(No Model.) 2 Sheets—Sheet 1.

# C. T. TOMKINS.

## Telephone Relay.

No. 238,459. Patented March 1, 1881.

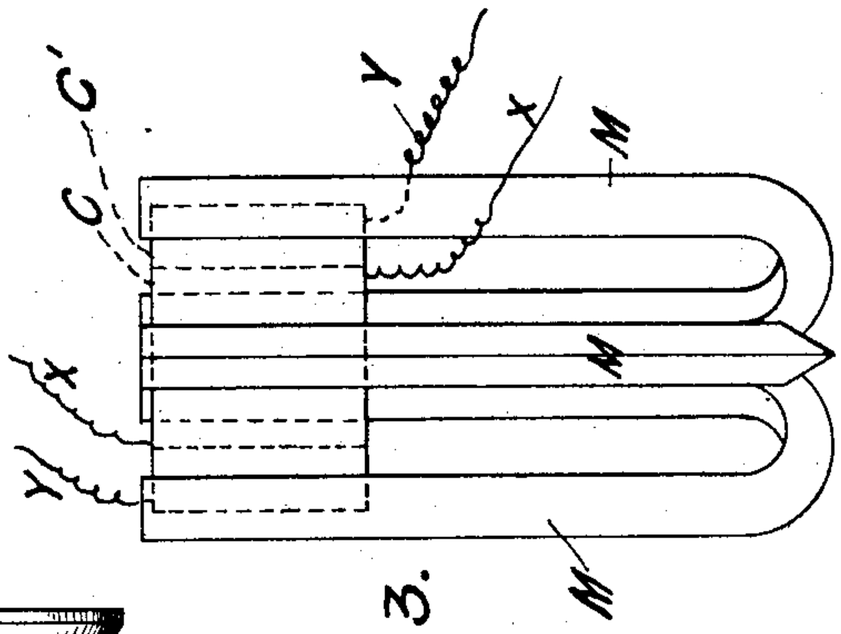


FIG. 3.

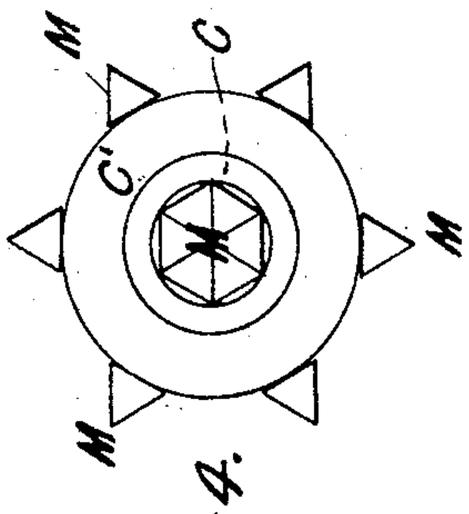


FIG. 4.

