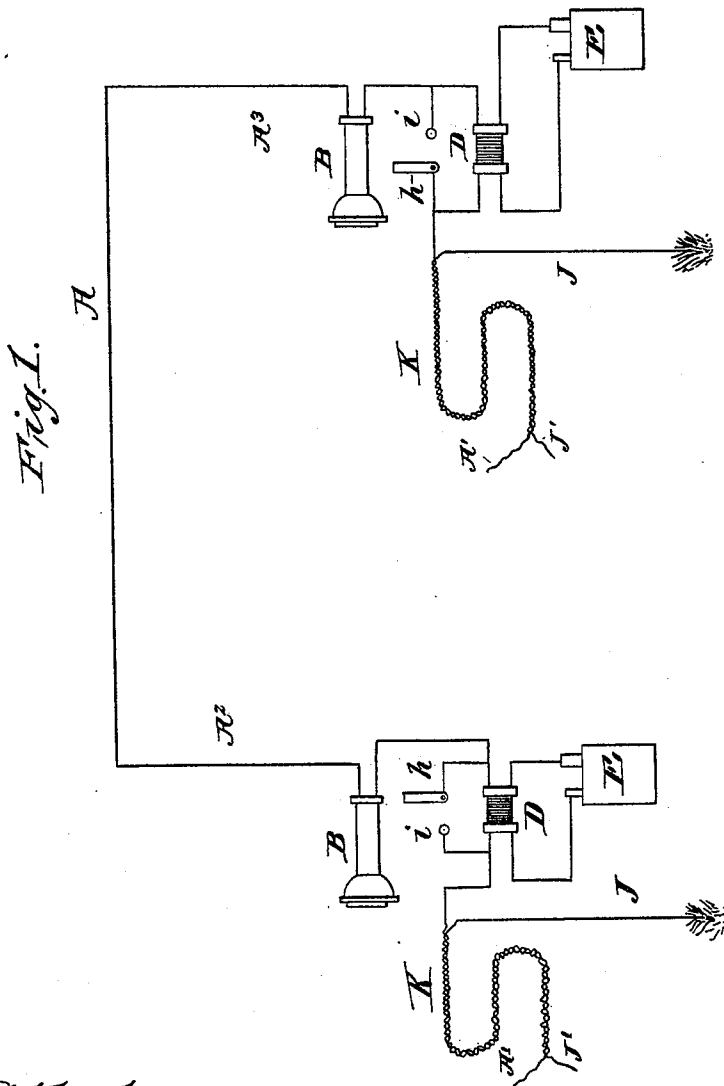


J. ABSTERDAM.  
TELEPHONY.

**No. 582,773.**

Patented May 18, 1897.



Attest:  
L. M. Benjamin.  
E. M. Skidwidge.

*Inventor,*  
*John Asterdam*

(No Model.)

