(No Model.)

J. EMMNER, Jr.

TELEPHONE TRANSMITTER.

No. 330,879. Patented Nov. 24, 1885.

Fig. 1.

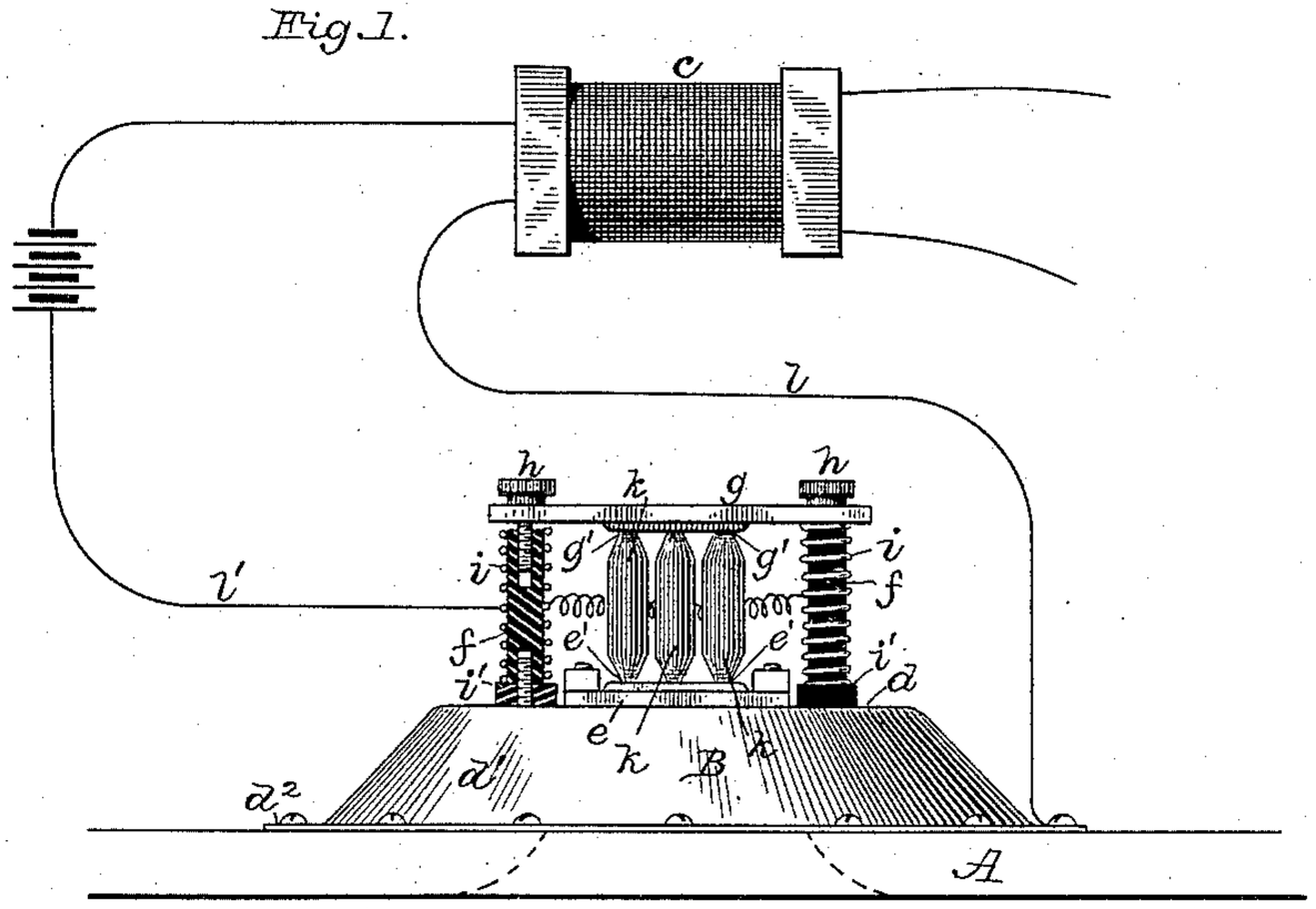


Fig. 2.

