(No Model.) 2 Sheets—Sheet 1.

A. METZGER.

ELECTRO MEDICAL APPARATUS.

No. 329,929. Patented Nov. 10, 1885.

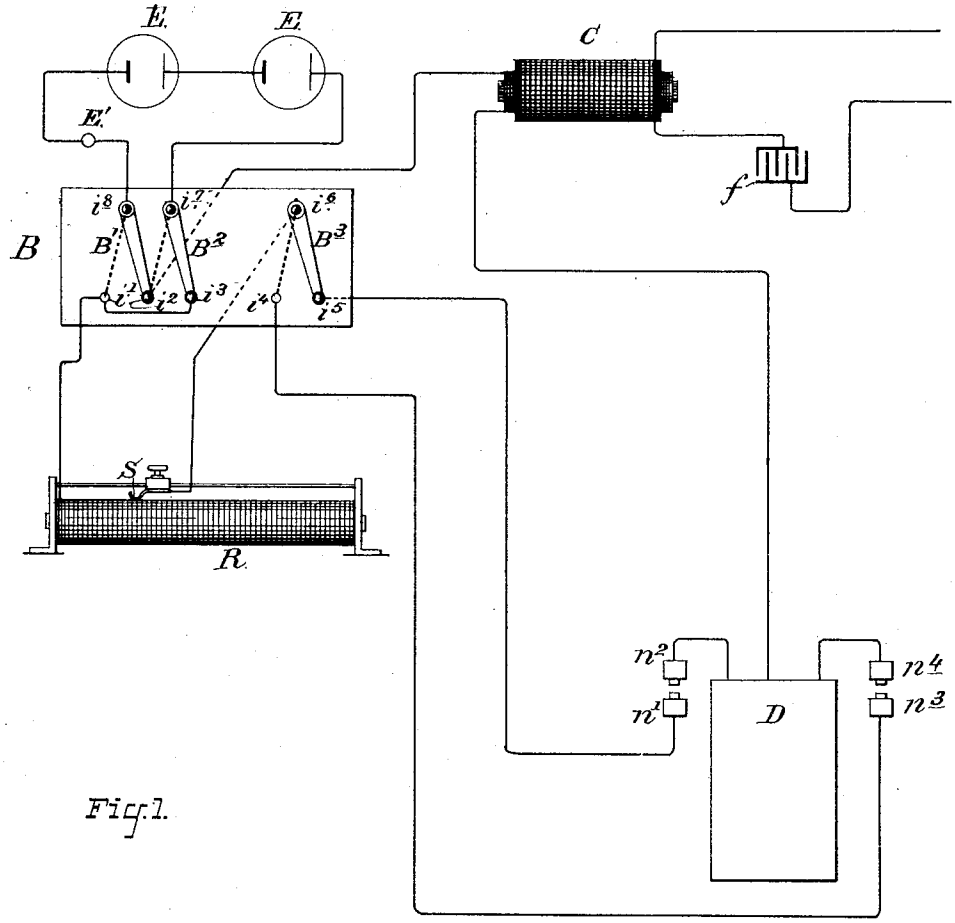

Fig. 1.

ATTEST:

J. A. Thurdle

E. Leibundgut

INVENTOR:

Amandus Metzger

by Brustlein Sury & Co.

Attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

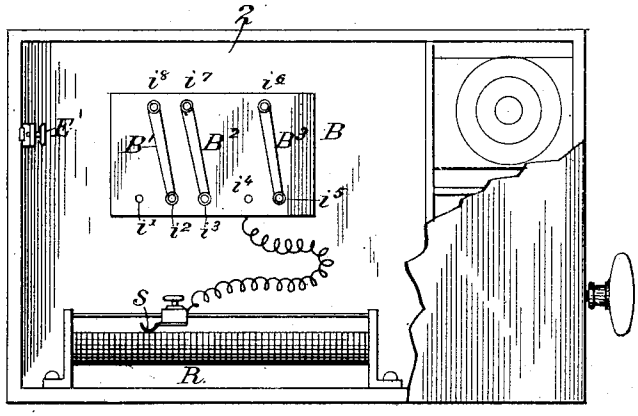
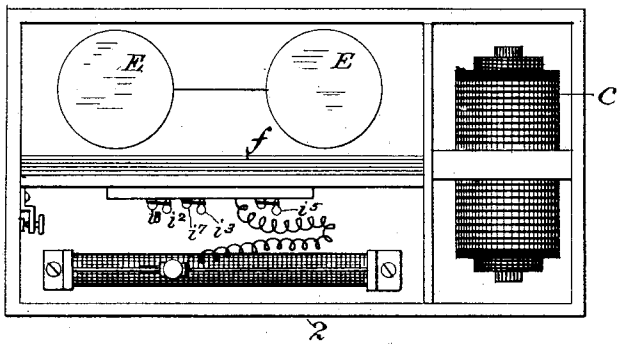


Fig. 3.