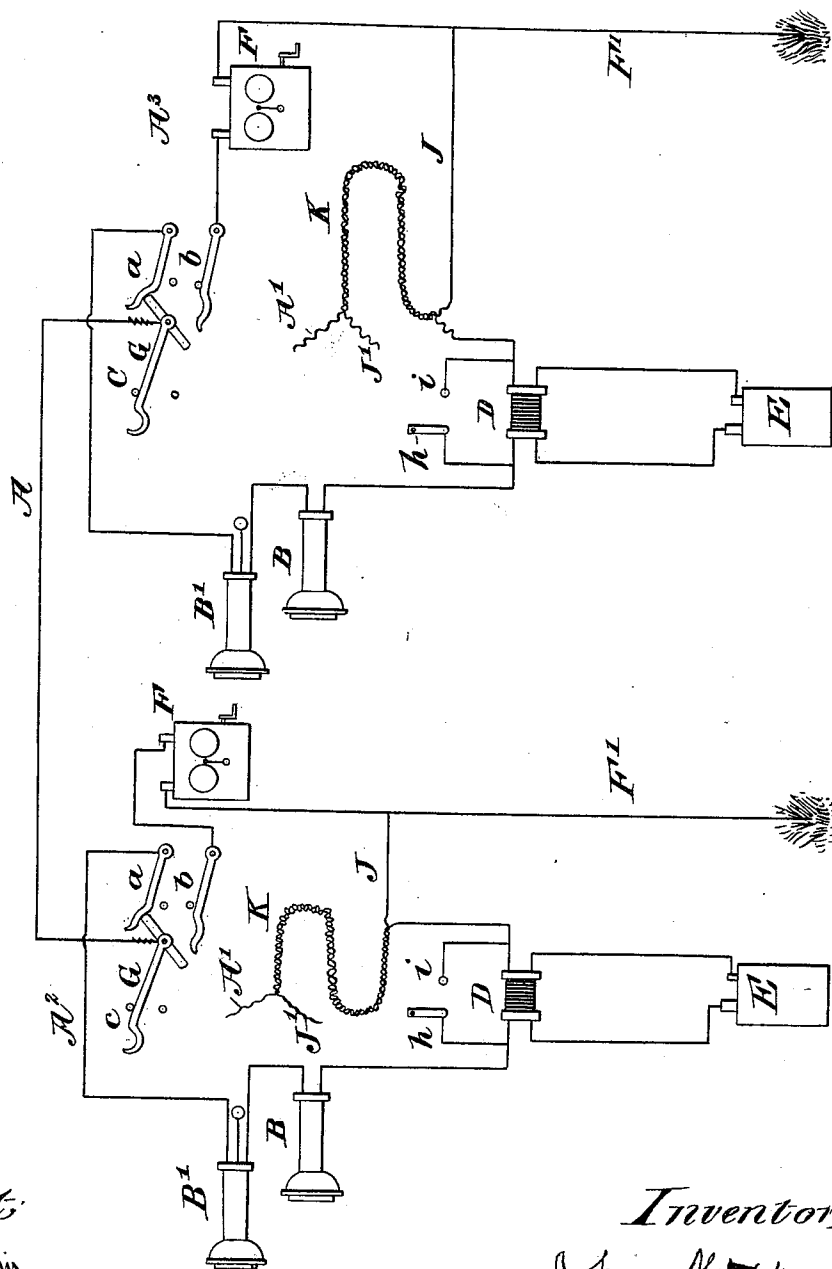
J. ABSTERDAM.  
TELEPHONY.

3 Sheets—Sheet 2.

No. 582,773.

Patented May 18, 1897.

*Fig. 2.*



*Attest;*  
*Wm. Benjamin*  
*S. M. Brown bridge.*

*Inventor;*  
*John Absterdam*

(No Model.)

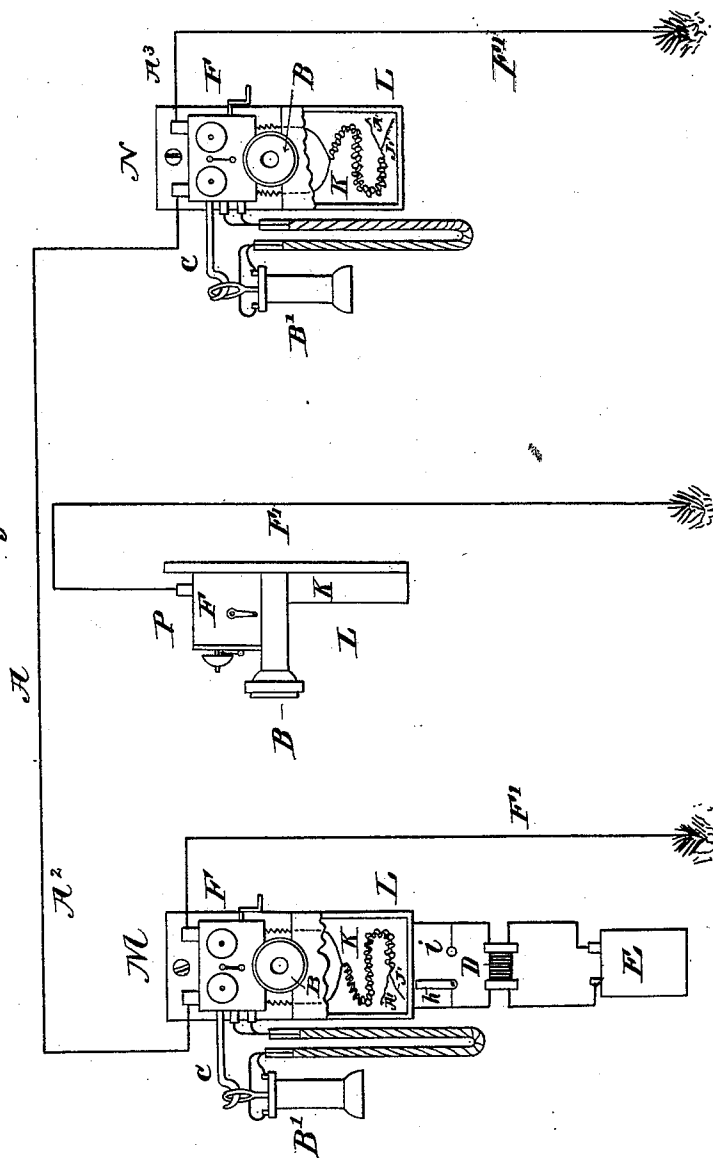
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J. ABSTERDAM.  
TELEPHONY.

