No. 772,630. PATENTED OCT. 18, 1904.

A. L. PARCELLE.

METHOD OF TRANSFORMING ELECTRICAL CURRENTS.

APPLICATION FILED APR. 10, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

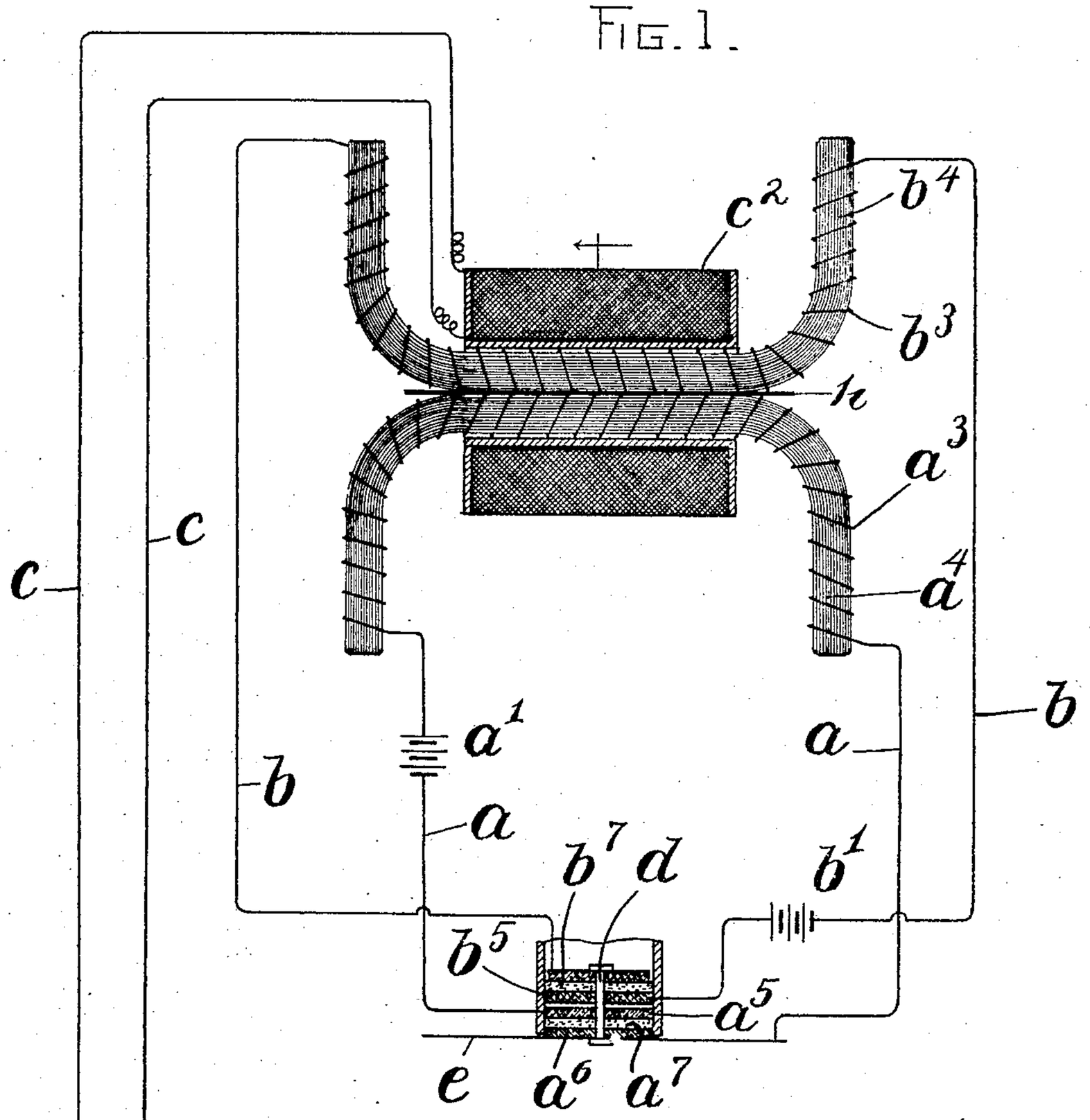
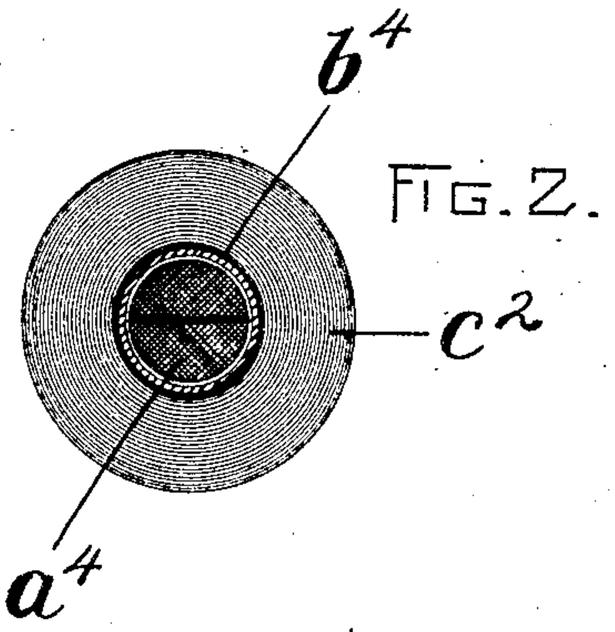


