No. 878,467. PATENTED FEB. 4, 1908.

I. C. ORSWELL.

INDUCTION COIL SYSTEM.

APPLICATION FILED APR. 20, 1907.

Fig. 1.

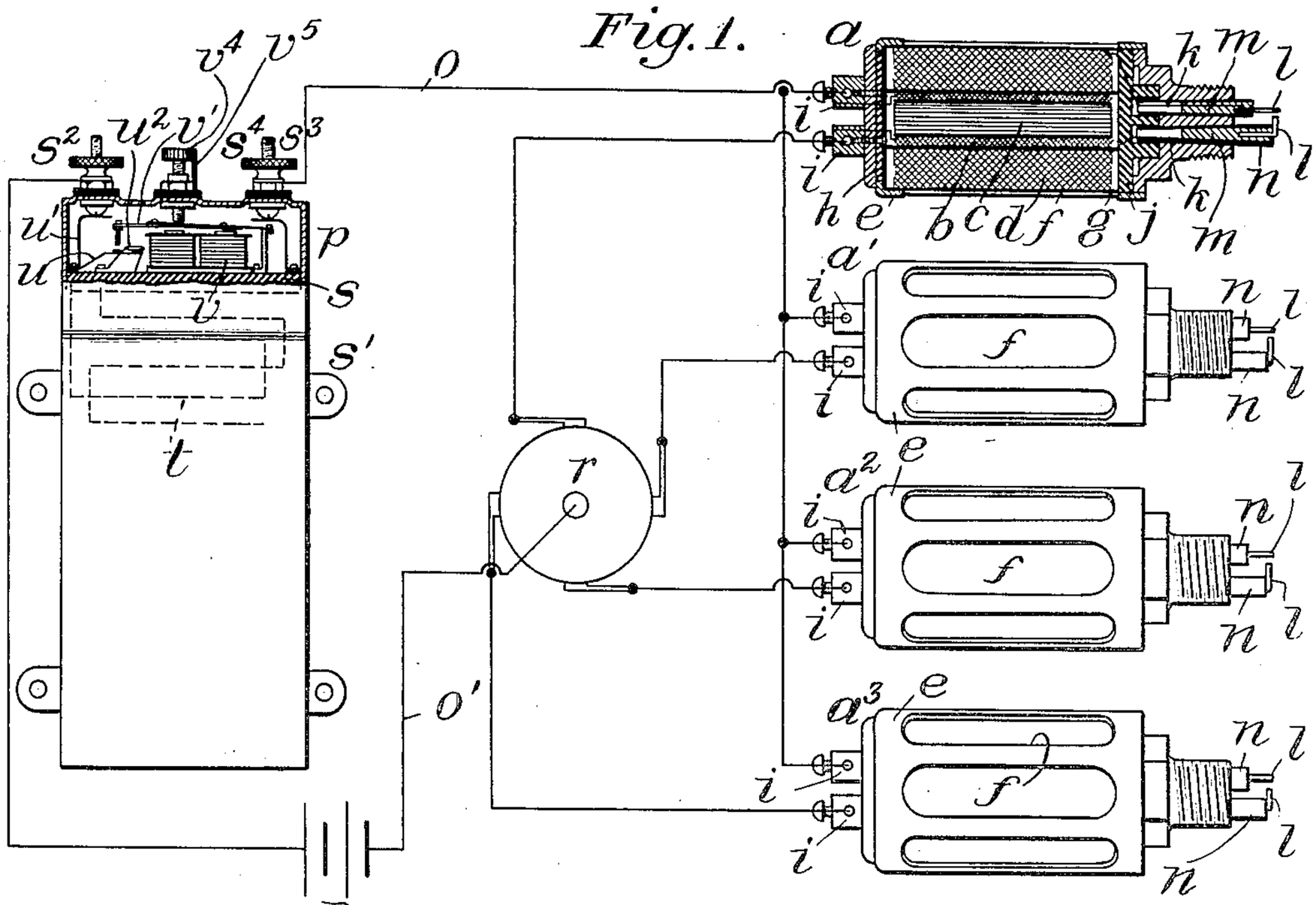
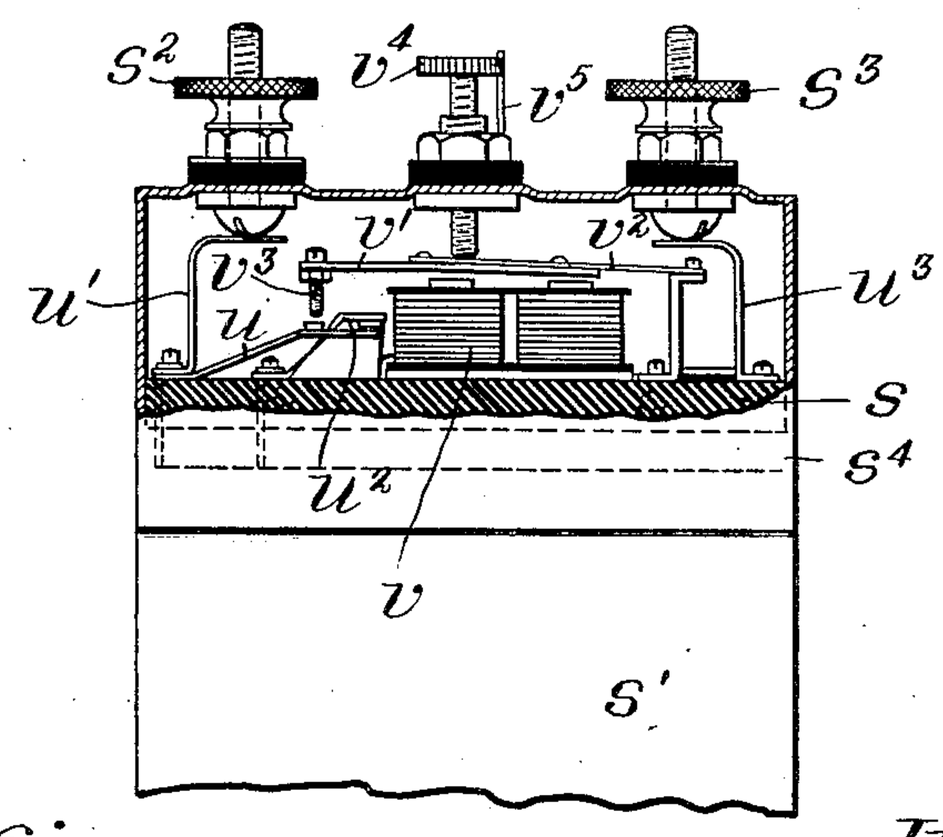


