

Nov. 11, 1924.

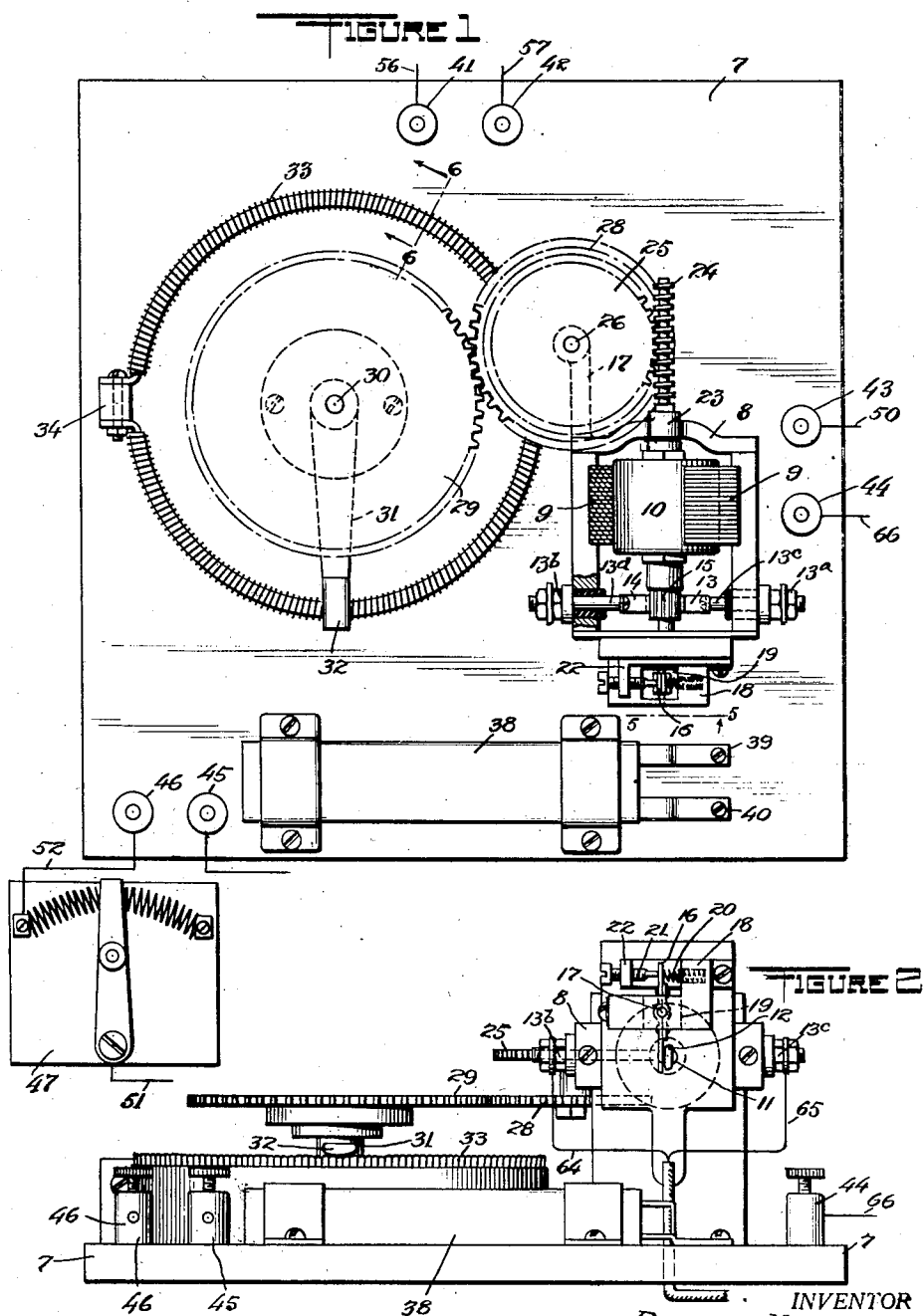
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1,514,746

