

(No Model.)

W. A. WEST.
TELEPHONE.

No. 470,634.

Patented Mar. 8, 1892.

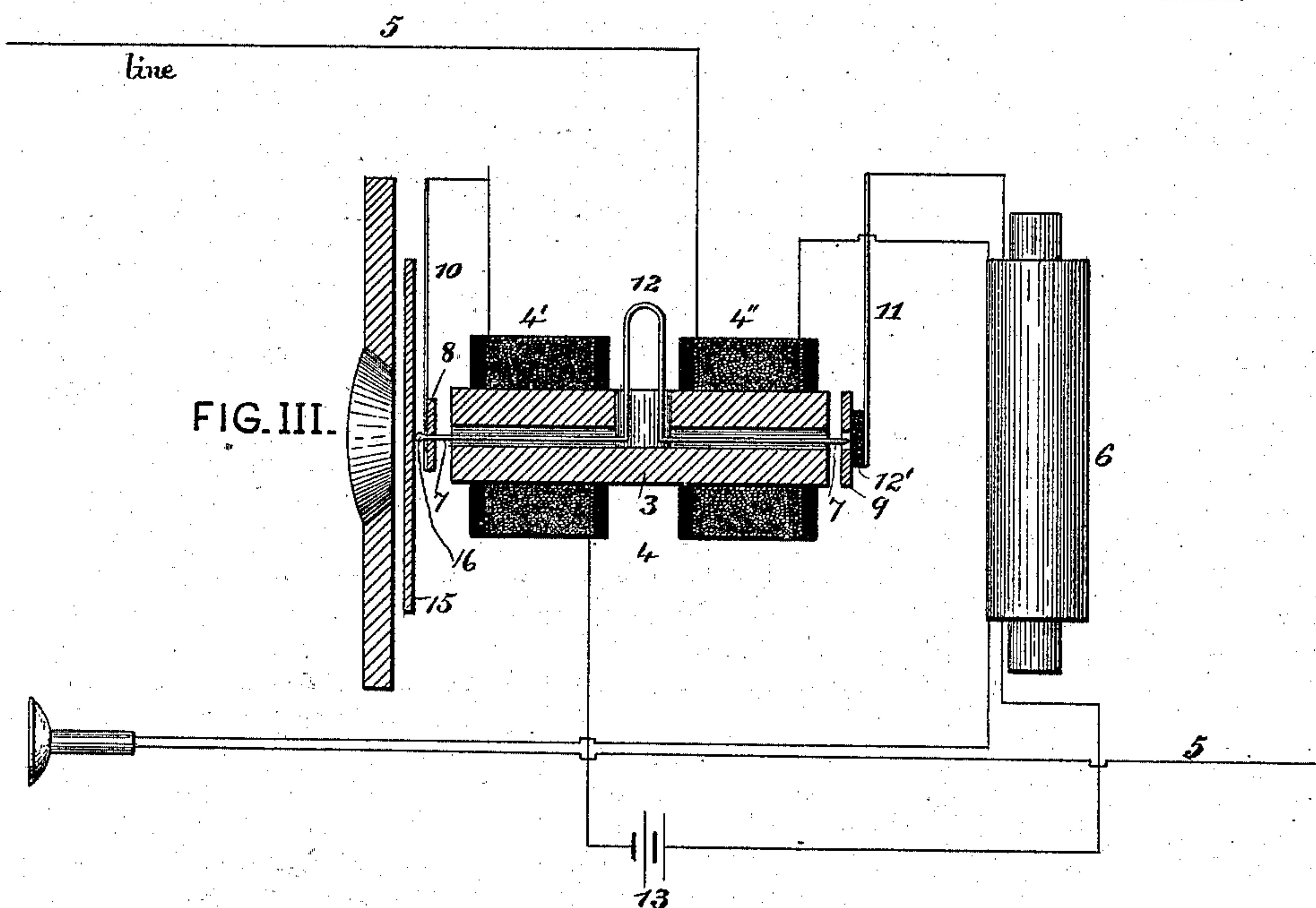
