F. A. GOWER.
Electric Telephone.

No. 217,208. Patented July 8, 1879.

Fig. 1.

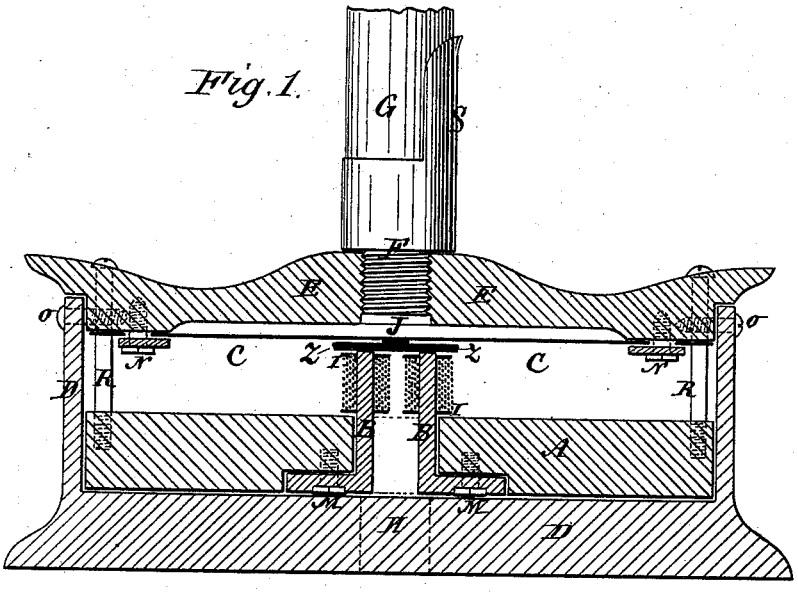
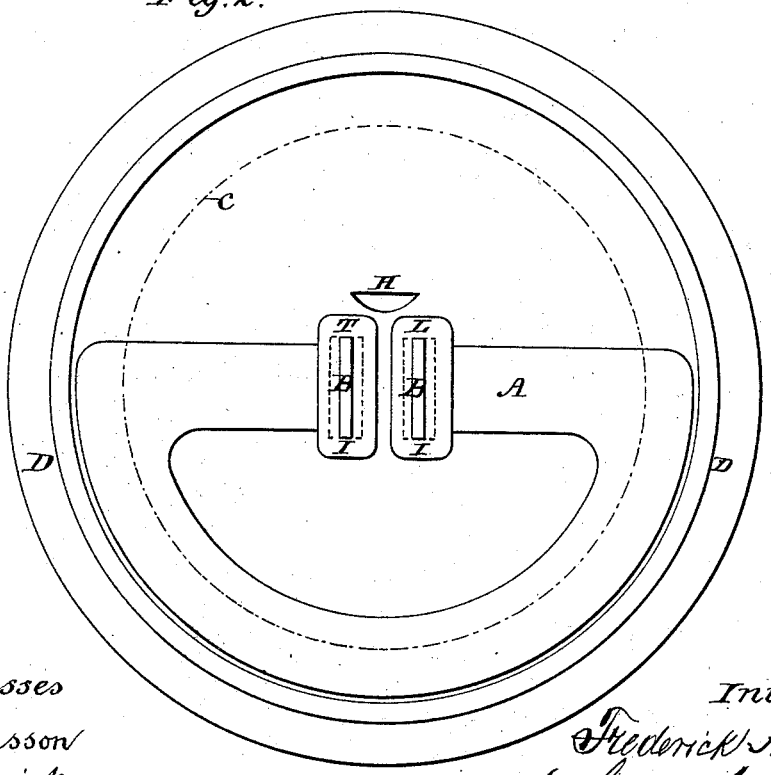


Fig. 2.



Witnesses
E. E. Masson
E. A. Dick

Inventor:
Frederick A. Gower
by A. Pollok
his attorney

UNITED STATES PATENT OFFICE.

