A. E. DOLBEAR.

Telephone.

No. 199,041. Patented Jan. 8, 1878.

Fig: 1.

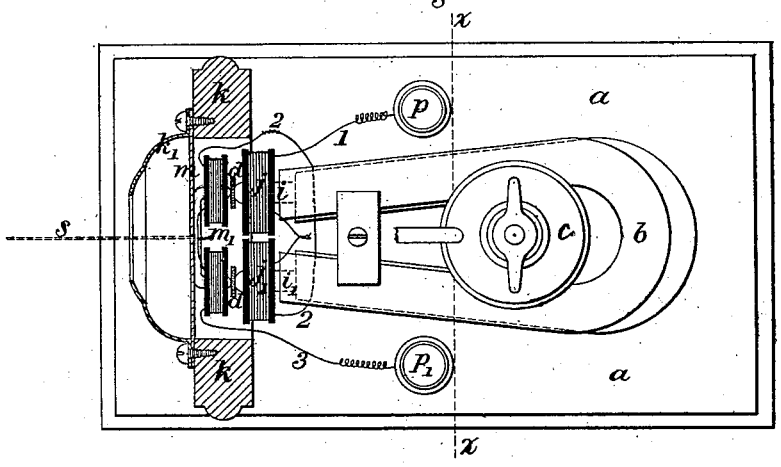
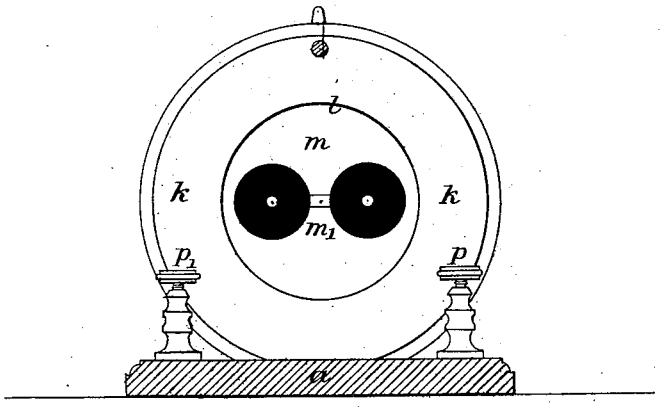


Fig: 2.



Witnesses:

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Inventor:

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by Frank L. Pope, Attorney

UNITED STATES PATENT OFFICE.

AMOS EMERSON DOLBEAR, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR TO THE GOLD AND STOCK TELEGRAPH COMPANY, OF NEW YORK CITY.

IMPROVEMENT IN TELEPHONES.

Specification forming part of Letters Patent No. **199,041**, dated January 8, 1878; application filed December 6, 1877.

CASE B.

To all whom it may concern:

Be it known that I, AMOS EMERSON DOLBEAR, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Telephonic Instruments, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My invention relates to a certain class of instruments technically known as "telephones," which are especially adapted to the transmission and reproduction at a distance of sonorous waves or vibrations of every description by means of electrical impulses traversing a circuit of conductors.

My improvements consist, first, in combining, with the permanently-magnetic cores and elastic diaphragm of a telephonic instrument, an electro-magnet, attached to and supported by said diaphragm, and so arranged as to act as an armature to the first-mentioned cores; second, in interposing suitable dampers, composed of india-rubber or other equivalent substance, between the poles of the magnetic cores and the armature thereof, or the elastic diaphragm, in order to destroy interfering vibrations; and, third, in an improved alarm attachment for telephonic instruments.

In the accompanying drawings, Figure 1 is a plan view, partly in section, of my improved instrument. Fig. 2 is a vertical transverse section of the same, taken in the plane of the dotted line *x x* in Fig. 1, the permanent magnet and its attachments being removed.

The instrument shown in the drawings is adapted to be used either as a transmitting or as a receiving instrument, and in its general construction and arrangement is similar to that described in my former application now pending in the Patent Office, designated as "Case A," which was filed on the 31st day of October, 1877, and to which reference is had.

My present improvement relates more especially to the construction and arrangement of the elastic diaphragm and inductor.

In Figs. 1 and 2, *a* is the base of the instrument. *b* is a permanent magnet, which may be of the U or horseshoe form, and composed either of separate laminæ or plates combined together, or of a single plate. The magnet *b* is mounted upon the base *a*, and secured thereto by a clamp, *e*. The soft-iron cores *i* and *i'*, enveloped in the helices or coils *j j'*, are mounted upon the poles of the permanent magnet *b* in such a manner as to receive magnetism therefrom by induction, in a manner well understood.

The elastic diaphragm *m* is composed of a thin sheet of metal, card-board, animal tissue, or other suitable material, preferably circular in form. The edges of this diaphragm are rigidly secured, by means of screws or otherwise, to a solid support or frame, *k*, in the center of which is an opening, *l*, which may be covered with a mouth-piece, *k'*, having an aperture an inch or two in diameter in the center.

