J. H. KELLOGG.

ELECTROTHERAPEUTIC AND EXERCISING APPARATUS.

APPLICATION FILED MAR. 22, 1917.

1,263,431.

Patented Apr. 23, 1918.

4 SHEETS—SHEET 1.

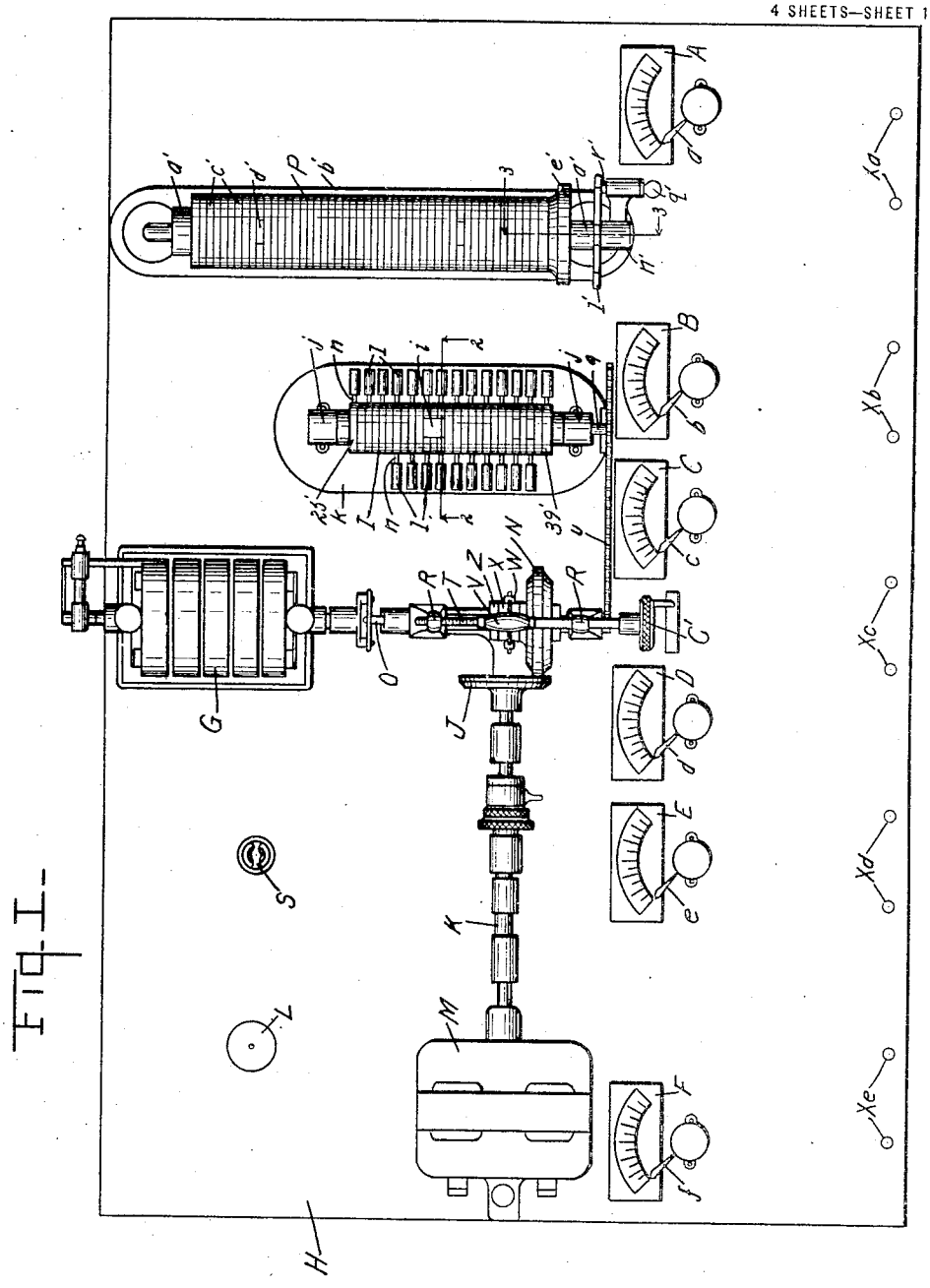


FIG. I.

WITNESSES:

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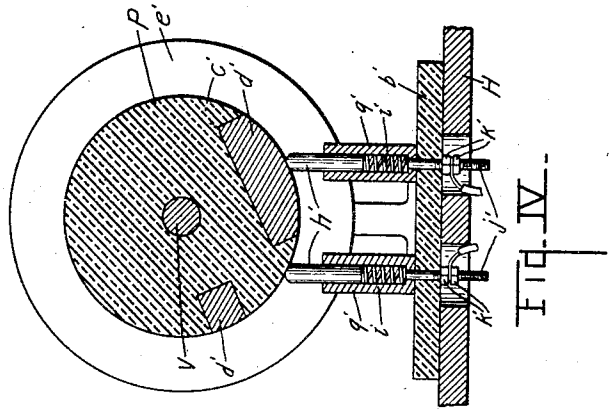


FIG. IV.

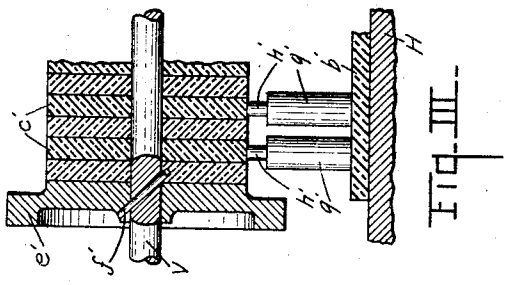


FIG. III.

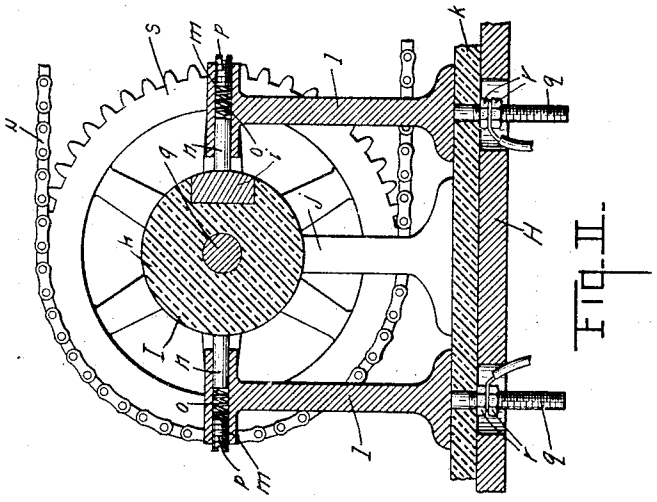


FIG. II.

