S. H. SHORT.
Electric Telephone.

No. 218,582. Patented Aug. 12, 1879.

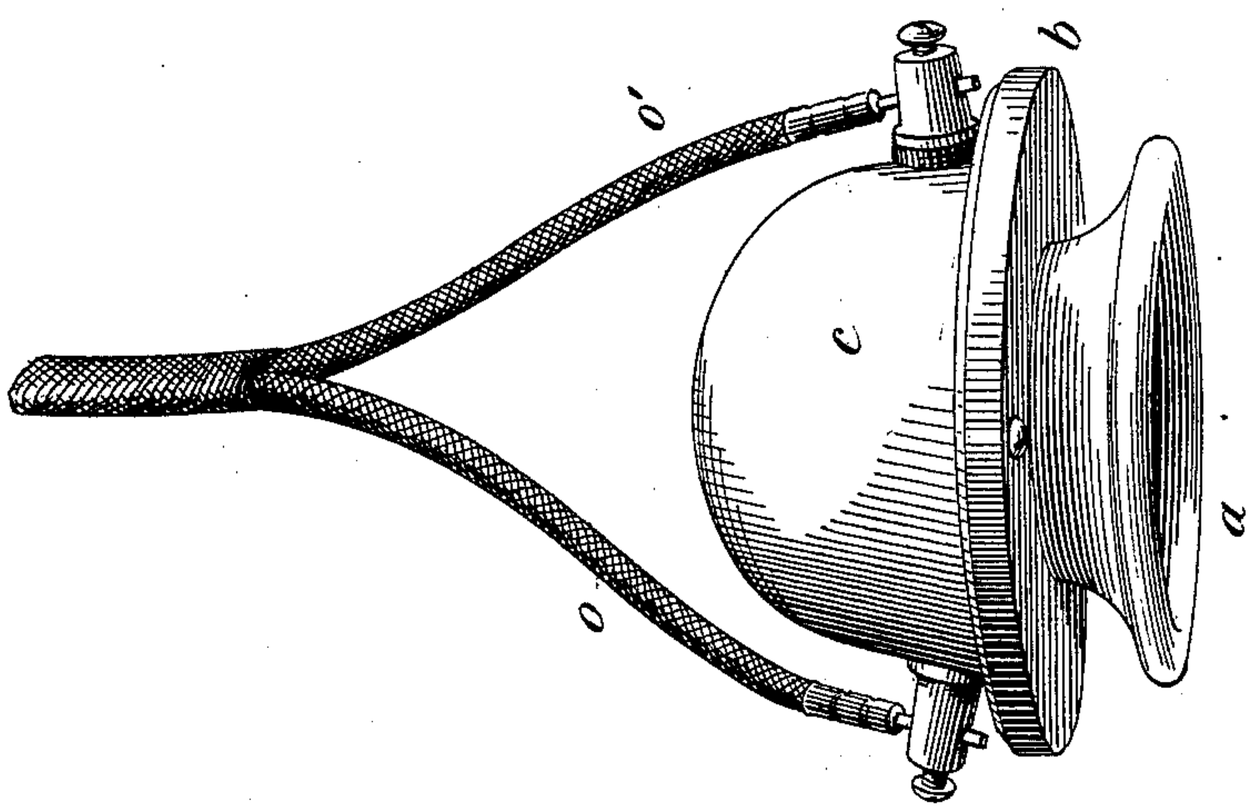


Fig. 1.

Fig. 2.