FREDERIC A. GOWER, OF PARIS, FRANCE, ASSIGNOR TO HIMSELF AND CORNELIUS ROOSEVELT, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC TELEPHONES.

Specification forming part of Letters Patent No. **217,208**, dated July 8, 1879; application filed January 15, 1879.

To all whom it may concern:

Be it known that I, FREDERIC ALLEN GOWER, of Paris, in the Republic of France, have invented a certain new and useful Improvement in Speaking-Telephones, called "Magnophone," of which improvement the following is a full, clear, and exact description.

This invention relates to the transmission of the human voice or other audible sound by means of electricity or magneto-electricity.

The use of magneto-electric currents developed in coils surrounding the poles of a magnet by means of the vibrations of a plate of soft iron placed in front of, but out of contact with, such poles is one of the well-known means of accomplishing this result, the magneto currents being used alone or in connection with an electric or battery current.

It is first to be observed, as an essential condition of such transmission with good practical results, that the vibrating plate be not allowed to come into contact with one or both poles of the magnet where two poles are used, or with the one pole where only one pole is used. The proper adjustment of the plate is one of great nicety, delicacy, and difficulty. In case such contact occurs it has, so far as I am aware, been uniformly found that the transmisson or reproduction of sounds is seriously impeded by such contact, either decreasing the volume or destroying the distinctness of audible sound proceeding from the instrument or from the receiver used in connection with such instrument as a transmitter. There is thus material loss to its capacity for transmitting spoken words.

By my invention the transmission of speech or audible sound is accomplished by the vibration of a plate or bar in direct contact with the pole or poles of a magnet provided with surrounding coils or helices.

The invention consists in the method of transmitting and reproducing sounds at a distance, and of producing electrical or magneto-electrical currents of varying intensity; also, in the means or instrument employed, to which I have given the name of "magnophone," and in the combination of parts, as hereinafter more fully set forth.

The pole or poles of a magnet surrounded by a coil or coils and an armature of soft iron are brought into permanent contact with each other, and such armature being connected with a plate of iron or other suitable material, and the coils made part of a closed circuit in which also one or more similar instruments are placed, speech or other audible sound produced in the neighborhood of the instrument may be perfectly reproduced in the other instruments in the circuit. The instrument so arranged will serve equally well either as transmitter or receiver without change in its arrangement, and may be used in the same circuit with other receiving or transmitting instruments.

In the accompanying drawings, Figure 1 represents a view, in central vertical section, of the instrument; and Fig. 2, a top view with the case cover and vibratory plate and armature removed.

B B are the poles of a magnet, such poles being of circular or other suitable form, and the magnet being of such shape and size as may be desired. The shape of the magnet, as shown, is semicircular, with the poles prolonged toward the center, which form is preferred, but is not essential to this invention. The poles B B are preferably separate pole-pieces of soft iron or steel secured to the magnet by the screws M M; but they may be made in one piece with the magnet, or they may be otherwise secured thereto.

Across the extremities of the poles B B is shown the armature Z Z, of soft iron, resting in permanent contact with such poles, and forming for such poles an effective armature, as the term "armature" is commonly employed. At the center of this armature, at the point J, it is firmly fastened, by soldering or in other suitable manner, to the plate C C, of iron or other suitable material, such as wood, parchment, &c., which is held firmly in place, or, as it may be, distended by rings of brass or other material, as shown in section at N N. By these rings such plate or membrane is firmly held by screws or otherwise against the under surface of the top E E of the box D D, containing the instrument. This top may be concaved in the manner shown, or more or less

concave, as may be desired, according to the material employed to form the plate or diaphragm C C, and consequently to the intensity of vibration of the air within this concavity which the movements of the plate as affected by the armature may occasion. The top E E may be secured to the case by screws, (shown at O.)

At F is shown the inner end of a speaking-tube or other mouth-piece, which is prolonged, as shown at G, with the protecting-tip S; or the said mouth-piece may be of other suitable form, or may be dispensed with altogether, its use being not an essential part of this invention. At R R are shown two vertical screws set into a magnet, A A, and by means of these screws the box-top E E and the plate C C may be raised or lowered, thus increasing or diminishing the tension upon the plate, since the middle portion of the plate J remains in a fixed position by reason of its attachment to the armature Z Z.

