No. 750,039. PATENTED JAN. 19, 1904.

R. VARLEY.

RUHMKORFF COIL.

APPLICATION FILED AUG. 21, 1903.

NO MODEL.

Fig. 1.

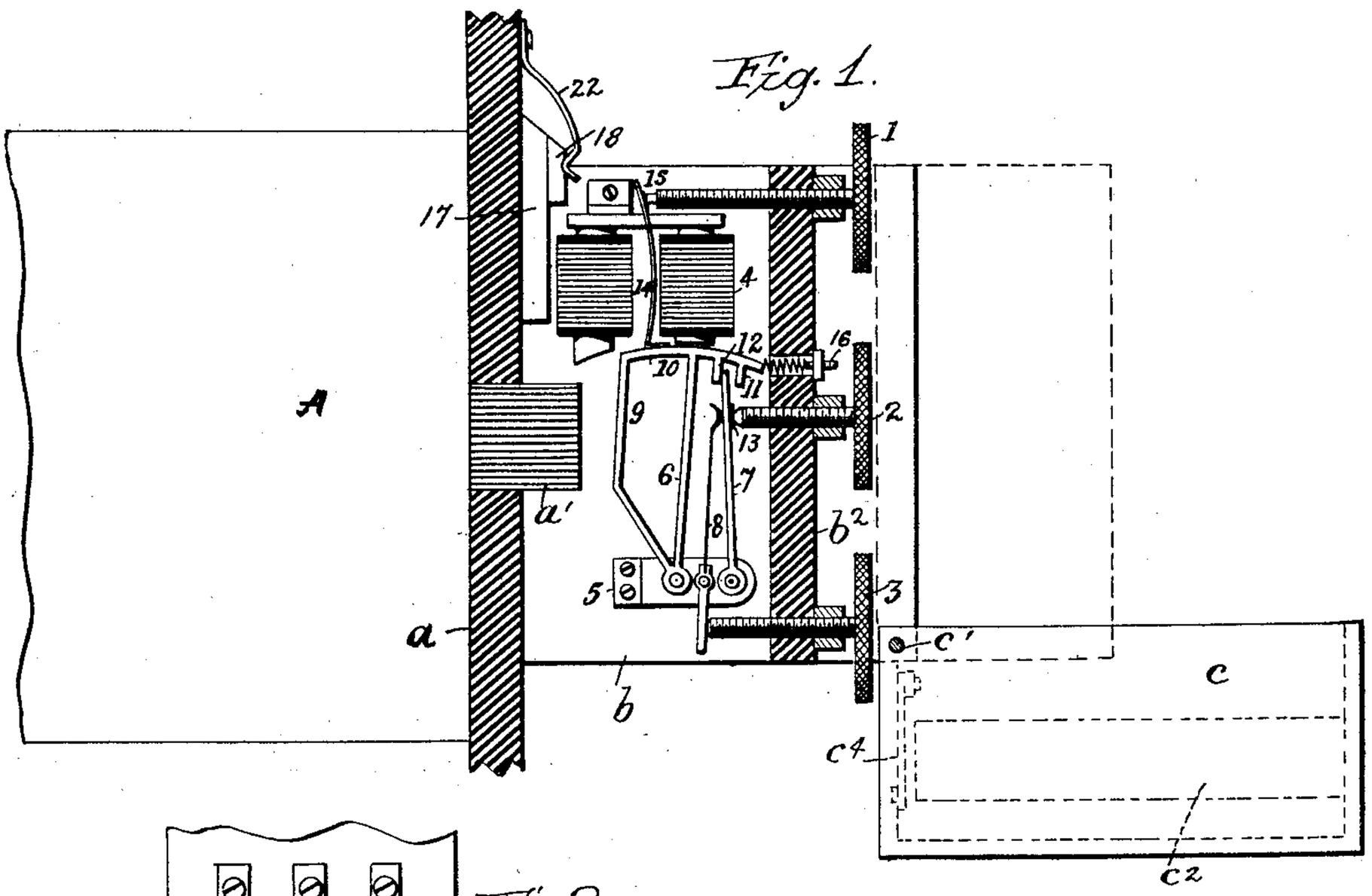


Fig. 2.

