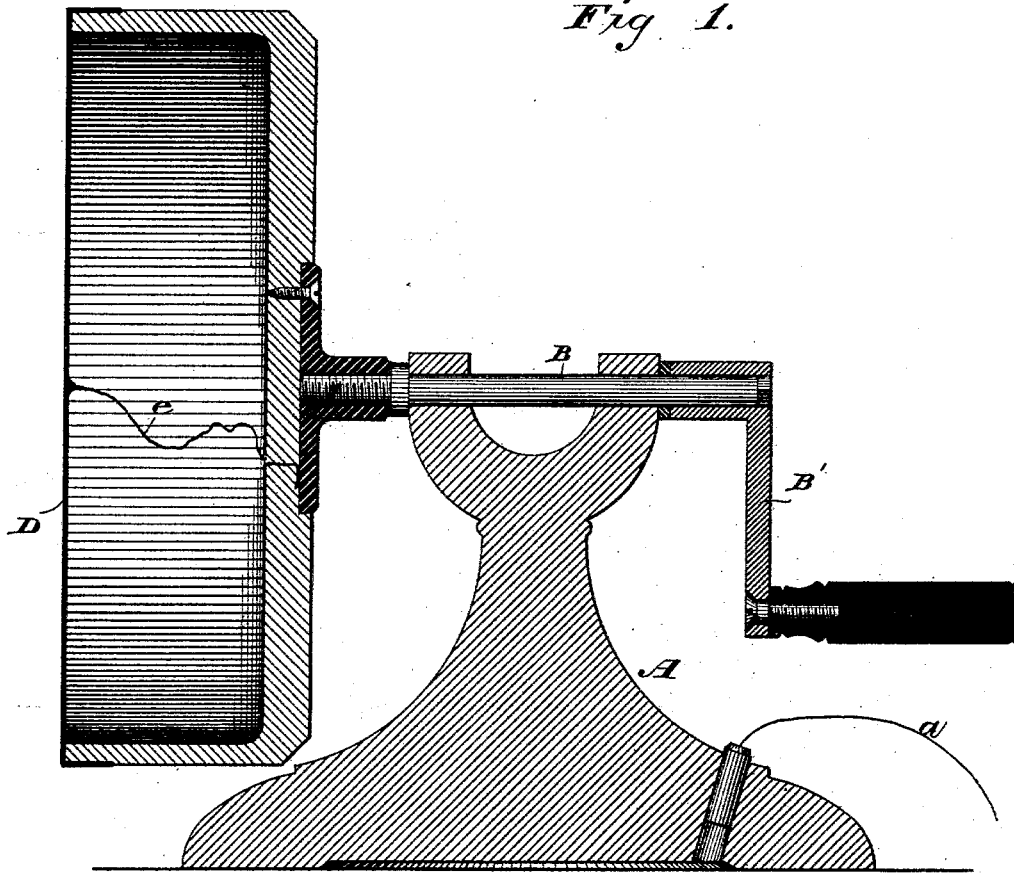


E. GRAY.  
Speaking-Telephone.

No. 210,776.

Patented Dec. 10, 1878.

