No. 852,193. PATENTED APR. 30, 1907.

A. B. McMILLAN.

ELECTRIC EXERCISING APPARATUS.

APPLICATION FILED APR. 4, 1906.

Fig. 1

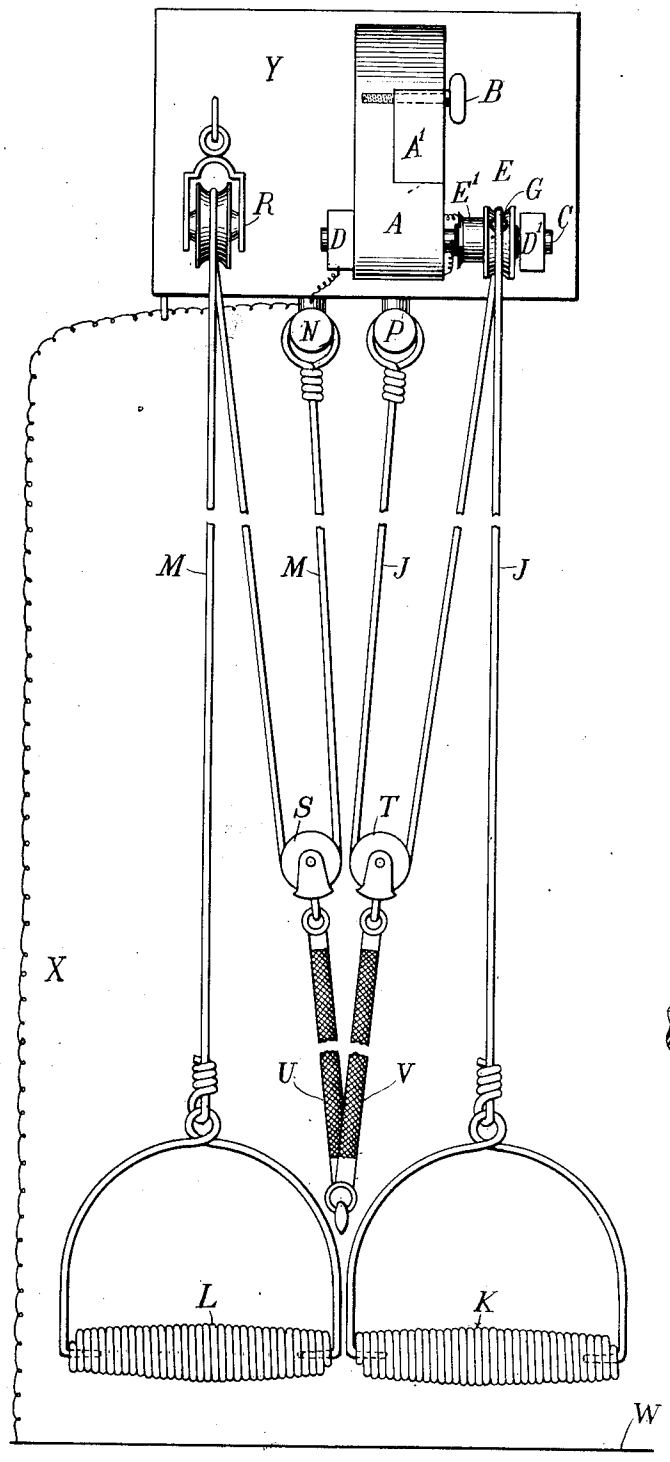


Fig. 2

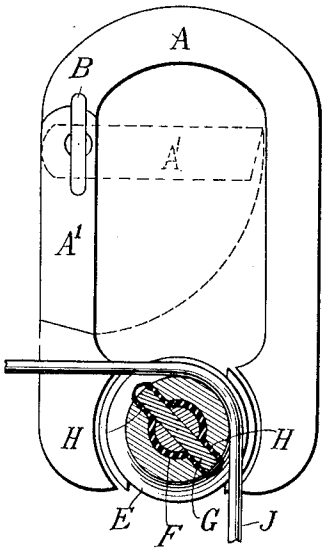


Fig. 3

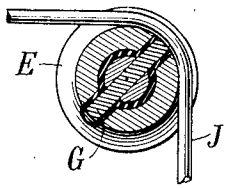


Fig. 4

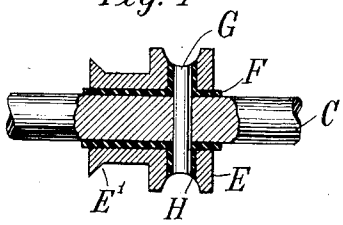
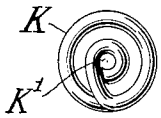


Fig. 5



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ELECTRIC EXERCISING APPARATUS.

No. 852,193. Specification of Letters Patent. Patented April 30, 1907.

Application filed April 4, 1906. Serial No. 309,877.

To all whom it may concern:

Be it known that I, ARCHIE B. McMILLAN, a subject of the King of Great Britain, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric Exercising Apparatus, of which the following is a specification.

This invention is an improvement in the electric muscular exercising apparatus described in U. S. Letters Patent Number 629,909, dated August 1st 1899, issued to me, in which an exercising cord is passed over the pulley of a small magneto-electric generator and the currents generated in the latter are led through the exercising cords and the body of the person exercising.

The object of my present invention is to simplify the apparatus described in above Letters Patent and I accomplish it by means of a combination pulley and commutator, or more properly speaking, a id as it will hereafter be called, combination pulley and armature short-circuiter, said combination device performing the functions of pulley, armature short-circuiter and collecting ring, obviating the use of three separate devices as hitherto, also their brushes and the wear and tear incidental to same. I also arrange the electrical circuit in such a manner as to obviate the use of switches and, further, provide a simple means of varying the strength of the generated current, all of which will be hereinafter fully described.

In the accompanying drawings: Figure 1 is a plan view, half actual size, of my improved exercising apparatus as it appears when fixed in position on the wall. Fig. 2 is a side view, full size, of the generator, in section through the center of the combination pulley and armature short-circuiter. Fig. 3 is a similar sectional view of the combination pulley and armature short-circuiter. Fig. 4 is a front sectional view of the same, and Fig. 5 is an end view of the grip part of handle K Fig. 1.

