T. A. EDISON.

Speaking-Telephone.

No. 208,299. Patented Sept. 24, 1878.

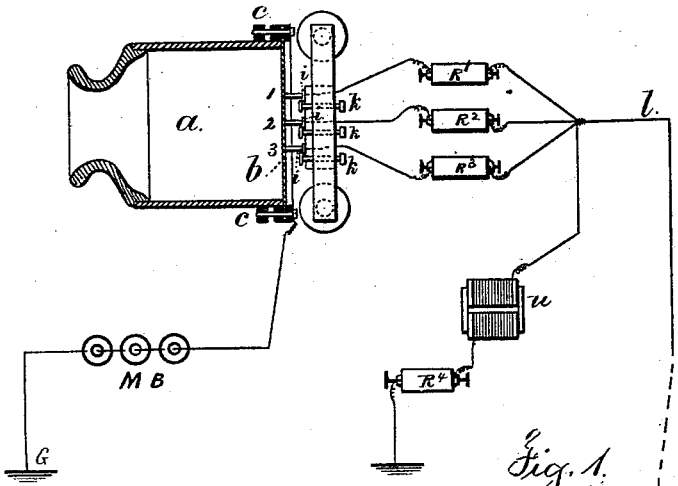



Fig. 1.

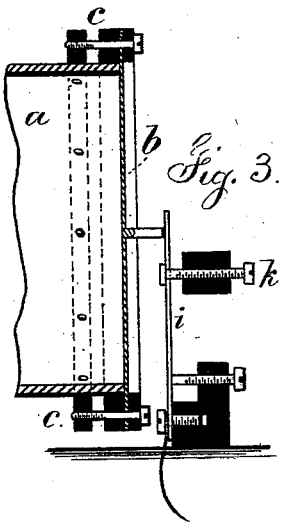



Fig. 3.

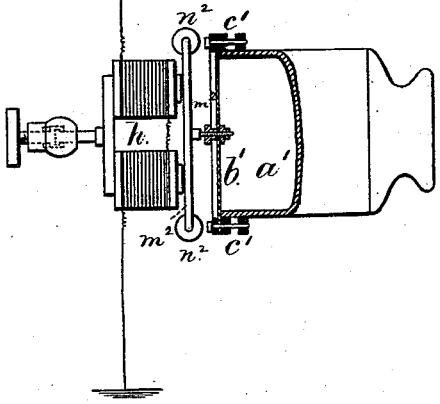
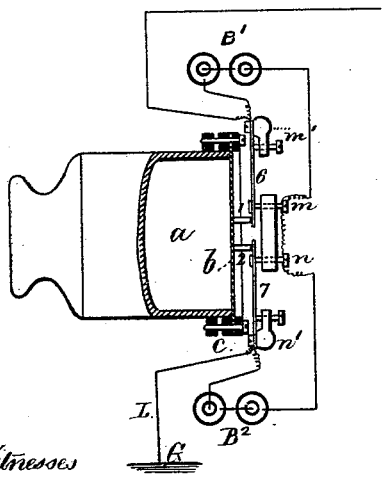



Fig. 2.




Witnesses

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN SPEAKING-TELEPHONES.

Specification forming part of Letters Patent No. **208,299**, dated September 24, 1878; application filed July 20, 1877.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented an Improvement in Speaking-Telegraphs, of which the following is a specification:

In acoustic telegraph-instruments there is comparatively little difficulty in transmitting musical tones, because the pulsations vary in number per second, and the distant reed or other receiving device that is of the same tone responds; but in speaking the tones of the voice are often in the same musical key, and hence there is difficulty in obtaining a clear response to the words spoken.

My invention relates to the transmission of varying strengths of current, according to the strength of the tone, and to a certain extent regardless of the musical key; and at the receiving-instrument a corresponding tympan receives the proper movement to produce a corresponding sound, through the agency of an electro-magnet operating on the same.

In the drawing, Figure 1 is a plan view of the transmitting and receiving devices, partially in section. Fig. 2 is a sectional view of a modification in the transmitting device; and Fig. 3 is a section, in larger size, of a portion of the transmitting apparatus.

The transmitting device consists of the resonant case *a*, with a tympan, *b*, over the end, the same being, by preference, a sheet of metal; and *c* are tightening rings and screws, whereby the tension of the tympan is regulated. A similar resonant case, *a'*, tympan *b'*, and tighteners *c'* are provided at the receiving-station, and the two should be made of the same, or nearly the same, character throughout, in order that the resonant conditions may correspond.