A small electro-magnet, *m'*, is firmly secured, by any convenient means, to the center of the diaphragm *m*, with its poles facing those of the cores *i i'*, and in close proximity thereto, so that it virtually acts as an armature to the cores *i i'* and the permanent magnet *b*. The electric circuit traversing the apparatus goes from the binding-screw *p* by the wire 1 to the helices *j j'*; thence, by the wire 2, to the helices of the electro-magnet *m'*, and from thence, by the wire 3, to the other binding-post, *p'*. These helices are so connected that a current passing through them will always tend to develop magnetism of unlike polarity in the ends of the cores of the respective electro-magnets which are opposite or facing each other, and consequently they will tend to attract each other with greater or less force, according to the strength of the existing current.

The operation of my improved apparatus is as follows: Two or more instruments being connected together in a telegraphic circuit in a manner well understood, a person desiring to transmit an oral communication places his mouth at the aperture of the mouth-piece *k'* of one of the instruments and speaks into it. The diaphragm *m*, being fixed at the edges,

but elastic and free to vibrate in the center, is thrown into vibrations which correspond in their amplitude and in their varying intervals with the sound vibrations produced in the atmosphere by the voice of the person speaking into the mouth-piece. The electro-magnet *m'*, being mounted upon the center of the elastic diaphragm, partakes of its motion, and its poles are thereby caused to alternately approach and withdraw from the extremities of the permanently-magnetic cores *i i'*. The changes in the normal magnetic condition of the soft iron of the electro-magnet *m'* and of the cores *i i'*, which are produced by the vibratory movements of the diaphragm *m*, induce magneto-electric currents in the surrounding helices, by the action of a well-known law. The waves or undulations of the electric current produced in this manner necessarily represent, in every essential particular, the original vibrations of the diaphragm *m*. At the receiving-station these waves or undulations give rise to varying magnetic intensities in the soft-iron cores *i i'* and in the electro-magnet *m*, which, by their correspondingly-varying mutual attraction, cause the diaphragm *m* to be thrown into similar vibrations, which are communicated to the atmosphere, and thence to the ear of the listener.

In the arrangement described in my former application it is necessary to construct the diaphragm either of iron or steel, and of sufficient thickness to give it the necessary amount of inductive capacity, and these limitations in respect to material and thickness are unfavorable to the production of the best results. By constructing the apparatus in the manner hereinbefore set forth, this objection is avoided, as the diaphragm may be made of such material and dimensions as are found by experiment to produce the best acoustic effects. Another important advantage gained by this mode of construction consists in the increased rapidity of action which results from employing an electro-magnet to serve as the armature of the permanent magnet, instead of a permanently-magnetic or neutral plate of iron or steel, which mode of construction has been found to produce much better results in practice than the one last mentioned. In order to remove the weight and inertia of the helices of the electro-magnet *m'* from the vibrating diaphragm, it will often be found preferable to attach the said helices permanently to the frame of the instrument, and make the soft-iron core movable within them, the core itself being attached to and supported by the diaphragm, as before.

I have discovered that the action of the apparatus is very much improved by the interposition of thin plates *d d* of india-rubber or other equivalent elastic substance between the poles of the stationary magnetic cores *i i'* and the armature which is attached to and vibrates with the diaphragm. These plates of rubber form what are technically termed "dampers," and by their action serve to destroy the minor sympathetic vibrations, which tend to interfere to some extent with the clearness of the articulation. The best results are produced when the pressure of the movable armature against the dampers is slight. This pressure may be conveniently regulated by the ordinary devices which are employed to adjust the distance between the magnet and its armature in all telegraphic instruments. I have shown in Fig. 1 a very simple and convenient alarm for telephonic instruments, which consists of a cord, *s*, attached to the center of the diaphragm, and having its surface prepared with resin or other equivalent material. By passing the thumb and fingers over this cord with a rubbing motion, when in a state of moderate tension, it may be thrown into powerful vibrations, which are communicated to the diaphragm *m*, and thence telephonically to the diaphragm at the receiving-station, producing therefrom a sound which may be readily distinguished at some distance from the instrument, and serves as a very efficient alarm.

I claim as my invention—

1. One or more helices or coils forming a portion of the main circuit, and surrounding a core or cores maintained in a permanently-magnetic state, in combination with an electro-magnet whose helices are included in the same circuit, and which is so arranged as to act as an armature to the first-mentioned core or cores, and an elastic plate or diaphragm capable of responding either to sonorous vibrations traversing the atmosphere or other medium, or to corresponding electro-magnetic vibrations induced in the cores or armature by the influence of a current of varying strength traversing the said helices.

2. An armature attached to or forming a part of an elastic diaphragm, in combination with a damper or dampers interposed between the said armature and the stationary core or cores, in the manner and for the purpose specified.

3. The alarm attachment for telephonic instruments herein described, consisting of a cord having a suitably-prepared surface, attached to the elastic diaphragm, in the manner and for the purpose specified.

In witness whereof I have hereunto set my hand this 28th day of November, A. D. 1877.

AMOS EMERSON DOLBEAR.

Witnesses:
SAMUEL JENNISON,
GEO. A. GRIFFIN.