(No Model.)

C. CUTTRISS & G. F. MILLIKEN.

TELEPHONIC RECEIVER.

No. 256,795. Patented Apr. 18, 1882.

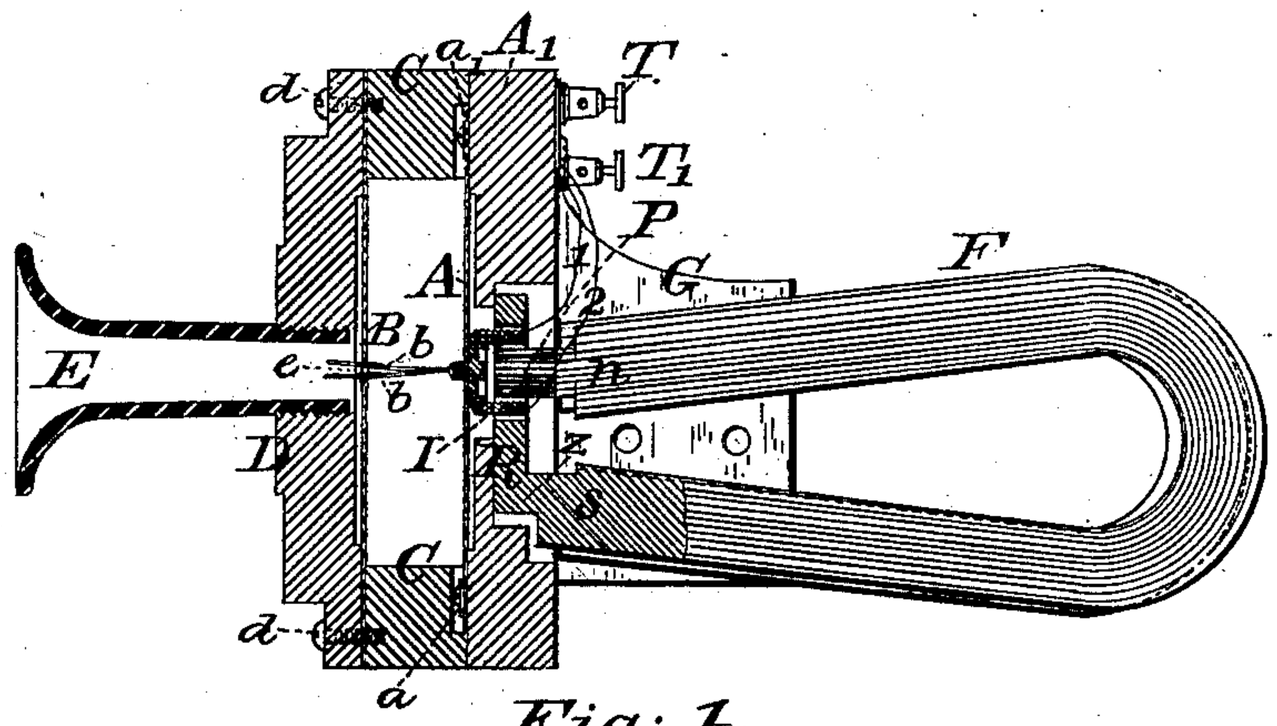

Fig: 1.