In Fig. 1, A is the permanent magnet of a small electric generator, mounted on a wooden base Y. A′ is a section of same pivoted at one end so at to be adjustable inward to any desired angle, B is a thumbscrew on which the adjustable section is pivoted and which locks said section in any position to which it may be adjusted. The object of this adjustable section is, by moving it out of the direct magnetic circuit, to reduce the number of magnetic lines passing through the armature, and thereby reduce proportionally the strength of the current, the larger the gap in the magnetic circuit the weaker the current. When the section is adjusted to right angles, as shown by the dotted lines in Fig. 2, all the magnetic lines passing through it are practically short-circuited. This enables the person exercising to reduce the electric shocks to any desired degree.

The armature is of well-known single coil type. One end of the coil is connected to the shaft C which is journaled in the bearings D, D′, and the other end to the combination pulley and armature short-circuiter E which is mounted on but insulated from said shaft by a sleeve of insulating material F. A metal pin G, Figs. 1, 2, 3 and 4, passes diametrically through the center of the pulley and shaft, being insulated from the pulley by insulating sleeves H, H, but fitted tight to the shaft thereby making connection with one end of the armature coil.

The exercising cords, J, M, are bare flexible conductors attached at one end to bare coiled wire handles K, L, and at the other to metal terminals P, N, respectively, their looped ends being loosely suspended thereon. Terminal P is a blind one but terminal N is connected to the bearing D thereby making connection with the end of the armature coil connected to the shaft.

Cord J passes over the pulleys E and T and cord M over pulleys R and S. Elastic bands U, V, are attached at one end to a common staple in or near the floor and at the other to pulleys S and T respectively which are suspended by and free to follow the movements of the exercising cords. The pulley R is suspended from the baseboard Y by a screw-hook and is not electrically connected to the generator.

