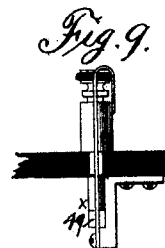
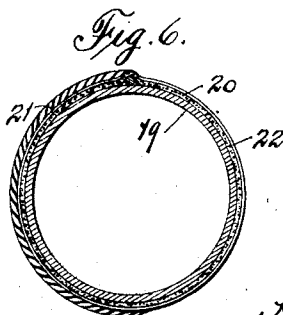
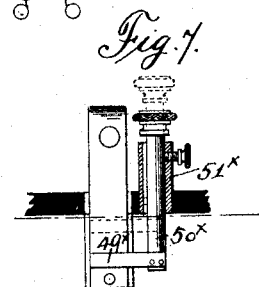
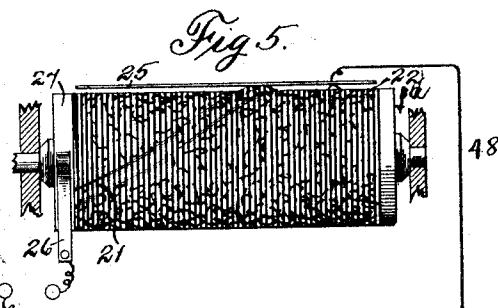
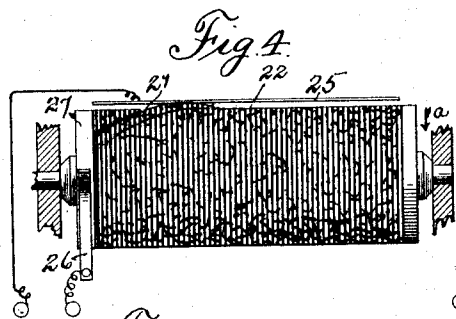
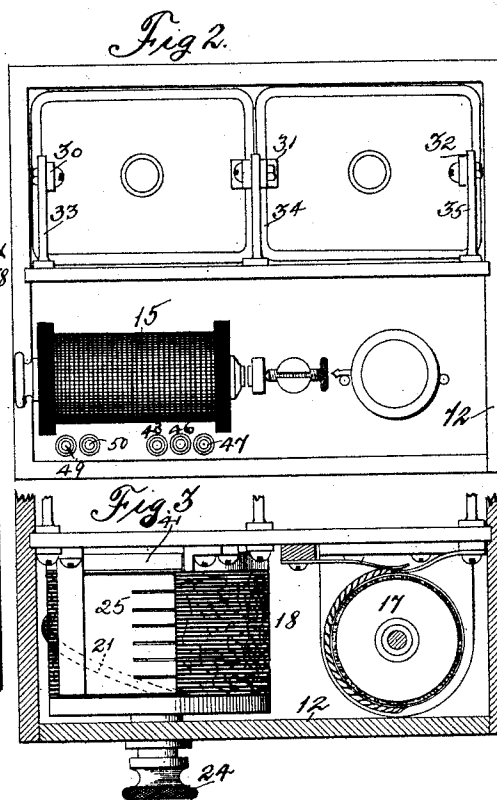
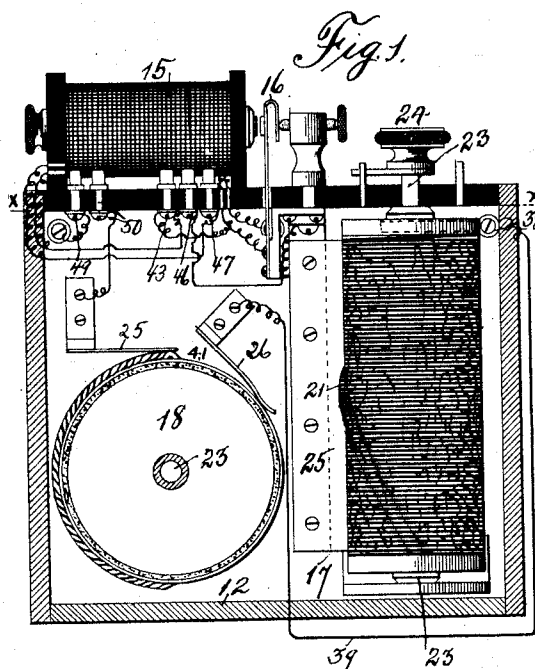


H. C. PORTER.

INDUCTION COIL FOR MEDICAL APPARATUS.