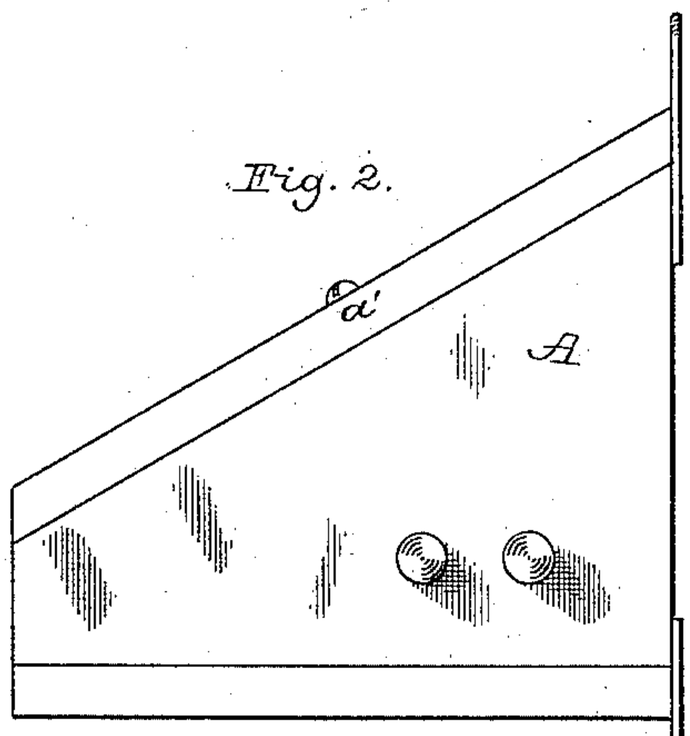
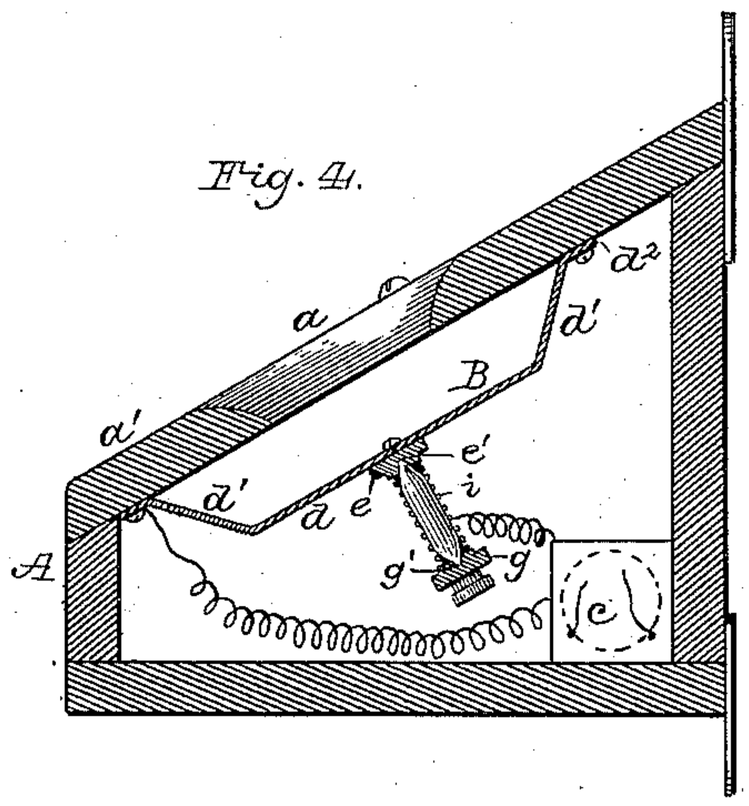


Fig. 4.