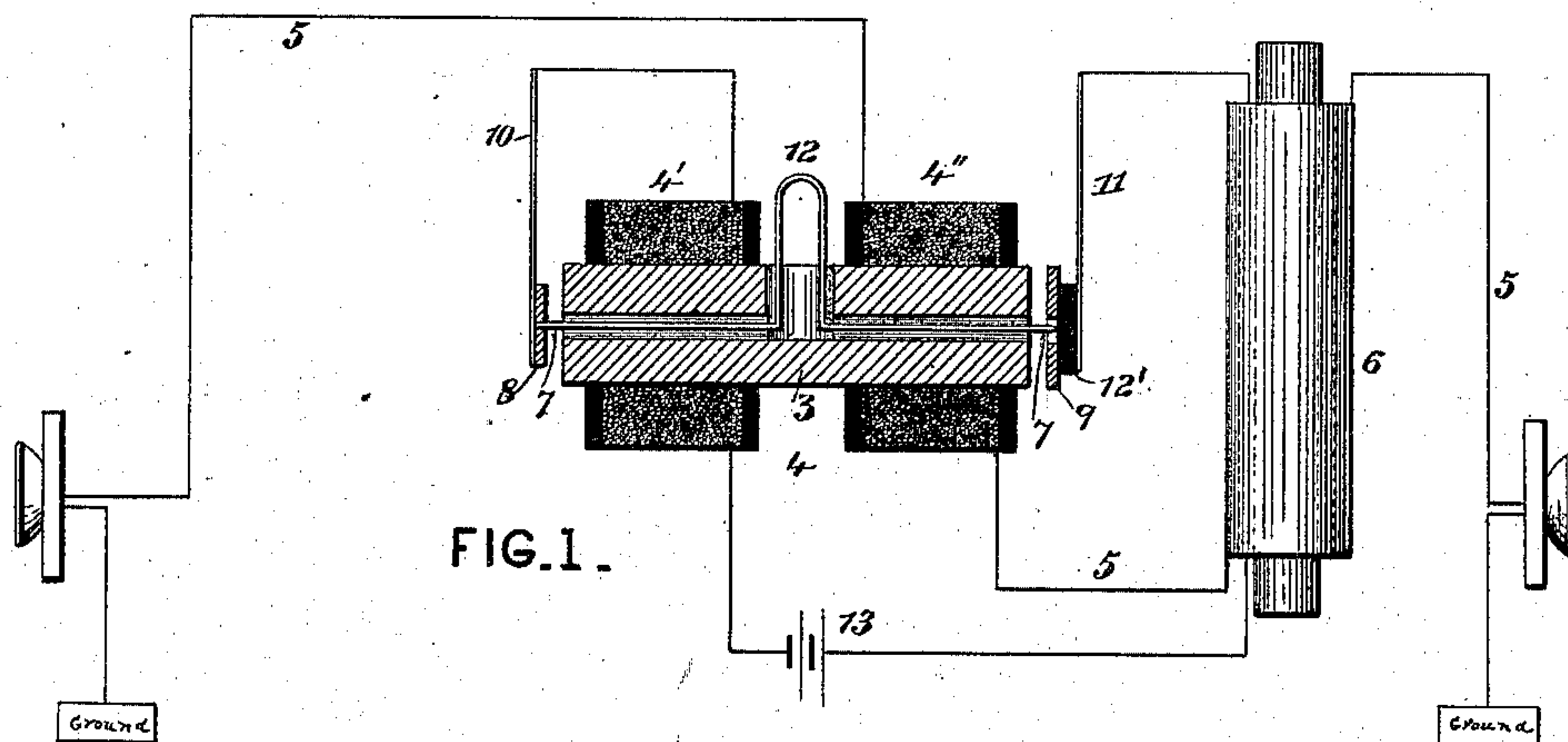
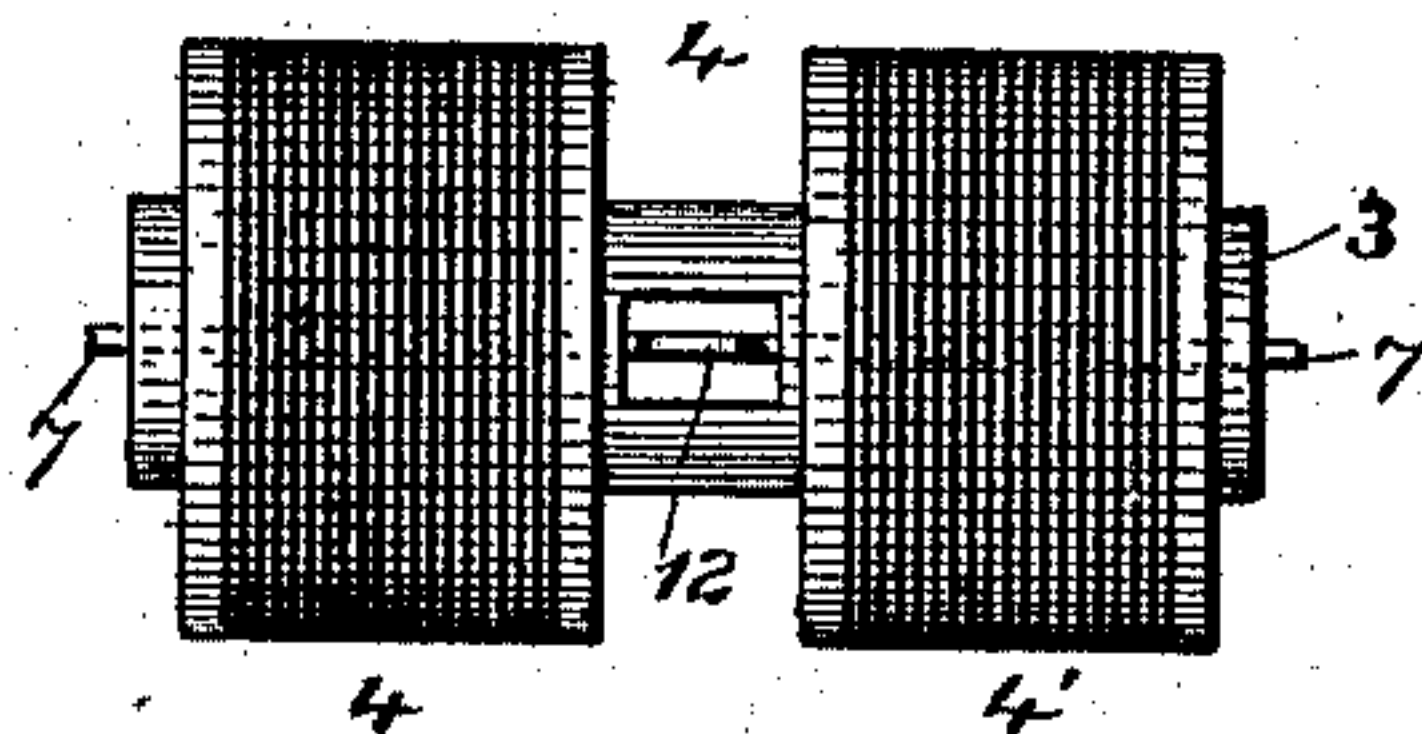


