(No Model.)

W. MARSHALL.

DUPLEX TELEPHONY.

No. 505,628. Patented Sept. 26, 1893.

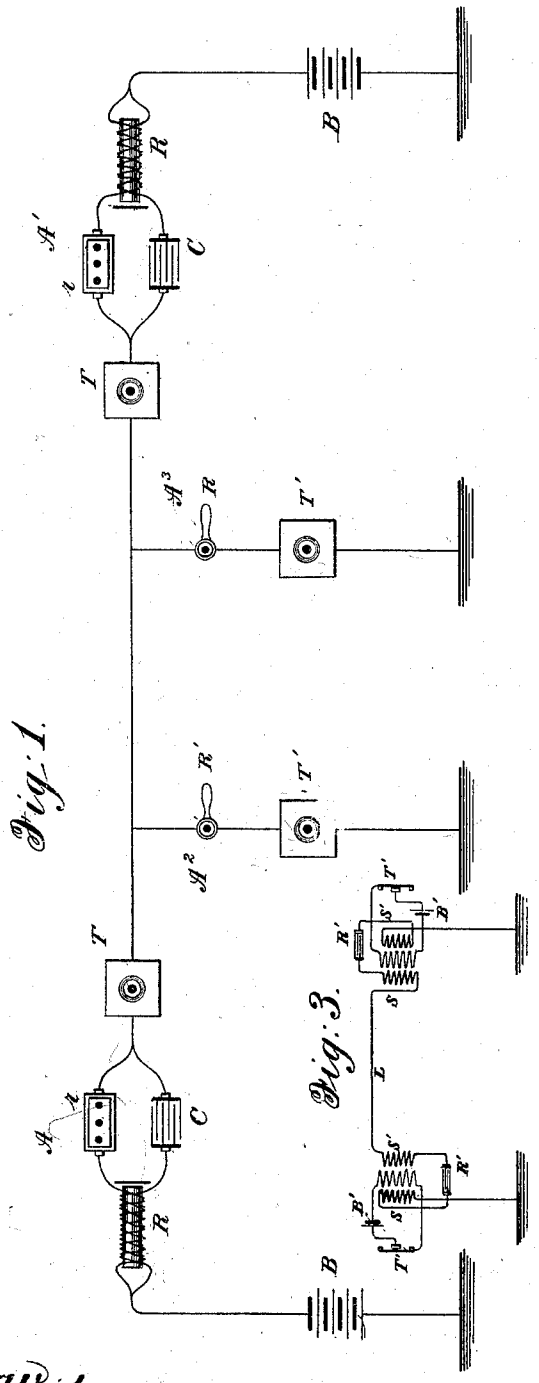

Fig. 1.

Fig. 3.

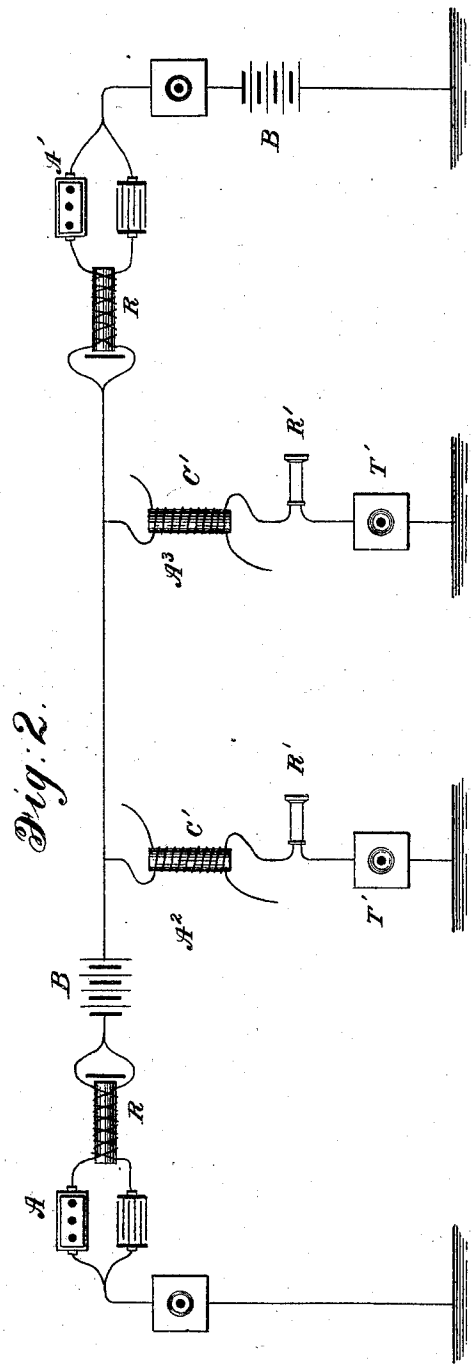

Fig. 2.

Witnesses.
John F. Nelson.
Elizabeth A. Stockbridge

Inventor
William Marshall
by G. N. Stockbridge
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM MARSHALL, OF NEW YORK, N. Y.

DUPLEX TELEPHONY.

SPECIFICATION forming part of Letters Patent No. 505,628, dated September 26, 1893.