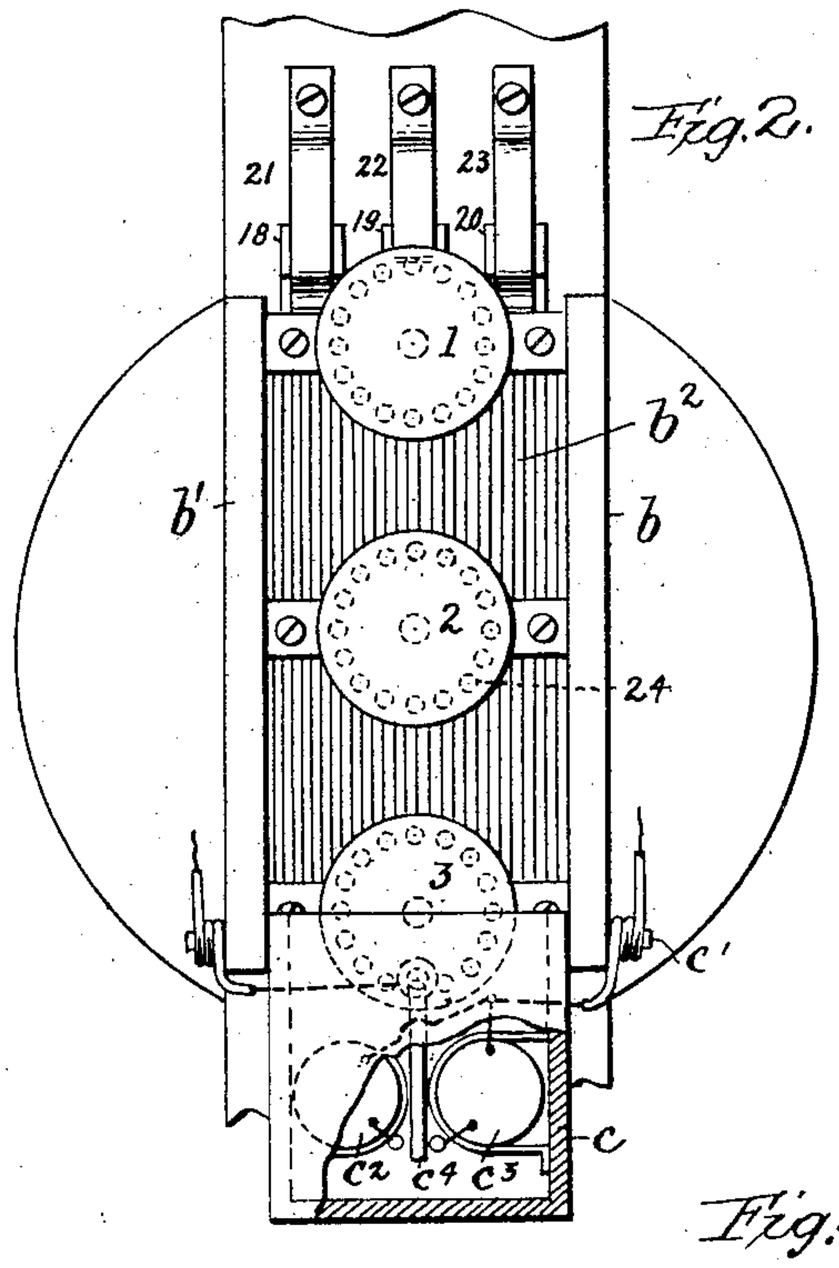


Fig. 3.