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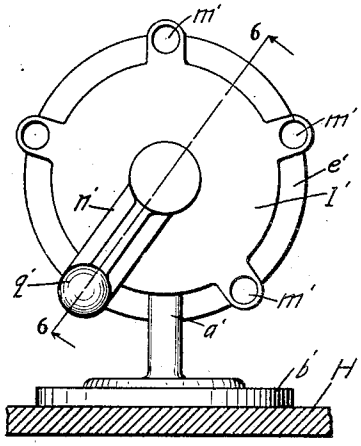


FIG. V.

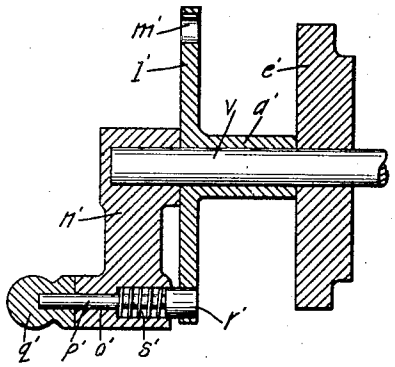


FIG. VI.

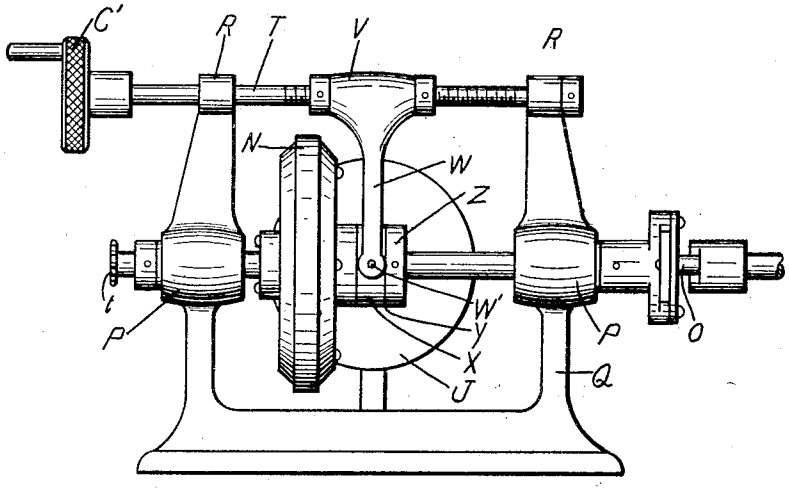


FIG. VII.

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APPLICATION FILED MAR. 22, 1917.

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4 SHEETS—SHEET 4.

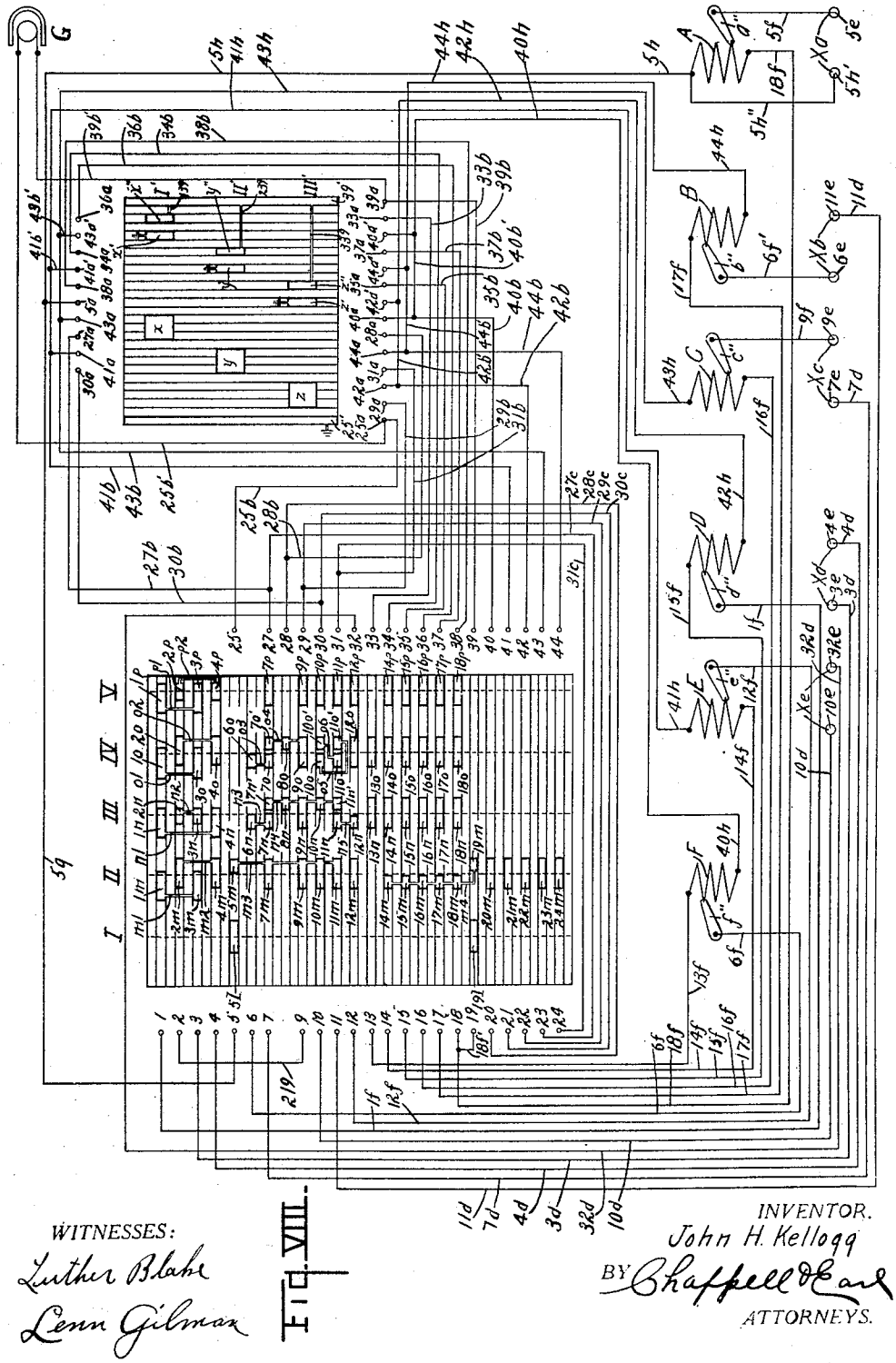


FIG. VIII.

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UNITED STATES PATENT OFFICE.

JOHN H. KELLOGG, OF BATTLE CREEK, MICHIGAN.

ELECTROTHERAPEUTIC AND EXERCISING APPARATUS.

