(No Model.) 2 Sheets—Sheet 1.

J. D. HUSBANDS.

TELEPHONIC RECEIVING INSTRUMENT.

No. 299,074. Patented May 20, 1884.

Fig. 1.

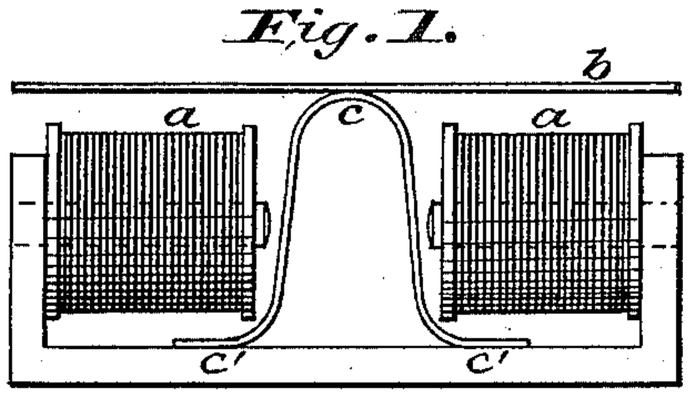


Fig. 2.

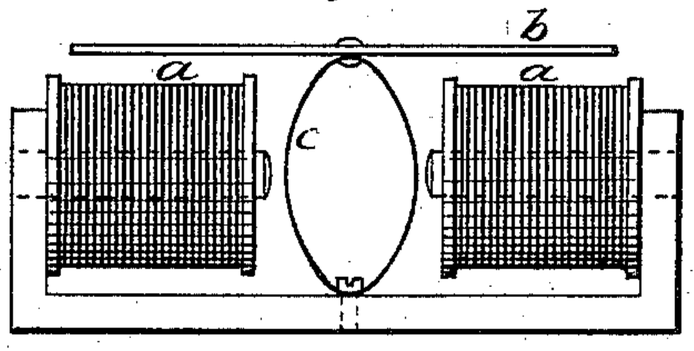


Fig. 3.

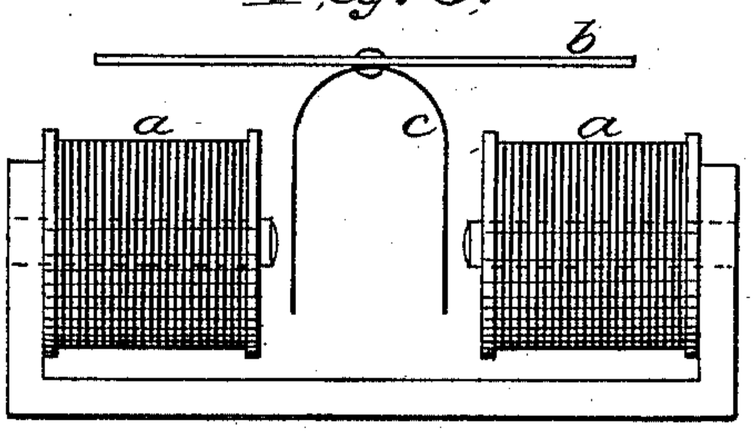


Fig. 4.

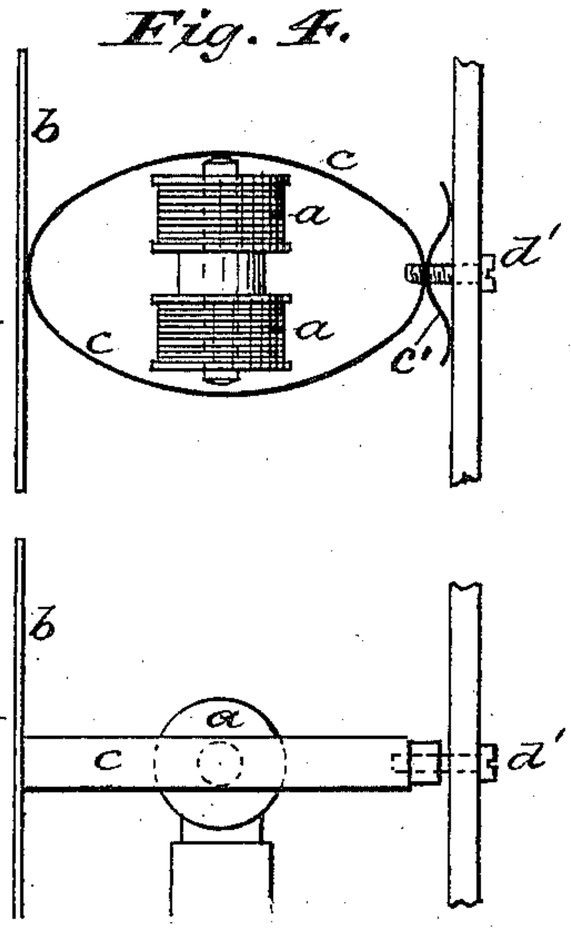


Fig. 5.

