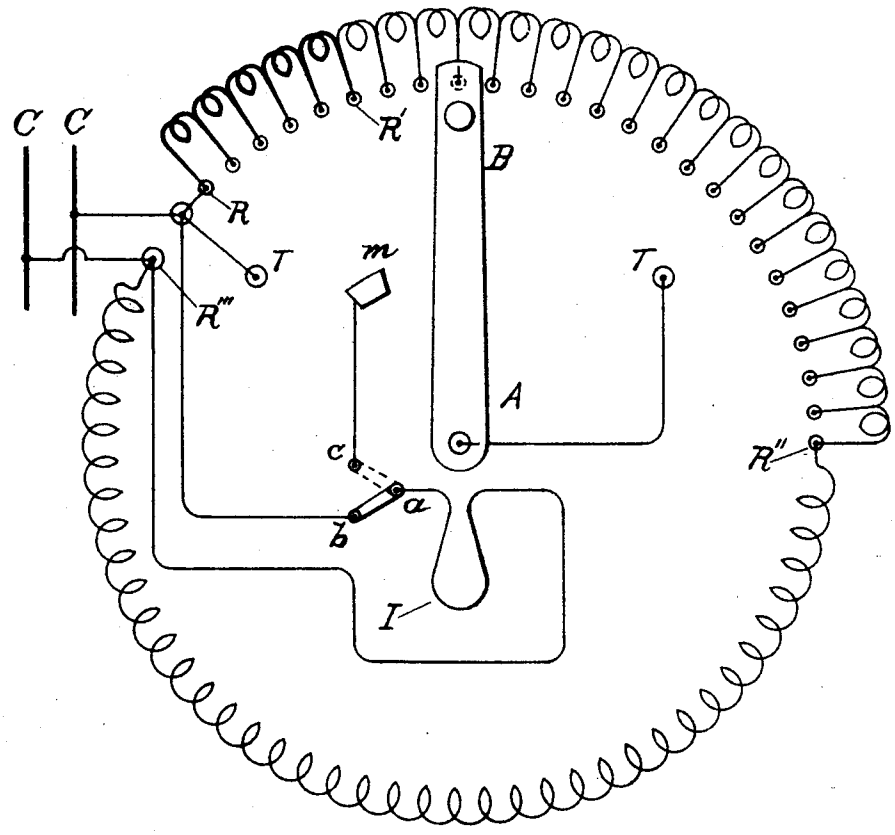
(No Model.)

W. J. SHIELDS.

COMBINATION VOLT GRADUATOR.

No. 588,246. Patented Aug. 17, 1897.



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UNITED STATES PATENT OFFICE.

WILLIAM J. SHIELDS, OF NEW WILMINGTON, PENNSYLVANIA.

COMBINATION VOLT-GRADUATOR.

SPECIFICATION forming part of Letters Patent No. 588,246, dated August 17, 1897.

Application filed March 24, 1897. Serial No. 629,079. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. SHIELDS, a citizen of the United States, residing at New Wilmington, in the county of Lawrence and State of Pennsylvania, have invented a new and useful Electrical Controller for Medical Purposes, of which the following is a specification.

My invention relates to improvements in instruments for controlling the current from an electric heat, light, or power circuit for medical purposes, whereby an electric current from a high-potential circuit can be conveniently and safely controlled and applied as a "galvanic" current if it be a direct current, and as a "faradic" current, and for other purposes where a low electromotive force is required, whether the original current be direct or alternating; and the objects of my improvement are, first, to furnish a gradually-varying electromotive force by the motion of a lever-arm without breaking the circuit; second, to maintain nearly constant on open or closed circuit the difference of potential between the electrodes of the controller, that the patient may not form part of a circuit having a much higher electromotive force than would be necessary to drive the required current through the patient's body with no other resistance in series with it, and thus be made liable to a severe shock should the cir- the current be abruptly opened or closed; third, to have under the control of the operator only a necessary and safe electromotive force and intensity of current, and, fourth, to so combine circuits and parts as to furnish from the same instrument, using largely the same circuits and mechanism for all purposes, a weak current with high electromotive force and a stronger current with lower electromotive force, thus attaining economy of construction and simplicity of manipulation. I attain these objects by the arrangement of circuits and mechanisms illustrated in the accompanying drawing.