MUSCLE STIMULATING ELECTRIC DEVICE

Filed Nov. 29, 1922

2 Sheets-Sheet 1



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FIGURE 3

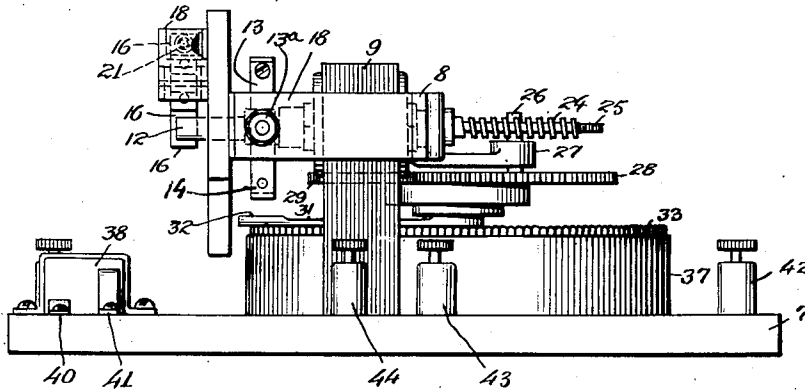


FIGURE 4

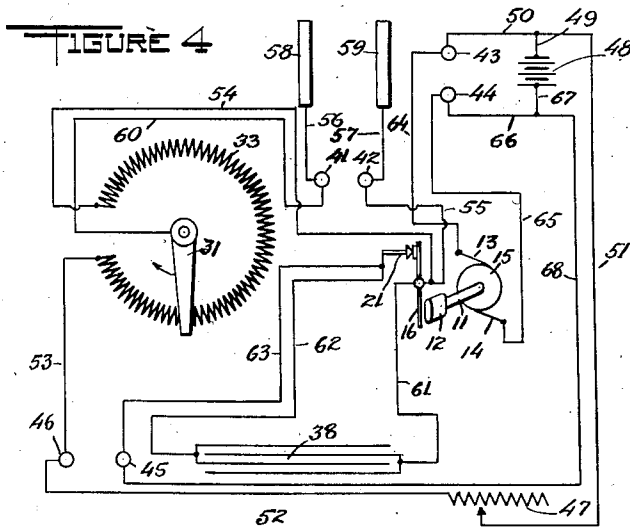


FIGURE 5

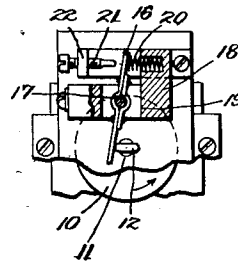
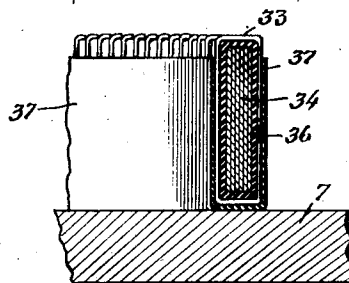


FIGURE 6



WITNESS
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UNITED STATES PATENT OFFICE.

REINHOLD H. WAPPLER, OF YONKERS, NEW YORK.

MUSCLE-STIMULATING ELECTRIC DEVICE

Application filed November 29, 1922. Serial No. 603,906.

To all whom it may concern:

Be it known that I, REINHOLD H. WAPPLER, a citizen of the United States, and resident of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Muscle-Stimulating Electric Devices, of which the following is a full, clear, and concise description.

My invention relates to muscle stimulating devices of a type suitable for use upon the muscles of the body, so as to cause them to periodically contract and then relax in such manner as to improve the circulation of blood through the muscles, and to have the effect of a scientific massage.

I seek to provide for the treatment of undeveloped, atrophied, unduly weak or injured muscles, by subjecting them to a succession of current impulses increasing slowly in intensity, thus causing a slow, progressive contraction of the muscles and forcing the stagnant blood out of the muscles and into the venous system; and then, when the intensity of the currents reaches a predetermined maximum to cause a sudden drop in the intensity of the electric currents and leaving the muscles to relax; so that the muscles, now emptied of the venous blood, are refilled by a rush of arterial blood, bringing to them the nutritious factors upon which they thrive.

The alternate contractions and relaxations of the muscles, taking place in the manner just mentioned, constitute a medical or therapeutic treatment, somewhat in the nature of an electrical massage, and having for its purpose the development of the muscles, or their restoration to normal size and proper function.