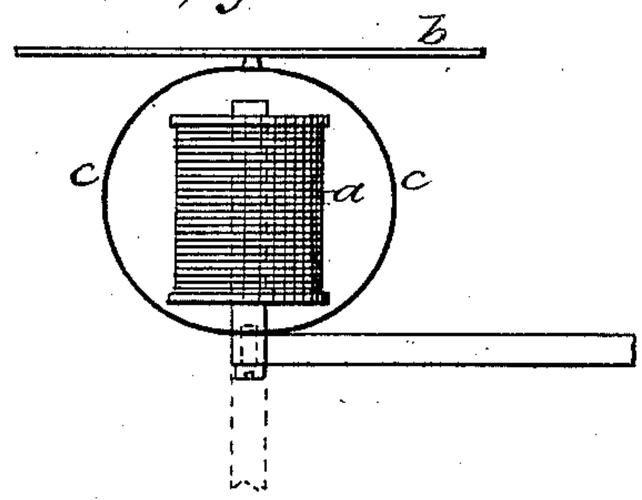


Fig. 6.

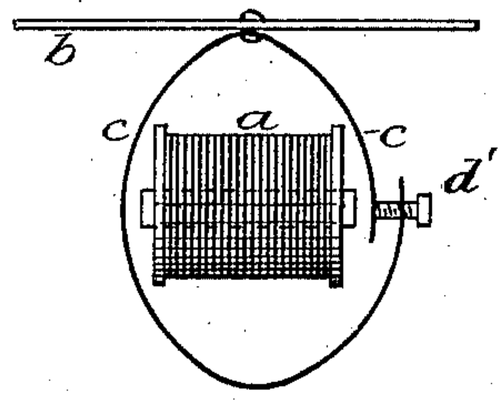


Fig. 7.

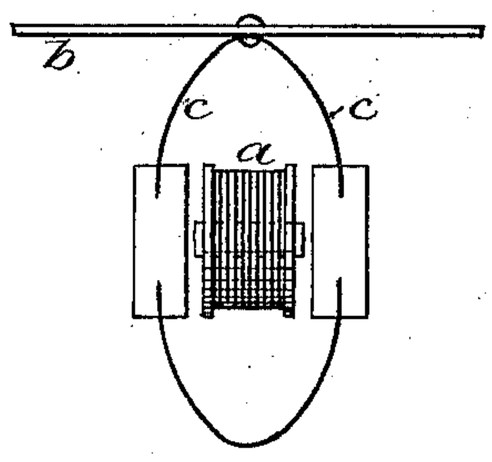
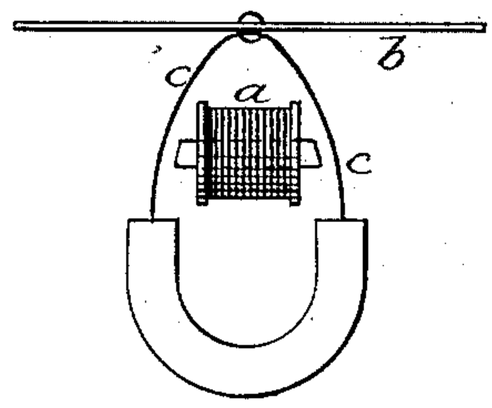


Fig. 8.



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(No Model.) 2 Sheets—Sheet 2.

J. D. HUSBANDS.

TELEPHONIC RECEIVING INSTRUMENT.

No. 299,074. Patented May 20, 1884.

Fig. 9.