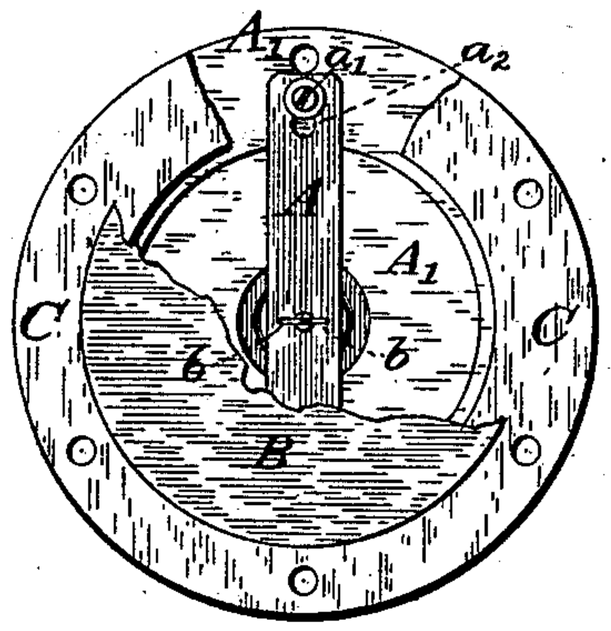

Fig: 2.

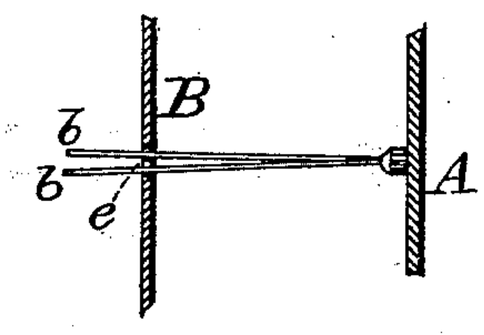

Fig: 3.

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UNITED STATES PATENT OFFICE.

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TELEPHONIC RECEIVER.

SPECIFICATION forming part of Letters Patent No. 256,795, dated April 18, 1882.

Application filed August 22, 1881. (No model.)

To all whom it may concern:

Be it known that we, CHARLES CUTTRISS, a subject of the Queen of Great Britain, and a resident of Duxbury, in the county of Plymouth and State of Massachusetts, and GEORGE F. MILLIKEN, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have jointly invented a new and useful Improvement in Telephonic Receivers, of which the following is a specification.

Our invention relates to that class of telephonic receivers in which a resonant body is thrown into vibration by the action thereupon of electric undulations or vibrations transmitted over a line from a distant station; and the particular object of the invention is to increase the loudness and clearness of the sounds which are produced in the atmosphere by the movement of said resonant plate when so actuated.

Our invention consists chiefly in a novel combination and arrangement of certain devices, whereby the mechanical vibrations produced by electric undulations are transmitted to the resonant plate of the receiver by the agency of friction.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of our improved telephonic receiver. Fig. 2 is a front elevation with the ear-tube and outer portion of the case removed, and Fig. 3 is an enlarged view of certain parts shown in Fig. 1.

In the drawings, A represents a plate constructed of very thin brass or similar resilient metal, which is preferably in the form of a strip having a much greater length than breadth. This plate is secured at one of its ends, by means of a screw, *a*, or otherwise, to the support A′, which is circular in form, and may be of wood, while its other end is loosely attached to the opposite side of the face of the support A′ by the screws *a′*, which pass through the slot a^2 in said strip.

An annular ring, of wood or other suitable material, C, preferably of the same external diameter as the support A′, is firmly clamped between said support and its cover D. The latter is perforated with a central opening, into which is inserted a suitable ear-trumpet, E. The ring C and cover D, when tightly screwed or clamped together, support a resonant plate or membrane, B, a portion of which is also shown in Fig. 2. This plate is rigidly held in position by screws *d d*, which extend through the support D into the ring C. The resonant plate B is preferably constructed in a circular form, of thin metal or of a stretched membrane, and is capable of producing sonorous vibrations in the surrounding atmosphere. It is perforated with a small aperture, *e*, at or near its center, (see Fig. 3,) through which pass one or more thin but stiff wires, *b b*. These wires are soldered or otherwise firmly attached to the vibrating plate A, and when the latter is thrown into vibration, as hereinafter explained, they move to and fro in a horizontal direction through the aperture *e* in the resonant plate B, and at the same time, and by virtue of their resiliency, press against the edges of the aperture *e* in the plate. Thus the plate A, being thrown into vibration by an undulatory electric current, as hereinafter described, moves the wires *d d* to and fro through the aperture in the plate B and against its edges. The vibrations of the plate A are therefore exactly reproduced, but with less amplitude, by the resonant plate B, and the wires *b b*, by their frictional contact with said plate, are found to produce much louder sounds than those produced by a diaphragm directly actuated by an electro-magnet. The space intervening between the supports A′ and D has the effect of re-enforcing the sounds produced by the plate B, and this, together with the action hereinbefore described, causes very loud and distinct sounds to proceed from the ear-piece E.