No. 586,622.

Patented July 20, 1897.



Witnesses:
 C. W. Graham
 W. T. Tompkins

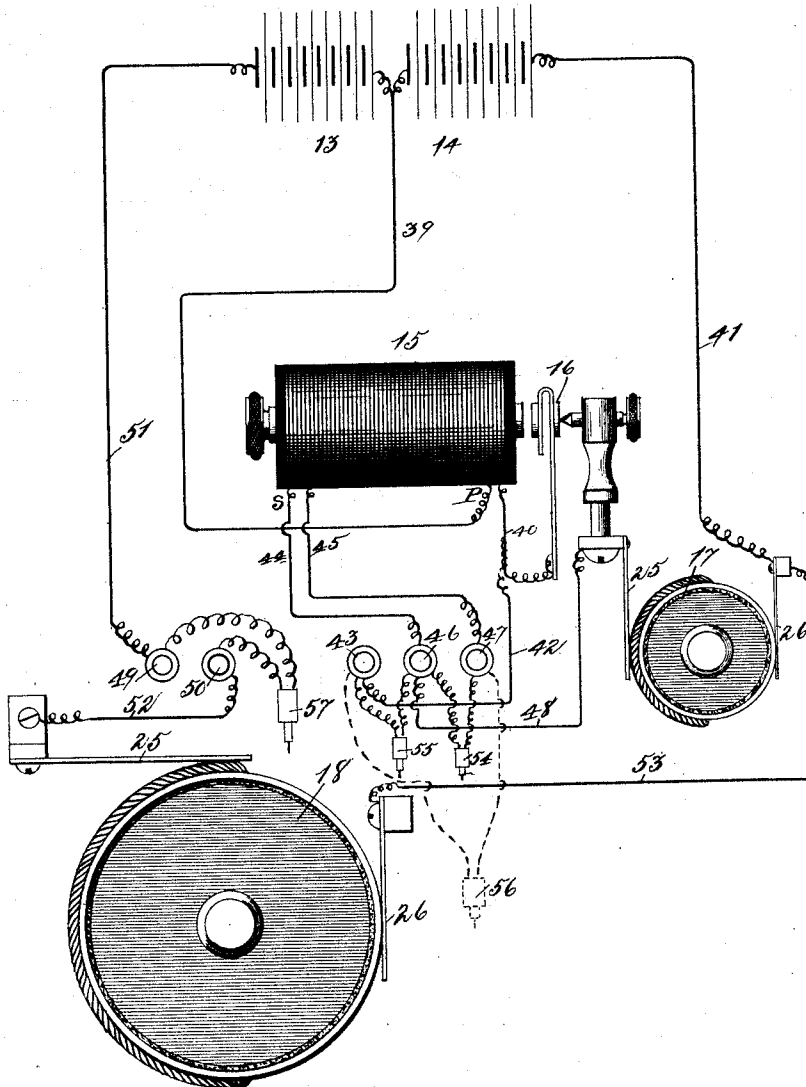
Inventor
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INDUCTION COIL FOR MEDICAL APPARATUS.

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Fig 10



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UNITED STATES PATENT OFFICE.

HENRY C. PORTER, OF CHICAGO, ILLINOIS.

INDUCTION-COIL FOR MEDICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 586,622, dated July 20, 1897.

Application filed January 26, 1895. Renewed January 18, 1897. Serial No. 619,679. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. PORTER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Applying Electricity to Medical and Surgical Uses, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in that class of apparatus employed to administer electricity to the person of a patient and also for purposes of surgical treatment.

My invention has for its object the provision of means whereby the many varying different desirable results in apparatus of this class are attained with a construction and arrangement capable of combination and co-operation within a small compass, so that the various parts may be assembled together as an operative whole and disposed within a case or box of small size, which is therefore portable, and provides means by which the apparatus may be readily and conveniently carried about.

In apparatus of this class it is desirable and of importance that the strength of the current should be varied when applied to different patients or for different purposes with the same patient and that gradations in the latter instances should be such as not to injure the patient. So, also, it is desirable and important that the apparatus should be capable of producing a high-tension current for certain purposes and also a quantitative or low-tension current for other purposes, and means should be provided whereby the one or the other may be interchangeably brought into use by the operator. Further, the apparatus should be capable of an output of wide range in current strength in order to adapt it for the different and varied uses to which it may be applied.