1,263,431. Specification of Letters Patent. Patented Apr. 23, 1918.

Application filed March 22, 1917. Serial No. 156,619.

To all whom it may concern:

Be it known that I, JOHN H. KELLOGG, a citizen of the United States, residing at Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Electro-therapeutic and Exercising Apparatus, of which the following is a specification.

This invention relates to improvements in electro-therapeutic and exercising apparatus.

It is well-known to those skilled in electro-therapeutics that when an electric current flows through a muscle or groups of muscles the muscles are contracted, the degree and intensity of contraction depending upon the strength or intensity of the current employed. Each contraction of the muscles represents an expenditure of energy. The present invention has been designed to utilize this principle for locally reducing the amount of adipose tissue at any desired part of the body of the patient being treated. If strong muscular contractions are induced in the muscles underlying a layer of adipose tissue the adipose tissue is consumed to supply the necessary amount of energy for such contractions and the deposit of adipose tissue at this point is thereby reduced.

The use of faradic current for this purpose has been suggested, but I have discovered that a sinusoidal current is more suitable for the purpose. This is due to the fact that it is necessary to make and break the circuit of the current flowing through the muscle or muscle group in order to produce a succession of muscular contractions, and it is desirable that an appreciable length of time shall elapse between the successive contractions in order that the patient may not become excessively fatigued. When a circuit supplying faradic current to the body of a patient is interrupted or when the circuit is completed the patient experiences an unpleasant sensation due to the fact that the current at the time of breaking or making the circuit has an appreciable strength. By employing a sinusoidal current and interrupting and establishing the circuit at the moment when the current passes through the zero point this unpleasant sensation is no longer experienced.

It is often desirable to treat a number of different parts of the anatomy at the same time, but it has been found that if the contractions induced in the various parts of the body occur simultaneously it is highly disagreeable to most patients and especially so for very feeble, sensitive or nervous patients. I have therefore designed an apparatus by means of which the contractions may be induced either simultaneously or in succession as desired, and furthermore, by the provision of a distributing switch I make it possible to cause these contractions in several orders of succession.

The main objects of my invention are therefore:

First, to provide an improved electro-therapeutic and exercising apparatus.

Second, to provide an improved electro-therapeutic and exercising apparatus by the use of which great muscular activity may be obtained without material shock or pain or the unpleasant sensations or results which are frequently an incident to electrical treatments.

Third, to provide an improved apparatus of the class described, which may be readily adapted or adjusted to various conditions or requirements of the particular case or person to be treated.

Fourth, to provide an improved apparatus of the class described employing a sinusoidal current.

Fifth, to provide an improved apparatus having these advantages which is comparatively simple in structure, economical, and is easily operated.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

The invention disclosed in this application is especially adapted to be used with the electro-therapeutic chair disclosed in my application, Serial No. 135,143, filed December 5, 1916, but may, of course, be utilized with any type of electrodes for transmitting the current to those portions of the body which it is desired to treat.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which:

Figure I is a plan view of the apparatus.

Fig. II is a sectional detail of the interrupter, taken on line 2—2 of Fig. I.

Fig. III is a longitudinal sectional de-

tail of the pilot switch taken on line 3—3 of Fig. I.

Fig. IV is a transverse section of the pilot switch.

Fig. V is a front end elevation of the pilot switch.

Fig. VI is a sectional detail taken on line 6—6 of Fig. V.

Fig. VII is a side elevation of the speed control means.

Fig. VIII is a diagrammatic illustration of the electrical connections of the apparatus.

In the drawings, similar reference characters refer to similar parts throughout the several views and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawings, H is a support of any suitable kind such as the top of a table upon which is mounted a motor M controlled by a suitable switch S, there being a pilot lamp L across the supply circuit to indicate that current is supplied to the motor circuit.

The generator G, so designed as to produce a sinusoidal E. M. F. is connected to the motor through a speed control apparatus comprising a friction disk J mounted upon the shaft K of the motor and a friction wheel N which is slidably mounted upon the shaft O and splined thereto. The shaft generator G extends at right angles to the shaft of the motor M in such a manner that the periphery of the friction wheel comes into contact with the face of the friction disk J. The extended end of the generator shaft rests in the bearings P of the pedestal Q. The pedestal Q is extended above the bearings P and bored to form bearings R for the screw threaded shaft T which has a hand wheel C′ at one end thereof by which it can be rotated in the bearings R.

A screw-threaded sleeve V is mounted upon the threaded portion of the shaft T so that when the shaft is rotated, the sleeve is moved longitudinally of the same, the direction of movement being dependent upon the direction of rotation of the shaft. The sleeve V carries a U-shaped extension W secured to a collar X by means of pins W′, the collar being rotatably mounted in a groove Y of the sleeve Z which is secured to the friction wheel N.

The speed control apparatus just described is in general a construction that is well known and a further detailed description of the same is thought to be unnecessary, it being obvious that the speed of the shaft O can be regulated by turning the hand wheel C′ to move the friction wheel N across the face of the disk J.

The interrupter I comprises a shaft g having mounted thereon a series of disks h with contact blocks designated generally by the reference character i secured therein. These contact blocks are arranged in three rows, I′, II′ and III′, as indicated in the development of the interrupter shown in Fig. VIII. These rows are spaced from each other by angles of 120°.

The shaft g is mounted in bearings j which are supported upon a strip of insulating material k resting upon the support H. Mounted upon opposite sides of the interrupter shaft g are brush supports l having transverse bores m through the top thereof in which are mounted brushes n bearing against the surface of the interrupter disks and a spring o interposed between the brush end of the screw p. It will be seen that the pressure of the brushes against the interrupter disks may be varied by adjusting screw p.

The brush supports l are extended through the insulating strip k and the support H in the form of threaded rods q which have nuts r thereon for securing the supporting posts to the strip k and also for attaching connecting wires to the supporting post l, the supporting posts being made of conducting material so as to conduct current to the brushes n.

Mounted upon the front end of the shaft g is a sprocket wheel s which is geared to the small sprocket t on the end of the shaft O by means of the chain u. The ratio of the gears s and t and the width of the contact blocks i upon the interrupter are so proportioned with each other and adjusted with relation to the winding of the generator G, that the brushes n make contact with and leave contact blocks i at the instant when the potential is zero or practically zero.

It will be noted that while the rows of contact blocks upon the interrupter are spaced by angles of 120°, the brushes n are spaced from each other by angles of 180°. It will therefore be apparent that at no time can more than one row of contacts on the interrupter be in engagement with either row of brushes. The contact blocks x', x'', y', y'', z', and z'' are only wide enough to contact with a single brush, while the contacts x, y and z are sufficiently wide to bridge two adjacent brushes.