The drawing is simply a plan, which is all that is necessary to show my claims, since my invention consists in the combination and proportioning of circuits which are connected through well-known mechanical devices.

In the drawing, R R′ R″ R‴ is a continuous conductor of high resistance connected across the terminals of a commercial circuit C C. The portion R R′ R″ of this conductor is connected at intervals with contact-points.

A B is a lever-arm pivoted at A. The lever-arm is of sufficient width to cover two contact-points, so that the circuit will not be broken by moving the lever-arm from one point to another. By moving the lever-arm from R to R″ the difference of potential between the shunt-terminals T T is increased upon the "fall-of-potential" principle, and with the controller connected to a direct or continuous-current circuit a galvanic current of any electromotive force within the limits of the usual requirements may be taken from the terminals T T.

The resistance of the whole conductor R R′ R″ R‴ is made small enough to allow considerably more current to pass through it than will be required in the shunt-circuit, so that opening or closing the shunt-circuit will not materially change the difference of potential between the terminals T T. The resistance of the portion R R″ of the high-resistance conductor is so proportioned to the resistance of the whole conductor that the maximum difference of potential between the terminals T T will be safe.

When the lever-arm A B comes in contact with the point opposite R′, it at the same time connects with the metal strip *m*, with which it makes a sliding contact, and when the switch *a b* is set in the position *a c* the portion R R′ of the high-resistance conductor, or that part of it lying between the lever-arm A B and the point R, is put in series with the incandescent lamp I, thus forming a circuit of lower resistance than the circuit R R′ R″ R‴, whereby a stronger current at a lower electromotive force suitable for cautery purposes, the primary of an induction-coil, &c., may be taken from the terminals T T. The strength of the current in this circuit may be varied by using lamps of different candle-power, and by raising the lever-arm off the contact-points, or by leaving a space between two of the points wider than the lever-arm, the circuit R R′ may be cut out, causing all the current passing through the lamp I to pass through the instrument connected to the terminals T T.

The point *c* is connected to A (instead of to R′) in the manner described, first, in or-

der to break the circuit when A B is moved to the right of R′, thus preventing the overheating of R′ R″, since R′ R″ is of smaller safe-carrying capacity than R R′; second, to permit the circuit R R′ to be cut out, leaving whatever conductor may be placed between the terminals T T in series with the incandescent lamp I in the manner explained above.

When the switch *a b* is in the position *a b*, the lamp I may be illuminated without affecting any other circuit.

What I claim is—

1. In an instrument for adapting the current from a commercial circuit to medical purposes, the combination first of a conductor of high resistance placed across the terminals of a constant-potential supply-circuit, a portion of which, R R′ R″, is connected at intervals to contact-points, with second a lever-arm A B pivoted at A so that it may make a sliding contact with said contact-points, covering two or more points at a time; third the remaining part of the conductor, R″ R‴, being so proportioned with reference to the resistance of the first part of the conductor, R R′ R″, and the electromotive force of the supply-circuit as to secure safety to the patient and protect the instrument in case of a short circuit between the electrode-terminals T T, while fourth the resistance of the whole conductor R R′ R″ R‴ is small compared with the resistance of the human body, all substantially as set forth.

2. In an instrument for adapting the current from a commercial circuit to medical purposes, the combination of first a conductor R R′ R″ R‴ of high resistance placed across the terminals of a constant-potential supply-circuit, of which the portion R R′ R″ is connected at intervals to contact-points, and the portion R R′ possesses lower resistance and greater carrying capacity than the remaining portion of the conductor, with second a lever-arm A B pivoted at A and third a conducting-strip *m* (with which the lever-arm makes sliding contact when it passes over the contact-points connected to R R′) and fourth an incandescent lamp or other conductor of lower resistance than R′ R″ R‴, which is connected through A B and *m* in series with R R′ or that part of R R′ which lies between R and the contact-points touching the lever-arm, all substantially as set forth.

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Witnesses:
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