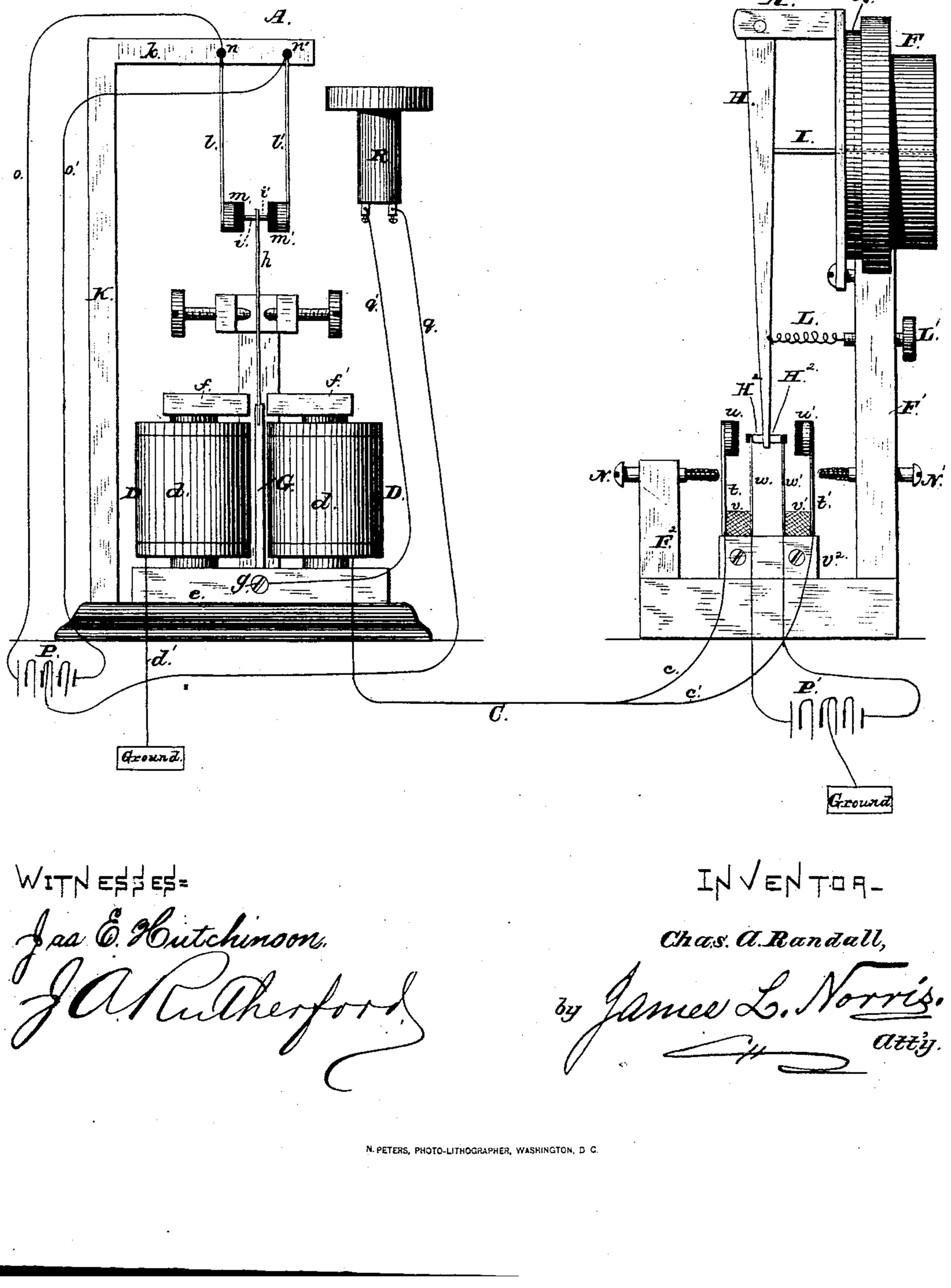
(Model.)