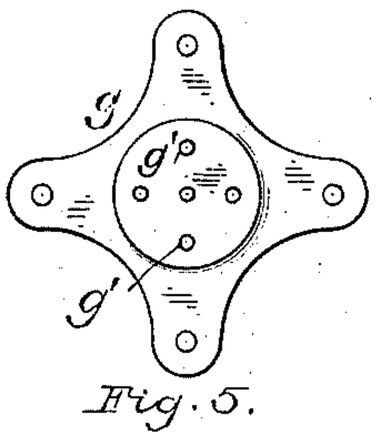


Fig. 5.

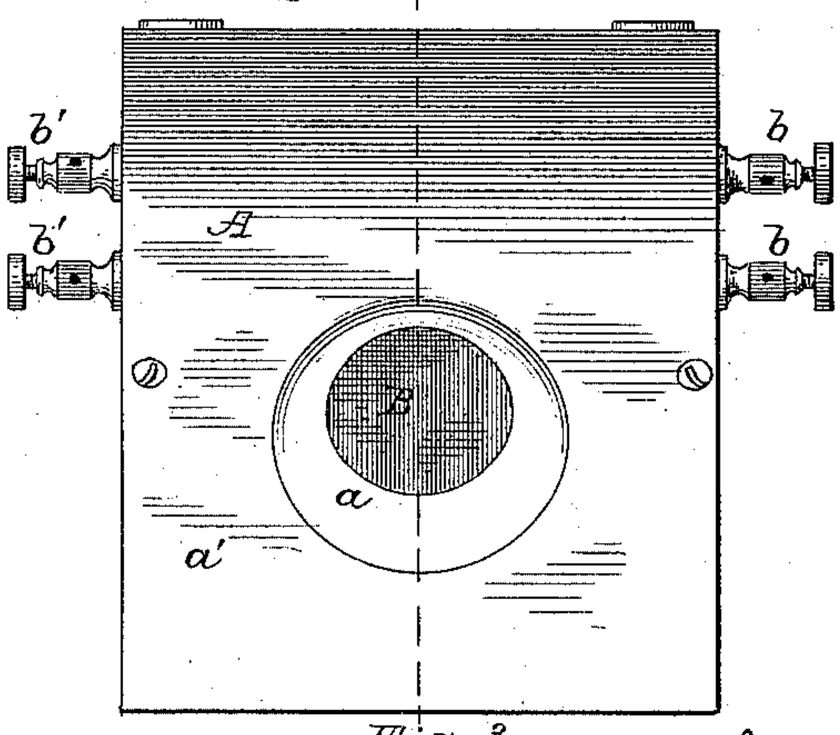


Fig. 3.

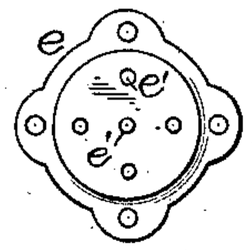


Fig. 6.

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UNITED STATES PATENT OFFICE.

JULIUS EMMNER, JR., OF WASHINGTON, DISTRICT OF COLUMBIA.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 330,879, dated November 24, 1885.

Application filed June 17, 1884. Serial No. 135,146. (No model.)

To all whom it may concern:

Be it known that I, JULIUS EMMNER, Jr., of Washington, in the District of Columbia, have invented certain new and useful Improvements in Telephone-Transmitters; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of the several features of my invention.

The object of my improvements is the production of a simple, inexpensive, and effective telephonic transmitter, in which the liability of variation in adjustment is reduced to a minimum.

A telephone embodying the main feature of my invention contains an electrode which is parallel with and rigidly attached to the diaphragm at or near its center, and which may be termed the "diaphragm-electrode;" also, a second electrode substantially parallel with the diaphragm, and mounted upon posts projecting from said diaphragm, but insulated therefrom or from the diaphragm-electrode, and this I term a "post-electrode;" also, as an entirely novel feature, one or more intermediate electrodes pointed at each end and loosely mounted substantially at right angles to the diaphragm, in conical seats or recesses provided therefor in the coincident faces of the two first-mentioned electrodes. All of these electrodes being mounted upon and directly supported by the diaphragm, when once adjusted, will maintain their relative positions, and require thereafter, as a rule, only such adjustment as may be requisite to compensate for abrasive wear of the contacts, and therefore I provide for an adjustment of the post-electrode with relation to the diaphragm-electrode, and thereby secure an adjustment of the contacts of the two ends of the intermediate electrodes. Inasmuch as my diaphragm actually supports these several electrodes, it must be sufficiently rigid to bear their weight without thereby being warped or deflected; but, aside from that, the diaphragm may be widely varied as to its component material and construction.

