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W. P. HORTON, JR.

METHOD OF AND APPARATUS FOR ADMINISTERING THERAPEUTIC ELECTRICITY.

(Application filed Dec. 5, 1898.)

(No Model.)

Fig. 1.

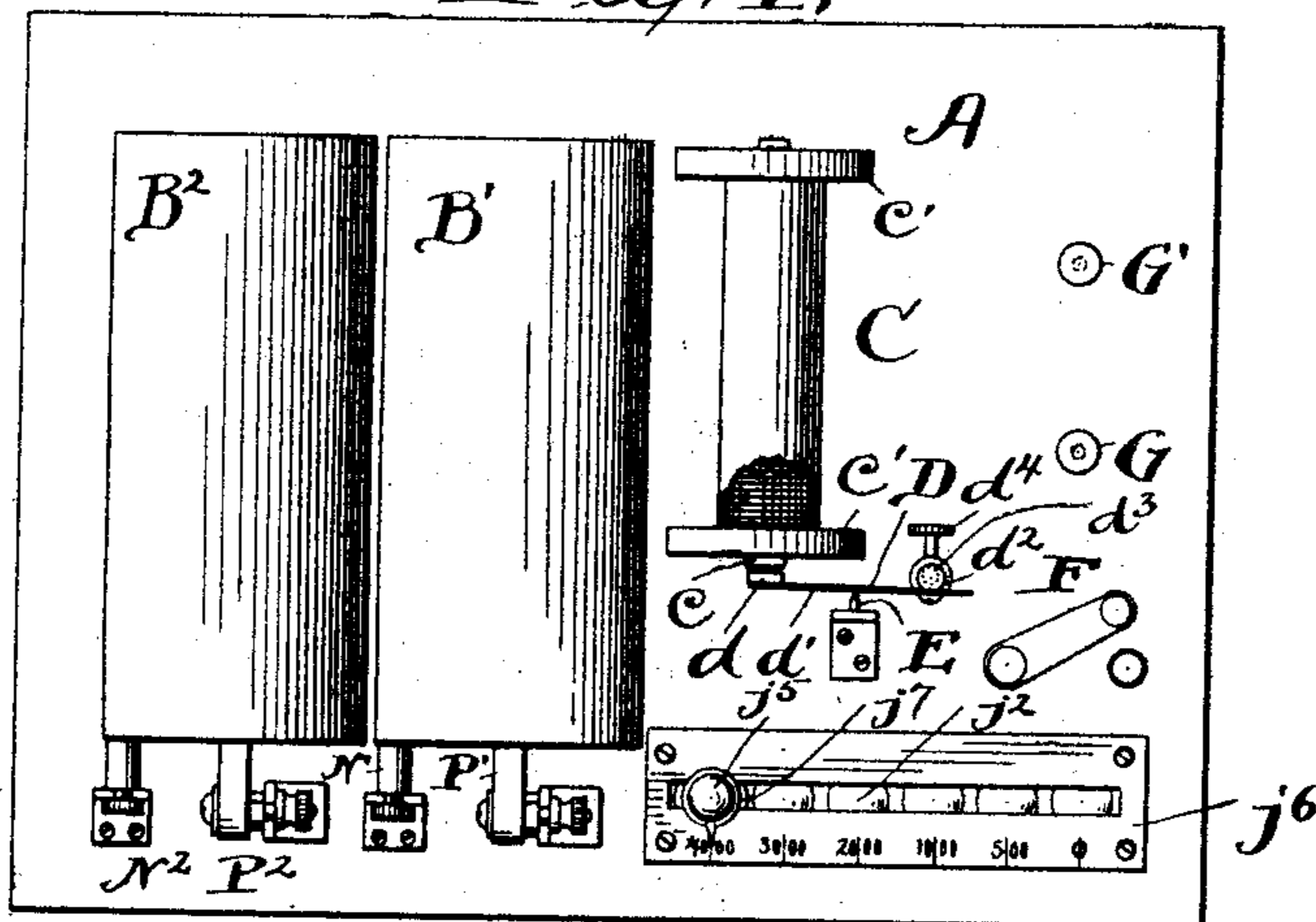


Fig. 2.