C. A. RANDALL.

Telephonic Telegraph.

No. 236,081. Patented Dec. 28, 1880.



WITNESSES=

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UNITED STATES PATENT OFFICE.

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TELEPHONIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 236,081, dated December 28, 1880.

Application filed September 29, 1880. (Model.)

To all whom it may concern:

Be it known that I, CHARLES A. RANDALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Telephonic Telegraphs, of which the following is a specification.

This invention relates to an improvement in that class of telephonic telegraphs in which, by the vibration of a transmitter-diaphragm, currents of alternately opposite polarity or in alternately opposite directions are caused to flow over a line-wire to a receiver, its object being to provide a receiving-station apparatus which will promptly respond to the alternations of the line-current and cause alternately opposite currents or impulses of varying force from a local battery to actuate the receiver-diaphragm for causing sound-vibrations thereof.

To this end my invention consists, first, in the combination, in a telephone system, of a main-line conductor, a telephonic transmitting apparatus arranged to transmit over said main line currents of alternately opposite polarities by the vibrations of its diaphragm, an automatic pole-changing tension-changer in the main circuit with said transmitting apparatus, and a local circuit, including a receiving-telephone arranged to be controlled by the line-currents and to change the direction and vary the tension of the electric current over said local circuit, all essentially as hereinafter described and explained; second, in the combination, in a telephone system, of a main-line conductor, a transmitting-telephone arranged to transmit currents of alternately opposite polarities and connected with said main line, an automatic tension-changer in circuit with said transmitting-telephone, and a local circuit, including a receiving-telephone arranged to vary the tension of the electric current over said local circuit, all substantially as hereinafter more particularly described.

The accompanying drawing illustrates the construction of the devices and arrangement of the circuits in my improved system.

The letter A designates the receiving apparatus, B the transmitter, (which forms the subject of a separate application for patent,) and C the main line.

In the receiving apparatus, D D is an electro-magnet consisting of the helices *d d*, having soft-iron cores connected by the yoke *e*, and terminating at the opposite ends in poles *f f'*, extending toward each other. A permanently polarized steel bar is pivoted at *g* to the yoke *e* and forms the armature of the instrument. This armature has fixed to its end a metal rod or plate, *h*, which at its outer end is provided with platina studs *i i'* projecting in opposite directions. From an arm, *k*, supported by a standard, K, metallic springs *l l'* extend downward, and carry at their lower ends, respectively, carbon buttons *m m'*, which normally are lightly in contact with the platina studs *i i'*. The upper ends of the springs *l l'* are secured to insulated studs *n n'* projecting from the arm *k*, and said springs are respectively connected with wires *o o'*, which lead to the opposite poles of the battery P. From the connection between the middle two cups of this battery P a wire, *q*, leads to one of the binding-posts of the telephonic receiver R, and from the other binding-post of said receiver a wire, *q'*, leads to and is connected with the pivoted end of the polarized steel armature G. One terminal, *d'*, of the helices *d* of the polarized relay leads to the ground, and the other is connected to the line-wire C, which at the transmitter is connected with two branch wires, *c c'*, which are respectively connected with contact-springs *t t'* of the transmitter. These springs carry at their upper ends carbon buttons *u u'*. Their lower ends are secured to blocks *v v'* of insulating material, preferably hard rubber, which are pivoted, by means of suitable screws, to plates v^2 projecting from the base of the transmitter. To the inner sides of the blocks *v v'* are secured light leaf-springs *w w'*, having at their upper ends platina studs arranged opposite to, but separated from, the carbon buttons *u u'*.

The letter F indicates the transmitter mouth-piece, supported by a standard, F', the position of the diaphragm being indicated by a dotted line, *x*. From the upper portion of the mouth-piece there projects an arm, H', to which is pivoted a downwardly-extending lever, H, having at its lower end studs H^2, projecting in opposite directions between leaf-springs *w w'*, and in contact therewith. From the lever H an arm, I, extends to the diaphragm of the

transmitter, and is pressed lightly against the same by a spring, L, attached to an adjusting-screw, L′, arranged in the standard F′.