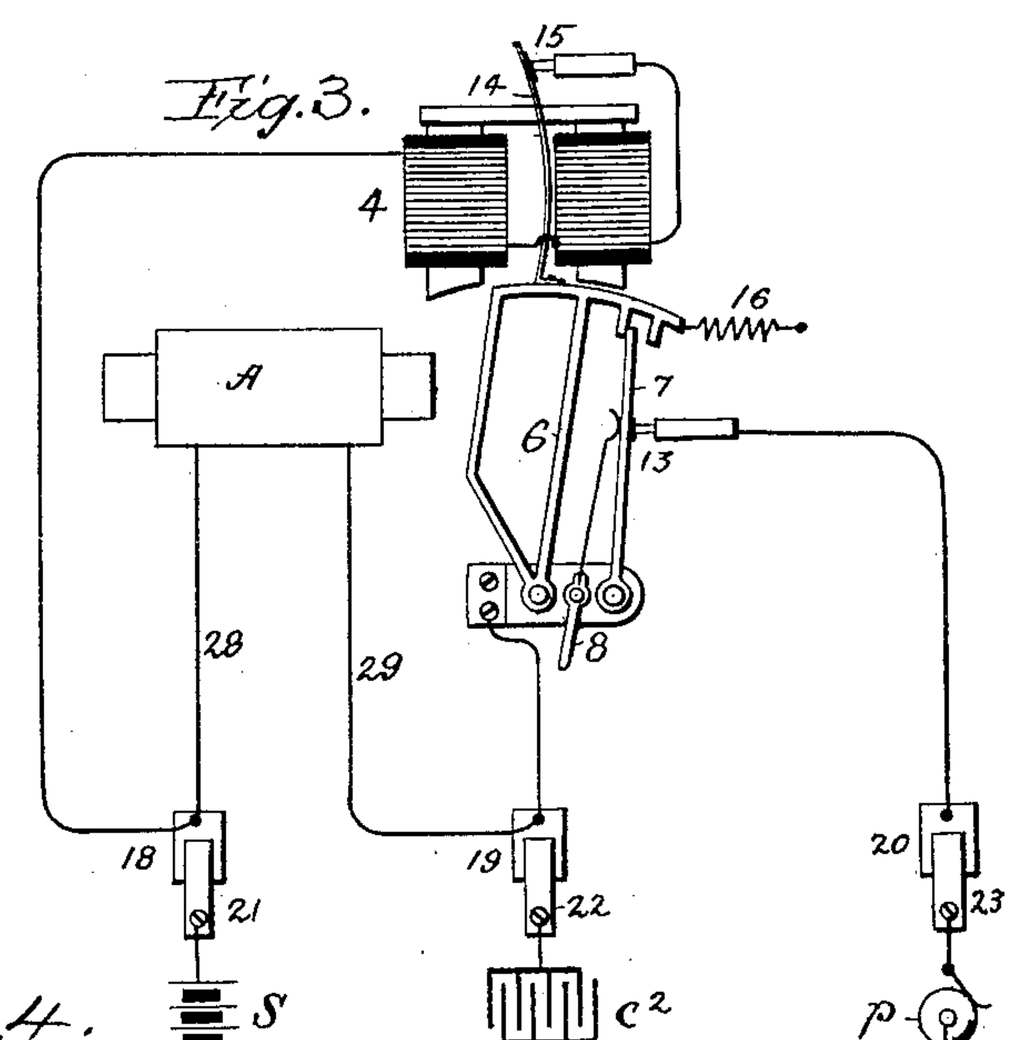
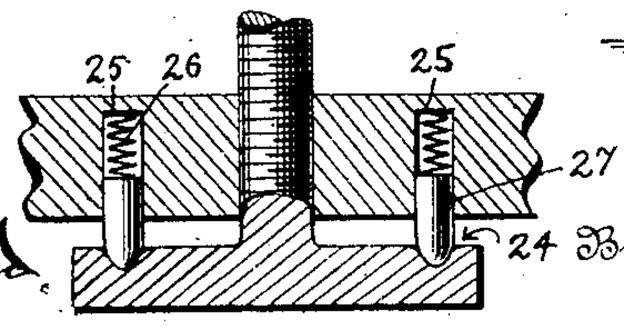


Fig. 4.



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No. 750,039. Patented January 19, 1904.

