(No Model.)

W. A. WEST.

TELEPHONE.

No. 329,983. Patented Nov. 10, 1885.

FIG. I.

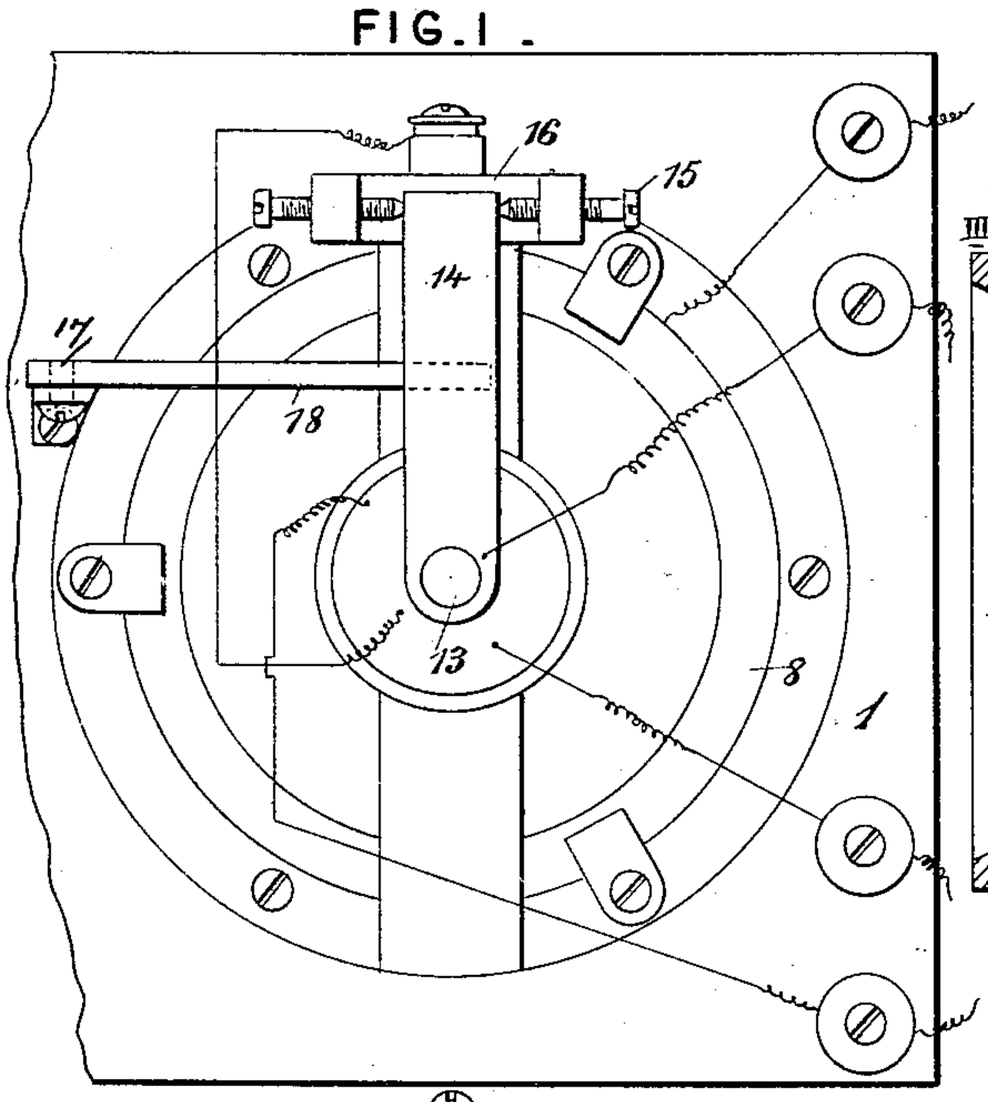


FIG. II.

