(No Model.)

T. A. EDISON.

TELEPHONE.

No. 272,034. Patented Feb. 13, 1883.

Fig. 1.

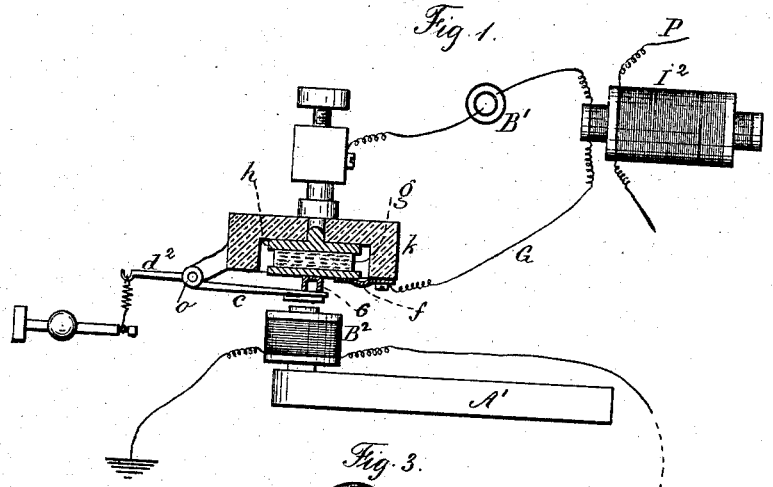
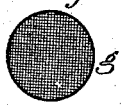


Fig. 3.



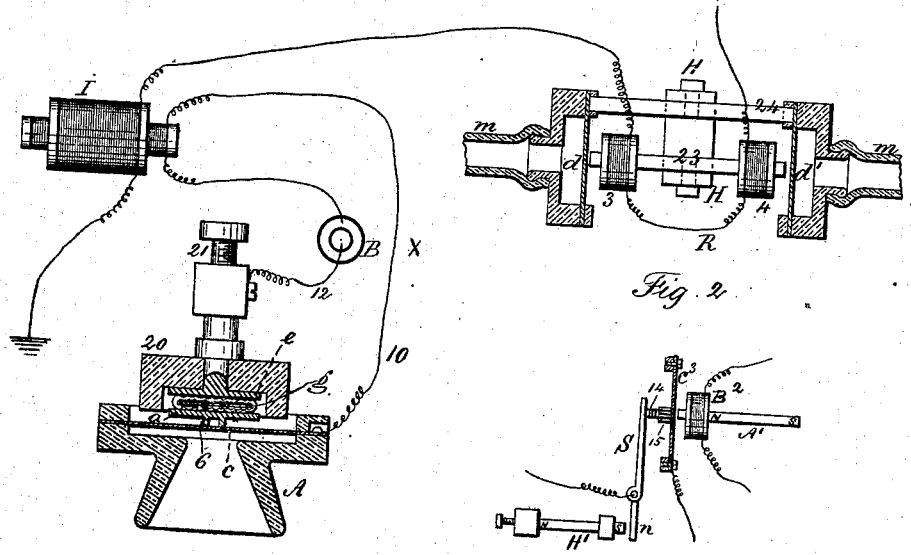


Fig. 2.

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 272,034, dated February 13, 1883.

Application filed October 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, have invented an Improvement in Telephones, of which the following is a specification.

This application is a division of my application filed November 18, 1878, No. 159, and said division is made for the purpose of separating from the said original application the different features of invention into three additional applications. The present I term "Case No. 159^{A}."

In my application No. 130, heretofore filed, the circuit passes through plumbago or similar material, and the diaphragm that is acted upon by the sound-waves serves to vary the electric tension by the extent of surface-contact.

In my case No. 151, patented April 30, 1878, No. 203,016, I have shown an induction-coil with primary and secondary circuits and receiving and transmitting telephones. A carbon button in a circuit, and acted upon by the diaphragm, is shown in my said case 151, and also in case 141. These are not therefore claimed herein.

In my present improvement I make use of a surface or surfaces having numerous points produced by scores or fine lines across the surface, preferably about at right angles to each other, and this surface or surfaces are in the electric circuit, and combined with the diaphragm, so that the movement given to the diaphragm by the sound-waves will produce greater or less intimacy of contact at the scored surface, and a consequent rise and fall of electric tension. I also combine with a button of carbon or equivalent material in one circuit an electro-magnet in another circuit, the armature of which varies the pressure upon such carbon or other finely-divided material, and by this means repeats the telephonic pulsations. I also construct the telephonic receiver in a peculiar manner to prevent injury by undue currents—such as from lightning—and so that the diaphragms and cores will be polarized by induction and the line-current will act in two helices to vary the magnetism.

In the drawings, the diagram Figure 1 represents the transmitting, receiving, and repeating instruments, the instruments at X being at one station, and the instruments at G being at the repeating-station. Fig. 2 is a detached view of a modification of the repeating-instrument, and Fig. 3 is a face view of the tension-regulator formed by a surface scored with numerous lines.

The telephonic transmitter A is made with a case containing the diaphragm or plate *c*, against which the sound acts to vibrate the same. The plate *e* is in the bottom of a vulcanite cup or holder, 20, and can be adjusted nearer to or farther from the diaphragm *c* by the screw 21. The tension-regulating device *g* is between the plate *e* and the second plate, *a*, the wires 10 and 12 of the circuit to the battery B connecting, so that the circuit passes through these plates and the intervening tension-regulator. The tension-regulating device is composed of two contiguous surfaces, one or both of which is scored with numerous fine lines, so as to produce a great number of contact-points. By adjusting the screw 21 the initial pressure can be regulated, and the vibrations of the diaphragm, due to the action of sounds, will vary the pressure and the extent of surface-contact, so as to produce rise and fall of tension in the circuit, by bringing more or less of the points on the surface or surfaces into contact. In Fig. 3 I have shown the surface scored as aforesaid, and it is to be understood that the scoring is to be of the requisite fineness, preferably several thousand to the inch.