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Patented May 18, 1897.

Fig. 3.



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Inventor,  
John Absterdam

# UNITED STATES PATENT OFFICE.

JOHN ABSTERDAM, OF NEW YORK, N. Y.

## TELEPHONY.

SPECIFICATION forming part of Letters Patent No. 582,773, dated May 18, 1897.

Application filed May 27, 1892. Serial No. 434,589. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ABSTERDAM, scientific and mechanical engineer, residing at New York, county of New York, and State of New York, have invented a new and useful Improvement in the Method of and Apparatus for the Transmission of Articulate Speech and other Sounds, of which the following is a specification.

My invention consists in a new method of and apparatus for transmitting or communicating articulate speech.

Heretofore articulate speech has been electrically transmitted by means of a continuous current in a closed circuit—that is to say, by gradually changing the intensity of a continuous electric current so as to make it correspond exactly to the changes in the density of the air caused by the sound of the voice, and this either by alternately increasing and diminishing the resistance in the circuit or by alternately increasing and diminishing the power of the battery, the conditions being such that the circuit must be kept closed to be used successfully, and that if open it will fail to act for the time being.

In the above, the Bell system, the only one heretofore practiced of which I am aware, the maintenance of a complete or closed circuit is of prime importance. It is therefore customary to make use either of an all-metal circuit, including the telephone instrument, or of a continuous conductor grounded at its ends to complete the circuit.

In some cases it has been proposed for special reasons to introduce into the circuit one or more condensers, through which the current was transmitted, the current remaining, however, a closed circuit—that is to say, a circuit through which a current from a battery or other generator could be transmitted and in which telegraphic instruments and other signaling instruments could be operated.

In all telephonic systems as heretofore employed serious difficulties and disturbances have arisen whenever the telephonic conductor was situated in proximity to telegraph line-wires or other electric line-wires by reason of the induced or dynamic currents set up thereby in the telephone-circuit.

In another application for patent filed by

me February 18, 1891, Serial No. 381,927, I have described an electrical system of transmission in which an open-line circuit is employed for the purpose of eliminating the disturbances arising by induction from neighboring lines and rendering the transmission of speech clear and distinct.

My present invention has in view a method of transmission involving the use of such an open line, but in combination with means for transmitting the speech “magnetically,” as I term it.

My invention consists, essentially, in maintaining a magnetic field in suitable inductive relation to the line, setting up on said line, independently of the means used for maintaining the field, magnetic variations corresponding to speech, and causing the said variations to be modified or reinforced by the reaction between the line and the said maintained field.

The inductive relation of the line to the means for maintaining such field may be conveniently established by what is known as an “induction-coil,” one coil of which, corresponding to the primary and preferably of low resistance, is in circuit with a battery or other means for maintaining a substantially constant flow of electric current without a battery-transmitter, while the other, corresponding to the secondary, is in the line circuit or connection upon which the magnetic variations corresponding to the speech are imposed by some means independent of the local circuit. Other means might be employed for establishing such magnetic field and keeping the main line in inductive relation thereto.

I find by actual experiment that when the speech variations are originated on said line at some other point, then the magnetic reaction between the line thus charged and the field maintained by the battery produce some modification or reinforcement of the speech variations, which result in the transmission of the speech with greater distinctness and power. I am not able to explain the exact way in which this distinctness and increased power are produced through the magnetic inductive relation of the line to the field. There is, however, a reaction between the two, which secures the result stated.

My invention consists, further, in particular combinations and features of invention more particularly recited in the claims.

In the accompanying drawings, Figure 1 is a diagram illustrating in its most simple form means for carrying my method into effect. Fig. 2 is a similar view showing the line equipped not only with the telephonic instruments, but also with signaling-bells, switches, and other appliances such as are demanded for commercial purposes. Fig. 3 is a similar diagram showing the line equipped with the same telephoning instruments, signaling-bells, switches, and other appliances shown in Fig. 2, with the difference that the line-switch is contained in the magneto-box, the speaking-telephone is fixed stationary adjacent to the magneto-box, and the coiled wire cord formed by the ends of the main line and the ground wire is inclosed in a box located adjacent to the speaking-telephone.