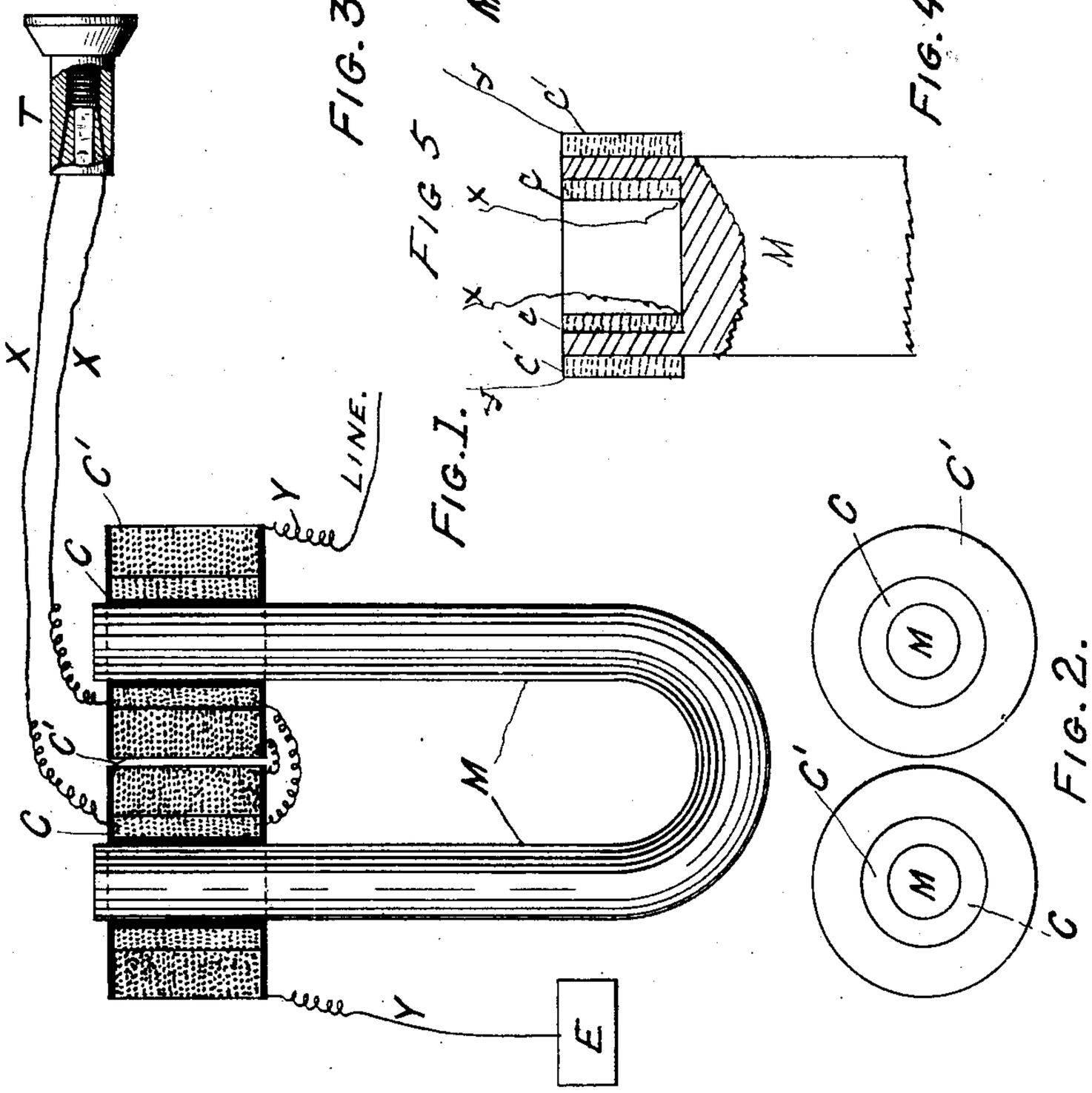


FIG. 1.




FIG 5




FIG. 2.

WITNESSES.

Amon Broadus

Wm. H. Broadus

INVENTOR.

Cornelius T. Tomkins

(No Model.) 2 Sheets—Sheet 2.

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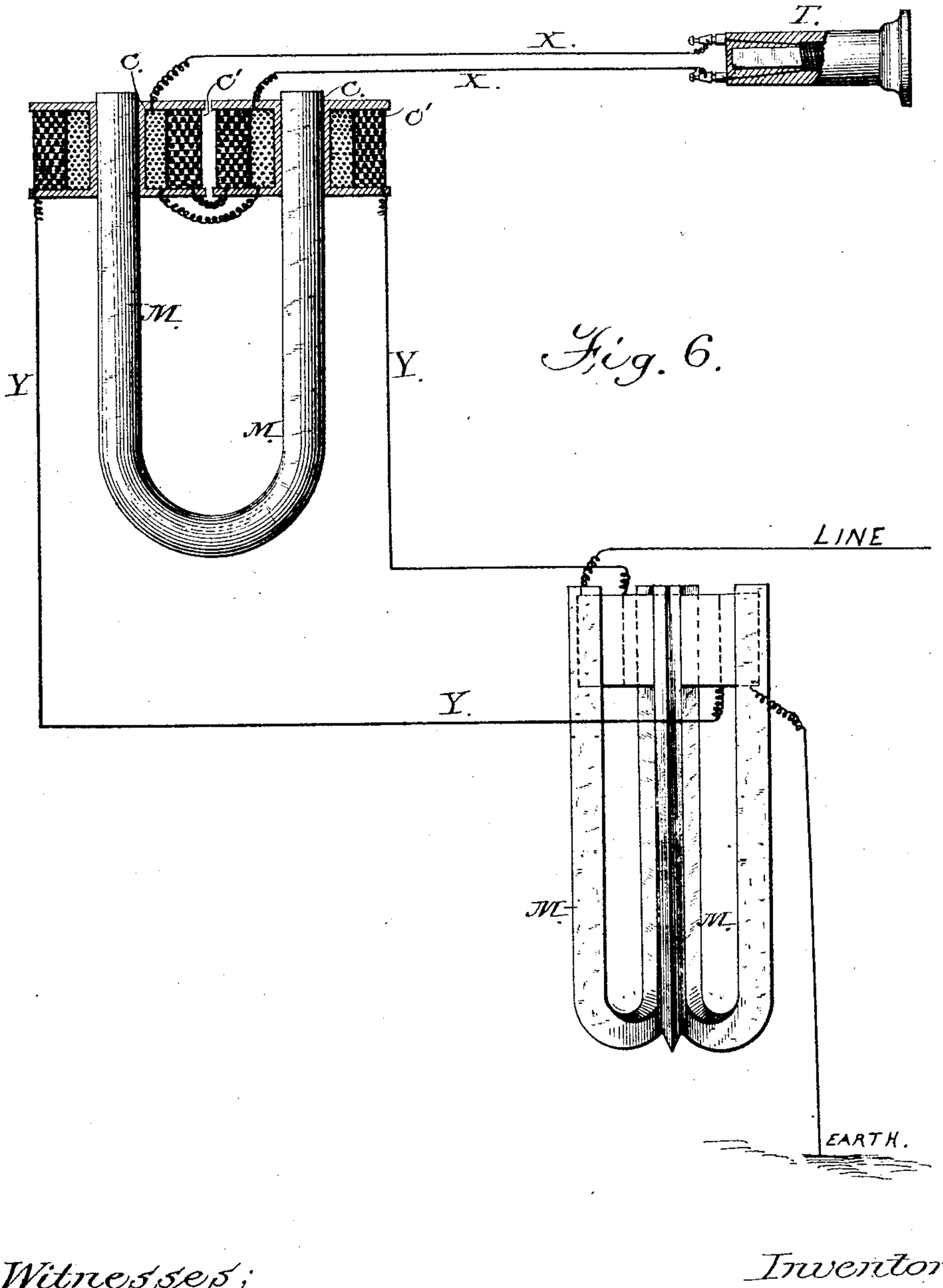