FIG. 2.



WITNESSES:
Walter V. Abell.
P. W. Pezzetti

INVENTOR:
A. L. Parcelle
by Kingsley Brown Quimby
his Attys

No. 772,630. PATENTED OCT. 18, 1904.

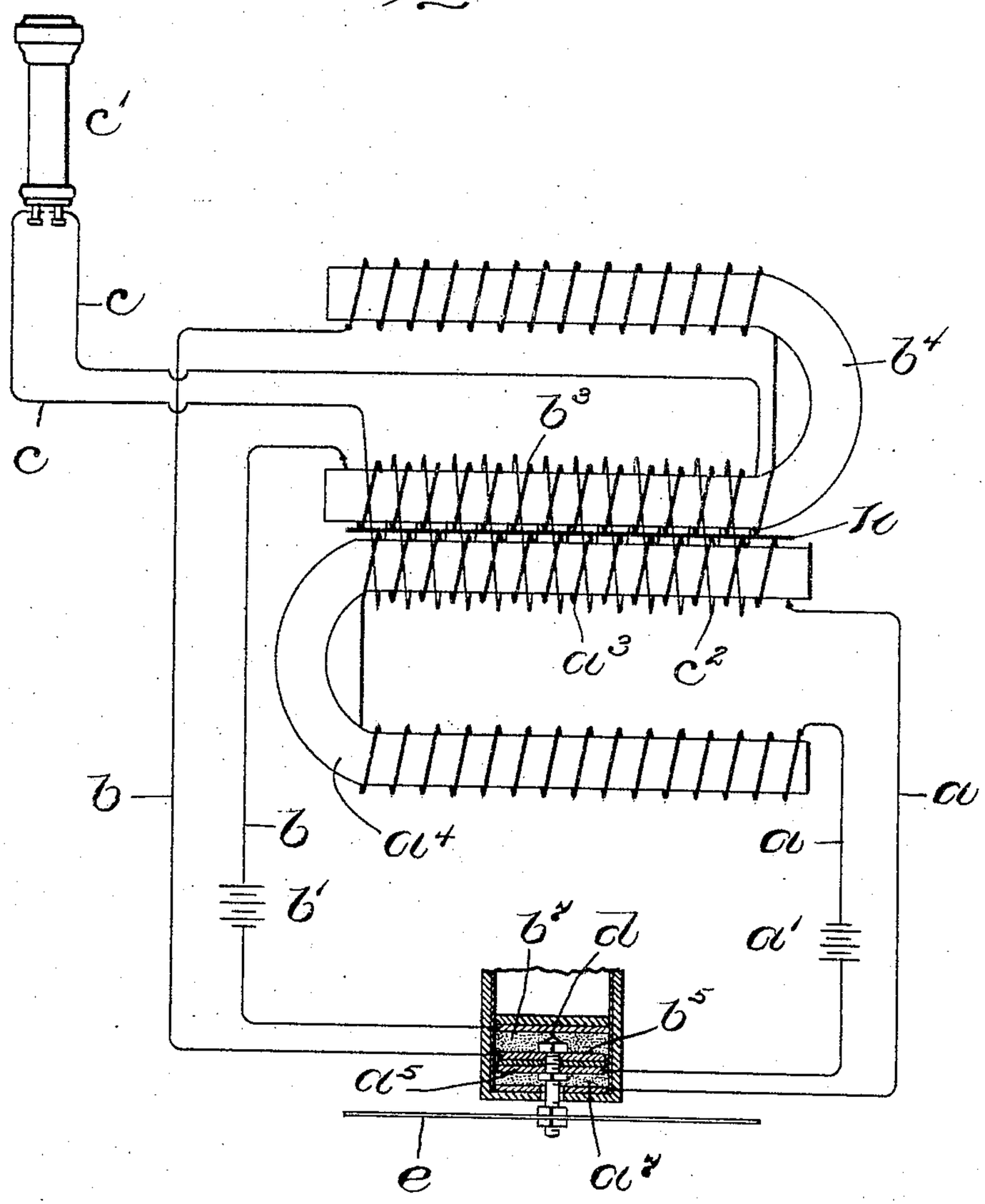
A. L. PARCELLE.

