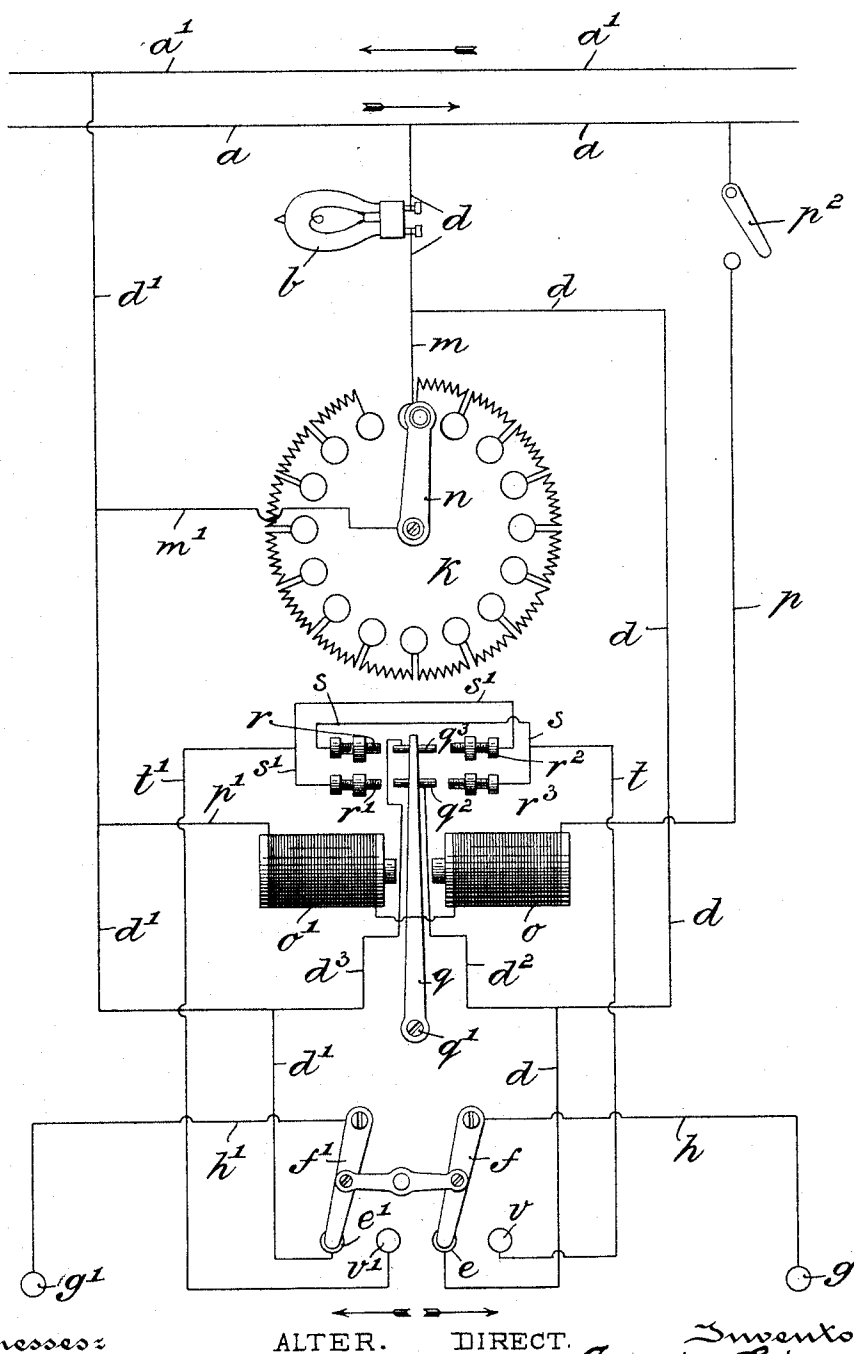


(No Model.)

F. GEIGER.  
ELECTROTHERAPEUTIC APPARATUS.

No. 587,436.