The distributing switch P has a shaft v rotatable in bearings a' supported upon the strip of insulation b' which rests upon the support H.

Mounted upon the shaft are a series of disks c' having contact blocks generally designated by the reference character d' secured therein in spaced relation. These disks are secured upon the shaft by pressing the end plate e' against the end disk and securing it to the shaft v by means of the pin f', which extends diagonally through the shaft,

the end plate e' and a portion of the first disk, as shown in Fig. III.

Mounted beneath the interrupter disks are brush holders g' having bores therein for receiving the brushes h' and the springs i', the spring bearing against the lower ends of the brushes to maintain them in contact with the disks. The brush holders g' are extended through the insulating strip b' and the support H and form threaded rods j' which carry nuts k' for securing the brush holders to the insulating strip and for securing conductor wires for conductive relation to the brush holders g'.

Secured to the forward bearing a' is a disk l' having holes m' formed therein at regular intervals. The shaft v of the distributing switch extends beyond the disk l' and has rigidly secured to its end an arm n', having a transverse bore o' through the free end thereof and at right angles to the disk l' to slidably receive the detent pin p', which has a handle q' at the outer end thereof and an enlarged detent portion r' at the other end thereof which engages the holes m' in the disk l', it being held in place by means of a spring s' bearing against the inner end of the enlarged detent portion.

By means of the construction just shown, the distributing switch contact blocks may be rotated and held so that any one of the rows of contact blocks, shown in the development in Fig. VIII, may be brought into contact with the brushes h'. Some of the contact blocks are wide enough to bridge two opposite brushes, while others are so narrow that they merely contact with a single brush. The lines I, II, III, IV and V divide each row of contact blocks into two parts, the parts lying on the right hand side of the line contact with the right hand brushes of the distributing switch and those on the left hand side of the lines contact with the left hand row of brushes.

It will be noted that certain of the contact blocks in each row are connected with each other by connections such as m', n^2, o^3, etc., these connections being made beneath the surface of the insulation so as not to come in contact with the brushes. The purpose of these connections will be explained farther on.

Mounted upon the support are a plurality of rheostats A, B, C, D, E and F having pivoted contact arms a'', b'', c'', d'', e'' and f'' and index pointers a, b, c, d, e, and f. These rheostats are used to regulate the strength of the current delivered to the binding posts indicated by the reference characters X^a, X^b, X^c, X^d, X^e, respectively, as shown in Figs. I and VIII.

The end disks 25′ and 39′ of the interrupter are made of conductive material so that they serve as collector rings and the end disk 25′ is grounded on the interrupter shaft as indicated in Fig. VIII, as are also the contact blocks x', y' and z' and the contact blocks x'', y'' and z'' are connected to the collector disk 39′ by means of connections 139, 239 and 339 respectively, which extend through the insulating material.

In Fig. VIII, the left hand brushes of the distributing switch are numbered from 1 to 24 consecutively except that the brush corresponding to number 8 is missing. The brushes on the right hand side of the distributing switch are numbered consecutively from 25 to 44 except that the brush corresponding to the number 26 is lacking. In this figure, the right and left hand brushes are spaced apart at a distance greater than the length of the contact blocks upon the rotating part of the distributing or "pilot" switch, but this is merely for convenience in tracing the circuits when the various rows of contact blocks are in contact with the brushes, it being understood that each of the longer contact blocks are sufficiently long to reach from a right hand brush to a left hand brush. The lines I, II, III, IV and V indicate the center line of each row of contact blocks. When a row of contact blocks are in contact with the brushes, the right hand brushes will contact with those portions of the contact blocks on the right hand side of the center line and the left hand brushes will contact with those portions of the contact blocks lying upon the left hand side of the center line. The contact blocks on the lines I, II, III, IV and V have been numbered to correspond with the numbering of the binding posts at the left hand side except that the reference characters for each row of contact blocks has an added characteristic letter, such as l for the first row and m for the second, n for the third, etc.

In Fig. VIII, the bottom row of brushes of the interrupter correspond to the right hand row of brushes, shown in Fig. I and the top row corresponds to the left hand row of Fig. I.

Wires 25^b, 28^b, 29^b, 31^b, 33^b, 35^b, 37^b, 39^b, 40^b, 42^b and 44^b connect the brushes 25, 28, 29, 31, 33, 35, 37, 39, 40, 42, and 44 at the right hand side of the pilot switch with brushes 25^a, 28^a, 29^a, 31^a, 33^a, 35^a, 37^a, 39^a, 40^a, 42^a and 44^a, respectively, at the bottom side of the interrupter, while wires $40^{b'}$, $42^{b'}$ and $44^{b'}$ connect the brushes $40^{a'}$, $42^{a'}$ and $44^{a'}$ at the lower side of the interrupter with the wires 40^b, 42^b and 44^b, respectively. Wire $25^{b'}$ connects one terminal of the generator G with the brush 25^a and wire $39^{b'}$ and the other terminal of the generator to the brush 39^a.

Wires 27^b, 30^b, 34^b, 36^b, 38^b, 41^b and 43^b connect the brushes 27, 30, 34, 36, 38, 41 and 43 at the right hand side of the distributing switch with the brushes 27^a, 30^a, 34^a,

36^a, 38^a, 41^a, and 43^a at the top side of the interrupter. Brush 5 at the left hand side of the distributing switch is connected to the brush 5^a at the top side of the interrupter by means of the wire 5^g. Brushes $41^{a'}$ and $43^{a'}$ at the top of the interrupter are connected to the wires 41^b and 43^b, respectively, by the wires $41^{b'}$ and $43^{b'}$, respectively.

The wires 5^h, 41^h and 43^h connect the brushes 5^a; 41^a and $41^{a'}$; 43^a and $43^{a'}$, respectively, at the top of the interrupter with one end of the resistances A, E and C, respectively, and the wires 40^h, 42^h and 44^h connect the brushes 40^a, $40^{a'}$, $42^{a'}$, 44^a and $44^{a'}$, respectively with one end of the resistances B, D and F, respectively. The wires 27^c, 28^c, 29^c, 30^c and 31^c connect brushes 27, 28, 29, 30 and 31 at the right hand side of the distributing switch with the brushes 20, 21, 22, 23 and 24 at the left hand side of the distributing switch. Brushes 13, 14, 15, 16, 17 and 18 are connected with the other ends of the resistances F, E, D, C, B and A, respectively, by the wires 13^f, 14^f, 15^f, 16^f, 17^f and 18^f, respectively. The brush 19 is connected to the wire 18^f by the wire $18^{f'}$. The binding posts 3^e, 4^e, 7^e, 10^e and 11^e at the bottom of Fig. VIII, are connected to the brushes 3, 4, 7, 10 and 11 at the left side of the distributing switch by means of the wires 3^d, 4^d, 7^d, 10^d and 11^d and the binding post 32^e at the bottom of Fig. VIII is connected to the brush 32 by means of the wire 32^d.