METHOD OF TRANSFORMING ELECTRICAL CURRENTS.

APPLICATION FILED APR. 10, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.



Witnesses:
Walter J. Abell
P. W. Pezzetti

Inventor:
A. L. Parcelle
by Wright Brown & Quinby
his Attys

No. 772,630. Patented October 18, 1904.

UNITED STATES PATENT OFFICE.

ALBERT L. PARCELLE, OF BOSTON, MASSACHUSETTS.

METHOD OF TRANSFORMING ELECTRICAL CURRENTS.

SPECIFICATION forming part of Letters Patent No. 772,630, dated October 18, 1904.

Application filed April 10, 1903. Serial No. 152,003. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. PARCELLE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Methods of Transforming Electrical Currents, of which the following is a specification.

This invention has relation to telephones, and has for its object the provision of a method by which the undulations or impulses in the secondary or receiver circuit are increased or magnified, so as to produce a more faithful reproduction of pitch, loudness, and timbre or quality of vocal sound than has hitherto been possible; but in addition to this somewhat secondary object the invention has for its object to provide a method of transforming electrical currents; and in this phase of the invention it consists in causing two primary coil circuits and cores to act upon a common secondary coil, so that the waning or falling impulse set up in said secondary coil by one primary coil is reinforced by the rising or increasing impulse in another primary coil.

As shown in the drawings, the apparatus may consist of a telephone having a receiver-circuit, including a secondary coil and two independent transmitter-circuits, each having its primary coils in inductive relation to said secondary coils. The transmitter-circuits act to induce or set up an alternating current in the receiver-circuit, the initial direction of the alternations in the current caused by said transmitter-circuits being opposite. This is achieved by employing transmitter-circuits whose currents are of opposite polarity or in the case of circuits having currents of the same polarity by winding the coils of the primaries in said circuits in different or opposite directions. By this construction and arrangement, in addition to the arrangement of the transmitter by which one variable-resistance medium is compressed when the other is expanded, the increase in conductivity in one transmitter-circuit is synchronous with the decrease in conductivity in the other transmitter-circuit. It follows therefore that the current induced in the secondary coil by the collapse or wane of the current in one transmitter-circuit is strengthened by the simultaneous induction of current in the same direction in the said secondary coil by a current or an increase in current in the other primary coil. The diaphragm upon which the sound-waves impinge is connected with the movable members of the two transmitters or with a single member of a double transmitter, whereby the compressions of the variable-resistance medium in one transmitter-circuit will be synchronous with the expansion of said medium in the other transmitter-circuit.

Referring to the accompanying drawings, Figure 1 represents a telephone which may be employed in connection with my improved method and which includes certain improvements. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents another telephone having a different arrangement of cores.

On the drawings, *a b*, Figs. 1 and 2, indicate two primary circuits, each shown as including a battery *a' b'*, respectively, although a single battery may be used if properly connected. The secondary circuit (indicated at *c*) includes the telephone-receiver *c'* and the secondary coil c^2, made of fine wire in the usual way.

The primary coils a^3 b^3 are wound upon independent cores a^4 b^4, respectively. Each core consists preferably of fine soft-iron wires bunched together in semicircular form covered with insulating material, the primary coils or windings extending well up to the ends of the cores. The two flat sides of the cores and their inclosing coils when well covered with insulation are placed together, whereby the two cores approximate a cylinder. The ends of the cores project some distance beyond the spool of the secondary coil and they diverge, as shown in Fig. 1, whereby each core is substantially U-shaped to prevent material magnetic leakage.

By virtue of the ends of the cores being widely separated quick action in discharging is promoted, especially when a direct current is employed for exciting them; but it will be apparent that where the current in the

primaries is alternating then the ends of the cores may be brought together to form a closed magnetic circuit.

A double transmitter or two oppositely-acting microphones are employed, as indicated, somewhat conventionally.