FIG. II.



ATTEST.

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UNITED STATES PATENT OFFICE.

WILLIAM A. WEST, OF BELLEFONTAINE, OHIO, ASSIGNOR OF TWO-THIRDS
TO W. H. WEST AND C. G. WEST, OF SAME PLACE.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 470,634, dated March 8, 1892.

Application filed November 12, 1883. Serial No. 111,593. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. WEST, of Bellefontaine, Ohio, have invented certain new and useful Improvements in Telephones, of which the following is a specification.

My invention consists of a reactionary reinforcing device which may be placed at an intermediate point on a telephone-circuit and serve to impart fresh strength to the electrical impulses originally transmitted, so that a much longer telephone-line can be successfully operated than has been heretofore possible. This device may also be used as a receiver or transmitter, and several features of its construction are also claimed in this application.

One specific form of the general invention herein claimed is shown and claimed in an application of mine filed July 25, 1883.

In the accompanying drawings, Figure I is a diagrammatic view of my apparatus used as a relay, with the main magnet shown in section. Fig. II is a plan view of the main magnet, and Fig. III shows the apparatus as a transmitter or receiver.

In the drawings, Fig. I, 4 is an electro-magnet having a longitudinally-perforated iron core 3. The coils of the electro-magnet are in two sections 4' and 4'', the latter being in the main-line circuit 5, which also passes through the secondary of induction-coil 6, while the former is in a local circuit, to be hereinafter described.

Within the hollow core 3 is a small needle or rod 7, of diamagnetic material, which at its central point is looped up into a delicate spring 12, a vertical slot being left in the iron core to receive it. Spring 12 may be fastened at the bend, if desired. Needle 7, with its spring 12, may be inserted by having the magnet-core made in halves or in any other way. At one end of the needle 7 there is rigidly fastened an armature-disk of soft iron 8, which is suspended by spring-arm 10, acting in opposition to spring 12. At the other end needle 7 rests against and forms a microphonic contact with a carbon button 12', which is faced with a perforated armature-disk 9 of soft iron and suspended by spring-arm 11, also acting in opposition to spring 12.

The core 3 is rendered normally magnetic by the local circuit, which goes from battery 13 to coil 4', to spring 10, to armature 8, needle 7, carbon button 12', spring 11, primary of induction-coil 6, and back to battery.