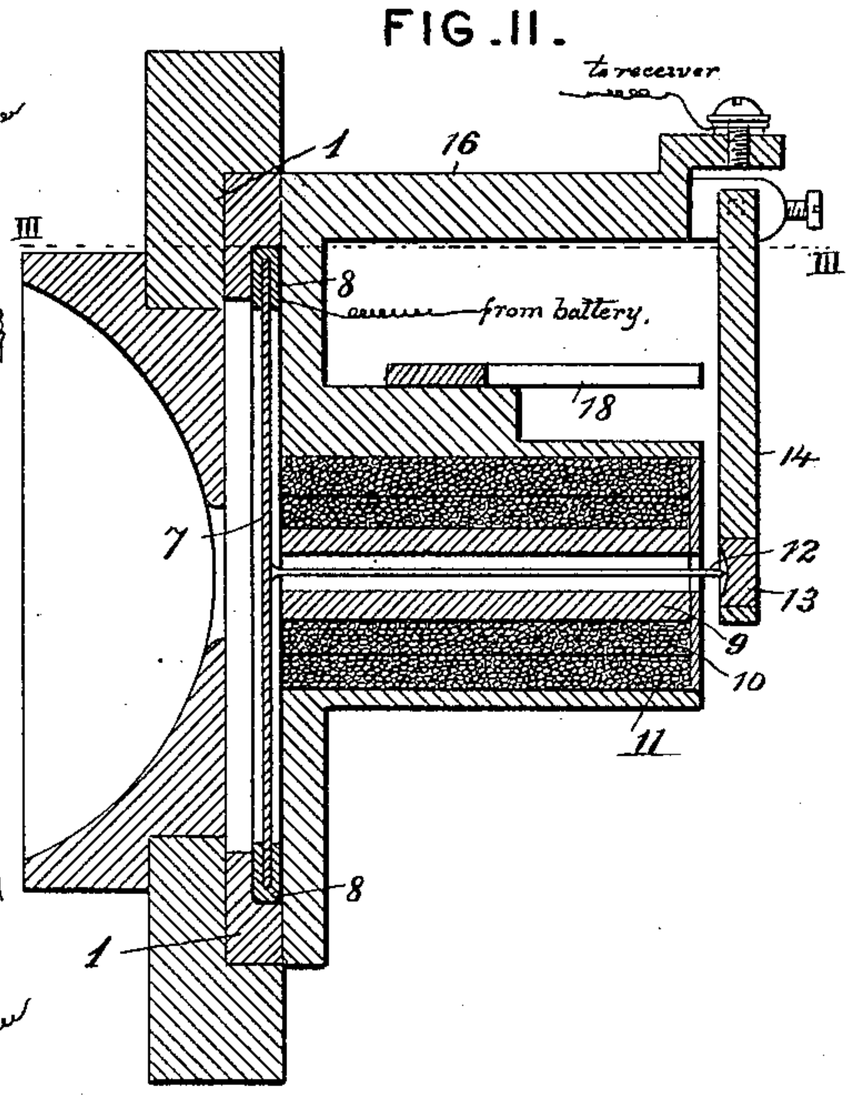


FIG. IV.

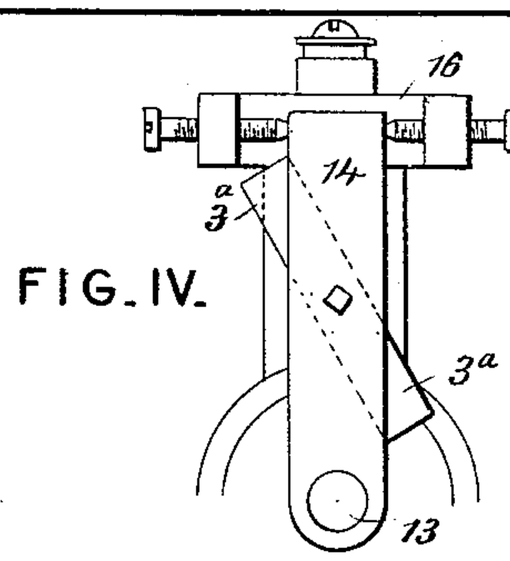


FIG. III.