The operation of the apparatus will now be seen to be very simple. The person exercising, hereafter termed the operator, in grasping the handles completes the generator circuit which may be easily traced starting from the end of the armature coil connected to pulley E thence through cord J, operator's body, cord M, terminal N, bearing D and shaft C to which the other end of the armature coil is connected. Therefore when the operator pulls on the handles, or handle K alone, the armature is rotated, alternating currents generated and the operator expe-

riences a series of strong shocks. Similar shocks are experienced when the armature is rotated in the reverse direction by the reaction of the elastic bands. The pulley E is thus shown to perform two functions; 1st, its natural function as a pulley, and 2nd, what is known as a ring collector, *i. e.*, transferring current from a rotating armature to the outer circuit. Its third function is that of armature short-circuiter which will now be explained.

To be a commercial success the generator in an apparatus of this kind must needs be very small. The actual size of this one is shown in Fig. 2 and the whole apparatus half-size in Fig. 1. Naturally the current from such a toy generator is of a very low E. M. F. and utterly useless through such a high resistance as that of the human body. To produce a high E. M. F. sufficient to pierce this high resistance and give strong shocks I employ the armature short-circuiter E which in its action confines the initial generated current to the armature by keeping the latter short-circuited except at two short intervals in each revolution when it opens the short-circuit and, being adjusted to do so at the moment of maximum magnetic flux, a high E. M. F. of self-induction traverses the outer circuit, which is always intact, and gives the operator a strong momentary shock at each opening of the short-circuit. In practice, with the rapid rotation of the armature the result is a quick succession of strong intermittent shocks.

The action of the pulley-armature short-circuiter E can be clearly seen by reference to Figs. 2 and 3. It has been explained that one end of the armature coil is connected to the insulated pulley E and the other to the insulated pin G through the shaft C. In the relative position shown in Fig. 3 it will be seen that the conducting exercising cord J electrically connects the said pulley with the said pin thereby short-circuiting the armature coil and keeping it so all the time the pin is in contact with the cord. In Fig. 2 the pin is free from the cord and the short-circuit is broken until the opposite end of the pin comes into contact with the cord, when the armature is again short-circuited. The outer circuit is never broken. The combination pulley-collecting ring and armature-short-circuiter E therefore performs efficiently the functions of these three devices and obviates the use of brushes and rubbing contacts. The handles K, L, are each formed of two lengths of stiff wire, one of the lengths wound in a single hollow cylindrical coil, of preferably greater diameter in the center than at the ends, the wire at both ends of the coil being formed into an axial loop, as shown at K′ in Fig. 5, for the purpose of providing bearings for the two ends of the other length of wire. This other wire is curved in a semi-circular shape extending from one end of the coil to the other, its two ends being bent inward at about right angles and fitting into the axial loops at either end of the coil and held therein by a tension purposely imparted to it. This wire is also curved, at its middle part, into a small loop for the convenient attachment of one end of the exercising cord.

In connection with the apparatus I provide a footplate W which is a thin sheet of metal of suitable size capable of being rolled up into a small compass when not in use, and connect it to terminal N by means of a flexible conducting wire X. To use the footplate the operator stands on it bare-footed and transfers the looped end of wire M from the terminal N to terminal P thereby disconnecting it from one end of the armature coil and connecting it, through cord J, with the other end. This places the exercising cords, and also the operators arms, in parallel circuit and, when exercising, the electric currents divide at the pulley passing along cord J in both directions, and the cord M, to the two handles, thence through the arms, trunk and legs of the operator and reuniting at the footplate return to the generator along the wire X, or vice versa. The simple arrangement of transferring the loop of wire M from terminal N to terminal P obviates the employment of a switch for rearranging the electric circuit.