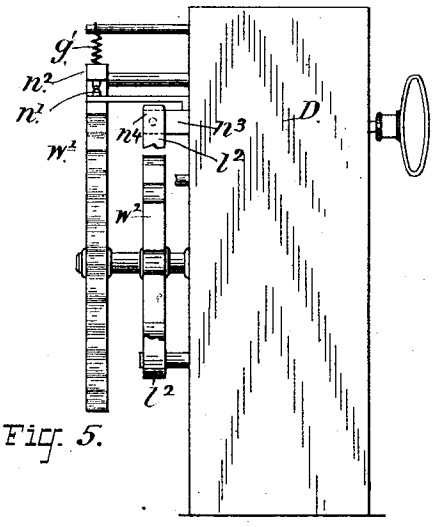


Fig. 5.

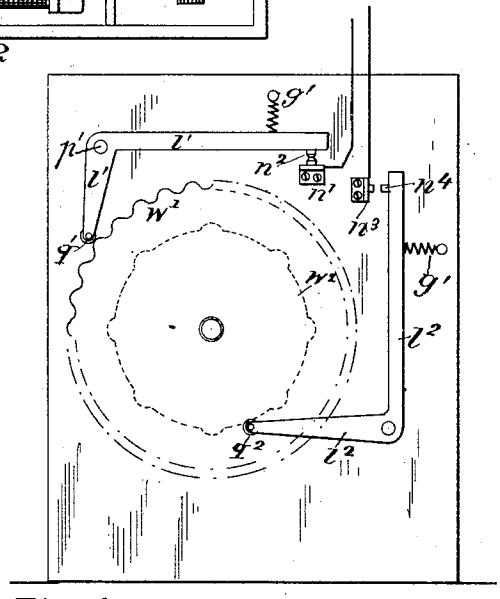


Fig. 4.

ATTEST:

J. A. Hurdle

E. Lilienguth

INVENTOR:

Amandus Metzger

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Attys.

UNITED STATES PATENT OFFICE.

AMANDUS METZGER, OF NEW YORK, N. Y.

ELECTRO-MEDICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 329,929, dated November 10, 1885.

Application filed May 25, 1885. Serial No. 166,602. (No model.)

To all whom it may concern:

Be it known that I, AMANDUS METZGER, a citizen of the United States, residing at the city of New York, State of New York, have invented certain new and useful Improvements in Electro-Medical Apparatus, of which the following is a specification.

My invention relates to induction or faradic apparatus used for medical purposes. By the apparatus heretofore used the effects which were to be produced were obtained in an unsatisfactory manner, besides some new effects, which are important for medical purposes, are obtained with my apparatus which could not be produced with the system heretofore used. Similar to the apparatus used before my invention, the latter provides for two distinct currents, one being procured from a battery and the other by induction. In my apparatus both circuits are different from the two formerly applied to electro-medical apparatus. The secondary coil which I use is placed immovable over the primary coil, and in the circuit belonging to the former I introduce a condenser, besides the body on which the electric current is to be applied.

In the drawings, Figure 1 is a diagram showing the dispositions of the parts of the apparatus I use, and the circuits connecting such parts. Fig. 2 is a front view of the apparatus, showing my invention for practical use, the parts being put up in a box for easier transportation. Fig. 3 is a top view of the apparatus, the cover of the box being removed. Fig. 4 is a side view, on larger scale, of a clock-work with special features for breaking the primary circuit at given time-intervals. Fig. 5 is a front view of the same clock-work.

Similar letters of reference indicate like parts.

In Fig. 1, E E represent a galvanic battery, (shown by two jars, for instance,) the two electrodes being connected with pins i^7 and i^8 of a switch-board, B, the circuit opened and closed with the apparatus by the contact-screw E'.

C represents an induction-coil, the primary coil of which is connected with pin i^2 of switch-board B, and from the secondary coil the current is brought to the body to be worked upon.

D is a clock-work in the circuit of the primary coil.

R is a resistance-coil, which is composed of a cylindrical rod of non-conducting material, around which a wire of German silver is wound in such way that each turn is isolated from the next ones. One end of the wire is connected with the switch-board pin i', and from there with pin i^3. A contact-spring, S, is suitably arranged to slide on the resistance-coil and connected with the switch-board pin i^6.

The object of the resistance-coil R is to introduce in the primary circuit more or less resistance, which effect is obtained by moving the spring S to the right or the left.

On the frame of the clock-work D there are mounted two circuit-closers, one being formed of the two contact-pieces n' and n^2, made, as usually, of hard metal, the former being isolated from the frame and connected by wire with pin i^5 of the switch-board, the contact n^2 being fast to a lever not insulated from the clock-work, and thus in the circuit passing through the primary coil and the clock-work. The other circuit-closer is provided in a similar way, one contact-piece, n^3, being connected by a wire with pin i^4 of the switch-board and the other, n^4, with the frame of the clock-work and the primary coil. The two circuit-closers are disposed thus that both are worked together, but at different time-intervals. The opening and closing of the circuit is obtained by suitable mechanism, as shown on Figs. 4 and 5. Contact-piece n' is fastened to the frame, but insulated from it. Contact-piece n^2 is fast to an angular lever, l' l', moving on fulcrum p', when cam-wheel W' acts upon the roller q', fast to the shorter arm of lever l'. A spring, g', is provided for opening the circuit when the roller q' meets the recesses of the cam-wheel W'. Contact-pieces n^3 and n^4 are similarly disposed, the former being insulated, and the latter fast to lever l^2, which is moved by cam-wheel W^2. The cam-wheels W' and W^2 are both set on the same shaft, receiving a regular revolving motion from an ordinary clock-work.