Application filed February 28, 1892. Renewed July 8, 1892. Serial No. 439,418. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MARSHALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Duplex Telephony; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to provide a system of intercommunication by electricity in which articulate speech or telegraphic messages may be transmitted by a direct current, simultaneously with the transmission of speech, over the same wire by means of an induced current, the two kinds of transmission being independent of each other, and not interfering with each other.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 represents a line equipped with instruments necessary for carrying out my invention, with terminal and intermediate stations; Fig. 2 represents a similar line equipped with slightly different instruments; and Fig. 3 illustrates the connections at the intermediate stations.

Referring to Fig. 1, A A′ are two terminal stations of a line designed to carry telephonic communications; and A^2, A^3 are two intermediate stations on the same line. At the terminal station A is a battery B one pole of which is grounded. The other pole is connected to line through a receiver R, and a transmitter T. The line is branched before reaching the receiver, and one branch is wound around the core of the receiver in one direction, and the other branch is oppositely wound around the same core. Beyond the receiver one branch passes through a resistance coil or box *r* while the other is connected with the terminals of a condenser C. The two branches unite beyond the condenser on the one side, and the resistance box on the other. The transmitter T is an ordinary carbon transmitter, but the line is connected directly to its terminals, the usual induction coil being dispensed with. In this way the terminal station instruments operate by means of a direct or primary current. The instruments at the other terminal station, A′, are identical with those just described, and it is evident that operators at these two stations can communicate with each other in the ordinary way by means of their transmitters and receivers. In other words, the operation of the transmitter T, say at the station A, will affect the coil of the receiver R at the station A′, or that part of the coil which is connected through the resistance box *r*. The other part of the coil which is connected through the condenser C will be practically cut out and will remain unaffected by the direct current on line. At the intermediate station A^2, I employ a transmitter T′, connected to earth, and a receiver R′ which instruments are respectively similar to the transmitter and receiver described in detail in my patent of September 21, 1886, No. 349,312. The receiver is a condenser receiver with alternate layers of tin foil and some thin insulating material, such as paper. Every other sheet of tin foil is connected to the same pole or terminal of the receiver, while the remaining sheets of tin foil are connected to the opposite pole. This instrument makes an excellent receiver which in practice is equal to the best. It also serves in place of a condenser which by its alternate changes of static condition when the transmitter T′ is operated, will affect the receiver at A^3 without disturbing or communicating with either of the terminal stations.

The connections at the terminal stations are illustrated in Fig. 3. It will be seen that the transmitter has two secondaries one of which is joined to line and to one pole of the condenser receiver and the other of which is joined to ground and the other pole of the receiver. The principle upon which this system operates is, that the direct current flows at the terminal stations through the branch containing the resistance and thus operates the receiver while the induced current flows equally through both branches without affecting the receiver.

In Fig. 2 the direct current circuit is equipped with the same instruments as are shown in Fig. 1. The induced current circuit at the intermediate stations is equipped with magneto receivers of the Bell type. At C′ is represented a double coil having two wires

wound around a magnetic core with their opposite ends free. The wires are connected, one to the main line and the other to the magneto receiver and through the telephone transmitter to ground. In other words, the instrument C′ is a double coil which is open at opposite ends and forms a sort of condenser in the circuit. The transmitter T′ may be of any of the well known types.

I prefer the instrument C′ (especially when Morse signals are being sent in the direct current circuit) to the condensers which are ordinarily employed. With the condenser, the telephone is liable to repeat the signals at the sending station, owing to the charge and discharge of the condenser in the induced current circuit. But when the coil C′ is used, there is no interference whatever.

I have shown in both figures of the drawings telephonic apparatus at the terminal stations, but it should be understood that I may use any apparatus at those stations capable of being actuated by a direct current. The number of the stations may be increased according to circumstances.

Having now described my invention, I claim—

1. In a system of electrical transmission, a receiving telephone having two helices oppositely wound, the two helices being in separate branches of the main circuit and one of the said branches containing a condenser, as and for the purpose set forth.

2. In a system of electrical transmission a receiving telephone having two helices oppositely wound, the two helices being in separate branches of the main circuit, and one of the said branches containing a condenser and the other an artificial resistance, as and for the purpose set forth.

3. In a system of electrical transmission, a series of stations two or more of which are provided with ordinary transmitting telephones without induction coils, and with differentially wound receivers one winding of which contains a condenser and the other an artificial resistance; and other two or more of which stations are each provided with a transmitter and a receiver and a condenser, the last two of which may or may not be the same apparatus, as and for the purpose set forth.

4. In a system of electrical transmission, a series of stations, two or more of which are provided with ordinary transmitting telephones without induction coils, and with differentially wound receivers, one winding of each containing a condenser and the other an artificial resistance; and the other two or more of which stations are each provided with a transmitter and a receiver and a double open coil wound around a magnetic core, as set forth.

In testimony whereof I have signed my name, in the presence of two witnesses, this 26th day of February, A. D. 1891.

WILLIAM MARSHALL.

Witnesses:
JAMES GREGORY,
JOHN E. ROSS.