A flanged extension E′ of the pulley-short-circuiter E is provided solely as a safe connection between the end of the armature coil and the pulley itself so that in event of the exercising cord slipping off the pulley it will be caught on said extension and thus be prevented from breaking off the armature wire connection which would invariably be the case if the armature wire were connected direct to the pulley without protection.

The principal feature of my invention above described is the combination pulley and armature shortcircuiter E which in its essential construction comprises a pulley having two insulated conducting contact points set in its periphery, diametrically opposite each other and any form of construction other than that hereinbefore described, embodying those essential features must necessarily come within the scope of this invention. In one form I construct it with a simple pulley, minus the extension, and instead of having a pin right through the pulley and shaft I insert two insulated pins through the side of the pulley, parallel with its axis, diametrically opposite to each other near the periphery of the pulley, so that in turning the groove in the pulley the pins become exposed similar to what they appear in Fig. 1. The pins project slightly on one side of the pulley and are electrically connected to the shaft thence to one end of the armature coil.

The pulley is insulated from the shaft and connected to the other end of the armature coil, the electric connections in this form being precisely the same as in the other.

It is not essential that the insulating conducting points in the pulley should be connected to the shaft; they may be connected directly to the armature winding, but inasmuch as the end of the winding is connected to the shaft for the purpose of conveying current to the outer circuit through the bearings without the medium of a collecting ring and brush, it is preferable to connect them to the shaft. I may use a flat grooved pulley in conjunction with a flat exercising cord, or strap, if desired. For the elastic bands, U, V, I may substitute metal springs or weights, or any other suitable resisting device.

Having now particularly described my invention, I desire to secure Letters Patent for:—

1. The combination in an electric generator for exercising apparatus, of a field magnet, a rotatable armature, a pulley fitted with two insulated conducting contacts in its periphery at diametrically opposite points, said pulley being mounted on, but insulated from, the armature shaft, one end of the armature winding connected to said insulated pulley and the other end to said insulated conducting contacts, and an exercising cord of conducting material for the operation of said pulley, substantially as set forth.

2. The combination in an electric exercising apparatus, of a field magnet, a rotatable armature, an insulated pulley on the armature shaft, a conducting pin passing diametrically through the center of the said pulley and shaft, said pin being in contact with the shaft but insulated from the pulley, the ends of said pin appearing flush with the periphery of said pulley on opposite sides thereof, one end of the armature winding connected to said insulated pulley and the other end to said armature shaft thereby making connection with the insulated pin, and an exercising cord of conducting material for the operation of said pulley, substantially as set forth.

3. The switching arrangement of the electric circuit comprising the looped ends of the cords J, M, and the terminals N, P, adapted to receive and hold said looped ends in suspension, said terminal N having electrical connection with the footplate and one end of the armature winding and said terminal P having electrical connection with the other end of the armature winding through the medium of cord J, whereby by the transfer of cord M from terminal N to terminal P the cords J, M, are changed from series to parallel circuit, substantially as set forth.

4. In an electric generator for exercising apparatus, a field magnet having an adjustable section, said section pivoted on and adapted to be locked in different positions by a suitable screw, for the purpose and substantially as set forth.

5. In an electric exercising apparatus, a grip handle formed of two lengths of bare wire, one of said lengths being wound in a single cylindrical or barrel shaped coil and terminating in a small axial loop at either end, the other length of wire suitably curved to form a semi-circular bridge between the ends of said coil and provided in its middle part with a suitable loop for the convenient attachment of a bare wire exercising cord and the ends of said wire bent inward at right angles to fit into the said axial loops, substantially as set forth.

6. In an electric generator for exercising apparatus adapted to be operated by drawing an exercising cord over a pulley mounted on the armature shaft, a pulley for the reception of said exercising cord, said pulley being formed of conducting material and provided with two conducting contacts inserted in and flush with the periphery of said pulley at diametrically opposite points, said conducting contacts being electrically connected together and insulated from said pulley, substantially as set forth.

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

ARCHIE B. McMILLAN.

Witnesses:

P. J. MIDGLEY,

JAS. O. SWORD.