Brushes 2 and 9 at the left of the distributing switch are connected by the wire 219. Brushes 6 at the left of the distributing switch is connected with the contact arm f'' by means of the wire 6^F. Brush 12 is connected with the contact arm e'' of the rheostat E by means of the wire 12^f and contact arm d'' of the rheostat D is connected to brush l by means of the wire l^f. The contact arms a'', b'' and c'' of rheostats A, B and C are connected to the binding posts 5^e, 6^e and 9^e, respectively, by means of the wires 5^f, 6^f and 9^f, respectively. Binding post $5^{h'}$ is connected to the same end of the resistance A, to which the wire 5^h is connected, by means of the wire $5^{h''}$.

In operation, when the distributer switch is in such a position that the contact blocks in line I bridge the brushes of the distributer switch current will be delivered to the binding post $5^{h'}$, 5^e, through the following paths: generator G, connections $25^{b'}$, 25^a, 25^b, 25, 51, 5, 5^g, 5^h, A, 18^f, $18^{f'}$, 191, 39, 39^a. The connections just recited form a circuit in which the resistance A is in series. Binding post $5^{h'}$ is connected by the conductor $5^{h''}$ with one end of the resistance A, and binding post 5^e is connected to the adjustable contact arm a'' by conductor 5^f and may be adjusted over the contact points of resistance A to shunt any desired current to the binding post $5^{h'}$ and 5^e.

When the distributer switch is again shifted so that the contact blocks in line II bridge the brushes the pairs of binding posts indicated by the reference characters X^b, X^c, X^d, and X^e, are energized through the following circuits: Starting with the generator G the current flows through the connections $25^{b'}$, 25^a, 25^b, 25, and contact block 5^m. The connector m^3 of the distributer switch connects contact blocks 5^m, 7^m, 9^m, 10^m, and 11^m in parallel. It will be noted that the last-mentioned contact blocks are in contact with the brushes at each side of the distributer switch.

The current is offered four paths to the left through the following connections,—7^m, 7, 7^d, 7^e; 9^m, 9, 219, 2, 2^m, m^2, 4^m, 4, 4^d, 4^e; 10^m, 10, 10^d, 10^e; 11^m, 11, 11^d, 11^e.

It will be noted that by the above connections one of the binding posts for each of the pairs mentioned above will be energized.

The following paths to the right from the contact block 5^m are also offered to the current,—7^m, 27, 27^c, 23, 23^m, 43, 43^b, 43^h, C, 16^f, 16, 16^m, m^4; 9^m, 29, 29^c, 22, 22^m, 42, 42^b, 42^h, D, 15^f, 15, 15^m, m^4; 10^m, 30, 30^c, 21, 21^m, 41, 41^b, 41^h, E, 14^f, 14, 14^m, m^4; 11^m, 31, 31^c, 24, 24^m, 44, 44^b, 44^h, B, 17^f, 17, 17^m, m^4. From the point m^4 the four circuits last described above are united and a common return comprising the following connections leads to the generator,—19^m, 39, 39^b, 39^a, $39^{b'}$, G. The last four circuits include the resistances C, D, E and B, respectively, in series.

The binding post 6^e is connected with the adjustable arm b'' by the conductor $6^{f'}$. In a similar manner the binding post 9^e is connected to the adjustable arm c'' by the conductor 9^f. The binding post 3^e is connected with the adjustable arm d'' by the connections 3^d, 3, 3^m, m^1, l^m, l, l^f. The binding post 32^e is connected with the adjustable arm e'' by the connections 32^d, 32, 12^m, 12 and 12^f. By the above connections the pairs of binding posts X^b, X^c, X^d, X^e, are energized with continuous sinusoidal current.

The binding posts $5^{h'}$ and 5^e are at the same time supplied with an interrupted sinusoidal current by means of the following connections,—generator G, $25^{b'}$, 25^a, $25'$, ground connections z', 5^a, 5^h, A, 18^f, 18, 18^m, m^4, 19, 39, 39^b, 39^a, $39^{b'}$, G. The above circuit includes the resistance A in series and is interrupted once during each revolution of the interrupter. The binding post $5^{h'}$ is connected to one end of the resistance A by the conductor $5^{h''}$ and the binding post 5^e is connected to the adjustable arm a'' by the conductor 5^f.

With the contact brushes on line III of the distributing switch bridging the brushes thereof the pairs of binding posts X^a and X^e will not be energized. The binding posts

11^e, 6^e, 9^e, 7^e, and 4^e will all be energized and the binding post 3^e will act as a common return for the five binding posts first mentioned. It is intended that the binding posts 6^e and 11^e will be connected to electrodes attached to the right and left leg, respectively. Binding posts 7^e and 9^e will be connected to electrodes attached to the right and left arm, respectively. Binding post 4^e will be connected to an electrode for the back and binding post 3^e will be connected to an electrode for the abdomen.

From the description to follow it will appear that the electrodes attached to the binding posts 6^e, 9^e, 4^e, 11^e, and 7^e will be energized in succession and that the electrodes attached to the binding post 3^e will act as a common return for the other electrodes.

By setting the distributing switch in this position contractions will be induced in this order,—right leg, left arm, back and abdomen, left leg, and right arm, the abdomen receiving five impulses of current for each impulse administered to the remaining parts.

Starting with the contact blocks of the interrupter on the line II′ in contact with the lower row of brushes, one side of the resistance B is connected with one side of the generator through the following connections:—44^h, $44^{a'}$, y', ground connection, 25′, 25^a, $25^{b'}$, G. The opposite end of the resistance B is connected with the opposite side of the generator through the following connections:—17^f, 17, 17^n, 37, 37^b, 37^a, y'', 239, 39′, 39^a, $39^{b'}$, G. These two sets of connections place the resistance B in series with the generator. The binding post 6^e is connected with the contact arm b'' by the conductor $6^{f'}$. In this position of the interrupter the connections from the binding post 3^e, which acts as a return for the current from the binding post 6^e, as explained above, to the generator, are as follows:—3^e, 3^d, 3, 3^n, n^2, 2^n, 2, 9, 9^n, n^4, $11^{n'}$, 31, 31^b, 31^a, y, $44^{b'}$, y', ground connection, 25′, 25^a, $25^{b'}$, G.

The connections just recited permit an impulse of current to be given to the right leg and abdomen. If the interrupter is then revolved in a direction to bring the contact blocks on line I′ in contact with the upper brushes the binding posts 9^e and 3^e will be energized, thus giving an impulse of current to the left arm and abdomen.