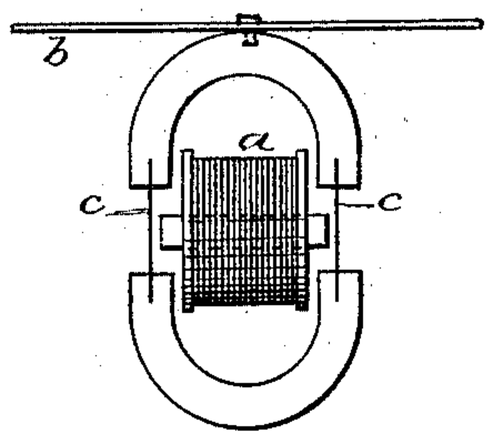
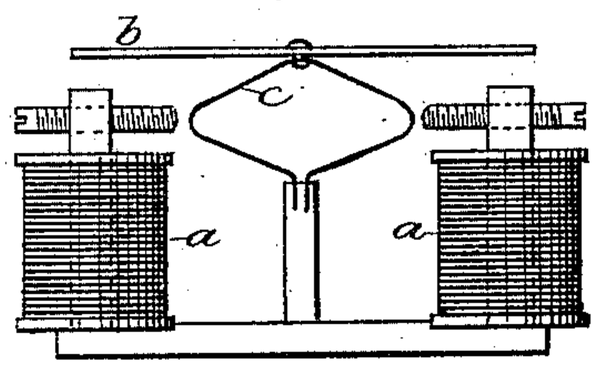


Fig. 10.



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UNITED STATES PATENT OFFICE.

JOSÉ DOTTIN HUSBANDS, OF LONDON, ENGLAND, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

TELEPHONIC RECEIVING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 299,074, dated May 20, 1884.

Application filed January 4, 1883. (No model.) Patented in England June 24, 1882, No. 3,008.

To all whom it may concern:

Be it known that I, JOSÉ DOTTIN HUSBANDS, of London, England, gentleman, have invented new and useful Improvements in Telephonic Receiving-Instruments, (for which I have obtained a patent in Great Britain, No. 3,008, bearing date June 24, 1882,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to telephonic receiving-instruments or receivers; and it consists, chiefly, in the combination of a diaphragm, disk, or tympan with an armature consisting of a hook or circle or part of circle of magnetic material projecting angularly therefrom into the field of an electro-magnet, and so arranged that when an undulatory or vibratory current caused by the action of the air-waves in the transmitting-instrument is passing through the coils of the magnet the latter will cause vibrations of the said armature, which vibrations will extend to the diaphragm or disk, and that the vocal or other sounds produced in the transmitter will be received by the said diaphragm and will be very clearly and distinctly reproduced thereby. The electro-magnets used may be of various constructions, a single electro-magnet being used in any of the forms. As shown in Figures 1, 2, 3, and 10, a single magnet of the U or horseshoe variety is used, having poles extending inwardly toward each other, upon which the helices of the electro-magnet are placed, the unattached portions of the flexible armature extending into the magnetic field between the poles and in proximity to the poles. In other cases, as shown in Figs. 4, 5, 6, 7, 8, and 9, the core of the magnet is a straight bar with one or more helices placed thereon, the poles extending on each side beyond the helix or helices, while the flexible armature extends around or partially around the poles and in proximity thereto and inclosing the electro-magnet. The advantage of this principle of construction is chiefly due to the angular arrangement or connection of the said armature with the diaphragm, which greatly increases the mechanical effect of the current-vibrations upon the diaphragm, and therefore augments the sounding capacity of the latter. I embody this principle of construction in various forms or modifications, some of which I have shown in the accompanying drawings.

Figs. 1, 2, 3, 4 to 10 are views of various forms of my improved receiver.

In these figures, *a a* or *a* is the electro-magnet. *b* is a disk or plate of thin metal or other suitable material. *c* is the flexible armature, which is in contact with the said disk or diaphragm, and this contact may be preserved by attaching the flexible armature to the disk or diaphragm, if desired, the requisite condition being simply that such contact or connection shall exist between the two that the vibration of one shall be communicated to the other. This armature *c* projects angularly from the disk or diaphragm before the poles of the electro-magnet.

If desired, a regulating-screw, *d'*, may be used for controlling and varying the contact or tension between the flexible armature and disk or diaphragm, as shown in Figs. 4 and 6.

In Fig. 1 the armature *c* is a bent elastic strip or tongue of metal attached to the disk *b*, with its two arms extending across the field of the magnet *a*. Its ends *c'* are or may be secured to the part on which they rest. It is obvious that this elastic armature will vibrate freely with and according to the variations of current in the magnet-coils, and will impart its vibrations to the disk *b* of the receiver. A similar action will result from the modified arrangements shown in Figs. 2 to 10, in which I employ a hoop, ring, ellipse, semi-ellipse, or similarly-formed elastic armature, *c*, so arranged, in combination with the disk *b* and magnet *a*, that the variations of strength due to the undulations of the current in the coils will act on the said armature, and thereby cause the vibrations of the disk, as above described.

It is obvious that in some of these arrangements, instead of using a magnet having its poles on opposite sides of the curved, angular, elliptical, or other armature, I may place a magnet having its poles within the same without impairing the result.

