

C. SORET.
AUDIPHONE.

APPLICATION FILED OCT. 5, 1912.

1,154,069.

Patented Sept. 21, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

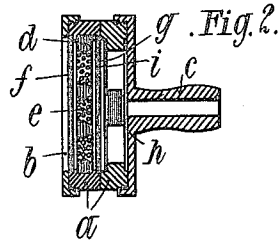
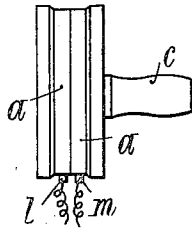


Fig. 3.

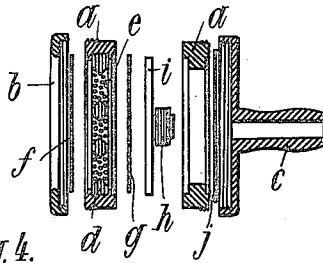


Fig. 4.

Fig. 5.

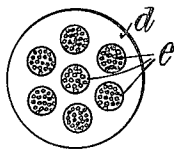
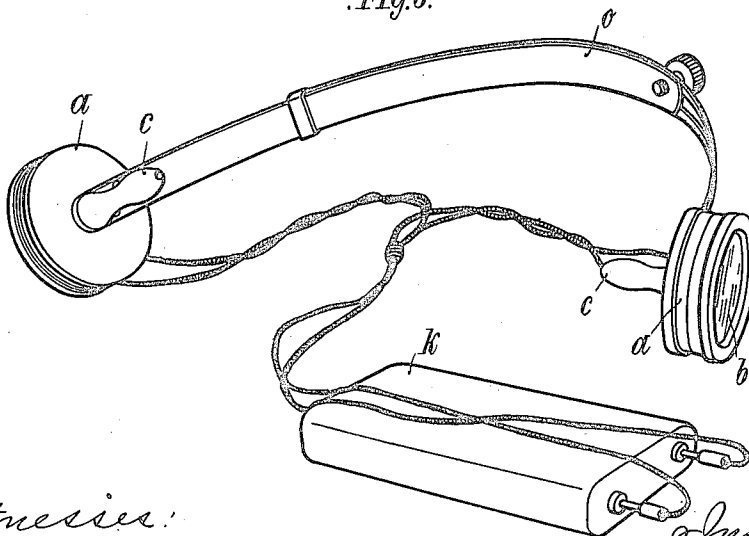
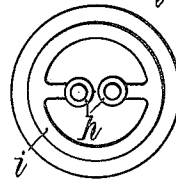


Fig. 6.



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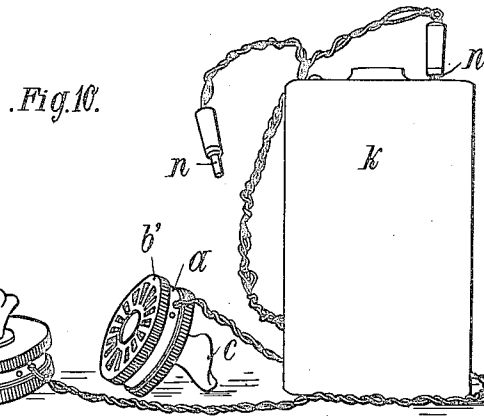
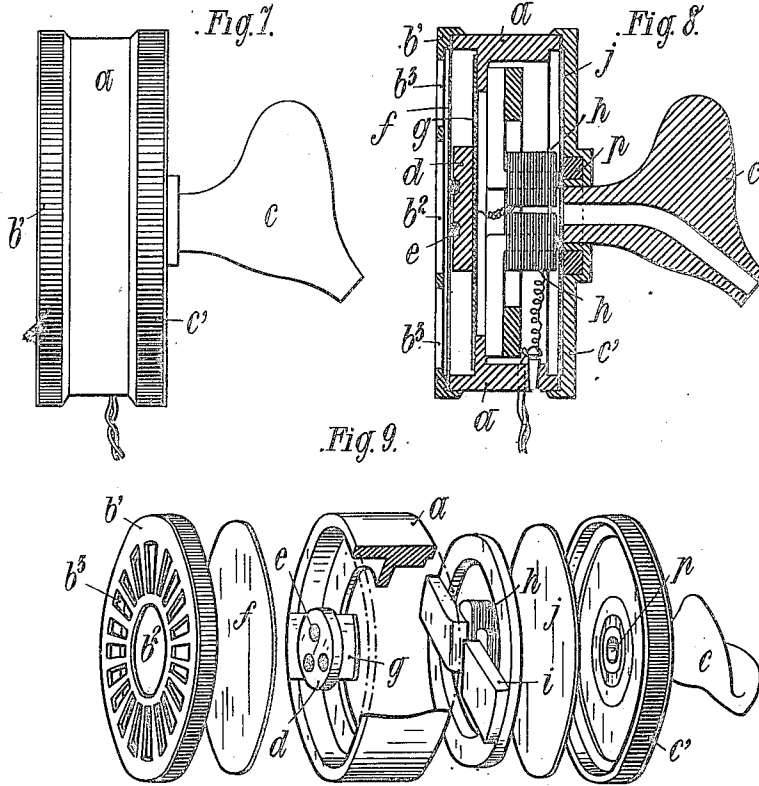
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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AUDIPHONE.