There are two or more contact-points at the transmitting-station. In Fig. 2, I have shown two, numbered 1 and 2; and in Fig. 1 there are three, numbered 1, 2, 3. These contact-points are so constructed and arranged in the electric circuit that when the voice acts in the resonant case and vibrates the tympan more or less, according to the strength, volume, or tone of the voice, the electrical condition of the line will be correspondingly influenced—that is to say, a feeble tone will produce but a feeble electrical response on the line, and the reverse; hence the electro-magnet *h*, acting at the receiving end, will exert a power to vibrate the tympan *b'* proportionate to the voice-power at the transmitting-station.

In Fig. 1 one pole of the main battery M B is connected to the earth, and the other to the tympan *b*. The line *l* is connected, through the rheostats $R^1$, $R^2$, and $R^3$, to the respective contact-springs *i*, and these press toward the points 1 2 3, respectively, but are withdrawn by the disk-pointed screws *k*, so as to be in proper proximity to the respective points. The point 2 closes the circuit, through $R^2$, with the smallest vibration of the tympan. The rheostat $R^2$ is of the greatest resistance, and hence but feeble pulsations pass to the line.

When the amplitude of vibration is increased by the strength of the sound, the circuit is closed, through $R^1$, by 1, and this rheostat is adjusted to offer less resistance; hence a stronger current passes to the line, and when the contact at 3 is closed the strongest current is sent on the line, because $R^3$ offers but little resistance. By this device the current is proportioned to the volume of sound acting upon the tympan of the resonant case, and the pulsations of that current respond to the vibrations of the tympan. Hence the electric pulsations become the reflex of the voice, and act in the distant magnet and upon the distant tympan to reproduce the same sounds. The number of contact-points and rheostats may be increased, if desired.

The electro-magnet helix *u*, rheostat $R^4$, and ground-connection serve to neutralize the static charge and discharge of the line and self-induction of the instruments. At the receiving-station, the armature $m^2$ is a spring-bar secured in standards $n^2$ at each end, and it is connected adjustably to the center of the diaphragm, and it vibrates by the action of the electro-magnet *h*, placed in front of it, and through the helix of this magnet the current passes from the line to the earth, or the reverse. This armature $m^2$ responds with greater rapidity and delicacy than a swinging armature, and

there is no risk of its movement being so great as to allow it to touch the cores of the electro-magnet and adhere to them.

In Fig. 2, the battery $B^1$ is connected between the adjusting-screw *m* and the standard $m^1$ of the spring 6, and the battery $B^2$ is in a circuit between the adjusting-screw *n* and the standard $n^1$ of the spring 7; and the screws *m* and *n* are insulated, but connected in the metallic circuit passing through the standards $m^1$ $n^1$, the batteries, and the line L to the ground G. It will now be evident that when at rest the respective batteries are short-circuited through 6 *m* and 7 *n*, and hence do not act upon the line; but when the tympan is vibrated the contact of 1 or 2 with its adjusting-screw is broken, and the battery-current passes to the line; and if the contact of both be simultaneously broken, the line-current is from both batteries and correspondingly pulsated. By this construction of circuit-closer the quantity of battery-power is increased in proportion to the increase of the power or volume of the voice in speaking.

Several of these contact-points and batteries may be used instead of two.

As I have shown in my previous application, No. 130, filed April 27, 1877, a diaphragm with means for regulating the tension thereof, no claim is herein made to such device.

In my application No. 130, filed April 27, 1877, I have shown a means for producing a rise and fall of electric tension by the vibrations of a diaphragm; and in my application No. 145, filed December 13, 1877, I have shown an armature-plate, an electro-magnet for the same, and a closed circuit to the source of undulatory electric energy. It is therefore to be distinctly understood that I do not, in this present application, make any claim to any such devices, but limit my claim hereunder to devices that are not shown in either of said applications.

I claim as my invention—

1. The combination, with the tympan arranged to respond to the human voice, of two or more contact-points operated by such tympan and the electric circuits, substantially as specified, whereby the current passing upon the line is pulsated in unison with the vibrations of the tympan and its volume proportionately increased or decreased, substantially as set forth.

2. The combination, with the resonant case and tympan, of two or more contact-points and rheostats, adjusted substantially as specified, to regulate the strength of the electric pulsations passing upon the line, as set forth.

3. The combination, with the diaphragm and resonant tube, of an electro-magnet and a spring-armature that is supported at both ends, substantially as set forth.

Signed by me this 16th day of July, A. D. 1877.

THOS. A. EDISON.

Witnesses:

GEO. T. PINCKNEY,

HAROLD SERRELL.