H represents, in dotted lines, a cavity in the bottom of the case D, to receive the lower end of the tube containing the vibrating reed, which is attached to the vibratory plate in the manner already described in my application for Letters Patent for pneumatic signal telephones. This vibrating reed is not essential to the operation of the present invention, but is very useful in connection with it.

In practical use of this magnophone system and this form of instrument, as shown, it follows, first, that when a person speaks in the neighborhood of the plate C C, whether through the speaking-tube, as shown, or in other manner convenient, the sonorous vibrations of the plate C C, being communicated to the armature Z Z, to which the plate is fastened, create some form of magneto-electric currents in the coils I I, I I, surrounding the poles, and these coils being in circuit with similar coils in an instrument essentially similar at some other part of such circuit, the disturbance produced in the armature Z Z is transmitted to and reproduced from the magnophone at such station; second, that the magnophone, as shown, being used simply as a transmitter, the vibrations of its armature and the resulting magneto-electric currents are transmitted along the connecting-line to any ordinary or suitable form of electric or magneto-electric receiving-instrument which may be employed at the distant station; third, that the magnophone, as shown, being employed as a receiving-instrument, any ordinary or suitable form of electric or magneto-electric current traversing the connecting-wire and passing through the coils I I creates molecular disturbance in the armature Z Z, and thus occasions sonorous vibrations in the plate C C, attached to said armature; fourth, that the magnophone, being in the same circuit with any ordinary or suitable transmitting and receiving instrument, may be used indifferently as a transmitter or receiver.

As points of special interest in connection with this system, I have observed, first, that no perceptible magnetic force is transmitted to the plate C C, even though such plate be formed of soft iron, provided the armature Z be sufficiently large to wholly cover the exposed upper surfaces of the poles B B; second, that perceptible magnetic force is transmitted to the plate C C in case the armature be not sufficiently large to wholly cover the surfaces of the poles, as stated; third, that if the armature be so small as thus to allow transmission of magnetic force to the plate, the power and value of the instrument for the transmission of speech or other audible sound is seriously impaired, and that such power and value is increased in proportion to the increase of surface of armature in contact with the poles, and also in proportion to the decrease of perceptible magnetic force in the plate.

It will be readily seen that the armature serves as a permanent keeper to the magnet.

It is evident that various modifications might be made in the details of the instrument without departing from the spirit of this invention. A magnet with a single pole facing the armature might be used, or the armature might be in contact with one pole only of a magnet with two poles. I find that the best effects are produced by a magnet with two poles, and the armature in permanent contact with both. An electro instead of a permanent magnet might be used, and other changes might also be introduced.

Having thus described my invention, I claim as points of novelty, for which I desire Letters Patent, as follows:

1. The method of conveying or of transmitting or reproducing speech or other audible sound by means of currents developed by the vibrations of an armature in pressure contact with the pole or poles of an electro or permanent magnet, substantially as described.

2. The method of producing electrical or magneto currents in a circuit by the vibrations of an armature in pressure contact with the pole or poles of an electro or permanent magnet surrounded by a coil or coils forming part of said circuit, substantially as described.

3. The combination of a permanent magnet, a coil or coils surrounding its pole or poles, and an armature with an elastic plate for retaining said armature in pressure contact with the pole or poles, and for imparting thereto vibrations corresponding to the vibrations of the atmosphere caused by a sound, or for reproducing therefrom such atmospheric vibrations, substantially as described.

4. An instrument for the transmission and reception of speech or other audible sound, consisting of an electro or permanent magnet and coils surrounding the poles thereof, and a diaphragm of soft iron or other suitable material, having attached on one side a plate or bar of soft iron in permanent contact with the poles of the magnet, substantially as set forth.

5. The combination, in a closed circuit, with a receiving-instrument of ordinary or suita-