1,154,069.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CELESTIN SORET, a citizen of the French Republic, residing at Havre, France, have invented certain new and useful Improvements in Audiphones, of which the following is a specification.

It has been known for a long time that it was possible to improve the hearing of certain persons, whose sharpness of hearing is impaired, by using for the purpose an amplifying or transforming acoustic relay. This relay is generally constructed so as to utilize vibrations of a speaking metallic diaphragm, and is applied to external organs of the ear on which it acts so as to insure a clearer perception of the sounds. Among the means which have been utilized for constituting this relay which comprises, like a minute telephone circuit, a transmitter, a receiver and a source of electric energy, can be distinguished those in which the transmitter is independent of the receiver which is applied to the ear, and those in which the receiver and the transmitter are connected together by a handle, and similar as regards the respective arrangement of the parts carried by the same, to an ordinary telephone apparatus. In the first case the transmitter is generally fixed to the chest and connected to the receiver and to the pocket battery by a flexible conducting cord. In the second case, the transmitter and the receiver are mounted at the end of a hollow handle which contains the battery as well as the electric connections.

It will thus be seen that in all these apparatus it is usual to separate the transmitter from the receiver, which makes the manipulation of the apparatus somewhat awkward, on account of the flexible cords or conductors, and of the fairly large dimensions of the various parts constituting the same.

This invention relates to a new apparatus in which the microphone transmitter and the telephone receiver are contiguous and form a very small body weighing merely a few grams. This body is provided with an ear-piece which extends the telephone receiver and engages with the meatus or auditory conduit into which it passes so as not to cause any inconvenience and to leave the hands of the user entirely free.

The weight of the independent apparatus thus constructed, is sufficiently small to make it possible (although it could be uti-

lized for making a unilateral apparatus used only for one defective ear) to build a bilateral apparatus by the combination of two similar independent apparatus connected together like two glasses of a pair of spectacles. The use of the bilateral apparatus has the advantage—since the two acoustic devices are independent as regards their working—that there is produced a certain physiological equilibrium between the sensations received by the two ears, which equilibrium is necessary if fatigue is to be avoided. It thus produces a kind of stereoscopic effect or enhancement of the sound, which gives to the user or patient the sensation of the shifting of the source of the sound waves, when the person speaking to him moves in speaking, even if he does not see the said person.

In the accompanying drawing given by way of example, Figure 1 is an elevation of one of the combined receiver-transmitter apparatus. Fig. 2 is a corresponding vertical section. Fig. 3 shows in vertical section the various parts constituting the apparatus. Figs. 4 and 5 show in plan the plate of the microphone and the electromagnets of the telephone receiver. Fig. 6 shows in perspective the bilateral magnetic audiphone as well as the battery, source of electric energy and the connecting conductors. Figs. 7-10 relate to another construction of the bilateral audiphone according to this invention.

The microphone and the telephone are arranged in two half cases *a* provided respectively on their bottoms or covers, one with an opening *b* of a large diameter, and the other with an ear-piece *c* which can be introduced into the meatus or auditory conduit. These cases *a* are connected together so as to form a very small box which contains inside the combined microphone and telephone systems.

The construction of the parts of the apparatus is similar to that of any other apparatus of the same kind, that is to say, the microphone comprises a plate *d* containing granulated carbon *e*, at either side of which are arranged an outside receiver plate *f* and an inner transmitter plate *g*, both being preferably of carbon. The telephone comprises two electromagnets *h*, the coils of which are wound on the extensions of a circular armature *i*. A vibrating plate *j* made of metal, completes the apparatus.

The current which is supplied from a

pocket battery *k* by a conductor terminating at the binding screw *l*, passes into the plate *f*, block *d* of the microphone, plate *g*, then into the electromagnets *h* and returns through the terminal *m* to the battery *k*. The undulatory variations of current, due to the action of sound vibrations on the microphone, bring about variations of magnetic field required for causing the plate *j* of the telephone receiver to vibrate.