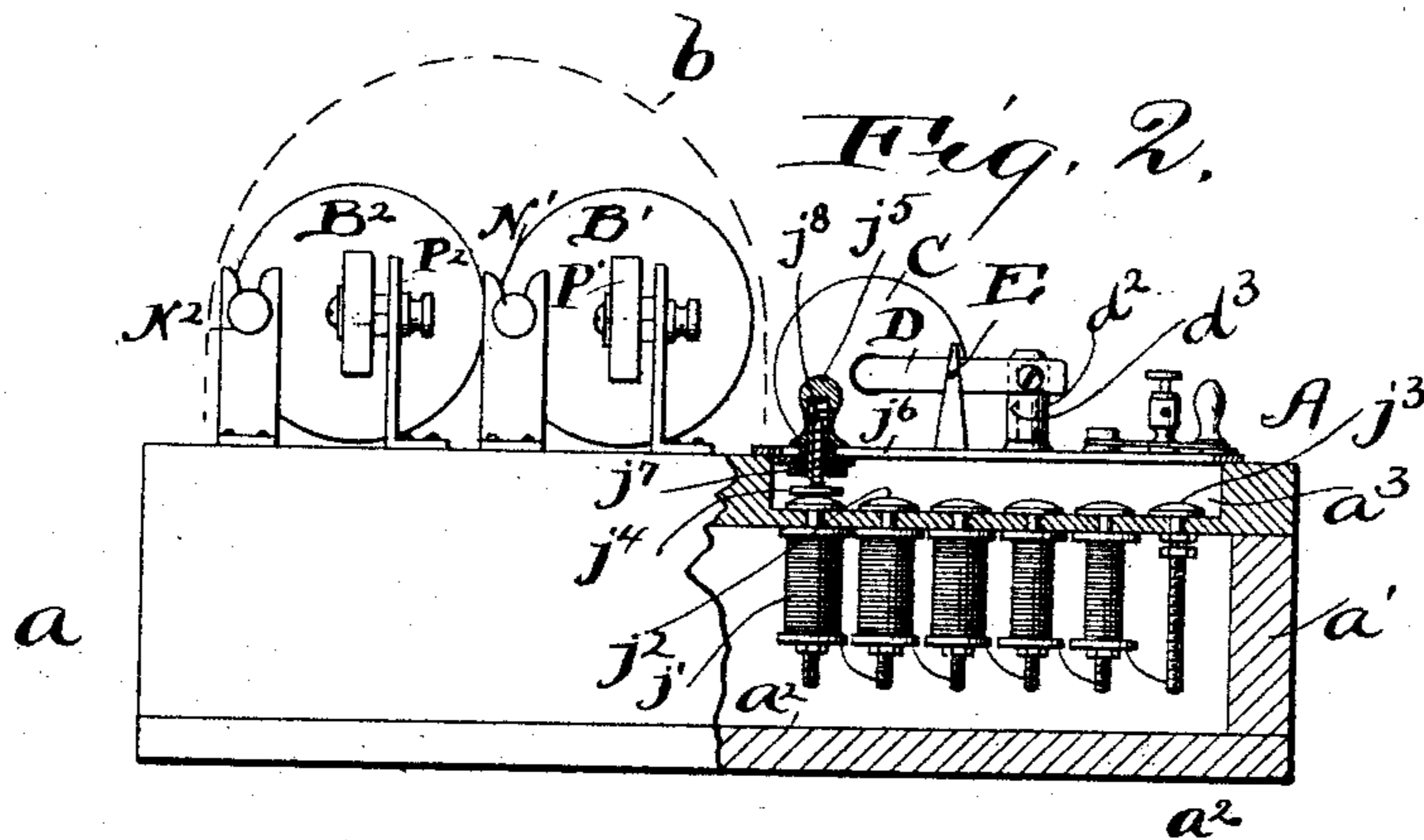
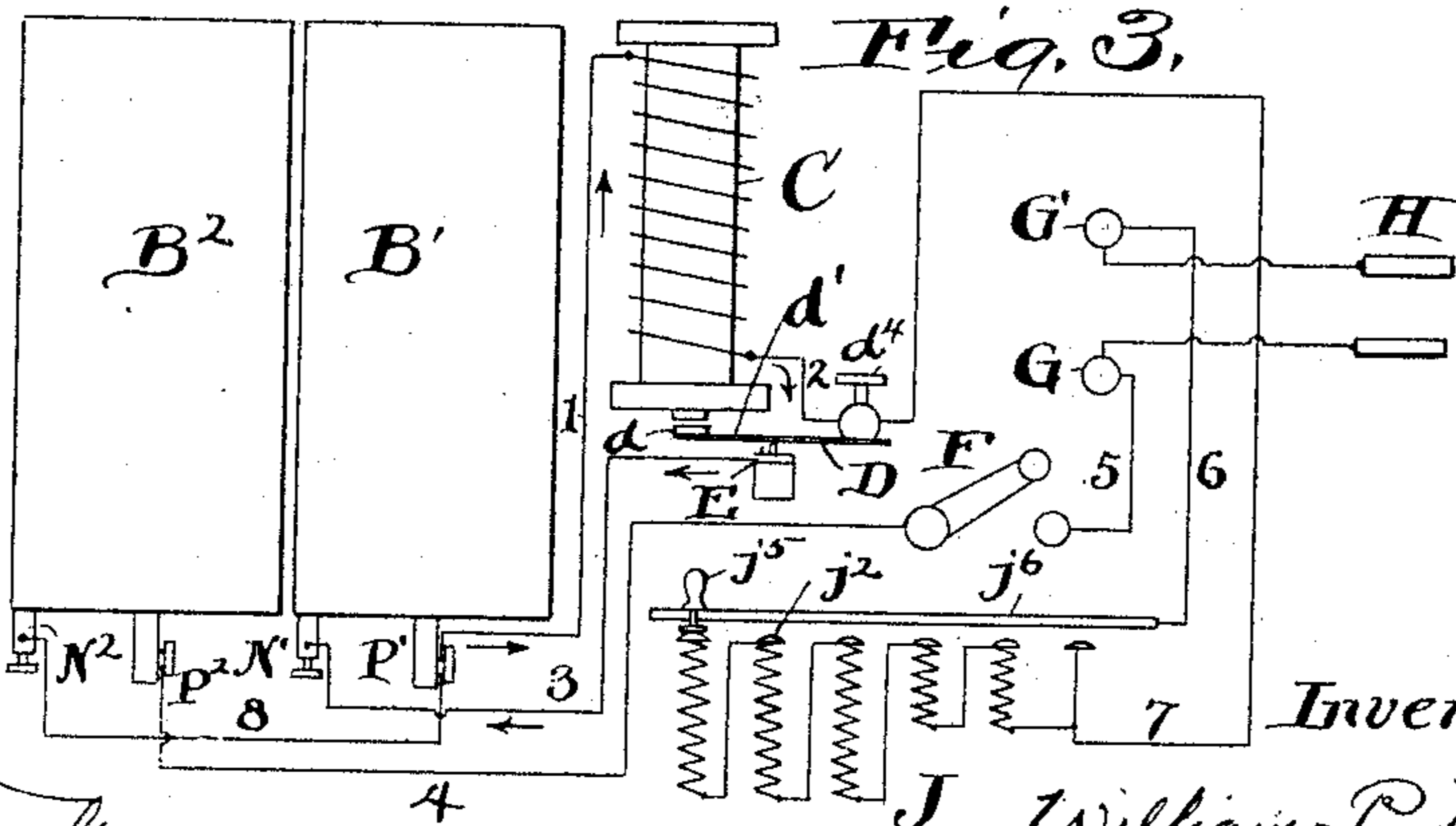