The lower ends of the springs *w w′* lead to opposite poles of a battery, P′, from the connection between the middle two cups of which a wire leads to the ground.

Adjusting-screws N N′ are arranged in the standard F′ and F², respectively, and carry on their inner portions suitable springs, which bear against the springs *t t′* and permit the same to yield.

It will be understood that the wires leading from the connection between the middle two cups of the batteries are each connected to both a positive and a negative plate, so that circuits may be established over the said wires from either end of the batteries.

The operation of the system and apparatus is as follows: The diaphragm of the transmitter being caused to vibrate by sound, the vibrations of said diaphragm cause to be transmitted through the arm I a vibratory motion to the lever H, which carries the light leaf-springs *w* and *w′*, causing the platina stud of first one and then the other to come in contact with its opposite carbon button, thus alternately making electrical connection between the line C through the branches *c c′* and opposite poles of a battery, P′, so that electrical currents of opposite polarity flow over the line and through the helices *d d* of the receiving apparatus A. The alternation of the current through said helices causes the polarized armature G to be attracted alternately by the poles *f f′*, and this causes the platina studs *i* and *i′* to press with greater and varying force upon the carbon buttons *m* and *m′* alternately. When the pressure is greatest upon the button *m*, for instance, a current flows from the battery P over wire *o*, spring *l*, button *m*, stud *i*, rod *h*, armature G, wire *q′*, through the telephone R, over wire *q* back to the battery; but when the pressure is greatest upon button *m′* the circuit is established from the other pole of the battery through wire *o′*, spring *l′*, button *m′*, and thence back to the battery through the telephone by the same route as before, currents of alternately opposite polarity being thus caused to actuate the diaphragm of the receiver in correspondence to the vibrations of the diaphragm of the transmitter.

By dispensing with one of the carbon buttons, *m* or *m′*, and its spring, dispensing with one of the wires, *o* or *o′*, and connecting the telephone-wire *q* to the opposite poles of the battery from the remaining wire, the receiving apparatus may be arranged to simply vary the tension of a current flowing in one direction through the receiver, this variation of tension being caused by the greater or less force with which the vibration of the armature G causes the rod H to press its platina stud against the carbon button, alternately light and strong contacts being made between the carbon button and platina stud, as the vibrations of the armature G vary in force and direction in correspondence with the varying force of the main-line current through the helices *d* and the polarity of the current transmitted. The variation in the force of the main-line current is caused by the variable contact pressure between the carbon buttons *u u′* and the platina studs of the springs *w w′* at the transmitter, this variable pressure contact resulting from the variable force with which the lever H vibrates in response to sound-vibrations actuating the diaphragm of the transmitter.

Having fully described my invention, I claim—

1. The combination, in a telephone system, of a main-line conductor, a telephonic transmitting apparatus arranged to transmit over said main line currents of alternately opposite polarities by the vibrations of its diaphragm, an electro-magnetic pole-changing tension-changer in the main circuit with said transmitting apparatus, and a local circuit, including the receiving-telephone, and arranged to be controlled by the line-currents and to change the direction and vary the tension of the electric current over said local circuit, all substantially as described.

2. The combination, in a telephone system, of a main-line conductor, a transmitting-telephone arranged to transmit currents of alternately opposite polarities and connected with said main line, an electro-magnetic tension-changer in circuit with said transmitting-telephone, and a local circuit, including a receiving-telephone, and arranged to be controlled by the line-currents and to vary the tension and force of the local currents over the receiving-telephone, substantially as described.

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

CHAS. A. RANDALL. [L. S.]

Witnesses:
B. P. BATCHELOR,
JOHN P. SEARS.