UNITED STATES PATENT OFFICE.

RICHARD VARLEY, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, A CORPORATION OF NEW JERSEY.

RUHMKORFF COIL.

SPECIFICATION forming part of Letters Patent No. 750,039, dated January 19, 1904.

Application filed August 21, 1903. Serial No. 170,281. (No model.)

To all whom it may concern:

Be it known that I, RICHARD VARLEY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Ruhmkorff Coils, of which the following is a full, clear, and exact description.

This invention relates to induction-coils, and has special reference to the interrupter or vibrator commonly employed with such devices.

The primary object of the invention is to provide an interrupter which shall be positive in its action and will insure under all conditions of the battery a quick break and a firm low-resistance closure of the primary circuit.

A further object is to provide an interrupter so constructed and mounted as to be readily applicable to the head of any ordinary induction-coil and removable therefrom at will.

A further object is to provide a simple and quick-acting device by which the adjustment of the contacts and the tension of the springs can be effected without tools and when once the proper adjustment is obtained will lock the parts against displacement.

A still further object is the protection of the adjusting-screws by so mounting the condenser-casing as to normally cover them, the casing being movable to afford ready access both to the screws and the condenser.

In carrying out my invention I mount the interrupter and the related parts, as well as the condenser, in a frame, which can be readily attached to and detached from the head of the induction-coil. I use a rigid plate instead of a spring-plate as the circuit-closer and hold the circuit closed by means of strong springs, which, together with the rigid plate, maintain a low-resistance contact. I provide an auxiliary magnet, either in series or multiple, with the primary coil to aid the latter in its attraction of the armature to break the circuit, and I so adjust the armature with respect to the said rigid plate that the latter is struck a hammer-blow to overcome the power of said springs and open the circuit. I also provide certain details of construction, which will be fully hereinafter described.

In the accompanying drawings, Figure 1 is a side elevation of the end of an induction-coil and a sectional view of my improvements applied thereto. Fig. 2 is an end view with the condenser-casing thrown back. Fig. 3 is a diagram of the circuits, and Fig. 4 is a detail.

Referring to the drawings by letters and figures, A indicates the induction-coil, of which a is one of the heads and a' the projecting end of the core. The improved devices are contained in a frame consisting of two side plates b and b' and cross-plate b^2. The cross-plate serves to hold the side plates together and to carry the adjusting-screws 1, 2, and 3. To an outer corner of this frame is pivoted a case c on a hinge-rod c'. This case contains two condensers c^2 and c^3, rolled into cylindrical form, also a switch c^4 for throwing either condenser into circuit, as exigencies may require. This condenser-case may be a solid block having cylindrical chambers to receive the condensers; but as shown it is a box. The hinge-rod projects at each end to support turns of the flexible conductor leading to the condensers and to prevent bending them when the case is swung on its hinge. The frame $b\,b'\,b^2$ can be secured in any desired manner to the head of the induction-coil.

Inside of the frame is mounted an electromagnet 4, having its poles presented at right angles to that of the induction-coil.

5 is a bracket on which are pivoted an armature-lever 6, a circuit-controlling plate 7, and a spring-plate 8. The lever carries two armatures, one of which, 9, is presented to the core of the induction-coil and the other, 10, to the poles of the magnet 4. An adjustable spring 16 normally holds the armatures away from their magnets. The armature-lever also carries two pins or shoulders 11 and 12, between which the end of plate 7 projects and has a play. Plate 7 controls the primary circuit by contacting with the end of screw 2 at 13 and the spring-plate 8 tends to hold the plate 7 against the screw with a force deter-

mined by the adjustment of screw 3. Projecting from the armature-lever is an auxiliary contact-spring 14, which coöperates at 15 with the adjusting-screw 1 to control the circuit of magnet 4. When this contact is closed, the spring 14 is distorted by the tension of spring 16 so that the lever 6 will have a certain movement toward the magnets before the spring 14 leaves the end of the screw.