The connections for thus energizing these binding posts are as follows:—The binding post 9^e is connected to the adjustable arm c'' by the conductor 9^f. One side of the resistance C is connected with the generator through the following connections:—43^h, $43^{b'}$, $43^{a'}$, x', ground connection 25′, 25^a, $25^{b'}$, G. The opposite end of the resistance C is connected with the other side of the generator through the following connections: 16^f, 16, 16^n, 36, 36^b, 36^a, x'', 139, 39′, 39^a, $39^{b'}$, G. The current flows from the binding post 6^e, to the binding post 3^e and from there to one side of the generator through the following connections:—3^e, 3^b, 3, 3^n, n^2, 2^n, 2, 9, 9^n, n^4, 7^n, 27, 27^a, x, 43^a, $43^{b'}$, x', ground connection, 25′, 25^a, $25^{b'}$, G.

If the interrupter is again revolved in the same direction the contact blocks on line III′ will contact with the bottom row of brushes and in this position of the contact blocks the binding posts 4^e and 3^e will be energized, and the current will be controlled by the rheostat D. In this position of the interrupter contractions will be induced in the back and abdomen. The rheostat D is in series with the generator through the following connections:—generator G, 25^b, 25^a, 25′, ground connection z', $42^{a'}$, 42^h, rheostat D, 15^f, 15, 15^n, 35, 35^b, 35^a, z'', 339, 39′, 39^a, $39^{b'}$, back to the generator G. The binding post 4^e is connected with the rheostat through the following connections:—4^e, 4^d, 4, 4^n, nl, l^n, l, l^f, and adjustable arm d''. The return path through the binding post 3^e comprises the following connections:—3^d, 3, 3^m, m^2, 2^m, 2, 9, 9^m, 29, 29^a, z, 42^a, $42^{b'}$, $42^{a'}$, z, ground connection, 25′, 25^a, $25^{b'}$, to the generator G.

In the next position of the interrupter the contact blocks on the line II′ will be in contact with the top row of brushes and the left leg and abdomen will receive an impulse of current. This means that the binding posts 11^e and 3^e will be energized. The rheostat E will regulate the current to these binding posts and is connected in series with the generator G through the following connections:—G, $25^{b'}$, 25^a, 25′, ground connection, y, $41^{a'}$, $41^{b'}$, 41^h, E, 14^f, 14, 14^n, 34, 34^a, y'', 239, 39′, 39^a, 39^b, to the generator G. The binding post 11^e is connected to the rheostat E through the following connections:—11^d, 11, 11^n, n^5, 12^n, 12, 12^f, and adjustable arm e''. The current will flow from the binding post 11^e through the body to the binding post 3^e and the return circuit will be through the following connections:—3^e, 3^d, 3, 3^n, n^2 2, 9, n^4, 10^n, 30, 30^b, 30^a, y, $41^{a'}$, 41^g, $41^{b'}$, $41^{a'}$, y', ground connection, 25′, 25^a, $25^{b'}$, G.

In the next position of the interrupter the contact blocks on the line I′ will contact with the lower row of brushes and the binding posts 7^e and 3^e will be energized, and muscular contractions in the right arms and abdomen will be induced. The current to these binding posts is regulated by the rheostat F which is connected in series with the generator through the following connections:—generator G, $25^{b'}$, 25^a, 25′, ground connection, X, $40^{h'}$, 40^h, F, 13^f. 13, 33, 33^b, 33^a, X″, 139, 39′, 39^a, $39^{b'}$, back to the generator G. The binding post 7^e is connected to the rheostat F by the following connections:—7^e, 7^d, 7, 7^n, n^3, 6^n, 6, 7^f, and an adjustable arm F′. The current from the binding post

7^e returns from the body to the generator through the following connections:—binding posts 3^e, 3^d, 3, 3^a, n^2, 2, 9, 9^a, n^4, 8^a, 28, 28^b, 28^a, x, $40^{a'}$, $40^{b'}$, x^1, ground connection, 25′, 25^a, $25^{b'}$, back to the generator G.

When the distributing switch is turned so that the contact blocks on the line IV bridge the brushes of the distributing switch and the interrupter is rotated, current impulses will be transmitted to the binding posts 6^e and 10^e, 11^e, and 32^e, 7^e in the order named, and the binding post 4^e will act as a common return for the current flowing through the body from the binding posts 6^e, 7^e, and 3^e. Current impulses will flow from the binding posts 6^e and 11^e through the body to the binding posts 10^e, and 32^e, respectively, or in the opposite direction, depending upon the direction in which the current is being generated in the generator G. With the electrodes which are attached to these binding posts contacting with the same portions of the body as described above, when the contact blocks on line III of the distributing switch are bridging the brushes thereof, and with electrodes connected to the binding posts 10^e and 32^e contacting with the right and left thighs respectively, the contractions will be induced in the right leg and thigh, left arm and back, back and abdomen, left leg and thigh, and right arm and back, in the order named, the back receiving three impulses of current to one of the other parts. The pair of binding posts X^a will not be energized.

With the contact blocks on the line II′ of the interrupter contacting with the bottom row of brushes, the binding posts 6^e and 10^e will be energized and contractions induced in the right leg and thigh, the current to these binding posts being controlled by the rheostat B which is connected in series to the generator through the following connections:—generator G, $25^{b'}$, 25^a, 25′, ground connection, y', $44^{a'}$, 44^b, B, 17^f, 17—0, 37^b, 37^a, y'', 239, 39′, 39^a, $39^{b'}$, to the generator G.

The binding post 6^e is connected to the rheostat through the conductor 6^f and adjustable arm b''. The current flowing through the body will return through the binding posts 10^e, connections 10^a, 10, 10—0, 0—5, 11—0, 31, 31^b, 31^a, y, 44^a, $44^{b'}$, $44^{a'}$, y', ground connection, 25′, 25^a, 25^b, to the generator G.

When the interrupter is then turned so that the line of contact blocks on line I′ of the interrupter is turned contact with the top row of brushes, binding posts 9^e and 4^e will be energized, contractions will be induced in the left arm and back, and the current to these binding posts will be regulated by the rheostat C which is connected in series with the generator G through the following connections:—generator G, $25^{b'}$, 25^a, 25′, ground connection, X′, $43^{a'}$, $43^{b'}$, 43^b, rheostat C, 15^f, 16, 16—0, 36, 35^b, 36^a, X″, 139, 39, 39^a, $39^{b'}$, to generator G.

The binding post 9^e is connected to the rheostat C by conductor 9^f and adjustable arm e'' the current flowing through the body will return through the following connections:—binding posts 4^e, 4^d, 4, 7—0, 0—2, 2—0, 2, 9, 9—0, 0—4, 7—0′, 27, 27^b, 27^a, X, 43^e, $43^{b'}$, $43^{a'}$, x', ground connection, 25′, 25^a, $25^{b'}$, to the generator G.