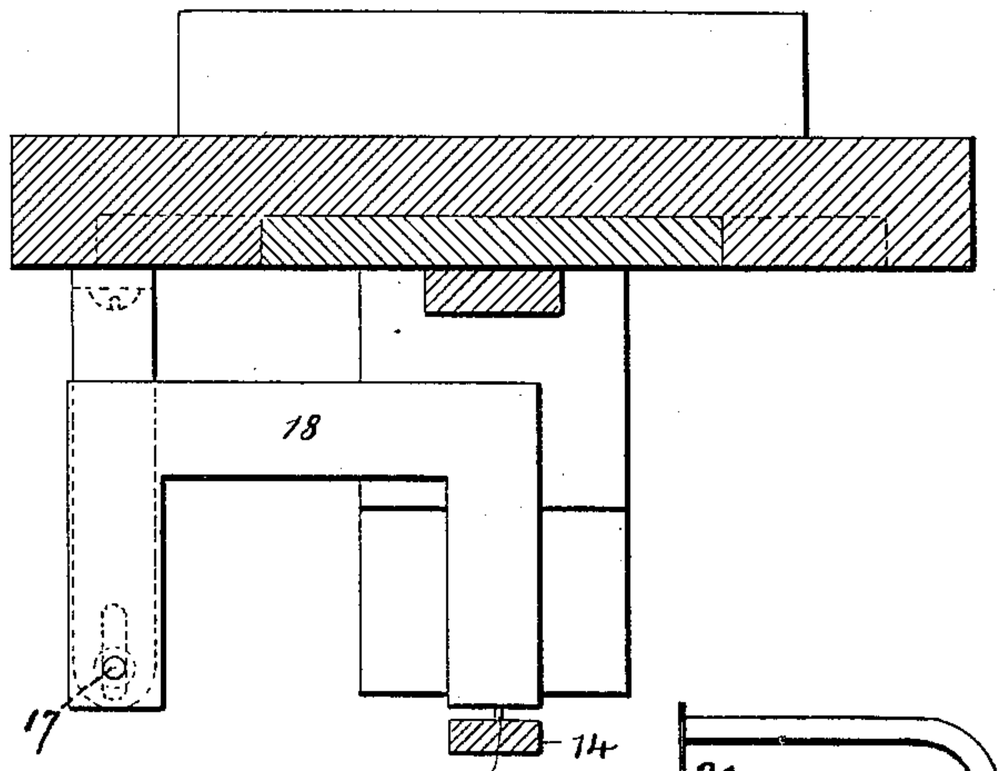