After fully describing a transmitter as preferably constructed by me, the features deemed novel will be specified in the several claims hereunto annexed.

Referring to the drawings, Figure 1 illustrates my diaphragm and the electrodes coupled with an induction-coil and battery. Figs. 2 and 3 respectively illustrate the complete transmitter in end and top views. Fig. 4 is a section of the same on line *x*, Fig. 3. Figs. 5 and 6 respectively illustrate the two main electrodes provided with seats for five intermediate electrodes.

The casing A may be variably constructed; but in its best form its mouth-piece *a* is located in the top *a'* of the casing, which is inclined at an angle of about thirty degrees from a horizontal line. The usual screw-posts, *b*, are also provided for line and ground connections, and they include in their circuit the secondary portion of an induction-coil, *c*, as usual in many telephonic transmitters. Similar screw-posts, *b'*, are also provided for the usual battery-connections, which communicate, as usual, with the primary portion of the induction-coil.

The diaphragm B, as here shown, has a flat vibrating face, *d*, an annular rim, *d'*, and a securing-flange, d^2, by which, with screws or nails, it is rigidly fastened to the under side of the top of the casing concentrically with the mouth-piece therein. It will be within certain portions of my invention if other forms of diaphragm be employed—as, for instance, a flat disk; but the best results will accrue if it be composed of a single piece of material struck up or molded substantially into the dish-shaped form shown in the drawings. For obtaining the best results this diaphragm should be composed of sheet metal, preferably soft iron tinned or otherwise protected against corrosion. When not in itself included in an electric circuit, it can be composed of such material as hard rubber, papier-maché, or wood well charged with shellac, care being taken in all cases that the vibrating face of the diaphragm be heavy enough to support and carry the weight of the electrodes without warping, as hereinbefore indicated. Near the center of the diaphragm shown, which is composed of sheet metal, there is a plate, *e*, composed of a low conductive material rigidly secured to and in good electric contact with the diaphragm. This plate *e* is the diaphragm-electrode, and it is provided on its outer face with one or more conical recesses or seats, *e'*.

At each end of said plate *e* there is an insulating-post, *f*, composed of hard rubber or other good non-conducting material, rigidly secured to and projecting from the rear side or face of the diaphragm; and upon the outer ends of said posts *f* there is a plate, *g*, composed of low conductive material, which I call a "post-electrode," and this is parallel and coincident with the diaphragm and the plate *e*, and, like that plate, it is provided with one or more conical seats, *g'*, which are truly coincident with the seats *e'*. The post-electrode is secured to its posts *f* by means of the thumb-screws *h*, which are tapped into the ends of said posts, and each of the latter is encircled by an expansive spiral spring, *i*, each having an abutment, *i'*, next to the diaphragm, composed of insulating material; but said springs at their outer ends are in good electric contact with the post-electrode. Between these two main electrodes, and substantially at right angles to the diaphragm, there are one or more intermediate electrodes, *k*, also composed of material having a low conductive capacity. Each intermediate electrode is pointed at both ends, and loosely occupies the conical seats *e'* and *g'* in the two main electrodes, and as the diaphragm is inclined, as shown, said intermediate electrodes are mainly supported by the seats in the post-electrode *g*. The apparatus thus described is placed in a battery-circuit which includes the primary portion of the induction-coil by way of the wires *l* and *l'*, which are respectively coupled to the diaphragm-electrode *e* by way of the annular rim of the metallic diaphragm, and to the post-electrode *g* by way of the two springs, *i*, which bear against its surface. The vibrations of the diaphragm due to vocal and other sounds are imparted to the two main electrodes, and the intermediate electrodes, being loosely mounted between them, are variably vibrated, so as to vary the character of their contacts with their seats in the main electrodes and cause the corresponding variations in the primary or battery circuit, which are requisite for properly influencing the secondary or line circuit during telephonic communication.