In the instrument A, Fig. 1, the tension-regulator is composed of a strip of platina scored by lines of ruling at right angles, and folded with a piece of felt, rubber, or similar material within the fold, and the scored surfaces in contact with the plates *a* and *e*, respectively. Several layers of foil, ruled as aforesaid, may be placed together, if desired, to obtain great resistance and variation in the electric tension of the circuit. The foil, ruled as aforesaid, is believed to operate in the circuit in a similar manner to a carbon button. Between the diaphragm *c* and plate *a* there is a short section of a tube, 6, to form a central bearing.

The inductorium I has its primary included in the circuit to the battery B and tension-regulator, and its secondary to the line and ground.

The receiving-telephone R is placed in the line-circuit passing through the secondary of the inductorium, so that it is always in posi-

tion to receive a message sent over the line without the change of any switches or connections.

At the receiving-instrument R there is a permanent magnet, H, and upon one pole there is a bar, 23, forming at its ends the cores for the helices 3 and 4, that are in the line-circuit, and upon the other pole of the magnet H there is a bar, 24, that is connected at its ends to the diaphragms *d d'*. These diaphragms hence are polarized by induction, and are of one polarity—say south—while the cores of 3 and 4 are polarized north by induction. Flexible tubes *m*, with ear-pieces, are connected to the chambers or cases holding the diaphragms *d d'*, so that the sound is conveyed to the ears.

This apparatus is not liable to become demagnetized, because any current which passes through the helices 3 and 4 acts to increase the induced magnetism at one end of the bar 23 in proportion as it tends to decrease the induced magnetism in the other end. Thus there will be no tendency to injure the permanent magnet H; but the telephonic current will cause the diaphragms to respond by the change of magnetism in the cores adjacent to the diaphragms.

The repeating-instrument at the station G contains an electro-magnet, B^2, the helix of which is in the main-line circuit. Its core is adjacent to an iron plate or armature, and the variation of the magnetism resulting from rise and fall of electric tension in the main line increases and decreases the pressure upon a button of carbon, *g*, or similar material forming the tension-regulator in a second electric circuit. I have shown the local circuit from the battery B' as passing to the plate *f* at one side of the circuit regulator *g*, and to the adjusting device of the plate *h* at the other side of the carbon or similar material, and in this local circuit is the primary of the inductorium I^2, the secondary of which is in the line P to the distant receiving-instrument.

I prefer to connect the core of the electro-magnet B^2 to one pole of the permanent magnet A', so that it may be polarized by induction, and hence the line-circuit will increase or decrease the magnetism of the core of B^2. The armature-plate of the magnet B^2 is shown upon a lever, *c*, having a fulcrum at *o*, and the spring at d^2, which should be adjustable, serves to apply an initial pressure to the tension-regulator *g*, and I prefer to use a short cylinder, 6, between the armature-plate and the disk *f* to insure a central bearing on the tension-regulator. When an electric wave from the distant station varies the power of the magnet B^2, the pressure upon the tension-regulator *g* is decreased or increased, and the primary current from B' acts in the inductorium to translate or reproduce on the second line, P, currents corresponding or proportionate to those sent from the instrument A.

The instrument shown in Fig. 2 is a very delicate translator, acting similarly to that in Fig. 1. The electro-magnet B^2 has a helix in the line-circuit, as before, and A' is its polarized core. C^3 is a diaphragm, and S is a lever, the short end *n* of which is attracted by an adjustable magnet, H'. Between the lever S and diaphragm C^3 there are the pieces 14 and 15 of carbon or other finely-divided material, that act as a tension-regulator for the translating or repeating circuit that passes through the lever S and diaphragm C^3. Hence the rise and fall of electric tension in the repeating-circuit will result from the vibrations of the diaphragm, producing more or less pressure and intimacy of contact in the tension-regulator at 14 15, the initial pressure being determined by the proximity of the magnet H' to the lever S.

It will be observed that in my telephone-instruments I provide an electric tension-regulator having an extended surface, in contradistinction to a point or small bearing, such as shown in my application No. 141, and instead of the electric tension-regulator coming directly into contact with the diaphragm, as in my application No. 130, I combine with the electric tension-regulating device an intermediate bearing, having a small contact with the diaphragm and the required extent of surface against the tension-regulator. This bearing is non-elastic, to transfer more positively to the tension-regulator the tremulous movements of the diaphragm as distinguished from the yielding material—such as cork or rubber—as shown in my Patent No. 203,016. If the current passes through this non-elastic bearing-piece, as at A, the same is to be of metal or other good conductor.

Certain of the devices shown herein are not claimed, as they form the subject of other applications.

I claim as my invention—

In a telephonic receiving-instrument, two helices, 3 and 4, and the core 23, that is magnetized by induction, in combination with a permanent magnet, H, and two diaphragms that are connected to the magnet H, so as to be magnetized by induction, substantially as set forth.

Signed by me this 30th day of March, A. D. 1882.

THOMAS A. EDISON.

Witnesses:
GEO. T. PINCKNEY,
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