Fig. 2.



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INDUCTION-COIL SYSTEM.

No. 878,467. Specification of Letters Patent. Patented Feb. 4, 1908.

Original application filed January 25, 1906, Serial No. 297,792. Divided and this application filed April 20, 1907. Serial No. 369,211.

To all whom it may concern:

Be it known that I, ISRAEL C. ORSWELL, a citizen of the United States, residing at Amesbury, in the county of Essex and State of Massachusetts, have invented an Improvement in Induction-Coil Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to induction coils and particularly to the construction and arrangement of such coils with reference to maximum effectiveness.

This application is a divisional of my prior co-pending application No. 297,792, filed January 25, 1906.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:—Figure 1 shows, partially in diagram, an arrangement of induction coils embodying one form of my invention, and Fig. 2 shows, partially broken away, an enlarged detail of the vibrator and attached condenser.

Referring to the drawings and to the specific embodiment of my invention there illustrated, I have shown a plurality of similarly constructed but independent induction coils a, a', a^2 and a^3. Each coil comprises a suitably proportioned primary winding b wound upon the soft iron wire core c, and a secondary winding d wound upon the primary b. The coils are each inclosed in a preferably metallic casing e, which is also preferably non-magnetic and longitudinally slit or cut away in several places, as at f. Within the metallic casing each coil is enveloped in a heavy insulating sleeve g, of mica or other suitable insulating material, and is protected at one end by heavy mica or other insulation h, through which pass the primary lead wires to the exterior connecting lugs i. At the opposite end the coil abuts against the porcelain insulating wall j, through which pass the leads k from the secondary coil.