While I deem it important to employ the springs *i*, I am well aware that fair results will accrue if the post-electrode be not thus confined between their screws and the springs, provided great care be exercised in so proportioning the length of the posts, the depth of the seats *e'* and *g'*, and the length of the intermediate electrodes as to secure for the latter the requisite freedom, and when said springs are dispensed with I connect the primary circuit directly to the post electrode.

The several electrodes may all be composed of the same material, or each of a different material, and either or all of them may be composite in their character. The cheapest material known to me which serves a good purpose in this connection is carbon in its usual form as employed in telephones; but I also obtain good results if the intermediate electrodes be composed either of pure silver or platinum, and also with carbon which is electroplated with either of said metals, and especially with carbon saturated or charged with solutions of the salts of either of said metals, preferably perchloride of platinum.

It is obvious that if a non-metallic diaphragm be employed the primary circuit will be connected directly with the diaphragm-electrode, as in other forms of telephones, and it is to be distinctly understood that this can be done without departure from certain portions of my invention.

As hereinbefore stated, one or more of the intermediate electrodes may be employed. If but one be relied upon, I prefer that it be located centrally with reference to the diaphragm. I have obtained the best results with three of the intermediate electrodes, as shown in Fig. 1, especially when used with a light battery and on a short line; but for a more extended service five of said electrodes, as shown in Figs. 5 and 6, may be satisfactorily employed.

While I obtain the best results with the diaphragm and the electrodes inclined, as shown, so that the intermediate electrodes will be supported mainly by the post-electrode, similar results will accrue if the inclination be reversed, so that the diaphragm-electrode will mainly support the intermediate electrodes. With the intermediate electrodes in a horizontal position, the variations in the electric current are liable to be irregular and unsatisfactory.

It will be observed that, inasmuch as all of my electrodes are mounted upon and carried by the diaphragm, neither of them can vary in its adjustment with relation to another, except so far as may occur from the wear of the contact-surfaces between the intermediate electrodes and their seats, and this in practice is found to be so slight, even with carbon as a material, that thus far in my experience only an initial adjustment has been required.

While I have shown the post-electrode supported by posts projecting from the working or vibrating portion of the diaphragm, and prefer that arrangement, I do not preclude myself from locating said posts *f* at other points on said diaphragm, provided they are rigidly mounted thereon, as distinguished from being mounted on portions of the casing, as heretofore.

I am aware that dish-shaped diaphragms have heretofore been employed for sound-transmitting apparatus; but, so far as my knowledge extends, they have always heretofore been so mounted on standards as to be wholly exposed to vibratory influences, and I believe I am the first to employ with electrodes, as described, a dish-shaped diaphragm having a flat face secured at its periphery to a casing concentric with a mouth-piece, whereby said face can vibrate like an ordinary flat

diaphragm, and be able to carry the weight of my electrodes without liability of warping or bending.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, substantially as hereinbefore described, of a metallic diaphragm, an electrode firmly mounted centrally thereon, a second electrode coincident with the first and parallel with the diaphragm, and mounted upon but insulated from said diaphragm, and one or more intermediate electrodes, substantially at right angles to the diaphragm and loosely seated in recesses in said first and second electrodes.

2. The combination, substantially as hereinbefore described, of the molded or struck-up diaphragm having a flat face, an annular rim, and a flange for securing it in position, the two main electrodes, and the one or more intermediate electrodes.

3. The combination of the diaphragm-electrode, the post-electrode, the one or more intermediate loose electrodes, and the posts, springs, and screws by which the post-electrode is maintained in position and adjusted with relation to the diaphragm-electrode for varying the contacts of the intermediate electrodes with their seats, substantially as described.

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Witnesses:
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DANIEL WARREN.