In Fig. 1, A represents a single conductor or line-wire extending from a telephone-station A<sup>2</sup> to a second telephone-station A<sup>3</sup> and including at each end a telephonic instrument B. At each station there is an induction-coil D and a local battery E, the poles of which are connected in circuit with the primary wire of the adjacent induction-coil, so that the battery-current flows continuously and uniformly through the primary wire of the induction-coil.

At each station the secondary wire of the induction-coil is connected into the main line A. The respective ends A' of the main line A instead of being grounded or otherwise connected are terminated at each station adjacent to a wire J, one end of which is grounded. The ends of the wires A' and J' may be twisted together into a cord K and are insulated or separated from each other, thus leaving the line A open at both ends, as shown at A' A', so that it is impossible to pass a current directly over the line or to operate telegraph instruments, bells, or analogous instruments thereon.

I prefer to extend the cord formed by the wires A' and J' into a coil of a considerable length, taking care at all times to maintain a perfect separation or insulation between them, so that they shall not form in any sense or possess any of the peculiarities of condensers.

In practice I find that although the line may be open at both ends, as above described, and although there may be no battery-current upon the line and no interruption or pulsation of the primary current through the induction-coils, as is generally believed to be necessary to set up secondary or induced currents in the line, nevertheless there exist in the line conditions such that articulate speech or other sounds uttered at a telephone at either station will be heard and understood in the receiving-telephone at the other station.

As will be seen, the general arrangement of apparatus somewhat resembles that of an or-

dinary telephone-line in that an induction-coil, local battery, and telephone receiver or transmitter are used, but differs radically therefrom in that the local battery is not used to set up the speech vibrations or variations, but the local current is allowed to flow without interference from any transmitting devices upon the local circuit which maintains the magnetic field in inductive proximity to the line, while the magnetic variations corresponding to speech are originated at some other portions of the circuits or apparatus independently of said local.

It will also be seen that in my invention no battery-transmitter whatever is employed, although the local circuit corresponding to that heretofore employed with battery-transmitters is used.

The apparatus represented in Fig. 2 is of the same general character and operates on the same principles as that above described, differing therefrom only in the inclusion of the bells, switches, and other devices through which signals are transmitted over the line in order to call the attention of the operator.

A represents the main line, consisting, as in the first example, of a continuous line-wire extending from one station to the other and terminating at each station adjacent to a conductor J, extending to ground, the separation or insulation of the conductors J' and A' being maintained, as in the first instance, in such a manner that it is impossible to work through the line with a continuous current. The said ends J' and A' may be twisted together into a cord.

B B' represent, respectively, transmitting and receiving telephones of ordinary construction included in the main line.

D D represent two induction-coils located at the respective stations, and each having its secondary wire included in the line A.

E E are batteries located at the said stations and connected in circuit with the primary wires of the respective induction-coils.

F F are ordinary magneto signal-bells located at the respective stations and provided with the usual manual operating devices. Each of these bells communicates constantly with the earth through a conductor F'. On the opposite side it communicates with a lever-switch G, through which it may be connected with the main line through connecting-spring b when it is required to signal thereover from either end to direct the attention of persons at the opposite end before the telephoning commences.

The switches G stand normally open, so that the signaling connections are all wholly disconnected from the line during the transmission of speech. When the switches G are open, the main line A extends through the connecting-spring a to its open terminal ends A' A'. The switches G are provided with the usual hooked arm c, on which to suspend the telephone-receiver, whereby the arm is depressed and the connecting-spring a thrown

out of contact, while the spring *b* is thrown into contact, thus connecting the line *A* to the ground through the magneto-signal devices and cutting the telephone instruments entirely out of the line for the time being, as proposed in ordinary telephone instruments of the present day.

When the telephones are in the line, speech uttered into the transmitter *B* at either station will be heard in the receiver *B'* at the other station, and this although, as in the first instance, the line *A* is open at both ends, as shown at *A' J'*, and although there is no interruption or variation of the battery-current flowing through the primary wires of the induction-coils.

It will be observed that in my system there is no transmitting telephone or microphone in the primary circuit, that consequently no changes of intensity take place in the currents flowing in said primary circuits, and that consequently I make use of a battery-current in its natural state, that is to say, in the condition in which it flows from the battery, and without subjecting the same either to interruption or to the effect of variable resistance. The location of the induction-coils and local batteries may be varied at will, and they may be placed at any desired distance from the transmitting and receiving telephones.