The apparatus which I prefer to employ for actuating the plate A and its attachments consists of a permanent magnet, F, of any suitable construction, which is secured to the support A′ by means of the clamping-pieces G, of which one is shown, another precisely similar one being placed on the other side of the magnet, and the two being held together by screws or bolts. The magnet F is preferably a compound magnet, built up of a number of independent plates separately magnetized

and afterward united together. To one pole of the magnet F—for example, the north pole, *n*—is affixed or inserted a cylindrical pole-piece, P, preferably of soft iron, while to the south pole, *s*, is affixed another pole-piece, R, consisting essentially of a hollow cylinder or ring provided with an angular projection, Z, by which it is attached (preferably by soldering) to the pole *s* of the magnet F. The diameter of the circular aperture within the ring is considerably greater than that of the cylindrical pole-piece P, so that the former will encircle the latter when the parts have been placed in position, leaving an annular space between the cylinder and the ring. By thus causing the actual south pole of the magnet F to completely encircle the cylinder which forms the north pole, nearly the whole of the magnetic energy is concentrated within a very narrow field between the poles.

I is the cylindrical coil or helix, of thin insulated copper wire, which is mounted upon and firmly attached to the center of the plate A, the axis of the coil being coincident with the axis of the cylindrical pole-piece P. This coil is constructed of such external and internal diameter as to be capable of vibrating to and fro in a direction parallel to its axis within the annular space left between the inner and outer pole-pieces, P and R. An undulatory current proceeding from a suitable transmitter enters at the binding-post T, passes through the coil I by wire 1, and returns by wire 2 and binding-post T′ to the ground or a return-wire, and thence to the generator. The current passing through the coil produces an alternate attraction and repulsion between it and the permament magnet and causes a to-and-fro vibratory motion of the coil, which is communicated to the plate A, upon which the coil is mounted, and thence by the wires *b b* to the resonant plate B.

The form of apparatus which we have described for actuating the plate A forms no part of our invention, and is not hereinafter claimed, but is nevertheless the form which we prefer to use in connection with our improved receiving apparatus. If desirable, however, any other well-known form of actuating apparatus may be used. For instance, the plate A may be constructed of magnetic metal and directly acted upon in the manner of an armature by an electro-magnet.

The organization hereinbefore described, by means of the friction caused by the wires *b b* moving in contact with the resonant plate B and the resonant chamber between the latter and the plate B, constitutes a telephone-receiver which is found to be capable of producing much louder and clearer articulate sounds than is possible by telephones heretofore in use.

We claim as our joint invention—

1. The combination, substantially as hereinbefore set forth, of a resonant plate, membrane, or body, a device for communicating vibrations to the same by frictional contact therewith, and apparatus for actuating said device by the conversion of electrical undulations or vibrations into mechanical force.

2. The combination, substantially as hereinbefore set forth, of a resonant plate, membrane or body, one or more wires or rods extending perpendicularly through an aperture formed therein, and in frictional contact therewith, and an electric actuator for imparting longitudinal vibrations to said wires or rods, which vibrations are communicated to said resonant plate.

3. The combination, substantially as hereinbefore set forth, of a resonant plate or membrane, one or more wires or rods extending perpendicularly through an aperture therein, and in frictional contact therewith, a vibratory plate supporting said wires or rods, and an electric actuator for producing vibrations in said wires and plates.

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