Fig. 6.

Witnesses;
J. Walter Fowler,
Jno. L. Condron.

Inventor;
C. T. Tomkins by
Munn & Co Attys.

# UNITED STATES PATENT OFFICE.

CORNELIUS T. TOMKINS, OF RED BANK, NEW JERSEY, ASSIGNOR TO EATON TELEPHONE COMPANY, OF BROOKLYN, NEW YORK.

## TELEPHONE-RELAY.

SPECIFICATION forming part of Letters Patent No. 238,459, dated March 1, 1881.

Application filed November 29, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, CORNELIUS T. TOMKINS, of Red Bank, county of Monmouth, and State of New Jersey, have invented a new and useful method of operating or working telephones, and certain devices to be used in connection with the said working of telephones for the purpose of continuing the transmission of telephonic sounds beyond the power of the instrument itself; and I do hereby declare the following to be a description of my said invention in such full, clear, exact, and concise terms as to enable any one skilled in the arts to which it appertains or with which it is most nearly connected to make and use the same, reference being had to the accompanying drawings, making part of this specification, and to the figures and letters of reference marked thereon.

By Figure 1 of said drawings is shown a side elevation of an ordinary U-magnet and a longitudinal section through a primary and secondary induction-coil fitted upon each pole of said magnet. Fig. 2 of said drawings is an end view of said magnet, looking upon the ends of its poles and the ends of the coils upon the poles. Fig. 3 of said drawings is an elevation of a multipolar magnet, upon the central pole of which are shown, in dotted lines, the primary and secondary induction-coils; and Fig. 4 of the drawings is an end view of said multipolar magnet, showing said double coils applied thereto. Fig. 5 of said drawings is a modified form of coil and magnet, hereinafter more fully explained. Fig. 6 shows two separate re-enforcing magnets introduced in the line and closed local circuits between the helix of the instrument and the primary coils of the first magnet, and between the secondary coils of the first magnet and the primary coils of the second magnet, the terminal ends of the secondary coil of the second magnet leading, one to the line and the other to the earth, as indicated.

It is well known that the transmission of articulate speech by telephone is limited to comparatively short distances, and this is more especially true of magneto-transmitters.

Now, I have discovered that the distance or resistance through which articulate speech can be transmitted can be greatly extended by placing, at given points in the line between the transmitting and receiving instruments, a supplemental transmitting power distinct from the instrument itself, consisting of a magnet having upon its pole or poles a double induction-coil, rightly connected electrically to the induction-coils of the transmitting and receiving instruments, respectively. Thus, for example, assume that we have a transmitter that will transmit articulate speech in full, distinct tones a distance of one mile only. Now, by properly connecting my invention to this same telephone at the mile station, it is made to transmit these same tones distinct and full a distance of two miles by a supplemental transmitting power brought into action by the telephone itself, but outside of itself. This transmitting power I call a "magneto-relay" for continuing the transmission of the electrical waves put in motion by the telephone. It is not an additional initial transmitting force, but a supplemental transmitting force to be brought into action at any given point in the line before the transmitted articulations become indistinct. The relay must, of course, be set near enough to the transmitter to take up the transmitted waves before they become indistinct, for it will not reproduce or increase the articulate sounds, but it will continue the transmission of the sound-waves almost indefinitely if brought into action while they are still distinct.