Although my invention in its broad aspect as here claimed is not merely limited to sparking systems for explosion engines, but is applicable to the production of sparks or electrical discharges for other purposes, I have herein shown the constructional details of each coil such that it is applicable to the ignition system of an explosion engine. The end of each casing is formed into a nipple and threaded for insertion into the walls of the engine cylinder in the usual fashion of a spark plug, and each coil is provided with sparking electrodes l, l, of platinum or other suitable material. These are set in tapered plugs m of conducting material within the tapered insulating sleeves n inserted through appropriate openings in the end of the nipple, the said sleeves having their inner ends entering suitable recesses formed in the outer face of the porcelain insulating wall. Through the highly insulated passage thus formed the secondary leads pass directly into and through the conducting plugs m, to which they are conductively joined.

It will be noticed that neither one of the sparking electrodes l is grounded but that both are mounted exteriorly upon the same structure containing the secondary and connected to the secondary by direct, extremely short, and highly insulated connections. I have found in practice that by associating the sparking electrodes in close proximity with the secondary, and particularly when there is maintained a completely insulated secondary circuit, the effectiveness of the coil, as evidenced by the thickness or strength of the spark obtained in proportion to the size of the coil, is largely increased. For example, I have found that a spark of the same intensity as is produced by a coil having one secondary terminal grounded and the usual secondary lead wire for the other terminal passing from the coil to the spark plug, can be produced from a coil constructed as described, of little more than half the dimensions of the first coil.

The primaries of the several coils described are well adapted to be connected by low tension primary leads with a single or common vibrator for the purpose of causing the usual vibratory interruption of the primary current. For this purpose one terminal of each primary is connected to a common conductor o, which is connected to one terminal of the vibrator or interrupter device p, which

I have here illustrated as an electro-magnetic vibrator or interrupter. The remaining terminal of each primary is connected through individual lead wires to any usual form of circuit-interrupting device or time switch or current distributer *r* for periodically and successively making and breaking each individual primary circuit. From the time switch the circuits pass through the common lead wire *o'*, including the battery B, to the remaining terminal of the vibrating device *p*, the said switch being adapted to be actuated or driven in any appropriate manner as, for example, in gas engines.

Referring more particularly to Fig. 2, the vibrator is mounted upon a suitable supporting block *s* of insulating material attached to the end of the casing *s'*, which herein is constructed to contain the condenser *t*, conventionally represented in Fig. 1, and connected in shunt about the vibrator contacts.

One contact is mounted upon the resilient metal strip *u*, which is secured to and in electrical contact with the upright metal clip *u'*. The other contact is mounted upon the overhanging metal strip u^2, the latter being directly connected, through the vibrator coil *v*, with the upright clip u^3.

The lead wires from the battery and induction coil, respectively, are connected to the exteriorly arranged binding posts s^2, s^3 upon the top of the condenser casing cover s^4 but insulated therefrom by the provision of suitable insulating washers. When the cover is placed in position upon the casing, the connections are automatically completed by contact between the upright clips *u'* and u^3 and the interiorly projecting screw heads mechanically and electrically attached to the binding posts s^2 and s^3. The cover may be held in position in any suitable manner.

The armature *v'* is carried by a resilient arm v^2, held at one end but free to vibrate at the other. The free end of the armature carries the adjustable screw v^3, which acts as a hammer device, and, on attraction of the armature by the vibrator magnet, strikes a hammer-like blow upon the resilient contact member *u*, the latter acting as an anvil device, causing the separation of the two contacts and the suitable interruption of the primary circuit. It will be observed that the period of break between the contacts is not co-extensive with the energization of the magnet, but that it occurs after the armature has been pulled down and is caused by the hammer-like blow of the screw v^3. The movement of the said screw being the same under all conditions and not being affected by the wear upon the make and break contact pieces, the speed of vibration is necessarily constant. The wear, therefore, between the contact points is taken up automatically without affecting the attractive distance of the armature from the electro-magnet. The necessity for adjustment of the vibrator parts is practically eliminated, but to have such adjustment readily available when desired or required, I have provided upon the casing cover s^4 the exteriorly accessible adjusting screw v^4, having a knurled head which can be readily turned by the hand. The tip of the adjusting screw acts as a stop or abutment to arrest the rearward movement of the armature and adjustment of the same, therefore, may be made to shorten or lengthen the attractive distance of the armature. The spring pin v^5 pressing against the knurled head of the screw serves as a stop to maintain any assigned position of adjustment.

