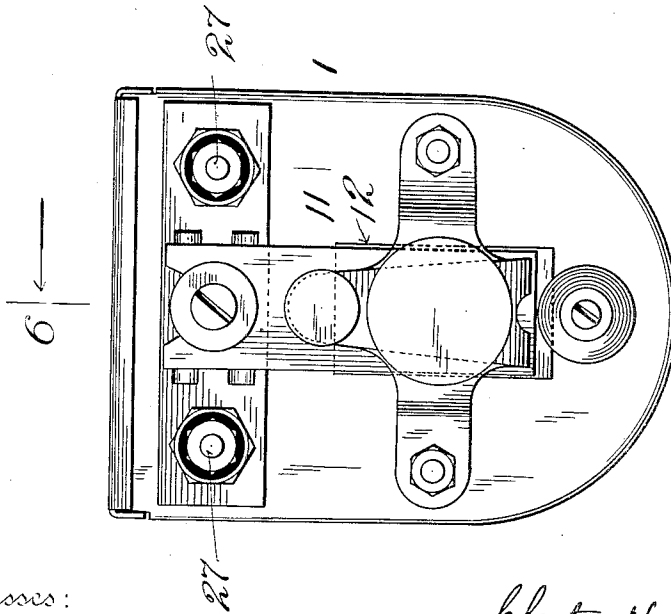


Fig. 5.

Witnesses:
C. H. Thordarson
Joseph Klein

Inventor
Chester H. Thordarson
By his Attorney
Samuel Edarby

UNITED STATES PATENT OFFICE.

CHESTER H. THORDARSON, OF CHICAGO, ILLINOIS.

HIGH-POTENTIAL SPARK-COIL.

No. 899,634.

Specification of Letters Patent.

Patented Sept. 29, 1908.

Application filed December 23, 1907. Serial No. 407,808.

To all whom it may concern:

Be it known that I, CHESTER H. THORDARSON, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have made a certain new and useful Invention in High-Potential Spark-Coils, of which the following is a specification.

This invention relates to high potential spark coils.

The object of the invention is to provide a construction of spark coil in which the spark produced is short and has a tendency to flame rather than being long with very little flame.

A further object is to provide an inclosing casing for the coil and which wholly incloses the same, the circuit breaker being placed outside of the casing and operated by magnetic action of the coil outside the case exerted through the case upon an armature outside the case and associated with the circuit breaker.

A further object is to provide a simple, efficient, economical and compact construction of spark coil adapted for general use where spark coils are required but specially designed for use in connection with the ignition devices of explosive engines.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings and finally pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference signs appearing thereon: Figure 1 is a view in bottom plan of a spark coil and its inclosing casing and embodying the principles of my invention. Fig. 2 is a view in section on the line 2, 2, Fig. 1, looking in the direction of the arrows. Fig. 3 is a view in transverse section on the line 3, 3, Fig. 2, looking in the direction of the arrows. Fig. 4 is a broken detail view in section, showing adjusting means for the platinum screws employed in connection with my invention. Fig. 5 is a view in end elevation showing the arrangement of circuit breaker mechanism. Fig. 6 is a broken view in longitudinal section on the line 6, 6, Fig. 5, looking in the direction of the arrows.

The same part is designated by the same

reference sign wherever it occurs throughout the several views.

In the use of spark coils as ordinarily constructed and particularly such coils employed in connection with the ignition devices of explosive engines, the spark produced is usually long but has very little tendency to flame. The coil employed for producing the spark commonly has a straight iron wire or other similar core while, usually a comparatively large amount of copper is used in the primary and secondary windings in order to produce the potential required to make the spark. The use of the increased amount of windings of course increases the ohmic resistance of the device and hence also the battery or other source of current consumption, while at the same time, the spark itself is long and with small power more nearly resembling the spark from a static machine. Moreover, spark coils employed in connection with the ignition devices of explosive engines usually require the core to protrude through the casing in order to operate magnetically the circuit breaker, thereby making it possible for the insulating compound within the casing, when liquefied by heat, to run through, or enabling dust, dirt, air, moisture or other foreign matter to gain access to the interior of the case, thereby corroding the iron or other parts of the coil structure and, hence, rapidly deteriorating the same.