Patented Aug. 3, 1897.



Witnesses:

Richard C. Maxwell.  
Thomas M. Smith.

ALTER. DIRECT.

Inventor:  
Frederick Geiger  
by J. Walter Douglass  
Attorney.

# UNITED STATES PATENT OFFICE.

FREDERICK GEIGER, OF PHILADELPHIA, PENNSYLVANIA.

## ELECTROTHERAPEUTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 587,436, dated August 3, 1897.

Application filed May 13, 1897. Serial No. 636,422. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK GEIGER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electrotherapeutic Apparatus, of which the following is a specification.

My invention has relation to an electrotherapeutic apparatus designed for use by physicians with any of the commercial electric currents found in cities or towns, whether direct or alternating, irrespective of their voltage, and also designed for use with ordinary battery or other generator currents; and in such connection it relates to the construction and arrangement of such an apparatus for such purposes among others.

The principal objects of my invention are, first, to provide in an electrotherapeutic apparatus in connection with a main circuit a patient or operator circuit in series with a fixed resistance and a variable resistance in shunt with the patient or operator circuit and directly in the main circuit, and, second, to provide in such an apparatus a main circuit, a fixed resistance and a variable resistance included in said main circuit, an operator-circuit in series with the fixed resistance and in shunt with the variable resistance, and a pole-changing switch interposed in the operator-circuit and adapted to convert an alternating current into a direct current.

My invention, stated in general terms, consists of an electrotherapeutic apparatus constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawing, which represents in diagram the construction and arrangement of an apparatus embodying main features of my invention.

Referring to the drawing,  $a$  and  $a'$  represent the main-line wires of any circuit, whether commercial of a direct or alternating character or from a battery or generator, as is most convenient. In this circuit is located a fixed resistance  $b$ , consisting, preferably, of a lamp adapted to pass a current of five hundred milliamperes, which current is found in

practice to be more than sufficient for use in general or ordinary galvanic treatment. This fixed resistance is located in series with the operator-circuit by the feeder-wires  $d$  and  $d'$ , which lead from the main circuit  $a$  and  $a'$  to two terminals or buttons  $e$  and  $e'$ , upon which is adapted to rest the two-part switch  $f$  and  $f'$ , connecting said terminals  $e$  and  $e'$  with the binding-posts  $g$  and  $g'$  by the wires  $h$  and  $h'$ .

The patient-circuit may be traced as follows: Starting from a main wire  $a$  it passes through the lamp  $b$  by the wire  $d$  to one terminal  $e$ , thence through the switch  $f$  and wire  $h$  to one binding-post  $g$ . It then passes through the patient to the other binding-post  $g'$ , thence by the wire  $h'$  and switch  $f'$  to the terminal  $e'$ , thence by the wire  $d'$  to the main-line wire  $a'$ . Between the lamp  $b$  and the main-circuit wires  $a$  and  $a'$  is located a variable resistance or rheostat  $k$ , graduated to fractions of an ohm and constituting a shunt for the patient-circuit to permit or offer a more free passage for the current passing through the lamp  $b$ , back to the main circuit rather than to the patient-circuit. Thus when a fraction of an ohm of resistance is introduced into the shunt-line it will permit of about ninety-nine per cent. of the current passing from the lamp back to the main circuit, while the operator or patient line being in series with the lamp, as above explained, will receive but one per cent. of the current passing through said lamp.

The shunt-circuit may be traced as follows: from the line  $a$  through the wire  $d$  and lamp  $b$  to the wire  $m$ , thence through the rheostat  $k$  and switch-arm  $n$  by the wire  $m'$  to the wire  $d'$ , and thence to the main-circuit wire  $a'$ . By varying the resistance  $k$  from a fraction of an ohm to about seventy-five ohms the voltage of the series or operator line may be varied from a fraction of a volt to about sixty volts, the amperage of said series or operator's line, however, being practically uniform, since it is controlled always by the fixed resistance or lamp  $b$  as well as by the shunt variable resistance  $k$ .