The operation of the device is accumulative or reactionary. Suppose a telephonic electrical impulse is transmitted over line 5, including coil 4'' and secondary of coil 6, of such a polarity as to coact with the current of the local battery in coil 4' and strengthen the magnetism of core 3 instantly armatures 8 and 9 are attracted still more, the microphonic pressure between needle 7 and button 12' increased, a stronger current passes over the local circuit, increasing still more the strength of coil 4', and by induction-coil 6 sending a fresh impulse to main line 5. This fresh impulse through coil 4'' adds yet another increment to the strength of core 3, which reacts on the microphonic contact and the strength of the local circuit and continues the accumulative process. If the primary impulse over the main line is of the opposite polarity, a corresponding reaction will be had.

The value of this instrument in long-distance telephony is apparent. It is well known that an electric current transmitted over a long line becomes gradually dissipated by leakage and retardation, so that a current of .04 ampères at one terminal station will be reduced to .01 ampères at the other terminal, or even, as in the case of telephonic currents with great electro-motive force and defective insulation, become practically lost.

By placing one of my relay-instruments at an intermediate point where the original current has not become too weak a fresh impulse is given to it, and it can be transmitted to the terminal station or another relay.

When used as a transmitter or receiver, a diaphragm 15, Fig. III, with a suitable mouth or ear piece, is placed so as to rest against armature 8, either directly or through the intervention of a metallic knob 16, which is a continuation of rod 7. As a transmitter it acts magnetically and electrically—magnetically by the effect of the vibrations of the iron diaphragm on the magnetic condition of core 3, which sets up induced currents in coil 4'' and the main line, and electrically by the

transmission of the diaphragm vibrations to the microphonic contact in the local circuit, which by coil 6 sets up currents in the main line also. Both of these actions are cumulative, as before set forth, for every variation in the current of main or local circuits reacts upon core 3 to intensify itself. As a receiver the varying current comes over the main line and through the coil 4". The effect of this current is accumulated upon core 3, as before described, as the result of which the varying attraction of the core for the diaphragm is intensified and the original current itself correspondingly strengthened. Although described as a series of steps, this accumulative action is practically instantaneous, and the effect is the same as if the intensified action was an original one.

It will readily be seen from the fact that any change in the magnetism of core 3 instantaneously reacts upon itself to intensify such change that any initial movement of diaphragm 15 is automatically increased by the increasing power of the core 3 acting at both ends on armatures 8 and 9 and that carbon button 12' is held more firmly to the magnet. Therefore, however great the amplitude of the vibrations of the diaphragm, due to loud speaking or other cause, the carbon button will never be thrown out of contact with needle 7 and no rattling or obscure sounds be transmitted.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. The combination of a continuous main line, transmitting and receiving instruments therein, and a reinforcing device consisting of a local circuit, means controlled by the main and local lines together for varying the current in the local circuit, and an induction-coil having its primary in the local and its secondary in the main circuit.

2. The combination of an iron core, magnetizing-coil surrounding the same, an armature at each end of the core, and a microphonic contact operated by the joint action of the two armatures.

3. The combination of an electro-magnet

and an induction-coil, the electro-magnet having two coils, one in the main and the other in the local circuit, and the induction-coil having its primary in the local and its secondary in the main circuit, with means operated by the electro-magnet for varying the current in the local circuit.

4. The combination of an electro-magnet having two coils and an induction-coil, one of the magnet-coils and secondary of said induction-coil being in the line-circuit, a local battery-circuit, including the primary of said induction-coil and the other magnet-coil, two armatures for the electro-magnet, and a microphonic contact in the local circuit controlled by the joint action of the armatures and the two circuits, as explained.

5. The combination of an electro-magnet, two armatures therefor, each pressed by opposing springs, and a microphonic contact controlled by said armatures.

6. The combination of an electro-magnet, an armature at each end thereof, a perforated core, and a diamagnetic needle passing through said core and rigidly connected to one armature while making a microphonic contact with the other armature.

7. The combination of perforated core 3, needle 7, and spring 12 with armatures, contacts, and circuits, as described.

8. The method, substantially as herein set forth, of reinforcing telephone-currents, which consists in varying the current in one or more local circuits arranged along the line by the initial line-currents and accumulating the variation by the increased local circuit, and causing said local currents to induce conspiring reinforcing-currents in the line.

9. The method, substantially as herein set forth, of reinforcing telephone-currents, which consists in varying the current in one or more local circuits by the initial line-circuit and causing said local currents to induce conspiring reinforcing-currents in the line.

W. A. WEST.

Witnesses:

E. M. BENTLEY,
H. E. KNIGHT.