Fig. 3.



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METHOD OF AND APPARATUS FOR ADMINISTERING THERAPEUTIC ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 622,922, dated April 11, 1899.

Application filed December 5, 1898. Serial No. 698,277. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. HORTON, Jr., a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Methods of and Apparatus for Administering Therapeutic Electricity, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

If a high-potential induced current and a low-potential continuous current be administered at the same time to the human body, the therapeutic effect is very much enhanced over that produced by either current alone.

I have invented an apparatus which may be called a "medical battery," which by its peculiar arrangement and connection may produce such current and a voltaic current and cause them to flow through the patient and through a governing resistance, which may keep down the voltaic current without correspondingly increasing the induced current. The invention includes both this apparatus and the method by which the same operates.

The apparatus consists of a pair of voltaic cells, an inducing-coil, a vibrator in series with the coil and thus adapted to make and break the circuit through the coil and cause it to produce an induced current, a governing resistance separate from the coil, whereby the current may be regulated without varying the coil, and such electrical connection that one cell locally operates the vibrator by leading through it and the coil and the other cell is on a circuit which passes through the governing resistance and the patient, but in so doing divides into two paths, one of which leads through the coil and the other through the first cell and the vibrator when closed. The inducing-coil which I use is a magnetic intensifying-coil, being but a few turns around a solid bar, and produces an extra induced current instead of a secondary current. The vibrator is operated directly by the magnetism of the core. There is a metallic sleeve surrounding the coil, which softens the induced current, reducing its jarring effect.