More particularly stated, I seek to produce a relatively small, simple, easily operated and inexpensive apparatus, for treating the muscles in the manner just indicated.

Reference is made to the accompanying drawings forming a part of this specification, and in which like reference characters indicate like parts throughout the several figures.

Figure 1 is a top view, partly a plan and partly a section, showing the principal mechanical parts of my apparatus.

Figure 2 is a side elevation of the base shown in Figure 1, and parts carried thereby.

Figure 3 is an end elevation, otherwise similar to Figure 2.

Figure 4 is a diagram of the wiring and various electrical connections.

Figure 5 is a fragmentary section on the line 5—5 of Figure 1, looking in the direction indicated by the arrows.

Figure 6 is a fragmentary section on the line 6—6 of Figure 1, looking in the direction indicated by the arrows.

A base board 7 carries most of the working parts. Mounted upon the base board is an electric motor 8, the fields of which are shown at 9 and the armature at 10.

The armature shaft appears at 11, and is provided with a flat end portion 12, of substantially paddle shape. The motor brushes are shown at 13 and 14, and the commutator at 15. Binding posts 13^a, 13^b, are provided with base portions 13^c, 13^d, which support the brushes.

A contact lever 16, mounted to rock upon a pintle 17, is supported by a block 18 of insulating material, this block being provided with an opening 19 and being made of insulating material. A compression spring 20, supported by the block 18, engages the contact lever 16. A contact screw 21, carried by a metallic frame piece 22, serves as a limiting stop for the contact lever 16, these two parts together constituting a contact for opening and closing an electric circuit. The flat portion 12 of the armature shaft is disposed immediately adjacent the lower end of the contact lever 16, these parts being so arranged that the rotation of the armature shaft causes the contact just mentioned to be continuously opened and closed. Thus the parts 12, 16, 20 and 21 together constitute an interrupter.

The armature shaft extends through a bearing 23, and carries a worm 24. This worm has a driving engagement with a gear 25, mounted upon a stub shaft 26, this stub shaft extending upwardly through a frame member 27. Mounted rigidly upon this shaft 26, and thus revoluble with the work gear 25, is a spur gear 28, meshing with a larger spur gear 29. A vertical shaft 30 supports the gear 29, and carries a contact arm 31, provided with a contact shoe 32 upon its outer end. The contact shoe 32 engages a winding 33, the form of which may be readily understood from Figures 4 and 6. The winding 33 encircles a core 34, the latter being curved so as to form almost a complete circle, as indicated in Figure 1.

A spacing block 34, of non-magnetic ma-

terial, separates the two ends of the core. The core 34 is laminated, and is surrounded by a layer of insulating material 36, as indicated in Figure 6. Another layer 37, also of insulating material, protects the outside of the winding 33, except at the top, which is bare as shown in Figure 6. Rotation of the gear 28 and consequent rotation of the contact arm 31 causes the contact shoe 32 to glide along over the convolutions of the winding 33, so as to make contact therewith.

A condenser appears at 38, and is provided with a pair of terminal strips 39 and 40, these parts being of conventional construction.

The base 7 is provided with binding posts 41, 42, 43, 44, 45 and 46, arranged in pairs as indicated in Figure 3, and used in making the various electrical connections.

A rheostat 47, which may be of ordinary construction, is used in connection with the base 7 and parts carried thereby.

A battery is shown at 48, and is used for supplying both the currents for driving the motor and the currents for energizing the winding 33. Connected with the battery 48 is a wire 49, and connected with this wire is a wire 50, leading to the binding post 43, and a wire 51, leading to the rheostat 47. A wire 52 leads from the rheostat to the binding post 46. A wire 53 leads from the binding post 46 to one end of the winding 33, and from the other end of this winding a wire 54 leads to the contact lever 16, and is connected with a wire 55 leading to the binding post 42. A pair of conductors 56 and 57 are connected with the binding posts 41 and 42, and lead therefrom to a pair of electrodes 58 and 59, through which the faradic currents are distributed to the muscles to be operated upon by the apparatus. A wire 60 leads from the binding post 41 to the contact lever 31.