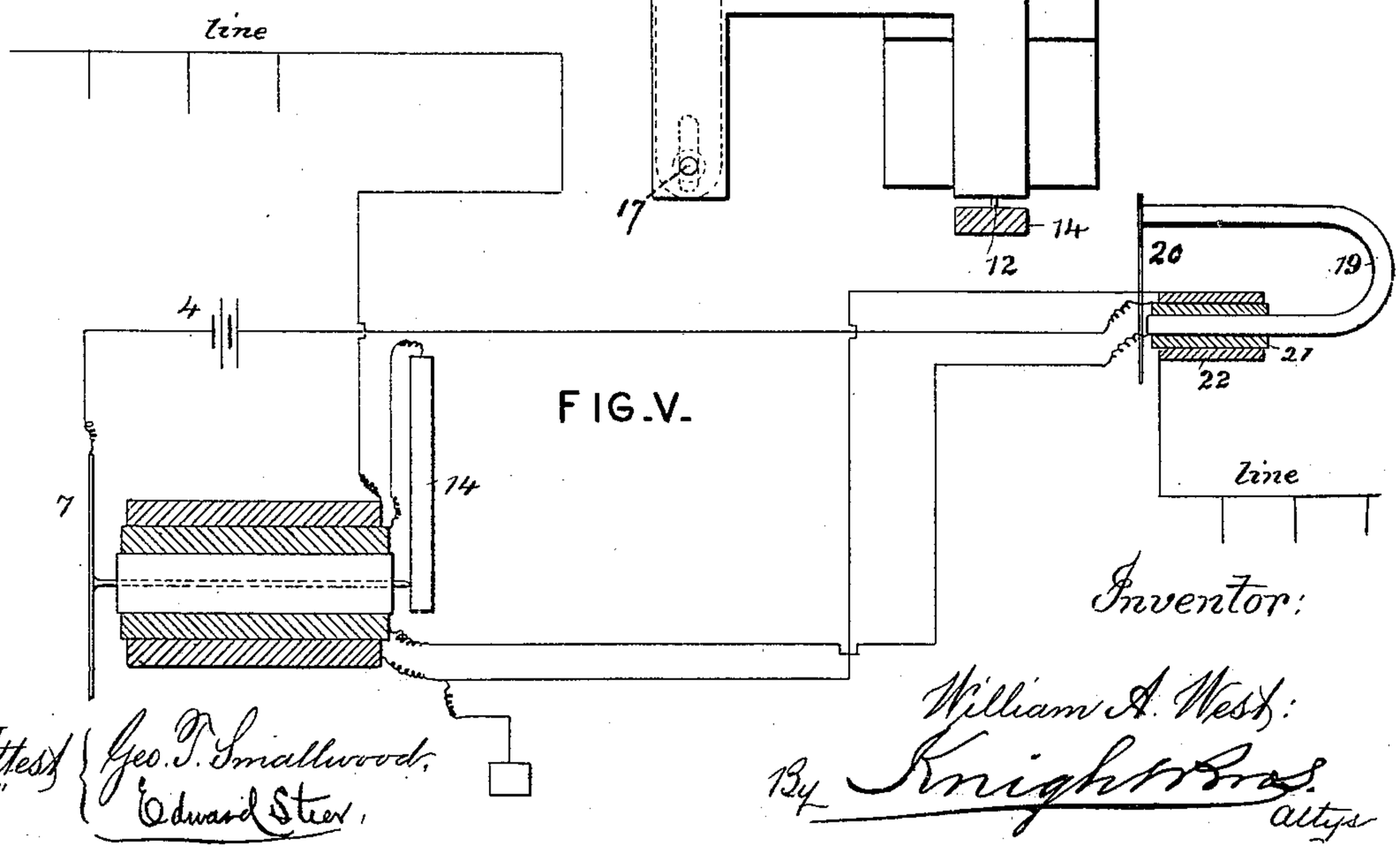