When the current from the main circuit  $a$  and  $a'$  is alternating, it may, if desired, be changed to direct prior to reaching the patient circuit or line by means of a pole-changing switch constructed substantially and

preferably as follows: In the main circuit is placed two electromagnets  $o$  and  $o'$ , having their poles of opposite polarity facing each other and operated by a current from the main line  $a$  and  $a'$  through the line or wires  $p$  and  $p'$  when the switch  $p^2$  is closed. Between the poles of the electromagnets  $o$  and  $o'$  is placed an oscillating permanent magnet  $q$ , consisting, preferably, of a thin piece of steel swinging freely on a pivot  $q'$ , so as to be alternately attracted and repelled by the alternating current passing through the electromagnets  $o$  and  $o'$ .

The permanent magnet  $q$  has at its free end two contact-lugs  $q^2$  and  $q^3$ , one of which,  $q^2$ , is connected by the wire  $d^2$  with the patient line-wire  $d$ , while the other,  $q^3$ , is connected by the wire  $d^3$  with the line-wire  $d'$ . These contact-lugs  $q^2$  and  $q^3$  are adapted to make contact with the contact-screws  $r$ ,  $r'$ ,  $r^2$ , and  $r^3$ , of which  $r'$  and  $r^2$  are connected by the wire  $s'$  and  $r$  and  $r^3$  by the wire  $s$ . The wire  $s$  is connected by the wire  $t$  with a contact-button  $v$ , and the wire  $s'$  is connected by the wire  $t'$  with a contact-button  $v'$ . The buttons  $v$  and  $v'$  are arranged in the path of the two-part switch  $f$  and  $f'$ , which when shifted is adapted to rest thereon. When this switch is thus shifted and the switch  $p^2$  is closed, the circuit through the pole-changing switch is as follows: from the main line  $a'$  by the wire  $p$  to the electromagnet  $o$ , thence to the electromagnet  $o'$  by the wire  $p'$  to the wire  $d'$  and to the main line  $a$ . At the same time the patient-circuit will proceed from the wire  $a$  through the resistance  $b$  by the wires  $d$  and  $d^2$  to the contact  $q^2$ , thence either to the wire  $s$  or  $s'$  by the wire  $t$  or  $t'$  to the button  $v$  or  $v'$  through the member  $f$  or  $f'$  of the switch and the terminal  $g$  or  $g'$ , and thence to the other terminal  $g'$  or  $g$  by the button  $v'$  or  $v$ , the line  $t'$  or  $t$ , the wire  $s'$  or  $s$ , to the contact  $q^3$ , and

thence by the wires  $d^3$  and  $d'$  to the main-line wire  $a'$ .

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

1. In an electrotherapeutic apparatus, a main circuit, a patient or operator circuit, a fixed resistance in series with the operator-circuit, and a variable resistance in the main circuit and in shunt with the patient or operator circuit, substantially as and for the purposes described.

2. In an electrotherapeutic apparatus, a main circuit, a fixed resistance and a rheostat included in said main circuit, and an operator-circuit in series with said fixed resistance and in shunt with the rheostat, substantially as and for the purposes described.

3. In an electrotherapeutic apparatus, a main circuit, a fixed resistance and a variable resistance included in said main circuit, an operator-circuit in series with the fixed resistance and in shunt with the variable resistance, and a pole-changing switch interposed in the operator-circuit, substantially as and for the purposes described.

4. In an electrotherapeutic apparatus, a pole-changing switch consisting of two electromagnets included in the main circuit of an alternating current and having poles of opposite polarity facing each other, an oscillating permanent magnet having two contacts in circuit with the operator-line, and contact-screws also in circuit with said operator-line, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

FREDERICK GEIGER.

Witnesses:

J. WALTER DOUGLASS,  
THOMAS M. SMITH.