While I have shown and described one form of my invention, and, for illustrative purposes, have disclosed and discussed in detail the construction and arrangement incidental to one specific application thereof, it is to be understood that the invention is limited neither to the mere details or relative arrangement of parts disclosed, nor to its specific application, as herein shown.

Claims.

1. An apparatus of the class described, having a casing, an insulating base or block therein dividing the casing into upper and lower compartments, a vibrator device mounted upon said block in the upper compartment, said device comprising a pair of magnet coils secured to said block, a resilient armature-carrying leaf spring having its free end above the coils and held at its other end upon a support at the side of the coils and near one end of the block, an armature secured to the under side of said spring between the same and the coils, while leaving the spring free to vibrate, a resilient contact member carrying a vibratory contact, the said member being supported upon the base adjacent its opposite end, with its free end adjacent the coils, and at the side of the electro-magnet the said contact member having an anvil device underlying the free end of the resilient armature member, a stationary contact overlying the vibratory movable contact of the resilient member and also supported upon the base or block at the side of the electro-magnet, a hammer device on the end of the armature member adapted to strike the anvil device of the contact member on the attracted movement of the armature, and an adjustable stop screw above the resilient armature member to limit its upward and return movement.

2. An apparatus of the class described, having a casing, an insulating disk or block therein, dividing the casing into upper and lower compartments, a vibrator device mounted upon said block in the upper compartment, external binding posts for attachment to lead wires, and coöperating sets of resilient contacts and fixed contacts, the

members of one set connected with the external binding posts, and the members of the other set connected with the vibrator terminals, and providing for the automatic making and breaking of the vibrator circuit when the vibrator and the adjacent casing structure undergo relative movement for the purpose of exposing the vibrator parts.

3. In an apparatus of the class described, a vibrator device comprising an insulating base, a pair of magnet coils secured to the base, a resilient armature-carrying leaf spring having its free end above the coils and having its other end supported upon the base at the side of the coils, an armature secured to the under side of said spring between the same and the coils while leaving the spring free to vibrate, said spring extending beyond said coils at the free end thereof, a resilient contact member carrying a vibratory contact, the said member being supported upon the base and at one side of said coils with its free end adjacent the coils, said contact member having an anvil device underlying the free end of the resilient member, a hammer device on the end of the armature member adapted to strike the anvil device of the contact member on the attracted movement of the armature, and an adjustable stop screw above the resilient armature member to limit its upward and return movement.

4. In an apparatus of the class described, a vibrator device comprising vibrator windings, a resilient armature member having its free end above the windings and held at its other end upon a support at the side of the windings while leaving the free end free to vibrate, a resilient contact member carrying a vibratory contact, said member being supported with its free end underlying and within the path of the free end of the armature member, a hammer device upon the free end of the armature member, an anvil device on the contact member adapted to be struck by the said hammer device, a stationary contact overlying the vibratory movable contact of the resilient member, and an adjustable stop device to limit the backward or rearward movement of the armature member and an insulating block or base whereon said armature member and contact members are supported.

5. In an apparatus of the class described, a vibrator device comprising the vibrator windings v, the resilient armature member v', having its free end within the influence of the windings and fixedly held at its opposite end, the resilient contact member u located at one side of the vibrator windings v and carrying a vibratory contact, said member being within the path of the free end of the armature member, a hammer device v^3 upon the armature member adapted to engage the contact member, a stationary contact member u^2, mounted at one side of the vibrator windings v and closely adjacent the contact member u and an adjustable stop v^4 and an insulating block or base whereon said armature member and contact members are supported.