To accomplish these results and other results to be hereinafter set forth by an apparatus simple and compact in form and capable of convenient transportation, as stated, is the object of my invention, and I will now proceed to describe the same particularly with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the apparatus, the casing or box being in section. Fig. 2 is a plan view of the same, the box or case cover being removed. Fig. 3 is a sectional view on the line *xx* of Fig. 1. Fig. 4 is a view illustrative of the rheostat or current-regulator, showing the same in one position. Fig. 5 is a like view showing the rheostat or current-regulator in another position. Fig. 6 is a cross-sectional view of the rheostat or current-regulator. Figs. 7, 8, and 9 are detail views illustrating the mechanism for manually determining or adjusting the rapidity of movement or vibration of the interrupter. Fig. 10 is a diagrammatic view of the circuit connections.

The casing or box containing the apparatus is designated at 12, within which is disposed all of the apparatus for the accomplishment of the many different desirable results, thereby rendering the same capable of convenient transportation.

As a source of current generation I employ, preferably, secondary-battery cells, as shown, to the number of two, but of course this number may be increased or diminished, as desired, and the cells being designated at 13 and 14.

An induction-coil 15 is included in circuit with the batteries, and an interrupter or vibratory contact-breaker 16 is employed in conjunction with the induction-coil, since the current from the battery is continuous. I also provide rheostats or current-regulators of a particular type (designated, respectively, at 17 and 18) and each included in independent circuits with the source of current generation, the rheostat 17 being also included in circuit with the induction-coil 15, while the rheostat or current-regulator 18 is included in a circuit independent of the said induction-coil.

I will now proceed to a description of the rheostat or current-regulators 17 and 18, which are the same in construction, except that for purposes of compactness of disposition the rheostat 17 is of a greater length than the rheostat 18, while the latter is of greater diameter than the former.

The rheostat consists of a cylinder 19, Fig. 6, covered with asbestos or other suitable insulating material, (designated at 20,) and a spiral rib 21 is formed along the surface of

the cylinder 19. Wound about the cylinder are a number of turns or coils 22 of wire, constituting the resistance and forming a continuous winding about the insulating covering 20. This wire is bare and insulated from the cylinder by the asbestos covering 20, and the several coils 22 are slightly separated from each other or slightly spaced apart. The cylinder 19 is mounted upon the axes 23, journaled in the sides of the case 12, one of which axes is provided with the thumb-wheel 24 on the exterior of the case, by which the cylinder is manually rotated to vary the resistance and regulate the current strength. A collector-brush 25 is provided, bearing upon the spiral rib 21, and a contact-brush 26 bears upon the conductor-ring 27, which latter is mounted upon the cylinder and electrically connected with the continuously-wound wire of the resistance-coils 22. A connecting lead or conductor 48 is provided connected to the collector-brush 25. The spiral rib 21 is also insulated from the cylinder by means of the asbestos covering 20. It is now evident that in the manual rotation of the cylinder 19 by means of the thumb-wheel 24 the resistance-coils 22 are more or less cut in as the position of the spiral rib 21 varies in its relation to the collector-brush 25, as the point of contact changes in the rotation of the cylinder from one end thereof to the other, as the brush 25 rests constantly upon the ridge and the current is collected from that coil immediately in contact with the brush. In the continued rotation of the cylinder and the shifting of the contact a greater number of coils are cut in, as will be observed by comparing Fig. 5 with Fig. 4, the cylinder being rotated in the direction of the arrow *a*; but should the cylinder be rotated in an opposite direction a less number of coils would be cut in or included, as will be observed by comparing Fig. 4 with Fig. 5. By this means, therefore, the turning of the cylinder is utilized to cut in or out coils of the resistance-wire and the variation in resistance is accomplished in a uniform and regular manner.

The secondary batteries 13 and 14 are connected with the induction-coil 15 by means of the lead 39, connected with each one of said batteries and extended to the primary coil of the induction-coil 15, the other side of the primary circuit being established by the lead 40, connected with the vibratory contact-breaker 16, and from thence to the collector-brush 25 of the rheostat 17, through the rheostat 17 to the contact-brush 26, and from thence by the lead 41 to the batteries. Connected with the lead 40 of the primary circuit of the induction-coil is a branch lead 42 to the binding-post 43.