17 is a plate of insulating material inserted between the side frames and carrying three metal blocks 18, 19, and 20, having seats for the ends of three spring-contacts 21, 22, and 23, which are fixed to the head of the induction-coil. When the frame is set in place against the head of the coil, the edge of plate 17 is thrust under these springs, the edge being beveled to facilitate the operation, and the springs go naturally to their seats in the blocks. This arrangement provides for simultaneously making electrical connection between the devices in the frame and the primary circuit, the battery, and the external circuit-closer, all of which are external thereto.

The adjusting-screws 1, 2, and 3 have large heads with milled edges, by which they can be readily turned between the thumb and finger and without the use of wrenches or other tools. Under the head of each screw is a circular row of shallow sockets 24, and in the frame through which each screw passes are two pockets 25, containing springs 26, upon which rest short bolts 27, projecting against the under side of the screw-heads in a position to enter the sockets 24 therein. These bolts not only act as locking devices for the screws, but serve as indicators to show when a desired adjustment is obtained. For instance, if a screw has been slacked back four notches for any reason it is known that the original adjustment can be obtained by turning the screw ahead four notches. As a locking device this is far preferable to binding-nuts for automobile purposes, as the jarring to which it is there subjected cannot affect it. When the condenser-case is turned down, the screws are covered and protected, and they, as well as the condensers, are at once accessible by throwing the case back or outward.

The operation of the circuit-interrupting devices will now be explained. The circuits as given in Fig. 3, while being correct so far as the course of the current is concerned, are not mechanically arranged as they would be in practice. For instance, the terminals 28 and 29 of the primary coil would be connected with the springs 21 and 22 instead of to the corresponding blocks, as shown; but the result is the same. Likewise one lead from the condenser would be connected to block 19 instead of to the spring 22.

S is the source of current, connected to earth on one side and to spring 21 on the other.

c^2 is one of the condensers, grounded on one side and connected to spring 22 on the other.

p is the external or engine circuit-breaker, likewise grounded and connected to spring 23.

With the circuits arranged as shown the primary coil and the auxiliary magnet 4 are in parallel, and when the circuit is complete both magnets act together upon the armature with sufficient power to overcome the springs 16 and 8. The movement of the lever 6 under this double attraction is at first unaccompanied by the plate 7, so that considerable momentum is developed in the lever, and when the pin 11 strikes the end of the plate 7 it is with a quick hammer-like blow, causing a very sudden rupture of the circuit at 13, which rupture in consequence is effected with only the slightest, if any, spark. Before the rupture of the circuit occurs at the points 13 the spring 14 has straightened out and opened the circuit of magnet 4 at 15, thus preventing the extra current which follows the breaking of the primary current from finding a path through the magnet 4 and forcing the same to be absorbed by the condenser c^2. The momentum created in lever 6 by the combined pull of the primary coil and magnet 4 is sufficient to continue the movement of the lever after the break occurs at 15 and accomplish a sharp opening at 13. When the attraction of both magnets ceases, springs 16 and 8 come into play and return armature-lever 6 and contact-lever 7, the latter being forcibly driven against the end of screw 2 to make a good contact and, if necessary, crush any minute foreign particles that may have settled between the contacts. In the same movement spring 14 is carried against the end of screw 1 and distorted to store power therein, which power is immediately exerted to create a rebound of frame 6, which aids the magnets in the next forward stroke.

In the ordinary type of circuit-controller for this kind of apparatus the armature-lever either carries a contact-spring or is a spring itself which makes contact with the end of the screw. Such a contact is more or less uncertain and is always of a comparatively high resistance, due to the fact that the stroke of the spring against the end of the screw distorts the former, causing it to tilt or rock on the end of the screw, thus establishing more nearly a knife-edge connection than a broad flat contact. In the present instance the main contacts 13 are formed by the rigid lever 7 and the end of screw 2. The form of the lever 7 does not undergo change in the operation of the apparatus, and if it is originally made so that the contact will be over a broad flat surface it will continue so in operation. At the same time by the use of the spring 14 I obtain all the benefits of rebound which are afforded by the ordinary spring-contacts. The pressure between the contacts 13 can be and is greater than is ordinarily obtained in a vibrator; but the device is nevertheless just as sensitive and free in vibration,