6. The combination with an induction coil, a casing, a vibrator and vibrator coil, said casing serving as a support therefor, and a cover for said casing, said cover being provided with exteriorly arranged binding posts adapted automatically to contact with the terminal connections of said vibrator when said cover is placed in position.

7. The combination with an induction coil, a casing, a vibrator and vibrator coil mounted upon said casing, a cover for said casing, and exteriorly accessible means upon said cover for adjusting said vibrator.

8. The combination with an induction coil, of a casing provided with an insulating base or block, a vibrator and vibrator coil mounted upon said base or block, fixed and movable contact members mounted upon said base or block, said vibrator being adapted when actuated by the coil to impinge upon the movable contact, thereby to separate it from the fixed contact, and exteriorly accessible means upon the cover of said casing for adjusting said vibrator.

9. The combination with an induction coil, a casing having an insulating base or block, a vibrator coil mounted upon said base or block, a vibrator also mounted upon said base or block in operative relation to the coil, fixed and movable contact members also mounted upon the base or block at one side of said coil, said vibrator when actuated being adapted to impinge upon the movable contact, thereby to separate it from the fixed contact, and exteriorly accessible means upon the cover of the casing to adjust the vibrator.

10. An apparatus of the class described having a casing containing an insulated partition dividing the casing into two compartments, an electro-magnet mounted upon said partition in one compartment, an armature therefor yieldingly supported, a fixed contact and a movable contact mounted at one side of said electro-magnet upon said partition, there being, a yielding support for the movable contact, means carried by said armature for striking said support on the same side as said two contacts, and adjusting means for regulating the normal distance of the armature from said electro-magnet.

11. An apparatus of the class described having a casing containing an insulated partition dividing the casing into two compartments, an electro-magnet mounted upon said partition in one compartment, an armature therefor yieldingly supported upon said partition, a fixed contact and a movable contact mounted upon said partition at one side of said electro-magnet, a yielding support for

the movable contact, means carried by said armature for striking said support upon the same side as said two contacts, and adjusting means for regulating the normal distance of said armature from said electro-magnet.

12. An apparatus of the class described having a casing containing an insulated partition dividing the casing into two compartments, an electro-magnet mounted in said partition in one compartment, an armature therefor yieldingly mounted upon said partition, a fixed contact and a movable contact mounted upon said partition, binding posts mounted exteriorly of said casing and in circuit with said fixed and movable contacts respectively, a yielding support for the movable contact, and means carried by the armature for striking said support on the same side as said contacts.

13. An apparatus of the class described having a casing containing an insulated partition dividing the casing into two compartments, an electro-magnet mounted upon said partition in one compartment, said compartment having an overhanging portion of the casing forming one end wall of said compartment, an armature yieldingly supported within said compartment, a fixed contact and a movable contact mounted upon said partition, binding posts mounted upon said overhanging portion of the casing, so as to be exposed exteriorly of the casing, said binding posts being in circuit respectively with said fixed and movable contacts, a yielding support for the movable contact, and means carried by said armature for striking said support on the same side as said two contacts.

14. The combination with an induction coil, of an insulating base or block, a vibrator and vibrator coil mounted upon said base or block, fixed and movable contact members mounted upon said base or block, said vibrator being adapted when actuated by the coil to impinge upon the movable contact, thereby to separate it from the fixed contact, and a casing wherein said base or block and parts supported thereon are mounted.

15. An apparatus of the class described having a casing containing an insulated partition dividing the casing into two compartments, an electro-magnet mounted upon said partition in one compartment, an armature therefor yieldingly supported upon said partition and having a hammer device adjacent one end thereof, a fixed contact and a movable contact mounted upon said partition at one side of said electro-magnet, the movable contact having an anvil device intermediate the ends thereof, the hammer of said armature when the latter is attracted being adapted to impinge upon said anvil and separate the movable contact from the fixed contact.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ISRAEL C. ORSWELL.

Witnesses:
ROBERT H. KAMMLER,
SIDNEY F. SMITH.