In Fig. 2 armature *c* is shown attached at its center to diaphragm *b*, and its free ends brought together and secured to the base of

the electro-magnet *a a*, between the poles of which the armature vibrates.

In Fig. 3 the armature *c* is shown with its extremities unattached. The electro-magnet is disposed as in Fig. 2.

In Fig. 4 the electro-magnet consists of a straight bar or core, with the helices properly disposed upon the ends thereof, the flexible armature in this case being elliptical, inclosing the magnet, and passing in proximity to its poles. The diaphragm is in simple contact or just in contact with the diaphragm, while opposite thereto the flexible armature is secured to a base by an adjusting-screw, *d'*, which, in connection with a spring, *c'*, interposed between the armature and the base, serves to regulate the contact of the diaphragm and curvature and the latter's distance from the poles of the magnet.

In Fig. 5 the armature *c* is shown surrounding the electro-magnet, whose pole is in proximity to the armature *c* at the point where it is attached to the diaphragm *b*. The extremities of the armature are secured to the base on which the electro-magnet rests.

In Fig. 6 armature *c* is represented surrounding both poles of the electro-magnet. It is rigidly attached to the diaphragm *b* only. The screw which serves to hold the extremities together permits also of a certain adjustment of the armature by bringing the two extremities in contact with each other, or holding them apart.

In Fig. 7 the armature *c*, which is rigidly attached to the diaphragm only, is enlarged at a point opposite each pole of the inclosed magnet. This may be done by inserting the extremities of each half-loop into a solid block of soft iron, as shown in the figure.

In Fig. 8 the lower half of the armature-loop *c* is replaced by a horseshoe-shaped weight secured to the armature at each extremity. The electro-magnet which armature *c* surrounds is so placed that its poles are in proximity to the vibrating upper section of the loop, which latter is attached to the diaphragm only. In this as well as in the modification shown in Fig. 7 the tension of the armature-loop depends upon the weight of the heavy inflexible parts suspended to it.

In Fig. 9 the armature-loop *c* is formed of two inflexible half-loops, attached to each other opposite the poles of the inclosed electro-magnet *a* by the part which is alone left free to vibrate under the influence of the magnet. In this as in the last three figures the armature is suspended from the diaphragm *b*.

In Fig. 10 armature *c* is shown attached as in Fig. 2; but the electro-magnet is shown provided with adjustable pole-pieces, which can be caused to approach or recede from the armature.

I wish it to be understood that I do not limit myself to any unimportant, unessential details of construction, such as the form or size of the magnets, the formation or construction of the case or box, or the manner of attaching the disks, the magnets, or the armature to the same; but

I claim—

1. In a telephonic receiver, the combination of an electro-magnet, an elastic armature therefor and controlled thereby, and a diaphragm, the elastic armature being in contact at its center with the diaphragm, and thence projecting angularly in opposite directions into magnetic proximity to the poles of the magnet, opposite parts of the armature being in such proximity to the opposite poles of the electro-magnet, substantially as described.

2. In a telephonic receiver, the combination of a diaphragm, an elastic or flexible armature in contact therewith and controlling the vibrations thereof, and extending therefrom in opposite directions from the point of contact, and an electro-magnet arranged with its poles in magnetic proximity to opposite parts of the flexible or elastic diaphragm and controlling its movements, substantially as described.

3. In a telephonic receiver, the combination, with an electro-magnet, of a flexible or elastic armature, opposite portions of which are in proximity to the poles of the magnet, and a diaphragm, with which the armature is in contact between its portions opposite the poles of the magnet, substantially as described.

4. In a telephonic receiver, the combination, of a diaphragm, an elastic or flexible armature contacting therewith and extending angularly therefrom in opposite directions, an electro-magnet having its poles in magnetic proximity to the portions of the armature so extending, and means for regulating the proximity of the armature to the poles of the electro-magnet, substantially as described.

5. In a telephonic receiver, the combination of a diaphragm, an elastic or flexible armature contacting therewith and extending angularly therefrom in opposite directions, an electro-magnet having its poles in magnetic proximity to the portions of the armature so extending, and means for regulating and varying at the same time the tension of the contact of the diaphragm and armature and the proximity of the armature to the poles of the electro-magnet, substantially as described.

6. In a telephonic receiver, the combination of a diaphragm, an elastic or flexible armature contacting therewith and extending angularly therefrom in opposite directions, an electro-magnet having its poles in magnetic proximity to the portions of the armature so extending, and a set-screw, *d'*, whereby at the same time the tension of the contact of the armature and diaphragm and the proximity of the armature to the poles of the electro-magnet may be controlled and regulated, substantially as described.

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