Now the parts and connections being as above stated, when the vibrator has the local

circuit closed the current from the second cell travels along the same conductor as the current from the first cell through the vibrator and the patient receives the voltaic current from the second cell, and when the vibrator opens the local circuit the patient receives the extra induced current from the coil and the thus modified voltaic current from the second cell, which now passes through the patient and the coil. Thus at all times, whether the vibrator is closed or open, the patient receives the current from the second cell, and this is modified when the vibrator opens the local circuit by the extra induced current from the coil.

The drawings are a clear illustration of my apparatus.

Figure 1 is a plan thereof. Fig. 2 is a side elevation, partly sectional; and Fig. 3 is a diagram of the component parts and their connections.

Referring to the parts by letters, A represents a suitable base which is preferably the top of a shallow box *a*, having the sides *a'* and the bottom *a*².

B' B² represent the two voltaic cells, which may be covered by a suitable shield, (indicated by the dotted line *b* in Fig. 2.)

C is the coil, which is simply an intensifying-coil consisting of a few turns of comparatively large wire around a solid core *c* between the heads *c'*.

D represents the vibrator, which consists of an armature *d*, secured to one end of a spring-strip *d'*, and the other end of which is rigid with a sleeve *d*². This sleeve is clamped adjustably to a stationary vertical stud *d*³ by means of a set-screw *d*⁴. This construction of vibrator, however, is not my invention.

E represents the point with which the vibrator is adapted to make or break connection.

F represents a switch for opening the circuit from the cell B² through the patient, and G G' represent the binding-posts with which the conductors from the patient are connected. These conductors may terminate in handles, which the patient grasps, as indicated by H in Fig. 3.

J represents the resistance. It consists of

a set of spools of very fine wire J' . These spools are connected together in series, and each spool is also connected with a head j^2 . These spools are contained within the box a below the base-plate A , and their heads are in the depression a^3 in that base-plate. These heads are adapted to contact with the plunger j^1 , carried by the knob j^5 , which slides in a slotted plate j^6 , which is connected with the binding-post G' . A washer and a nut j^7 , screwed to the knob beneath the plate j^6 , secure the knob slidably to that plate, while a spring j^8 , surrounding the shank of the plunger and bearing at one end against the plunger and at the other against the knob, gives the plunger the desired spring-pressure against the heads j^2 . The head j^3 is also provided, which has no resistance, but is directly connected with the line.

Now when the plunger is in contact with the first spool—that is, the one at the left hand in the drawings—the circuit must pass through all of the spools. When the knob is moved to the right one head, the resistance in the first spool is cut out, and each subsequent movement cuts out the preceding spool until when the knob is at the extreme right the total resistance is cut out. As shown in the drawings, the first three spools are of one thousand ohms' resistance, and the next two of five hundred each, and thus the resistance inserted into the line may be four thousand, three thousand, two thousand, one thousand, five hundred, or zero ohms. It is to be observed that these spools are all wound in the same direction and around metallic centers, wherefore they have self-induction, which reduces and thus governs the extra induced current from the coil C . Thus the cutting out of resistance simultaneously increases both the voltaic current and the induced current.

The electrical connections are indicated by numerals.

1 is the line from the positive pole P' of the cell B' to the coil.

2 is the line from the coil to the vibrator.

3 is the line from the point E to the negative pole N' of the cell B' , this constituting the local circuit through the coil and vibrator.

4 is the line from the positive pole P^2 of the cell B^2 to the switch F .

5 is the line from the switch F to the binding-post G' .

6 is the line from the binding-post G' to the resistance.

7 is the line from the resistance to the vibrator, and 8 is the line from the positive pole of the cell B' to the negative pole N^2 of the cell B^2 .

When the vibrator stands in the position shown in the drawings, the current from the cell B' travels locally in the direction of the arrows along the circuit composed by the line 1, the coil C , the line 2, the vibrator, the point E , and the line 3. At the same time if the switch F is closed (it is shown open in

the drawings) and the binding-posts G and G' are connected through the patient a shunt-circuit is established via the line 8 through the cell B^2 , via the line 4 through the switch F along the line 5 through the patient, via the line 6 through such portion of the resistance as the knob cuts in, and via the line 7 to the vibrator. As the resistance of this circuit, however, is several thousand ohms, while the circuit through the vibrator is preferably only the fraction of an ohm, the current which the patient obtains from the cell B' is immaterial, but he obtains the full current from the cell B^2 .