When it is desired to cut out the induction-coils from the main line, I close the switch *h* on the contact-point *i*, and in some cases the induction-coils and local batteries may be entirely omitted.

The apparatus represented in Fig. 3 is of the same general character and operates on the same principles as that shown and described in Fig. 2, differing therefrom only in the inclosing of the telephone-switches into the magneto bell-ringers and fixing the speaking-telephones stationary, while the receiving-telephones are fixed to the magnetos with the usual conducting flexible cords and connected to the line-switches therein, the wire cords *K* being inclosed into a box adjacent to the said magnetos. *A* represents the main line, consisting, as in the first and second examples, of a continuous line-wire extending from one station to the other and terminating at each station into a cord twisted with the wire *J*, one end of which is grounded and the coiled cord *K* is inclosed in a box *L*. *B B'* represent, respectively, the transmitting and receiving telephones included in the main line, as in Fig. 2. The receiving-telephones are hanging on the hooked arms *c*, pressing the same down, which closes the switches *G* with the signaling-circuit, and the telephones are cut out from the line. *M* represents one of the telephone apparatus with the induction-coil *D* and local battery *E* all complete for practical operation. *N* represents the other telephone apparatus all complete for operation, with the induction-coil and local battery

omitted. *P* represents a side view of the telephone apparatus complete minus the said local battery and induction-coil, *B* representing the fixed speaking-telephone beneath the magneto *F*, *L* representing the box containing the wire cord *K*, the receiving-telephone *B'* not being shown, as it is contained on the other side of the telephone apparatus. In this figure the wire *J* is connected to ground in the same manner as shown in Fig. 2, with the exception that instead of having one of its ends connected to the ground-wire *F'* outside of the magneto *F* it is connected to said ground-wire through the switching devices inside of the said magneto in such a way that when the receiving-telephones *B'* are hanging on their respective hook-levers *c* the signaling-line circuit is established and the telephones are cut out from the line, and when the receiving-telephones are taken off from said hooked arms the telephones are connected to line through said switch *G*, as shown and described in Fig. 2.

When the telephones are in the line, speech uttered into the stationary telephone *B* at either station will be heard and understood in the telephone *B'* at the other station, and this although, as in Fig. 2, the line *A* is "dead open" at both ends.

Having thus described my invention, what I claim is—

1. As a means of transmitting articulate speech, an open main line subjected to the magnetic influence produced by a constant current in a local line or circuit, and means independent of the local circuit for transmitting speech by originating variations of magnetic condition corresponding to speech, as and for the purpose described.

2. In a magnetic-telephone system, a permanently open main line containing the telephone, in combination with an induction-coil whose secondary wire is included in the main line, and whose primary wire is included in a local battery-circuit with a constant and unchanging current therein.

3. In a magnetic-telephone system, a main-line wire whose ends terminate adjacent to but are insulated from the ground-wires, telephones located in said main line, an induction-coil having its secondary wire located in the main line, and a closed local circuit of substantially constant resistance including a battery and the primary wire of the induction-coil.

4. In a magnetic-telephone system, a continuous main line open at its ends, the telephone instruments located therein, a closed local circuit of unvarying resistance including a battery, and an induction-coil acting magnetically on the main line, ground-lines having their terminals located adjacent to, but insulated from, the terminals of the main line, ground-wires each provided with a signal mechanism, and switches through which the ends of the main line may be disconnected

from the telephones, and connected with the ground-line for signaling purposes, substantially as shown and described.

5     5. In a magnetic-telephone system, the combination with the open line, of means for transmitting speech magnetically, and means for maintaining a magnetic field in suitable magnetic relation to the line, whereby the variations corresponding to speech may be modified or reinforced by the reaction between the  
10 line and field.

6. The improved means for transmitting speech magnetically, comprising an open line, means for setting up magnetic variations corresponding to speech on a wire or circuit, and  
15 means for modifying or reinforcing said variations by the reaction between the line and a magnetic field maintained by a substantially

constant electric current from a suitable source.

20     7. In a telephone apparatus, the combination, substantially as described, of a battery or other generator of electricity in constantly-closed circuit with constant resistance with the primary of an induction-coil, a main line  
25 for the secondary of said coil, and a magnetotransmitter in said secondary as a means of transmitting speech.

In testimony whereof I hereunto set my hand, this 26th day of May, 1892, in the presence of two attesting witnesses.

JOHN ABSTERDAM.

Witnesses:

CHARLES W. BENJAMIN,  
EDITH M. STROWBRIDGE.