It is among the special purposes of my present invention to produce a spark coil device which is very simple and compact in construction and arrangement and efficient in operation, wherein the magnetic power required in the production of the spark is greatly increased with a reduced amount of copper in the coil windings, thereby reducing not only the cost of construction but also the amount of current consumption and of the ohmic resistance, and which will produce a spark having a tendency to flame and, hence, one that is better suitable for use in insuring gas ignition when used in connection with the ignition devices of explosion engines.

In carrying out my invention I propose to inclose the coil and its associated magnet core wholly within an inclosing case, and to operate the circuit breaker, by means of the influence of the magnetic field upon an armature placed outside of the case, the lines of force of the field, generated within the case, operating through the wall of the case, there-

by avoiding the necessity of protruding the core through the case.

Referring to the accompanying drawings wherein I have shown a construction embodying the principles of my invention, the inclosing casing is designated by the reference sign 10. The circuit breaker is designated generally by reference sign 11, and may be of the usual or any well known or convenient construction, except that it has associated therewith an armature 12, for the operation thereof, said armature being operated by the influence of the magnetic field generated as hereinafter described.

Arranged wholly within the casing 10 are the coils and their associated parts. These, in the particular form illustrated, comprise the primary coil 13, and the secondary coil 14, through which passes the leg 15 of the core, the cooperating leg 16 of the core being placed outside the coils but having the pole faces 17 of its ends arranged in suitable relation, respectively, with the ends of the leg 15. In practice I prefer to employ a laminated magnet core, both the legs 15 and 16, being composed of flat strips or laminations, as clearly shown, and held or bound together in any suitable manner, as, for instance, by means of the bindings 18. The pole face of the leg 16 at one end thereof bears against the surface of the core leg 15, while at the other end, namely, the end where the magnetic field is generated or created for operating the circuit breaker, the pole face of the one leg is separated from contact with the other leg sufficiently far to form an air space 20, therebetween, thereby producing an interruption of the magnetic circuit at this point.

In practice I have found that the higher efficiency is attained when the air gap or space 20 is adjusted to the lowest or minimum area which will allow sufficient magnetic leakage to operate the armature 12.

The wiring connections may be and are shown the same as those ordinarily employed in connection with devices of this nature.

I have found that an induction coil having primary and secondary windings and a laminated magnetic circuit, nearly closed, or having an air space or gap, as above described, is well adapted for my purpose, and that when the air space or gap is of sufficient extent to give the requisite magnetic leakage through the wall of the inclosing case to move an armature to operate the circuit breaker, less copper is required in the windings of the primary and secondary, more energy is developed in the magnetic field the ohmic resistance losses are less, and a spark of more suitable character for efficient service in connecting igniting devices for explosive engines is produced, than with spark coils as heretofore commonly constructed and now in use.

The spark from a coil having the described construction and arrangement, as I have found, has a greater tendency to flame than the sparks produced in the ordinary forms of devices of this nature.

By using the magnetic interruption or leakage afforded in the magnetic circuit by the air gap therein, as above described, for operating the circuit breaker armature the special and important advantage is gained that the magnetic field can be made to operate through the casing, which may be of wood, fiber, or any non-magnetic metal, and in practice, where a metal casing is employed, I prefer to make that portion of the same lying between the circuit breaker armature and the coil within the casing of non-magnetic material having a high electrical resistance, such, for instance, as brass, otherwise the action of the armature is impeded or made more sluggish by induced currents generated in that part of the case. The effect of the metal case on the magnetic field, that is the sluggishness produced by such case on that portion of the magnetic field which passes through the case, does not in any way impede the velocity of the magnetic lines which lie entirely within the casing, nor does the metal case appear to impede the speed of that portion of the magnetic lines which lie within the case but which also pass through the case to the armature. However, such magnetic lines, when the primary circuit is open, will rapidly close that portion of the path of such lines which lies inside the case, and then disappear as a current eddy near the armature, and if the secondary is closed the spark produced by these magnetic lines will dissipate a large portion of their energy on the secondary circuit.

That the velocity of the magnetic lines, generated by the apparatus as above described, is very great in closing on the secondary when the primary circuit is open can be understood from the fact that a core of one centimeter cross sectional area and magnetization of ten thousand maximills can produce a secondary potential of five volts per turn of winding which is equal to a velocity of more than ten thousand meters per second.