FIG. V.



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" Edward Stier.

Inventor:
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By Knights Bros.
Attys

UNITED STATES PATENT OFFICE.

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TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 329,983, dated November 10, 1885.

Application filed November 20, 1884. Serial No. 148,449. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. WEST, a citizen of the United States, residing at Bellefontaine, in the county of Logan and State of Ohio, have invented certain new and useful Improvements in Telephonic Telegraphs, of which the following is a specification.

The main object of my invention is to control the vibrations of the movable contact in telephones, intending by "movable contact" that moving part which, for the purpose of completing the circuit in which it is included, contacts with the contact carried by the diaphragm. If, for instance, we suppose a pendant or freely-moving contact-piece which normally rests against or makes contact with a rigid contact carried by the diaphragm, the vibrations of the diaphragm, due to the sound-waves which strike it, will, through the intermediary of the rigid or fixed contact, put the movable contact-piece into vibration.

It is with a view to controlling this vibratory movement of the movable contact that my invention has mainly been devised.

I find that the result aimed at can be accomplished by exerting upon the pendant an attractive force, which, called into action when the movable contact moves in a direction away from the fixed contact, influences at that time the contact to move in the opposite direction—that is to say, in a direction to re-establish contact between the two contact-pieces; and it is preferred to apply this force in such manner that it shall, as respects the movable contact-piece, be repellent or attractive, according to the conditions of the circuit in which the movable contact-piece is included—that is to say, so long as the contact between the two contact-pieces is undisturbed to exert a repellent force which will about offset the attractive force of the electro-magnet in the transmitter-circuit, but when the movable contact moves outwardly or away from the fixed contact-piece to then exert attractive force in order to restore the normal condition of the circuit.

I have made the method just indicated of controlling the vibrations of the movable contact the subject of a divisional application for Letters Patent.

In the present application I shall describe the preferred form of apparatus I have devised for the purpose of effectuating said method.

In the drawings accompanying this specification, Figure I is a rear elevation of a transmitter constructed in accordance with my invention. Fig. II is a vertical central section of the same. Fig. III is a longitudinal section on line III III, Fig. II. Fig. IV is a rear elevation of a modification hereinafter referred to. Fig. V is a diagrammatic representation of a telephone-circuit containing my improved transmitter and receiver.

Within the frame 1 the transmitting-diaphragm 7 is fixed by its edges so as to allow freedom of motion to its center. A rubber band, 8, is preferably employed as a seat on both sides of the diaphragm. Fixed opposite to the center of the diaphragm is the perforated soft-iron core 9, which is wound with the primary and secondary wires 10 11 of an inductorium. Said wires are wound in opposite directions upon the core, so that their poles will coincide. Fixed to the center of the diaphragm is a rigid needle, 12, of any desired conducting material, one end of which rests against a carbon or other suitable contact-button, 13, supported on the lower end of a pendant, 14, preferably of soft iron.

The needle is what I have termed the "fixed contact," and the pendant is the "movable contact." The latter is capable of freely vibrating, and is so supported by its trunnion-screws 15, working in a bracket, 16, fixed to the frame, as to hang vertically, and in this position to contact, without appreciable pressure, with the end of the needle.

The primary wire 10 of the induction-coil is, in the illustration given in the drawings, in a local circuit, in which are included also the diaphragm and the fixed and movable contact-pieces, the course of the circuit being from battery 4, through diaphragm, needle, pendant, and primary 10 of the induction-coil to the receiver 19, and thence back to battery. The circuit, normally, is closed, and consequently the core 9 is magnetized, and the pendant is attracted thereby. If the helix 10 be wound so as to make a north pole of that end of the core next to the pendant, the latter will of course be of an opposite polarity so long as it is under the influence of the core.

Under the arrangement thus far described the vibration of the diaphragm, caused by speech or other influences, will, through the needle, impart vibratory movement to the freely-swinging pendant, with the effect of causing the two contacts to recede from and approach each other so long as the vibrations continue. Amplitude and regularity of vibration of the pendant are determined by the loudness of speech, the proximity of the speaker, and other conditions, and unless some corrective be applied these causes are apt to produce irregular and undue vibrations of the freely-swinging pendant, with the result of producing similar irregularity in the impulses transmitted over the circuit. To correct this trouble, I make use of a permanent magnet or its equivalent—such as a permanently or constantly energized electro-magnet—so positioned and arranged that at the times when the pendant or movable contact recedes from the fixed contact and is freed from the magnetic influence of the core 9 (whose attractive power over the pendant is lost by the disturbance of the circuit due to the recession of the contacts from each other) it will, by its attractive force, tend to draw the pendant or movable contact in a direction to restore the normal condition of the circuit; and this magnet is arranged also so that at other times it will exert a repellent force to about offset the attractive force of the electro-magnet 9, thus in effect leaving the pendant or movable contact as free to move as though neither magnet were there. In the arrangement shown in the drawings for bringing about this result a permanent magnet, 18, is employed, fixed to the main frame by a set-screw, 17. This magnet—preferably of horse-shoe form—is so placed as to present to the pendant a pole of similar polarity to that of the pendant. For instance, if, as already supposed, the pole of core 9 presented to the pendant be N when the core is magnetized, the pendant will be of S polarity when the circuit is normal. Consequently the S pole of the permanent magnet 18 should be presented to the pendant. Care should be taken to adjust the magnet so that its repellent force upon the pendant will not more than neutralize or offset the attractive force of the core 9, and this can easily be determined by experiment. If the permanent magnet should be placed too near the pendant—in other words, if the repellent force should exceed the other—the permanent magnet would alternately repel and attract the pendant, with the effect of alternately making and breaking contact between the pendant and the needle, thus putting the pendant into rapid vibration, and virtually making a rheotome of the instrument.