Turning the interrupter in the same direction the contact blocks on the line III′ will next contact with the bottom row of brushes and the binding posts 3^e, and 4^e, will be energized, contractions will be induced in the back and abdomen, and the current flowing to these binding posts will be regulated by the rheostat D which is connected in series with the generator G through the following connections:—generator G, $25^{b'}$, 25^a, 25′, ground connection, z', 42^a, 42^b, rheostat D, 15^f, 15, 15—0, 35, 35^b, 35^a, z'', 339, 39′, 39^a, $39^{b'}$, to the generator G. The binding post 3^e is connected to the rheostat D by the following connections:—3^e, 3^d, 3, 3—0, 0—1, 1—0, 1, F, and adjustable arm d''.

The current from the binding post 3 will flow through the body and return through the following connections:—binding post 4^e, 4^d, 4, 4—0, 0—2, 2—9, 2, 9, 9—0, 29, 29^b, 29^a, z, 42^a $42^{b'}$, $42^{a'}$, z', ground connection, 25′, 25^a, $25^{b'}$, to the generator G.

The line of contact blocks on line II′ of the interrupter will next contact with the top row of brushes and the binding posts 11^e and 32^e will be energized, contractions will be induced in the left leg and thigh and the current to these binding posts being controlled by the rheostat E which is connected in series with the generator G by the following connections:—generator G, $25^{b'}$, 25^a, 25′, ground connection, y', $41^{a'}$, $41^{b'}$, 41^b, rheostat E, 14^f, 14, 14—0, 34, 34^b, 34^a, y'', 239, 39′, 39^a, $39^{b'}$, back to the generator G.

The binding post 32^e is connected with the rheostat E through the following connections:—32^e, 32^d, 32, 12—0, 12, 12′, and adjustable arm e''. The current will flow from the binding post 32 through the body to the binding post 11^e and back to the generator through the following connections:—11^d, 11, 11—0, 0—6, 10—0′, 30, 30^b, 30^a, y, 41^a, 41^g, $41^{b'}$, $41^{a'}$, y', ground connection, 25′, 25^a, $25^{b'}$, to the generator G.

In the next position of the interrupter binding posts 3^e and 7^e will be energized, contractions will be induced in the right arm and back and the current through these binding posts being controlled by the rheostat F, which is connected in series with the generator G through the following connections:—generator G, $25^{b'}$, 25^a, 25′, X′, $40^{a'}$, 40^b, rheostat F, 13^f, 13, 13—0, 33, 33^b, 33^a, x'', 139, 39, 39^a, $39^{b'}$, to the generator G. The

binding post 7^e is connected to the rheostat F by the following connections:—7^e, 7^d, 7, 7—0, 0—3, 6—0, 6, 6^f, and adjustable arm f''. The current from the binding post 7^e will flow through the body and return through the binding post 4^e by the following connections: 4^e, 4^d, 4, 4—0, 0—2, 2—0, 2, 9, 9—0, 0—4, 9—0, 28, 28^b, 28^a, X, 40^a, $40^{b'}$, $40^{a'}$, X', ground connection, 25', 25^a, $25^{b'}$, to generator G.

With the distributing switch set so that the contact blocks on the line V bridge the brushes thereof current impulses will be transmitted to the pairs of binding posts X^b, X^c, X^d, and X^e in the order named, and contractions will be induced in the legs, arms, back and abdomen, and thighs, in the same order, the electrodes contacting with the body in the same manner as in the previous position of the distributing switch. The pair of binding posts X^a will not be energized.

With the interrupter in position so that the contact blocks on the line II' thereof contact with the bottom row of brushes the binding posts 6^e and 11^e will be energized and the current thereto controlled by the rheostat B which is connected in series with the generator through the following connections:—G, $25^{b'}$, 25^a, 25', ground connection, y', $44^{a'}$, 44^h, rheostat B, 17^f, 17, 17^p, 37, 37^b, 37^a, y'', 239, 39', 39^a, $39^{b'}$, to the generator G.

The binding post 6^e is connected with the rheostat B by the conductor $6^{f'}$ and the adjustable arm b''. The current flowing from the binding post 6^e through the body will return to the generator G through the binding post 11^e and the connections 11^d, 11, 11^p, 31, 31^b, 31^a, y, 44^a, $44^{b'}$, 44^a, y', ground connection, 25', 25^a, $25^{b'}$, to the generator.

When the interrupter is then turned so that the contact blocks on the line I' contact with the upper row of brushes the binding posts 7^e, and 9^e will be energized and the current thereto controlled by the rheostat C which is connected in series with the generator G by the following connections:—generator G, $25^{b'}$, 25^a, 25', ground connection, X', $43^{a'}$, $43^{b'}$, 43^h, rheostat C, 16^f, 16, 16^p, 36, 36^b, 36^a, X'', 139, 39^a, $39^{b'}$, to the generator G.

The binding post 9^e is connected with the rheostat C by the conductor 9^f and adjustable arm c''. Current flowing from the binding post 9^e through the body will return to the generator G through the binding post 7^e and connections 7^d, 7, 7^p, 27, 27^b, 27^a, x, 43^a, $43^{b'}$, $43^{a'}$ x', ground connection, 25', 25^a, $25^{b'}$, to the generator.

In the next position of the interrupter the contact brushes on the line III' will contact with the bottom row of brushes and the brushes 3^e and 4^e will be energized, the current to these brushes being controlled by the rheostat D, which is connected in series to the generator G through the following connections:—$25^{b'}$, 25^a, 25', ground connection z', $42^{a'}$, 42^h, rheostat D, 15^f, 15, 15^p, 35, 35^b, 35^a, z'', 339, 39', 39^a, $39^{b'}$, back to the generator.

The binding post 3^e is connected to the rheostat D through the following connection:—3^e, 3^d, 3, 3^p, p^1, l^p, l, l^f, and adjustable arm d''. The current flowing from the binding post 3^e through the body will return through the binding post 4^e and the following connections:—4^d, 4, 4^p, p^2, 2^p, 2, 9, 9^p, 29, 29^b, 298, z, 42^a, $42^{b'}$, $42^{a'}$, z', ground connection, 25', 25^a, $25^{b'}$, to the generator.

With the interrupter positioned so that the contact blocks on the line II' contact with the top row of brushes the binding posts 10^e and 32^e will be energized, the current to these brushes being controlled by the rheostat E, which is connected in series with the generator by the following connections:—generator G, $25^{b'}$, 25^a, 25', ground connection, y', $41^{a'}$, $41^{b'}$, 41^h, rheostat B, 14^f, 14, 14^p, 34, 34^b, 34^a, y'', 239, 39', 39^a, $39^{b'}$, to the generator G.