The current from the cell B' , traveling around the coil C , energizes its core c , and the armature is drawn toward the core, thus breaking the circuit at the point E . The cell B' is thus out of circuit; but if the switch F is closed and the patient holds the handles H the current from the cell B^2 passes from P^2 , as before, through the patient and the resistance to the vibrator, and from thence via the line 2, the coil C , and the lines 1 and 8 to the negative pole N^2 , this passage through the coil being possible because the voltaic current from B' through it has ceased. At the same time the patient receives the extra induced current caused by the magnetism of the coil which travels along the conductors 2, 7, 6, 5, 4, 8, and 1 in the direction of the arrows, and thus through the patient and the resistance.

The current from the second cell is so reduced by the resistance of the patient that it does not energize the coil sufficiently to retain the vibrator, and the latter springs back by its own resilience and closes the local circuit. Thus the patient receives alternately first the voltaic current from the cell B^2 and an insignificant portion from the cell B' and then the voltaic current from the cell B^2 , modified by the extra induced current from the coil C .

The cutting out of resistance, which is distinct from the windings of the inducing-coil, increases, as desired, the quantity of current which the patient receives without reducing the induced current, and by this means a more beneficial current is obtained than where the regulation is caused by governing the electromotive force of the induced current by shielding the core, as is the usual custom, or where the regulation is such that as one current increases the other decreases.

Having described my invention, I claim—

1. The method of administering therapeutic electricity which consists in supplying the patient alternately a quantity of voltaic current and then a quantity of voltaic current modified by the extra induced current from a magnetic coil and governing the quantity by an interposed self-inductive resistance which allows the simultaneous increasing of both the voltaic current and the induced current.

2. In a medical battery, in combination, a

source of voltaic electricity, a source of induced electricity, suitable connections whereby both may pass through a patient at the same time, and an inductively-wound resistance and means for varying the amount of the same which is in circuit whereby the two currents may be increased simultaneously.

3. In a medical battery, in combination, a voltaic cell, suitable connections whereby a current therefrom may flow through the patient, and an inducing apparatus which forms part of this circuit at the time the induced current is taking place whereby this induced current simultaneously flows through the patient, and a governing resistance which is separate from the inducing apparatus.

4. In a medical battery, in combination, a voltaic cell, suitable connections whereby a current therefrom may flow through a patient, a magnetic intensifying-coil causing an extra induced current in the circuit where the voltaic current is flowing, said coil being surrounded by a metallic sleeve whereby the induced current is softened.

5. An apparatus consisting of two voltaic cells, an inducing-coil, a vibrator in series with the coil and thus adapted to make and break the circuit through the coil and cause it to produce an induced current, and a governing resistance, and such electrical connections that one cell locally operates the vibrator by leading through it and the coil and the other cell is in a circuit which passes through the governing resistance and the patient, but in so doing divides into two paths, one of which leads through the coil and the

other through the first cell and the vibrator when closed.

6. A medical battery consisting of the voltaic cells B' B^2 , the magnetic coil C, the vibrator D adapted to be operated thereby, the point E with which the vibrator makes or breaks contact, the governing resistance J, the lines 1, 2, 3 connecting the cell B' locally through the coil, a line 4 leading from the cell B^2 and adapted to continue through the patient to the vibrator, and a line 8 connecting the pole of the cell B' with which the line 1 is connected with the pole of the cell B^2 with which the line 4 is not connected, substantially as described.

7. In a medical battery, in combination, the cells B' B^2 , the coil C, the vibrator D, the point E, the resistance J, the switch F, the binding-posts G and G', the line 1 leading from the cell B' to the coil, the line 2 from the coil to the vibrator, the line 3 from the point E to the other pole from the cell B' , the line 4 from the cell B^2 to the switch, the line 5 from the switch to the binding-post G, the line 6 from the binding-post G' to the resistance J, the line 7 from the resistance to the vibrator, and the line 8 connecting the remaining pole of the cell B^2 with that pole of the cell B' which is connected with the line 1, substantially as described.

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

WILLIAM P. HORTON, JR.

Witnesses:

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E. L. THURSTON.