My invention is not, therefore, an improvement in telephones, but in "telephoning;" and it consists of means introduced in the line-wire for continuing the transmission of the sound-waves beyond the transmitting power of the instrument itself.

The drawings illustrate a practicable construction and application of the invention to the ordinary magneto-telephone; but it is apparent that its construction and application may be greatly varied and enlarged without departing from the spirit or substance of the invention.

Reference being had to the drawings, Fig. 1 represents an ordinary horseshoe-magnet, M, of considerable power, the poles of which are surrounded by helices of fine wire. Each helix

is divided into two parts—an internal coil or layer, C, and an external coil or layer, C′, making a primary and secondary coil on each pole of the magnet. The terminal points or poles *x x* of the inner or primary coil, C, are connected to the poles of the induction-coil of an ordinary magneto transmitting-telephone, T. The ends or poles *y y* of the outer or secondary coil are connected, one to the line-wire and the other with the ground E, or to a return-current wire, as may be desired. Now, when the telephone T is in action, the electrical sound waves or impulses are carried, by the induced current, through the inner or primary coil, C, of the auxiliary magnet, causing a disturbance of its magnetism, and inducing a strong current in the secondary coil C′, by which the transmission of the electrical sound-impulses are continued on the line-wire in connection with relay and the receiving-instrument. By these means a weak magneto-telephone is made to transmit distinctly through almost any resistance, the principle being somewhat analogous to the relay in telegraphing, a strong magneto-electric current in this case being generated by a weaker one, through the intervention of additional magnets and induction-coils, instead of an augmented electric current through the intervention of additional batteries, as in the case of telegraphing; but the principle, though analogous, is not exactly the same as the relay in telegraphing, for in the latter it is only necessary to increase the strength of the current to increase the energy of the sounder; but in the telephone the relay does not increase the loudness of the sounds, but only continues the transmission of the sound-waves in the strength they are received by it. Thus a loud voice spoken into a weak transmitter will be transmitted and reproduced loudly but a short distance; but if at the end of that distance this magneto-relay be placed, the transmission of the sound-wave will be continued, and the sound-waves reproduced as loudly and distinctly as received.

By Fig. 3 of the drawings is shown a modification of the invention, consisting of a strong multipolar magnet, having the primary and secondary coil, C and C′, on the central pole of the magnet, the poles *x x* of the primary coil being connected to the telephone, and the poles *y y* of the secondary coil, one to the line and the other to the return-current, as in the other case. The use of the multipolar magnet possesses a decided advantage over the horseshoe-magnet, for the obvious reason that the outer induction-coil, C′, is embraced by the outer poles of the magnet, both coils being set upon the central pole and embraced by all the outer ones completely within the field of the magnet.

In making the relay, a straight-bar magnet, either simple or compound, may of course be substituted for the U-magnet shown by the drawings, and the magnet may be electro instead of permanent. The magneto-telephone used in connection with these re-enforcing magnets and coils may have very little resistance in their induction-coils. I have used one having but nine ohms resistance, and yet found it to work well in connection with the auxiliary magnet and coils through one hundred and ninety thousand ohms of resistance. In fact, I have not yet found a limit as to the amount of resistance through which a telephone can be made to work in combination with these magneto-induction relays, which, of course, may be multiplied until the desired strength of current is reached.

The advantage of this invention is apparent. The ordinary magneto-telephone, now limited as to the distances through which it will work, becomes, by this invention, practically unlimited in the reach of its transmitting power.

By Fig. 5 of the drawings is shown a modified form of the magnet and coil, one of the coils in this case being placed in a hole or cavity made in the pole of the magnet, and the other around the outside of the pole, as shown.

In concluding this specification, I recognize, in the patent to Francesco Rossetti, December 7, 1880, No. 235,173, the state of the art as it bears upon my invention. In that patent a Ruhmkorff coil is used, having a primary helix of very low resistance, in combination with a magneto-telephone having a helix also of very low resistance. My invention differs from Rossetti's in that I use a permanent magnet having upon its pole or poles a double coil. Instead of a soft-iron core in combination with a double coil, as in Rossetti's case, I use a permanent magnet in combination with a double coil, thus introducing in the line an additional magnetic power.

What I claim as my invention is—

The means, substantially herein described, of re-enforcing and continuing the transmission of telephonic sounds or articulations through long distance or great resistance, consisting of one or more permanent magnets, having upon its or their pole or poles a double induction-coil, interposed at given points between the transmitting and receiving instruments, and having a closed metallic local circuit between the helix on the magnet of the telephone and the primary helix on the re-enforcing magnet, the terminal ends of the secondary coil being the line and earth circuit, substantially as described.

CORNELIUS T. TOMKINS.

Witnesses:

AMOS BROADNAX,

WM. H. BROADNAX.