The binding post 32^e is connected to the rheostat E by the following connections:—32^e, 32^d, 32, 12^p, 12, 12^f, and adjustable arm e''.

Current flowing from the binding post 32^e through the body will return to the generator through the binding post 10^e and the following connections:—10^d, 10, 10^p, 30, 30^b, 30^a, y, 41^a, 41^g, $41^{b'}$, $41^{a'}$, y', ground connections, 25', 25^a, $25^{b'}$, to the generator G.

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

1. In an electro-therapeutical apparatus, the combination of a sinusoidal generator, a plurality of electrode binding posts, circuits connecting said generator to said binding posts, an interrupter in said circuits comprising a cylinder of insulating material having a plurality of rows of contact blocks secured in the outer periphery thereof, a metal shaft extending through said cylinder and rotatably journaled in bearings, one of said contacts in each row being grounded upon said shaft, a collector ring at each end of said cylinder, one of said collector rings being grounded upon said shaft, the other of said collector rings being connected to a contact block in each of the said rows, two spaced rows of brushes mounted to separately contact with said contact blocks, a synchronizing driving connection between said generator and said interrupter shaft, a distributing switch interposed in said circuits comprising a cylinder of insulation rotatably mounted, a detent for holding said cylinder in any desired position, a plurality of rows of contacts arranged longitudinally thereof, connections between certain of said contacts, spaced rows of brushes arranged

to engage said contacts, and adjustable rheostats in said circuits for controlling the strength of current delivered to said binding posts, for the purpose described.

2. In an electro-therapeutical apparatus, the combination of a sinusoidal generator, a plurality of electrode binding posts, circuits connecting said generator to said binding posts, an interrupter in said circuits comprising a cylinder of insulating material having a plurality of rows of contact blocks secured in the outer periphery thereof, a metal shaft extending through said cylinder and rotatably journaled in bearings, one of said contacts in each row being grounded upon said shaft, a collector ring at each end of said cylinder, one of said collector rings being grounded upon said shaft, the other of said collector rings being connected to a contact block in each of said rows, two spaced rows of brushes mounted to separately contact with said contact blocks, a synchronizing driving connection between said generator and said interrupter shaft, a distributing switch interposed in said circuits comprising a cylinder of insulation rotatably mounted, a plurality of rows of contacts arranged longitudinally thereof, and spaced rows of brushes arranged to engage said contacts.

3. In an electro-therapeutical apparatus, the combination of a sinusoidal generator, a plurality of electrode binding posts, circuits connecting said generator to said binding posts, a distributing switch interposed in said circuits comprising a cylinder of insulation rotatably mounted, a plurality of rows of contacts arranged longitudinally thereof, spaced rows of brushes arranged to engage said contacts, and adjustable rheostats in said circuits for controlling the strength of current delivered to said binding posts, for the purpose described.

4. In an apparatus of the class described, the combination of a sinusoidal current generator, a plurality of electrode binding posts, a plurality of adjustable rheostats for controlling the current delivered to said binding posts, a circuit for each of said rheostats connecting said rheostats in series with the generator, each of said rheostats having an adjustable contact arm connected to one of said binding posts, connections for connecting the remaining binding posts to said generator, a distributing switch interposed in said series circuits and last mentioned connections for distributing the current to the various binding posts in various orders of succession, an interrupter also interposed in said series circuits and said connections for making and breaking the circuits at desired intervals, and a driving connection between said generator and said interrupter synchronizing the making and breaking of said circuits with the zero point of the current generated by said sinusoidal generator.

5. In an apparatus of the class described, the combination of a sinusoidal current generator, a plurality of electrode binding posts, a plurality of adjustable rheostats for controlling the current delivered to said binding posts, a circuit for each of said rheostats connecting said rheostats in series with the generator, each of said rheostats having an adjustable contact arm connected to one of said binding posts, connections for connecting the remaining binding posts to said generator, and a distributing switch interposed in said series circuits and last mentioned connections for distributing the current to the various binding posts in various orders of succession.

6. In combination a sinusoidal generator, a plurality of electrode binding posts, circuits connecting said generator and said binding posts, a distributing switch interposed in said circuits for distributing the current to said binding posts, an interrupter for making and breaking said circuits in succession, and a synchronizing connection between said interrupter and said generator.

7. In combination an alternating current generator, a plurality of electrode binding posts, circuits connecting said generator and said binding posts, a distributing switch interposed in said circuits for distributing the current to said binding posts, an interrupter for making and breaking said circuits in succession, and a synchronizing connection between said interrupter and said generator.

8. In combination an alternating current generator, a plurality of electrode binding posts, circuits connecting said generator and said binding posts, and a distributing switch interposed in said circuits for distributing the current to said binding posts.

9. In an apparatus of the class described, the combination with a motor and a sinusoidal generator, of an interrupter electrically connected to said generator, synchronizing driving connections for said generator and interrupter, electrode binding posts, circuits connecting said interrupter with said electrode binding posts, and adjustable rheostats connected in said circuits.

10. In an apparatus of the class described, the combination with a motor and a sinusoidal generator, of an interrupter electrically connected to said generator, synchronizing driving connections for said generator and interrupter, electrode binding posts, and circuits connecting said interrupter with said electrode binding posts.

11. In an apparatus of the class described, the combination with an alternating current generator and electrode binding posts, of circuits connecting said generator to said

binding posts, an interrupter in said circuits synchronized with said generator, and adjustable rheostats in said circuits.

12. In an apparatus of the class described, the combination with an alternating current generator, of a plurality of electrode circuits connected therewith, means interposed in said circuits for successively making and breaking the same, and distributing the current to said circuits in various different orders.

13. In an apparatus of the class described, the combination with an alternating current generator, of a plurality of electrode circuits, and means connected with said circuits for distributing the current thereto in various different orders.

14. In an apparatus of the class described, the combination with an alternating current generator, of a plurality of electrode circuits, an interrupter in said circuits synchronized with said generator, and adjustable rheostats in said circuits.

15. In an apparatus of the class described, the combination with a sinusoidal generator, of a plurality of electrode circuits, an interrupter interposed in said circuits, synchronizing driving connections between said generator and interrupter, and adjustable rheostats connected in said circuits.

16. In an apparatus of the class described, the combination with an alternating current generator, of a plurality of electrode circuits, a distributing switch interposed in said circuit for distributing the current thereto, and adjustable rheostats in said circuits.

In witness whereof, I have hereunto set my hand and seal.

JOHN H. KELLOGG. [L. S.]

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."