Although both circuit-closers are set in motion together, only one is acting in the electric circuit at a time, according to the position of the corresponding switch-lever, B^3. The latter having the position i^6 i^5, the circuit-closer n' n^2 will be in action in the circuit of the primary coil, while the other circuit-closer will have no effect. On the contrary, the circuit-closer n^3 n^4 will be in action when the switch-rod has the position i^6 i^7, while the interrupter n' n^2 will have no effect.

In the circuit of the secondary coil I use a condenser, *f*, which may be of any known pattern—for instance, consisting of alternate layers of mica and tin sheets connected in the ordinary way known to all skilled in the art.

In order to apply my invention to an apparatus which may be easily moved to the place where it is to be used, I prefer to have the parts placed in a box, as shown in Figs. 2 and 3, which will be readily understood in reference to the preceding description of the parts, which are designated by similar letters on all figures.

By the arrangement thus described I obtain the following effects: First, the direction of the electric current in the primary coil can be reversed, which is accomplished by moving the switch-rods B′ and B^2; second, the strength of the currents can be modified by means of the resistance-coil R—viz., by moving the spring S to the right or to the left on the same; third, the currents can be interrupted at either short or long intervals by moving switch-rod B^3 either in position i^6 i^5 or in position i^6 i^4.

When the electrodes of my apparatus are applied to any part of a living body, and the primary current is alternatively closed and opened, a shock is felt only on opening but not on closing the circuit, the effect of the condenser in the secondary circuit being that the shocks on closing the circuit are practically annulled, as for physiological applications.

It is well known that it is very difficult to provide means for obtaining regular interruptions of currents in electro-medical apparatus. Therefore with the apparatus heretofore used the interruptions produce alternating strong shocks on opening the circuit and slight shocks on closing the same, whereby the force of the latter is very variable; therefore, the irritations of parts of living bodies which are the object of electro-medical treatment are not uniform with such apparatus. The object is, however, attained by using my apparatus, the condenser doing away with the shocks from closing the circuit, and the regularity of the shocks from opening the circuit being secured by a clock-work. The interruption of the current is thus not depending from the strength of the latter as in ordinary apparatus, where an electro-magnet is used for opening and closing the circuit, the speed of such device varying, of course, greatly from the current in the circuit itself.

The resistance-coil, which in my apparatus is placed in the primary circuit, is provided for regulating the effects of the shocks in very fine and uniform graduation; but this effect is only obtained by using said resistance-coil in combination with the condenser in the secondary circuit. The effect of the condenser in the secondary circuit is, further, to insure the effect of the switch B′ B^2 in the primary circuit.

I am aware that it is not new to use a resistance-coil in connection with an electro-medical apparatus. I am further aware that cam-wheels controlled by clock mechanism have heretofore been used for sounding alarms, &c.; but I am not aware that an adjustable resistance-coil was ever before used in connection with an electro-medical apparatus having a primary and secondary circuit and clock mechanism for operating circuit-closers.

The current, as represented, passes from the positive pole of the battery to the switch-lever B^2; thence to the metallic pin i', to the resistance-coil R, from which it passes to the spring S, to the switch-lever B^3, to metallic pin i^5; thence to the contact-points n' n^2, through which it passes to the clock-work D; thence to the primary coil C, from which it returns to the metallic pin i^2; thence to the switch-lever B′, back to the battery, thus forming the primary circuit.

The secondary circuit passes from the secondary coil C′ to the condenser *f*, thence through the body of the patient back to the secondary coil, thus forming a complete secondary circuit.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with an electro-medical apparatus, of a primary and secondary circuit, the latter having a condenser interposed therein, substantially as shown and described.

2. The combination consisting of the case 2, batteries E, metallic pins i^7 i^8, switch-board B, induction-coil C, metallic pin i^2, clock mechanism D, resistance-coil R, metallic pins i' i^3, contact-spring S, metallic pin i^6, contact-points n^3 n^4, metallic pin i^4, angular levers l' and l^2, rollers q' q^2, springs g', cam-wheels W′ W^2, switch-levers B′ B^2 B^3, and condenser *f*, the whole forming a complete device, substantially as shown and described.

In testimony whereof I hereunto sign my name, in the presence of two subscribing witnesses, this 15th day of May, 1885.

AMANDUS METZGER.

Witnesses:
E. TIEGEL,
WILLIAM A. DE WATTAILLE.