Instead of utilizing, for keeping the apparatus against the ear, and as has already been attempted to do, ear-pieces which fit exactly into the meatus or auditory conduit which they close (which may be an inconvenience and even become intolerable), the two apparatus of the bilateral audiphone are connected together by a weak spring *o* which is lengthened, and the length of which is adjusted at will in order to adapt it in a suitable manner. The spring *o* rests on the neck without exercising any pressure, so that the whole apparatus, although held in a very steady manner on the two ears, does not in any way inconvenience the patient. This arrangement enables deaf people to take advantage also of the waves which reach them directly, and which are added to the telephone sounds for correcting their harshness.

The audiphone thus constituted is for the hearing what the spectacles are for the sight. It works as a corrector, that is to say, it improves direct perception of sounds, instead of forming a substitute for it, and is of such a nature as to bring about gradually the real reëducation of the ear. The combination in a single block of the telephone and of the microphone distinguishes and characterizes the invention, for generally in the well-known apparatus the single microphone operating one or two telephones, is secured to the chest, while the receivers are secured to the ears. The position of the microphone exposes it to shocks, so that the vibrating plate is necessarily covered with a facing, generally of ebonite in which are provided holes so as to enable the sound waves to act on the vibrating plate. This arrangement makes it necessary, in order to obtain sufficient area of perception, to use microphone of large diameter, the carrying of which is a considerable drawback. In the apparatus according to this invention, the microphone plate may be left, if necessary, completely free.

In the construction shown in Figs. 7-10, the spring *o* intended to secure together the two microtelephonic blocks, has been done away with, the perforated ear-pieces *c* with which the rear faces of each of the said blocks are provided, being sufficient for keeping them against the two ears if the latter are of normal shape.

Each of the receiving-transmitting apparatus constituting the bilateral audiphone,

is inclosed in a casing *a* of a single piece, closed by bottoms or covers *b'* *c'*, one of which *c'* is provided with an ear-piece *c* of a special shape, and the other one *b'* is perforated. To that end, the bottom *b'* is provided with a central opening *b²* surrounded by other radial openings *b³*, uncovering the largest portion of the microphone plate *f*, without affecting the strength of the apparatus.

The microphone is constituted by a pastil or disk *d* of small dimensions resting on a narrow, thin and flexible ebonite plate *g*. The pastil *d* is provided with three very small cells of conical shape, with strongly oblique and highly polished walls. The depth of the said cells does not exceed one-third of the thickness of the pastil *d*, and they contain respectively a few grains of carbon *e*. To the said pastil *d* which is covered by the carbon plate, is connected the conducting wire which terminates at the electromagnet *h* of the receiver.

The telephone comprises a powerful magnet *i* with successive poles terminating in polar pieces of rectangular cross-section, on which is wound the wire connected, on the one hand, to the body of the microphone, and on the other hand, to an inner insulated terminal which communicates with one of the poles of the battery *k*, the other pole of which is connected by flexible wires to the body of the apparatus. It is a permanent magnetic system, the intensity of field of which varies with the variations of the microphone resistance.

In front of the poles of the magnet *i* and in the cover *c'*, is arranged a soft iron ring *p* intended to insure a better distribution of the lines of force through the vibrating plate *j* and forming an exciter for retaining the power of the magnet *i*. The plate *j* of the receiver is held in the casing *a* by the cover *c'* provided in the center with a perforated ear-piece *c* arranged for keeping the apparatus in place in an ear of normal shape and dimensions.

One of the characteristics of the whole, in addition to its bilateral character and to the combination of all the constituent parts of each of the apparatus into a single light block, consists in the enormous resistance of each of the microphones, owing to which, by connecting them in parallel, very little current is consumed. In that way, on the one hand, certain secondary vibrations are avoided, and on the other hand the battery of very small volume can last for a very long time. It will be seen moreover that the flexible conductors pass direct into the interior of the casings *a* and that they terminate respectively at their opposite ends in plugs *n* which engage with the connection sockets with which the battery *k* is provided. It is therefore sufficient to disengage one of

the plugs *n* from the corresponding socket, in order to render the apparatus inoperative, which does away with any switch.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a magnetic audiphone, the combination of two audiphones each constituted by a receiving microphone and a transmitting telephone connected together in one and the same case the parts of which serve to connect together the parts of the said microphone and telephone and means for supporting each audiphone at the ear of the user.

2. In a magnetic audiphone, the combination of two audiphones each constituted by a receiving microphone and a transmitting

telephone connected together in one and the same case, which comprises a vibrating receiving plate and members for transmitting the sound to a transmitting plate arranged at the side of the ear-piece communicating with the ear, the ear-pieces of each audiphone being adapted to fit the ear so as to enable them to adhere to the ears naturally.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CELESTIN SORET.

Witnesses:

A. HUARD,
CONSTANT FRIERARD.