A wire 61 leads from the contact lever 16 to the condenser 38, and a wire 62 leads from this condenser to the contact screw 21. Another wire 63 leads from the contact screw 21 to the binding post 45. A wire 64 leads from the motor brush 13 to the binding post 43, and a wire 65 leads from the motor brush 14 to the binding post 44. A wire 66 is connected with the binding post 44 and with two wires 67, 68. The wire 67 leads to the battery 48, and the wire 68 leads to the binding post 45.

The operation of my device is as follows:

The battery 41 and 48 being in action, the motor 15 is energized by means of a circuit which may be traced as follows: battery 48, wires 49 and 50, binding post 43, wire 64, motor brush 13, commutator 15, through armature and back, motor brush 14, wire 65, binding post 44 and wires 66 and 67 back to battery 48. This circuit energizes the motor, and the consequent rotation of the arma-

ture shaft causes the paddle shaped portion 12 of the armature shaft to repeatedly strike against the contact lever 16, thus causing this contact lever and the various parts immediately associated therewith to act together as an interrupter.

The rotation of the armature shaft causes power to be transmitted from the motor through the worm 24, worm gear 25, shaft 26, gears 28 and 29, and contact arm 31. The rotation of this contact arm 31 causes the shoe 32 to glide around upon the top of the winding 33, as above described, making a sliding engagement with the convolutions thereof, which are bare, as above described. The electrodes 58 and 59 being properly positioned relatively to the muscles or other anatomical parts to be treated, and the rheostat 47 being adjusted in accordance with the strength of the currents to be used, the annular magnetic member is energized and de-energized more or less rapidly, in accordance with the speed of the motor, and currents are thus sent through the muscles to be treated.

A circuit may be traced now as follows: battery 48, wires 49 and 51, rheostat 47, wire 52, binding post 46, wire 53, a part of winding 33, to the contact arm 31 wherever it happens to be at the moment, thence through this arm, wire 60, binding post 41, conductor 56, electrode 58, through the muscles or the like to be treated, and thence to electrode 59, wire 57, binding post 42, wire 55, contact lever 16, contact screw 21, wire 63, binding post 45, and wires 68 and 67, back to battery 48.

Another circuit may be traced as follows: battery 48, wires 49 and 51, rheostat 47, wire 52, binding post 46, wire 53, all of winding 33, wire 54, contact lever 16, contact screw 21, wire 63, binding post 45, and wires 68 and 67, back to battery 48. The circuit just traced does not go through the electrodes 58 and 59, but does go through the entire length of the winding 33. Each of the circuits just traced is opened and closed by the rocking movements of the contact lever 16.

A condenser circuit, in parallel with each of the two circuits just mentioned, may be traced as follows: contact screw 21, wire 62, to one plate of the condenser 38: and from the other plate of this condenser through wire 61 to contact lever 16, which contacts with the contact screw 21 as above described. The condenser circuit just traced is for the purpose of preventing sparking between the contact screw 21 and the contact lever 16, and is also to conserve the electric energy.

It will be noted that as the contact arm 31 rotates, it first makes contact with one end of the winding 33 and then passes along the entire length of this winding to the other end thereof, so that the contact shoe carried

by the arm 31 is brought into and out of engagement with each convolution of the winding. As a result of this arrangement, the circuit through the electrodes 58 and 59, and consequently through the muscles to be treated, is one in which the intensity of the electric currents is constantly changing. During each complete revolution of the contact arm 31 a large number of current pulsations are sent through the circuit just mentioned. These pulsations begin with the mean voltage of the circuit at its lowest and end when the mean voltage is at its highest, the number of pulsations for each revolution of the contact arm 31 being equal to the number of rocking movements made by the contact lever 16. Thus it will be seen that the muscles to be treated are subjected to the action of successive current pulsations, the intensity of which begins low and gradually rises to a predetermined maximum, and then ends abruptly, this process being repeated with each revolution of the contact arm 31.