The secondary circuit (designated at 44 45) of the induction-coil 15 terminates in the binding-posts 46 and 47, and the binding-post 46 is also connected by the lead 48 with the supporting-post of the contact-breaker 16 of the induction-coil 15. The batteries 13 and 14

are also connected with the binding-post 49, and the collector-brush 25 of the rheostat 18 is also connected with the binding-post 50, the lead 51 connecting the former and the lead 52 the latter. The contact-brush 26 of the rheostat 18 is connected with the lead 41 to the battery by the lead 53.

It is now evident that if an instrument (designated at 54) is connected up with the binding-posts 46 and 47 a secondary or induced current will be obtained and utilized, which induced current is regulated by the rheostat 17, included in the primary circuit. Should an instrument, such as 55, be connected with the binding-posts 43 and 46, the current would be received and returned over a lead 40 of the primary circuit, the connecting-lead 42, and the lead 48. Should an instrument, such as 56, (indicated by the dotted lines,) be connected with the binding-posts 43 and 47, the current would then be received and returned over a primary lead 40, the connecting-lead 42, the secondary leads 45 and 44, and the connecting-lead 48. In each of these cases of circuit arrangement the current is regulated by the rheostat 17.

As is evident, the rheostat 18 is arranged in circuit with the batteries 13 and 14 independent of the circuit arrangement just described, and the instrument 57, connected with the binding-posts 49 and 50, has the current passing therethrough regulated by the rheostat 18 and is arranged independent of the induction-coil 15.

By employing secondary or storage batteries I obtain an output of considerable sustained strength of current and therefore am enabled to employ the apparatus for purposes requiring such current, and by means of the rheostats or current-regulators this current strength may be adjusted to the different exigencies of use and the gradations of change obtained with exceeding uniformity and without those intermittent pulsations incident to the ordinary rheostats in which the current is rendered intermittent by the breaking of the circuit. It is of importance in apparatus of this character that the regulation of the current should be uniform from the fact that a patient of an exceedingly nervous temperament may be injured by intermittent pulsations.

By means of the induction-coil and vibrator, which act as a step-up transformer, the battery-current induced in the secondary of the induction-coil is of an exceedingly increased tension and is regulated by means of the rheostat 17. By this arrangement I obtain a high-tension current and means for regulating the same. As described, I also provide a rheostat 18, included in a circuit independent of that circuit including the rheostat 17, which latter coöperates with the induction-coil, and since this rheostat is independent both of the induction-coil and the rheostat 17 and also included in circuit with the batteries it is evident that the current

from the batteries passes through the rheostat 18 and does not pass through the induction-coil. By this arrangement I obtain in one and the same apparatus a high-tension current by means of the induction-coil and a quantitative or low-tension current, the former being regulated by the rheostat 17 and the latter by the rheostat 18 in a circuit independent of that including said rheostat 17.

10 In order to obtain a practically continuous current for the uses to which this apparatus may be applied, as well as an intermittent or alternating current, I provide means by which the rapidity of vibration of the interrupter 15 or contact-breaker 16 may be adjusted, since it is evident that if the contact-breaker 16 vibrates at a given rate the alternations of current will be perceptible, and if this rate of vibration be increased to a sufficient degree then the alternations of the current will become imperceptible and therefore the alternations will, for practical purposes, be without influence upon the patient, and for the uses to which the apparatus is applied the 25 current will be in effect a continuous one.

30 In order to regulate the rapidity of vibrations of the contact-breaker 16, I simply change the pivot of the same by means of the sliding member 49^x, which embraces the contact-breaker 16, a rod 50^x, passing through the sleeve 51^x, being connected with the sliding member 49^x, so that by manually moving the rod 50^x either up or down the pivot of the

contact-breaker 16 is changed and the contact-breaker rendered thus capable of a more 35 or less rapid degree of vibration.

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

In an apparatus for applying electricity to 40 medical and surgical uses the combination with a source of current generation of a plurality of current-regulators each of which is adapted to be included in circuit with the source of generation and each one of which 45 is arranged in a circuit independent of the other together with an induction-coil included in circuit with one of the current-regulators and which induction-coil is independent of the other current-regulator whereby 50 in one and the same apparatus either a high-tension or low-tension current may be interchangeably employed and each regulated as desired and a contact-breaker for the induction-coil together with means for varying the 55 rapidity of vibrations of said contact-breaker consisting of a sliding member and a manually-operated adjusting-rod for said sliding member.

In testimony whereof I affix my signature 60 in presence of two witnesses.

HENRY C. PORTER.

Witnesses:

CHAS. C. BULKLEY,
W. T. TOMPKINS.