The secondary coil 11 of the transmitter is in the main-line circuit, as shown. Impulses sent over the line from a distant station act, through the coil 11, to disturb the equilibrium of the magnets 9 and 18, thus causing corresponding vibrations of the pendant, which, through the local circuit, are conveyed to the receiver 19, whose primary coil 21 is in said local circuit. To intensify this action, I prefer to surround the primary coil 21 of the receiver with a secondary helix, 22, included in the main circuit, as shown. This, however, is not indispensable, for the receiver may be in the local circuit only. In any event, however, my transmitter is interposed, as indicated, between the original transmitter and the receiver, with its primary coil in circuit with the primary coil of the receiver.

For long lines on which great confusion of the messages is caused by induction, I have found it best to shunt to ground, as shown at 23, all the original current received from line, depending upon the induced changes in the current of the local circuit alone to affect the diaphragm of the receiver. By actual experiment I have found that with such an arrangement the strong induced currents on the line were rendered entirely nugatory in any action on the receiver, while the changes in the line-circuit due to the voice were retained in full force.

I have described the best way known to me of carrying my improvement into effect. I do not wish to be understood, however, as restricting myself to the precise details herein set forth, inasmuch as the same can be varied considerably without departure from this invention. For instance, as shown in Fig. IV, I can dispense with the magnet 18, and can make the pendant itself the permanent magnet. In such case it should be provided with a pivoted or otherwise suitably-arranged keeper, 3^a, for adjusting its strength relatively to that of the magnet 9, so as to obtain as nearly as practicable an equilibrium of forces between the two so long as the local circuit is normal. I prefer, however, the arrangement shown in Figs. I, II, and III of the drawings.

What I claim herein as new and of my own invention is—

1. The combination, with the fixed and movable contacts and electro-magnet and circuit in which said contacts and electro-magnet are included, of a controlling-magnet which, when the movable contact during its vibratory movement recedes from the fixed contact, tends, by its attractive force, to draw the said movable contact in the opposite direction, substantially as and for the purposes hereinbefore set forth.

2. The combination, with the fixed and movable contacts, the electro-magnet, and the circuit including said contacts and electro-magnet, of a controlling-magnet arranged and operating, substantially as described, to exercise upon the movable contact repellent or attractive force, according as the circuit is made or broken, substantially as and for the purposes set forth.

3. The combination of the fixed and movable contacts, the electro-magnet having a secondary coil in the main-line circuit and a primary coil in a local circuit including the said contacts, a controlling-magnet arranged

and operating to exercise upon the movable contact repellent or attractive force, according as the local circuit is made or broken, and a receiver located also in said local circuit, substantially as and for the purposes hereinbefore set forth.

4. The combination of the transmitting-diaphragm, the fixed and movable contacts, the electro-magnet, the receiver, the primary circuit in which said contacts, electro-magnet, and receiver are included, and the controlling-magnet, substantially as and for the purposes hereinbefore set forth.

5. The combination of the fixed and movable contacts, the electro-magnet having a secondary coil in the main-line circuit and a primary coil in a local circuit, a controlling-magnet for influencing the movable contact, substantially as described, and a receiver provided with an inductorium, consisting of a primary coil included in said local circuit and a secondary coil included in said main-line circuit, substantially as and for the purpose hereinbefore set forth.

W. A. WEST.

Witnesses:
OCTAVIUS KNIGHT,
HARRY E. KNIGHT.