Speaking from the standpoint of physiology and therapeutics, what occurs is this: At the start, the muscles, being weak, undeveloped, atrophied or injured, are full of dark, venous blood, which is very sluggish, owing to the inaction, or unduly limited action, of the parts affected. As these parts are subjected to the action of the electric currents above described the muscles are caused to automatically contract, the contraction becoming stronger and stronger as the voltage increases, and being strongest when the voltage reaches its maximum. Then there is a sudden relaxation of the muscles, due to the stoppage of the electric currents as the contact shoe 32 finishes each revolution. As the muscles suddenly relax, they are, by the natural circulation of the blood, instantly filled or at least partially filled with scarlet or arterial blood, which thus takes the place of the dark venous blood.

It may happen that quite a number of turns of the contact arm 31 are necessary to completely change the entire volume of blood within the muscles or other parts being treated, but the tendency of the apparatus is to cause the change to take place quite rapidly; and in any event at the end of the operation the diseased parts are left full of scarlet or arterial blood, and of course completely emptied of the dark or venous blood.

More than this, the muscles thus treated are forced into action, and thus exercised and practically massaged. The final result is that various healing processes of nature are greatly assisted, so that the apparatus may be effectively used for the physical benefit of the patient, and may be instrumental in curing certain diseases.

I do not limit myself to the precise mechanism shown, as variations may be made therein without departing from my inven-

tion, the scope of which is commensurate with my claims.

I claim:

1. A device of the character described, comprising a core of magnetic material, a winding mounted upon said core of magnetic material and provided with bare portions, the core of magnetic material with said winding thereupon having a general arcuate form, a revoluble contact arm disposed adjacent said winding and slidably engaging the bare portions thereof, means for actuating said revoluble arm, a pair of electrodes communicating with said winding for the purpose of distributing faradic currents therefrom, and means for subjecting said winding to the action of pulsating electric currents.

2. A device of the character described, comprising a core of magnetic material, a winding carried by said core of magnetic material and provided with bare portions, the core of magnetic material and the winding having together a general arcuate form, a contact arm revolubly mounted adjacent said winding and engaging the bare portions thereof, a pair of electrodes communicating with said winding for the purpose of distributing faradic currents therefrom, an interrupter, and motor mechanism connected with said interrupter and with said contact arm for the purpose of actuating the interrupter and the contact arm.

3. A device of the character described comprising a core of magnetic material bent circularly and forming almost but not quite a complete circle, a winding mounted upon said core of magnetic material and also forming almost but not quite a complete circle, said winding being provided with bare portions, a contact arm disposed adjacent said winding and provided with a portion slidably engaging said bare portion of said winding, a source of electricity, a pair of electrodes, an interrupter, an electric circuit including said source of electricity, said pair of electrodes, said interrupter, said winding and said contact arm, and an electric motor connected with said source of electricity and driven thereby, said electric motor being provided with means for actuating said interrupter and said contact arm.

4. In a device of the character described the combination of a core of magnetic material, a winding mounted upon said core of magnetic material and provided with bare portions, said core of magnetic material and said winding having together a general arcuate form, a revoluble contact arm engaging said bare portions, means for actuating said revoluble contact arm, a source of electricity connected with said winding and said contact arm for the purpose of energizing said winding as controlled by movements of said contact arm, a

pair of electrodes, connections for enabling said winding when energized and deenergized to energize said electrodes by means of faradic currents, and a source of pulsating current connected with said winding for the purpose of energizing and deenergizing the same.

5. A device of the character described, comprising a core of magnetic material, a winding carried by said core of magnetic material for the purpose of energizing the same, said winding being provided with bare portions, said core and winding having together a general arcuate form, a contact arm revolubly mounted adjacent said winding and slidably engaging the bare portions of said winding, a pair of electrodes

communicating with said winding and energized thereby for the purpose of distributing faradic currents, an electric circuit connected with said winding for energizing the same, a contact connected with said electric circuit for opening and closing said electric circuit in order to energize and deenergize said winding, an electric motor provided with a revoluble armature shaft, connections for enabling the rotation of said shaft to open and close said contact, and gearing from said revoluble shaft to said contact arm, for actuating the said arm.

Signed at Long Island City, in the county of Queens and State of New York, this 27th day of November, 1922.

REINHOLD H. WAPPLER.