*Fig. 1.*



WITNESSES

*Geo W Beck*  
*Wm A Skinkle*

INVENTOR

*Elisha Gray*

By his Attorneys

*Baldwin, Hopkins & Peyton*

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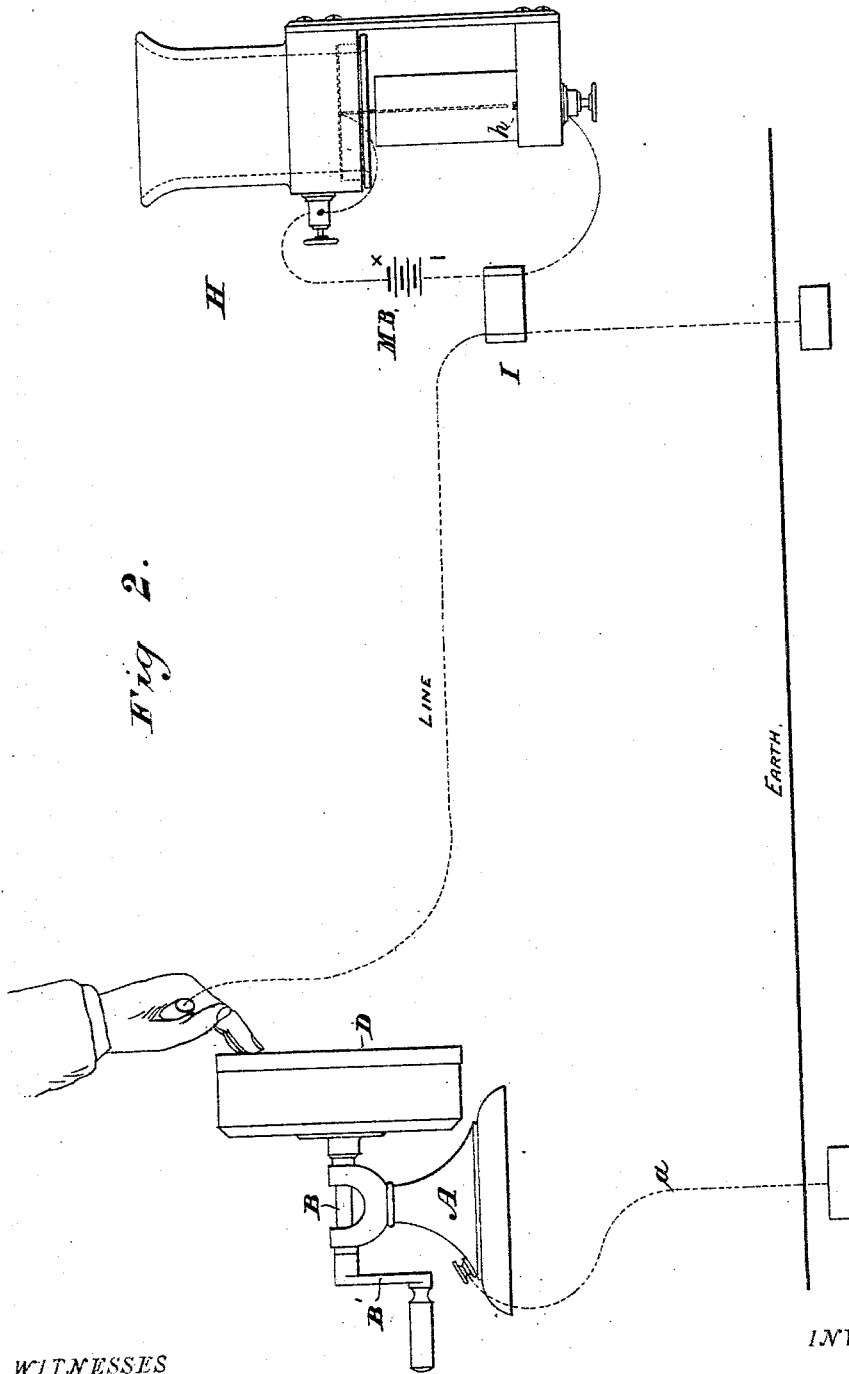


Fig 2.

WITNESSES

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# UNITED STATES PATENT OFFICE.

ELISHA GRAY, OF CHICAGO, ILLINOIS.

## IMPROVEMENT IN SPEAKING-TELEPHONES.

Specification forming part of Letters Patent No. **210,776**, dated December 10, 1878; application filed August 3, 1878.

*To all whom it may concern:*

Be it known that I, ELISHA GRAY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Speaking-Telephones, of which the following is a specification:

In Letters Patent No. 166,096, granted to me July 27, 1875, on an application originally filed April 18, 1874, I have shown and described apparatus for transmitting rhythmical vibrations representing composite sounds or musical tones of different pitch telegraphically, and for reproducing said tones at the receiving end of the line through the medium of animal tissue.

My present invention constitutes a new application of the principle exemplified in said Letters Patent, its object being to reproduce articulate sounds at the receiving end of the telegraphic circuit through animal tissue in gliding contact with a plate of suitable metal.

Any of the well-known speaking-telephones which transmit with sufficient intensity may be employed as a transmitter, in my improved apparatus. I prefer, however, for a transmitter the one known as the "water-telephone," described in a pending application for Letters Patent filed by me October 29, 1877, or the Edison carbon telephone-transmitter, or some instrument used in connection with a battery, on account of the greater power which may be obtained from such a transmitter.

I prefer to use currents of considerable tension in working my improved apparatus, the most convenient and economical mode of doing which is by the use of an induction-coil, as shown and described in my Letters Patent above mentioned.

The receiving apparatus is substantially the same in construction and operation as the one heretofore employed by me for reproducing musical tones transmitted through a telegraphic circuit.