because of the fact that I use the pull of magnet 4, as well as of the primary, to overcome the extra pressure at the contacts. Any amount of adjustment of the springs can be made without impairing the conductivity of the contacts. I am aware that the circuit-controller of an induction-coil has been operated by an auxiliary magnet; but, so far as known to me, it has not been operated by an auxiliary magnet acting in conjunction with the primary coil, and this is what affords the advantages of my device. The resistance of the auxiliary magnet is high compared to that of the primary winding of the induction-coil, so that the current it takes is comparatively small, and I have found that even if the resistance of the primary winding is made sufficiently less for it to take the current that is consumed in my auxiliary magnet the resulting action upon the circuit-controller is not near so satisfactory as when the combination arrangement is used. The current consumed in the auxiliary magnet is so small that the induced current in the secondary of the induction-coil is very nearly as great as when the auxiliary magnet is not used.

Having described my invention, I claim—

1. A vibrating circuit-controller for induction-coils, consisting of a rigid pivoted plate carrying one contact, a fixed companion contact, a spring tending to hold the rigid plate against the fixed contact, and an armature adapted to strike the rigid plate a hammer-like blow.

2. The combination of an induction-coil, an electromagnet and a vibratile circuit-controller, the circuit-controller being operated by the combined action of the coil and electromagnet, substantially as described.

3. The combination of an induction-coil, an electromagnet, an armature-lever common to both and a circuit-controlling element actuated by said lever.

4. The combination of an induction-coil, an electromagnet, an armature-lever common to both, a circuit-controlling element actuated by said lever and an adjustable spring against which the coil and magnet act.

5. The combination of an induction-coil, an electromagnet, an armature-lever common to both, two circuit-controlling elements actuated by said lever and adapted to control the circuits of the primary winding of said coil and the electromagnet respectively.

6. The combination with an induction-coil, of an armature-lever provided with two shoulders and a circuit-controlling plate projecting between said shoulders, the space between the shoulders affording a certain movement of the armature-lever independent of the plate, for the purpose set forth.

7. The combination with the primary winding of an induction-coil, of an electromagnet in parallel relation thereto, an armature-lever common to both, a spring acting upon the lever in opposition to the magnetic pull, and a circuit-controller actuated by the armature-lever.

8. The combination with the primary winding of an induction-coil, of an electromagnet in parallel relation thereto, an armature-lever common to both, a spring acting upon the lever in opposition to the magnetic pull, and two circuit-controllers actuated by the armature-lever, one of which controls the circuit of the electromagnet while the other controls the circuit of the primary winding.

9. The combination with the primary winding of an induction-coil, of an electromagnet in parallel relation thereto, an armature-lever common to both, a condenser, two circuit-controllers actuated by the armature-lever and controlling the circuits of the primary winding and the electromagnet respectively, and means whereby the circuit of the electromagnet will be opened ahead of the primary circuit upon each stroke of the lever.

10. The combination with an induction-coil, of a detachable frame applied to the head thereof, said frame carrying a vibrator, substantially as described.

11. The combination with an induction-coil, of a detachable frame applied to the head thereof, said frame carrying a vibrator, and adjusting-screws exposed outside, and a condenser-casing hinged to said frame and adapted to cover said screws, substantially as described.

12. In a Ruhmkorff or other induction coil, the combination with a vibrator, of a contact-screw for the same, said screw having a head provided with a series of notches and a stationary spring-pressed pin adapted to engage with any of said notches for the purpose of locking the screw at any point of adjustment.

13. In a Ruhmkorff or other induction coil, the combination with the vibrator, of a pivoted spring-plate bearing at one end against the vibrator, a set-screw bearing against said plate and means for locking the set-screw at any point of adjustment.

In witness whereof I subscribe my signature in presence of two witnesses.

RICHARD VARLEY.

Witnesses:

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WILLETT CHADWICK.