E. BERLINER.

Telephone.

No. 199,141. Patented Jan. 15, 1878.

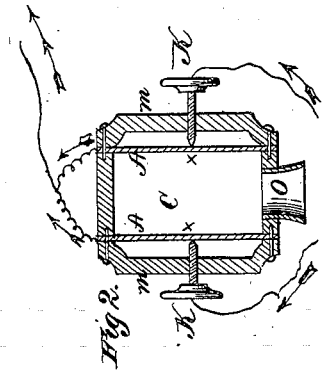

Fig 2.

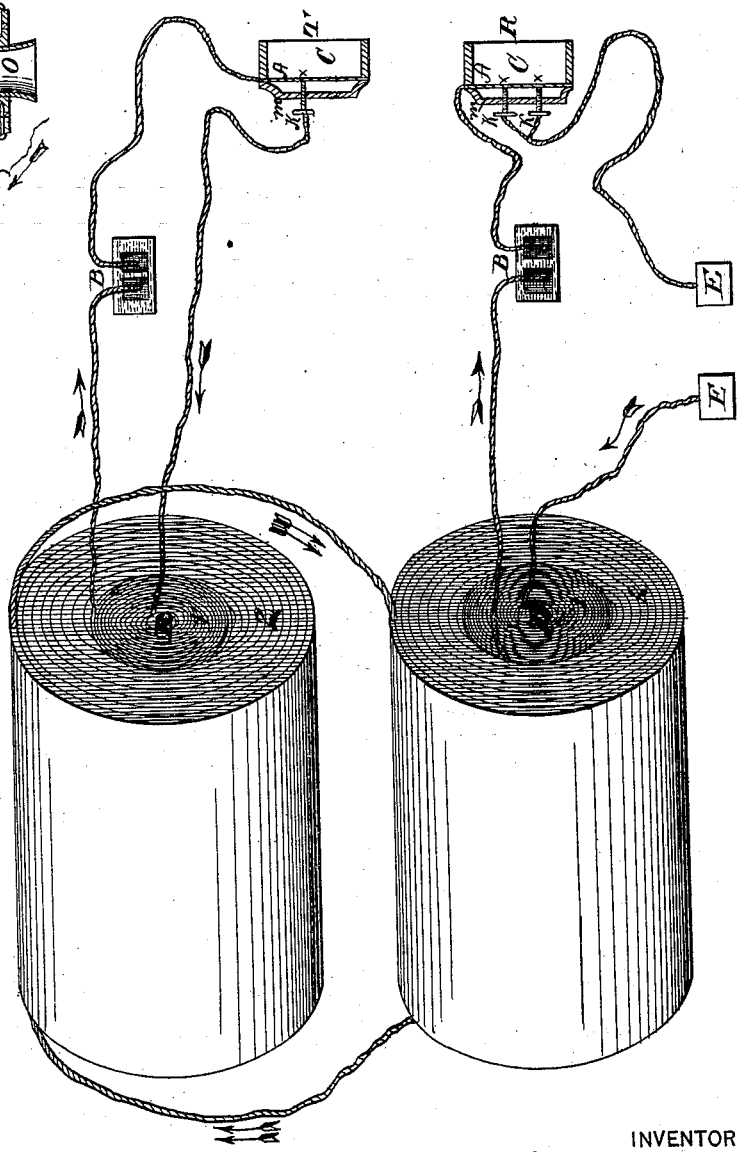

Fig 1.

WITNESSES

Franck L. Durand

C. L. Evert.

INVENTOR

Emile Berliner.

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN TELEPHONES.

Specification forming part of Letters Patent No. **199,141**, dated January 15, 1878; application filed October 16, 1877.

To all whom it may concern:

Be it known that I, EMILE BERLINER, of Washington, District of Columbia, have invented certain new and useful Improvements in Electrical Telephony, of which the following is a specification:

These improvements shall be applied, in such instances where it is necessary to increase the effect of an electric current on a telephone-receiver, by connecting the main line on which the transmitter is situated with a local-battery circuit on which the receiver is situated. They also refer to a certain multiplication of a former device of the telephone itself, as herein more fully specified.

In an application for Letters Patent made by me June 4, 1877, I have shown how sound may be transmitted and reproduced by means of a vibratory metal or carbon plate in contact with a metal or carbon pin. The transmission was made by either breaking the contact or by alternately weakening and strengthening the same at each vibration of sound affecting the plate. The reproduction of the sound was effected by permitting such a current thus consisting of electric waves to pass through a similar receiving-instrument, consisting also of a metal or carbon plate in a vibratory position in contact with a metal or carbon pin. As shown in the said application, each electric wave passing over the point of contact would cause a recoiling of the plate from the pin. Thereby an air-wave would be produced, and, as the electric waves would follow one after the other in exact accordance with the transmitting sound-waves, the air waves or vibrations produced by the receiving-instrument, occurring at the same rate and measure, would, therefore, reproduce the same tone that affected the transmitter. Since then I have found that when sound is transmitted by varying the intensity of the current without interrupting the same—namely, by merely weakening or strengthening the contact at each vibration, and thereby the current—the effect on the receiving-instrument is not very strong, and particularly at long distances the effect is but feeble, and requires some attention to be audible. I have therefore constructed an apparatus, together with a combination of currents, which will materially assist to remedy the deficiency mentioned—first, by having not one but several points of contact with one and the same plate, or a modification of such a device by which several contacts are affected simultaneously; and, secondly, by using a kind of telephonic relay or transfer in connection with a local-battery circuit. This is shown in the drawings, as follows:

In Drawing No. 1, R is a telephone, consisting of a metal or carbon plate, A, in contact with the metal or carbon pins or screws K K, and mounted on the box or tube C, while the screws are held in position by the insulating-bar *m*. T is a telephone-transmitter, consisting of a vibratory plate, A, in contact with the pin K. Each of these instruments is situated within a separate battery-circuit, and each circuit passes through the primary coil of one of the two induction apparatus 1 2 and 1 2, while the secondary currents or lines of both have been combined into one closed circuit, as shown by the double arrows. The consequence of this combination is not only that any changes of the intensity in one battery-circuit will produce a similar change in the other, but by this any sound affecting the instrument T will be reproduced by the instrument R, or vice versa, and if the two are separated by a distance which would materially weaken the strength of a galvanic current, the local battery will supply some of the lost force. This phenomenon is partly explained by the iron cores D D. These cores, being electro-magnetic, strive toward an equilibrium of their electro-magnetic force, and any change herein caused by a variation of the respective battery-current will cause a similar magnetic change in the other core, which change will again affect the other battery-current by induction.

This combination can be used with great advantage in submarine-cable telegraphy, or other kind where it is advisable to send messages by merely modifying the electrical condition of the cable or main line. For this purpose an inductorium is placed on each shore-station. One pole of either secondary coil is connected to the cable, while the other pole of the same circuit is grounded on its respective shore. The primary coil of each inductorium is connected at short circuit to a local battery,

which circuit passes through a telephone. By merely suddenly weakening, strengthening, or interrupting the primary current on one shore a metallic-sounding tick is heard from the telephone on the other side of the cable, and a tick again on restoring the circuit to its former condition. Using, therefore, a closed Morse key as interrupter or modifier of the primary current, common telegraphing can be carried on, which, being oral or audible, is much preferable to the present method of optic signs. The tick produced is not a reproduced sound, for sound was not transmitted, but is merely one air-wave, acccompanied by an internal vibration of the molecules of the plate caused by the action of one electric wave passing over the point of contact. A feature of this combination is also that, when letting the secondary circuit pass through a human body, no shock is felt when interrupting the primary of one inductorium, provided the two primary currents are of equal strength. If one, however, is stronger than the other, a shock is felt depending in strength upon the difference in strength of both primary currents.

In combination with this the number of contact-pins may be increased up to a certain extent, in order to multiply the effect this instrument shall produce.

In Figure II is shown a modification of the telephone, in which there is the box or tube C, closed by the two vibratory plates A A, in contact with the pins K K, both contacts becoming affected simultaneously by electrical waves passing over them. The effect is similar to that described in the telephones, Fig. I.

The combination of the three circuits may, of course, be applied to other kinds of telephones than those described herein, and is also subject to changes of form, place, or arrangement to each other, because there are many forms of induction apparatus on the same principle; and the main telegraph-line may be either one of the primary circuits or the secondary circuit common to both.

It is but natural that in certain cases it is preferable to use only one contact-pin in the same instrument, according to what effect shall be produced. I only mention echo-songs, when to heighten the effect, sometimes one and again several contacts may be employed.

I do not claim, broadly, the combination, in the telegraphic circuit, of two or more tympans, a resonant box, and one or more circuit-closers to each tympan, when such an arrangement is used for a transmitter of sound only; but

What I do claim is—

1. A telephonic receiving-instrument consisting of a vibratory plate of metal or carbon, forming one pole or end of a galvanic current, arranged in contact with several metal or carbon pins, which together form the opposite pole of the same current, for reproducing sound.

2. A telephonic receiving-instrument consisting of two metal or carbon plates in a vibratory position, each in contact with a metal or carbon pin, arranged in such a manner that both contacts are affected simultaneously by the same electric waves.

3. A combination of two induction apparatus with two separate battery-circuits, one of each passing through one of the primary coils, the secondaries of which are combined into one closed circuit with the iron cores, for the purpose described.

4. A mode of transforming waves of induced or tensional electricity into sound by permitting them to act by induction upon a continued galvanic current, which passes through a vibratory medium, forming one pole, and being in contact with the opposite one of the said same galvanic current.

5. The telephonic receiving-instrument situated within a continued galvanic circuit, in which undulations are produced by the inductive undulatory currents of another electric circuit.

EMILE BERLINER.

Witnesses:
C. L. EVERT,
FRANK GALT.