My invention therefore consists in combining, in an electric circuit, telephonic apparatus capable of transmitting articulate speech with a resonant receiver through the intervention of animal tissue in gliding or frictional contact with said resonant receiver. This receiver may consist of a plate of any of the

well-known metals, whether capable of induction or not. I prefer, however, to use a plate, disk, or diaphragm of thin sheet metal—such as zinc or German silver, highly polished, and oxidized on the surface exposed to friction. The frictional or gliding contact between the animal tissue and the receiving-plate may be produced in various ways; but I have found in practice the simplest and most effective to be to mount the receiving-plate upon a resonant box or case mounted upon a shaft, so as readily to be revolved by means of a pulley, crank, treadle, or other well-known motor. By this means an even pressure and uniform rotation of the receiving-plate is secured.

The animal tissue may consist of one or more fingers of the human hand interposed in the circuit and pressed against the plate. Various other equivalent substances are mentioned in my patent above mentioned.

The accompanying drawings show one convenient form of apparatus for carrying out the objects of my invention. Obviously, however, the details of construction of both the transmitter and receiver may be greatly varied without departing from the spirit of my invention.

Figure 1 represents an axial transverse section through the receiver; and Fig. 2 represents an arrangement upon circuit of the entire apparatus, including both transmitter and receiver.

The base or supporting-stand A is, by preference, made of metal, and of a weight and size sufficient to maintain it in position without fastening it to its support. A shaft, B, revolves in suitable bearings upon this stand, being driven by a crank, B', or by a pulley, clock-work, or other suitable prime mover, and carries a hollow resonant box or case of wood, or some other resonant substance. The outer or open end of this box is covered by a thin sheet-metal disk, plate, or diaphragm, D, preferably of zinc, as the surface of this metal is usually covered with a very thin film of oxide, which is highly favorable to the proper action between the animal tissue and the plate when in gliding contact.

The diaphragm, it will be observed, is connected with the shaft and base by a wire, e, inside the resonant box or case, the base being

in turn connected with the ground by a wire, *a*. The transmitter H in this instance is an ordinary speaking-telephone, of the form shown in my application filed October 29, 1877, above mentioned, known as a "variable-resistance telephone," which class includes the microphone, the carbon transmitter, the water transmitter, and all others of that class which produce the sound-waves by causing the vibrations of the diaphragm to vary the resistance of the battery-current proportionately to the amplitude of motion of said diaphragm. I do not, however, confine myself to a transmitter of this class, but contemplate using any form which will transmit the vibrations with sufficient force.

The main battery M B is shown in Fig. 2 as short-circuited through the transmitter and through the induction-coil I, having the usual primary and secondary circuits in such relation to each other as will produce the best results at the receiving end of the line.

Starting from the plus pole of the battery, the circuit passes through the transmitter-point *h*, thence through the primary helix of the induction-coil and back to the other pole of the battery. The secondary helix has one of its poles connected to the line, the other with the ground. At the receiving end of the line the circuit passes through animal tissue, which may consist of the human body or other equivalent material, which is in contact with the plate D, from whence the circuit passes to the ground through the stand, as shown in Fig. 2, and as hereinbefore described.

The induction-coil may be dispensed with by using a battery of high tension and small quantity; but this method would not be so economical in practice as the one hereinbefore described.

In my patent of July 27, 1875, hereinbefore mentioned, I have shown that rhythmical vibrations in a primary circuit corresponding to any given musical tone or any given number of tones simultaneously produced are correspondingly produced inductively in a secondary circuit, and that when these vibrations were passed through animal tissue, in contact with a receiver, such as described, the tones were audibly and accurately reproduced.

My present invention contemplates not only the production of musical tones, but sounds of every character and quality, so that any noise, whether consisting of spoken words, musical tones, or other sounds, made or uttered in the transmitter or in its immediate vicinity, would be reproduced audibly at the receiving end of the line on the revolving plate.

I do not, therefore, claim the use of an animal-tissue receiver for the reproduction of musical tones, in combination with a transmitter only adapted to send such tones, as this constitutes the subject-matter of the patent hereinbefore mentioned.

What I claim herein as new, and desire to secure by Letters Patent, is—

The combination, in a telegraphic circuit, of a telephonic transmitter capable of transmitting articulate sounds or spoken words with a receiver capable of reproducing such sounds or words through the intervention of animal tissue in frictional contact with said receiver.

In testimony whereof I have hereunto subscribed my name.

ELISHA GRAY.

Witnesses:

JOHN F. PARET,  
DAVID M. ERSKINE, JR.