The feature of inclosing the coil wholly within the case I regard as a very important feature of my invention for the reason that thereby protection is afforded against dampness, moisture, dust and the like while at the same time variations of temperature do not affect the apparatus or its operation. These are particularly useful and valuable characteristics where the device is employed in connection with sparking devices of explosion engines used on automobiles. In such field of use the casings containing the coils may be readily and easily mounted in any convenient and accessible place and which may

be readily detached while presenting a neat and finished appearance.

In Fig. 4, I have shown a special form of adjustment which may be employed for the platinum screws used in connection with the apparatus. The adjustment of these screws is the only adjustment necessary about the apparatus. In the ordinary form of adjustment either a lock nut is employed for locking the screw in its adjusted position or else a ratchet adjustment is employed. The former method of adjustment is objectionable for the reason that the operation of turning up the lock nut tight disarranges the adjustment of the screw. The ratchet form of adjustment is objectionable for the reason that adjustments are thereby effected in steps and cannot be made very close. To overcome these objections I employ a specially formed bushing 25, into which the platinum screw 26 extends, the end of such screw being received in a separate locking screw 27, mounted in the bushing 25, but insulated therefrom. By this construction the platinum screw is locked without in any way changing its adjustment.

It is to be understood that many variations and changes in the details of construction and arrangement might readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details of construction and arrangement shown and described. But having now set forth the object and nature of my invention, and a construction embodying the principles thereof, and having described such construction, its purpose, function and mode of operation,

What I claim as new and useful and of my own invention and desire to secure by Letters Patent is:

1. A high potential spark coil having an air gap formed transversely through the magnetic circuit thereof, an inclosing casing for said coil, and an armature arranged outside the casing and adapted to be operated by the magnetic field generated within the casing.

2. In a high potential spark coil an inclosing casing, means arranged within the casing for generating a magnetic field, and a movable armature arranged outside the case and adapted to be operated by the influence of said magnetic field.

3. A high potential spark coil having an air gap formed transversely through the magnetic circuit thereof, an inclosing casing for the coil and a movable armature arranged outside the casing and adjacent the air gap.

4. A high potential spark coil having a primary and a secondary winding, a core therefor, said core having an air gap in the magnetic

circuit thereof, and a movable armature arranged adjacent the air gap.

5. A high potential spark coil having a primary and a secondary winding and a core therefor, said core having an air gap in its magnetic circuit, a casing for wholly inclosing said windings and core, and a movable armature arranged outside the casing and at a point adjacent said air gap.

6. A high potential spark coil having a laminated core, said core having an air gap formed through the magnetic circuit thereof, and a movable armature arranged opposite the air gap to be operated by the magnetic field at this point.

7. A high potential spark coil having a laminated core, said core having an air gap through the magnetic circuit thereof, an inclosing casing for said coil and core, and a movable armature arranged outside the casing, opposite the air gap in the core.

8. A high potential spark coil including a primary and a secondary winding and a laminated core, said core having an air gap transversely through the magnetic field thereof, and a movable armature arranged opposite said air gap.

9. A high potential spark coil including a primary and a secondary winding and a laminated core, said core having an air gap transversely through the magnetic field thereof, an inclosing casing for said coil, and a movable armature arranged outside the casing and at a point opposite the air gap.

10. A high potential spark coil including a core having an air gap formed transversely through the magnetic circuit thereof a non-magnetic metal case inclosing said coil and core, and a movable armature arranged outside the case and at a point opposite the air gap.

11. A high potential spark coil including a core having an air gap transversely through the magnetic circuit thereof, a metallic case wholly inclosing said coil and core and having a non-magnetic wall opposite said air gap, and a movable armature arranged outside the casing and opposite said non-magnetic wall.

12. A high potential spark coil having a core, said core provided with an air gap through the magnetic circuit thereof, in combination with a circuit controlling screw, means for adjusting the same, and a locking screw therefor.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 16th day of December A. D., 1907.

CHESTER H. THORDARSON.

Witnesses:

WALTER QUITMAN,

SYLVANUS E. LAMBERT.