Two stationary members a^5 b^5, properly insulated from each other, are used in conjunction with two movable members a^6 b^6, rigidly connected together, as by the pin or screw d. The said members may be made of carbon or other conducting material. Between each stationary member and its coacting movable member is placed a variable-resistance medium a^7 or b^7, as the case may be, such as granular carbon. The vibratory diaphragm e is connected rigidly to the member a^6 or the pin or screw d.

Operation: Assuming that the diaphragm be moving inward, the variable-resistance medium a^7 will be compressed and that at b^7 expanded. The conductivity in circuit a will be increased and a current flow from battery a' through primary coil a^3 around core a^4. This induces a current in the secondary circuit c in the opposite direction through the action of the magnetic lines set up in core a^4. As the diaphragm springs back by its inherent resiliency, the current in circuit a is weakened, and the collapse of the magnetic lines of force in core a^4 induces a change of current in the secondary c^2 opposite to the initial direction. Synchronously with the collapse of said magnetic lines the granules b^7 are compressed, whereby a current flows from battery b' through primary coil b^3 in a direction opposite to the direction of the first-mentioned current through primary a^3. Thereupon a current is induced in secondary coil c of the same direction and phase as that induced by the collapse of magnetic lines in core a^4, so that the full strength and benefit of both batteries is obtained at the time most desirable. This operation is repeated for each vibration of the diaphragm.

In Fig. 3 two U-shaped magnets are arranged side by side, one leg of each magnet being surrounded by the secondary coil. This arrangement has some advantages on account of the simplicity and convenience of its mechanical construction.

The two cores are separated by insulation h, as is the case in the telephone shown in Fig. 1. In this construction two or more cores are employed, (constructed with a view of preventing magnetic leakage from one core through the other,) each core having its own primary winding and so placed in relation to the other that a single secondary coil surrounds and embraces both cores and in such position that the magnetic lines set up in the cores by the current in the primary winding shall "cut" or surround the secondary coil.

By means of this device electric currents may be transformed to a higher or lower potential, multiphase currents converted to single phase, undulatory, interrupted, or vibratory direct current converted into alternating with one separation and without material loss, and these currents may be derived from a single source, such as a multiphase generator, or from separate source, as shown in the drawings, and whatever may be its source through the action of these primary coils on the secondary coil it will be converted into simple alternating currents, which may be used for lighting and power, telegraphing either with or without wires, telephoning, and, in fact, for all purposes for which electric currents are useful.

In the case of the telephone, the two sources of electricity do not injure the microphones or double transmitters, their effect and influence being on the secondary only of the induction-coil. As they are both controlled by a single diaphragm, they are always in proper phase relation to each other, so that at the impingement of each sound-wave upon the diaphragm the batteries are thrown upon the line in succession, so as not to interfere with or counteract each other.

It is a matter of common knowledge that it has been proposed to use an alternating current in conjunction with a single primary winding and also to employ two primary coils on a single core; but these contrivances do not accomplish the results achieved by my invention and are foreign thereto, as will be appreciated by those skilled in the art.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. The herein-described method of inducing or setting up alternating currents in a coil by causing the magnetic lines from two or more cores acting independently and successively to act upon or cut said coil.

2. The herein-described method of transforming electric currents which consists in causing multiple primary coils and cores to act upon a common secondary coil so that the waning or falling current set up by one primary coil is reinforced by the rising current in another primary coil.

3. The herein-described method of transforming electric currents which consists in superimposing a rising current onto a waning or falling current in a secondary coil by simultaneously and synchronously increasing a current in one primary coil and core acting on said secondary coil and decreasing a current in a secondary primary coil and core acting on said secondary coil.

4. The herein-described method which consists in simultaneously increasing the electric

current in a circuit containing a primary coil and core and decreasing a current in a second primary coil and core, and by said primary coils and cores inducing alternating currents in said secondary coil with the electrical impulses of one primary circuit synchronous with the waning or decline of the current in the other primary circuit, so that one inductive impulse is superimposed upon another in the secondary circuit.

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

ALBERT L. PARCELLE.

Witnesses:

MARCUS B. MAY,

C. C. STECHER.

Correction in Letters Patent No. 772,630.

It is hereby certified that in Letters Patent No. 772,630, granted October 18, 1904, upon the application of Albert L. Parcelle, of Boston, Massachusetts, for an improvement in "Methods of Transforming Electrical Currents," an error appears in the printed specification requiring correction, as follows: On page 2, line 69, the word "separation" should read *operation*, same page, line 125, the word "secondary" should read *second;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of November, A. D., 1904.

[SEAL.]

F. I. ALLEN,

Commissioner of Patents.