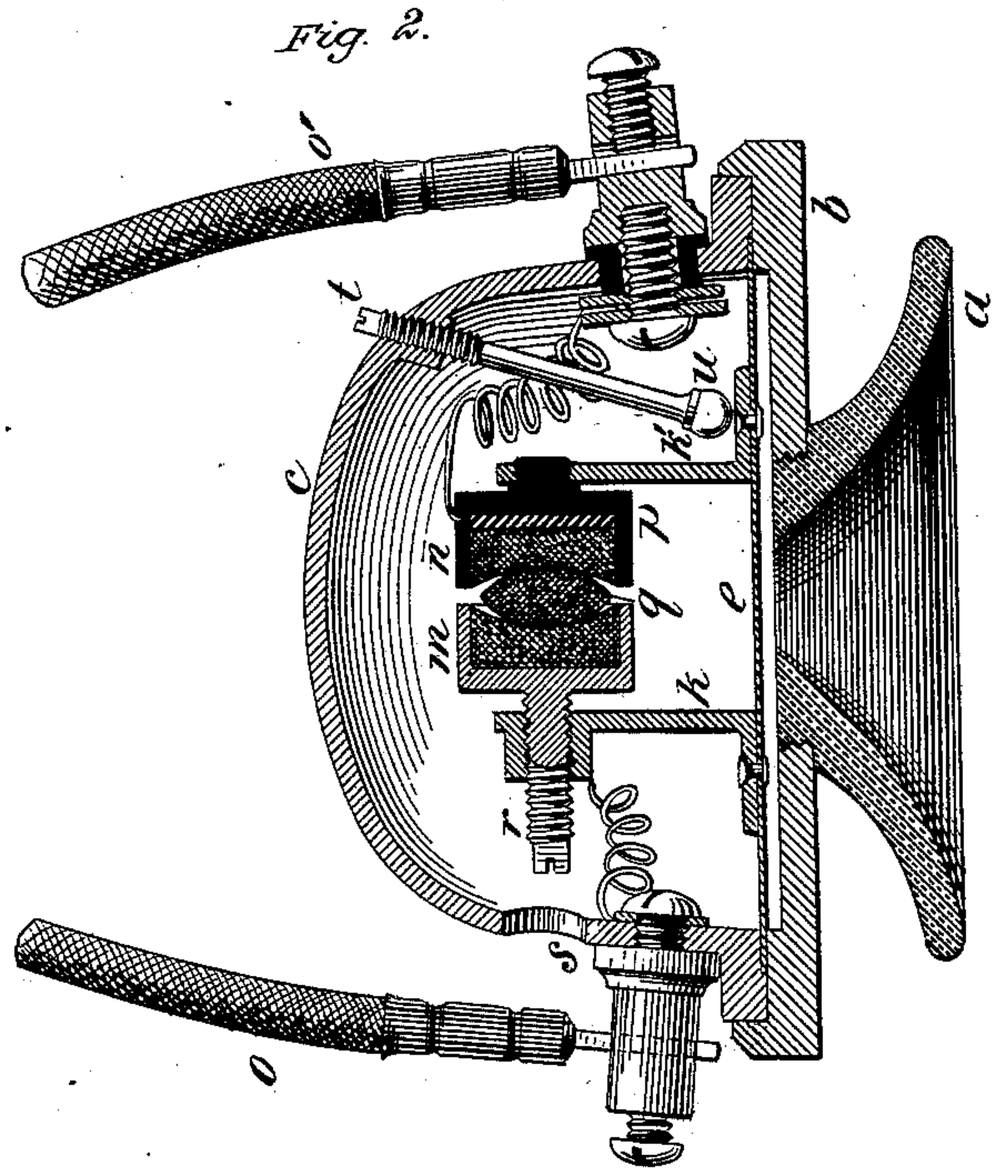
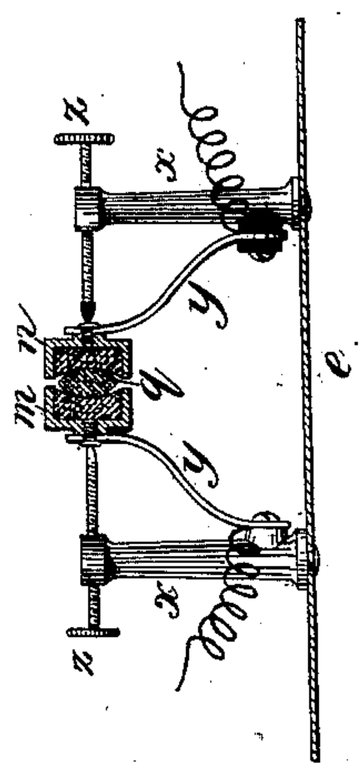


Fig. 3.



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UNITED STATES PATENT OFFICE.

SIDNEY H. SHORT, OF COLUMBUS, OHIO.

IMPROVEMENT IN ELECTRIC TELEPHONES.

Specification forming part of Letters Patent No. **218,582**, dated August 12, 1879; application filed May 8, 1879.

To all whom it may concern:

Be it known that I, SIDNEY H. SHORT, of Columbus, Franklin county, State of Ohio, have invented an Improvement in Electric Telephones, of which the following is a specification.

My invention relates to the transmitting-instruments of an electric speaking-telephone, and more particularly to instruments of that class in which the electric undulations which convey articulate speech are controlled or caused by the varying resistance of an imperfectly-conducting medium under pressure. As these variations in the amount of pressure upon the conducting medium are caused by the vibrations of a diaphragm set in motion by the slight impulses of the sound-waves, and are themselves very slight and inadequate to produce the desired effects in circuits where there is any considerable resistance, it has been deemed necessary to seek some special material for such conducting medium, so that the necessary scope in the variations or rise and fall of the tension could be obtained without too great resistance to the electrical current.

The object of my invention is to secure the same results by increasing the amount of pressure which is applied to the ordinary carbon used as a medium for the transmission of the variable electrical undulations, and by enlarging the scope or degree of variation in the pressure applied through the agency of the ordinary vibrating diaphragm, whereby the excessive resistance of the ordinary carbon medium may be overcome, and a sufficient variation in the electrical undulations be obtained. Heretofore the pressure has been applied to the carbon or other imperfectly-conducting substances in the transmitting-instrument directly from the diaphragm, using for that purpose only the force and motion imparted to the said diaphragm by the sound-waves. This construction and mode of operation leave the carbon medium ordinarily free from pressure, and allow it to offer its full and natural amount of resistance to the electrical current, while the variety in pressure and the consequent variety in the electrical undulations are only such as can be produced by the slight and unassisted impulses of the diaphragm directly applied to the carbon or other medium.

My invention consists, first, in holding, by mechanisms substantially as described, the carbon or other imperfectly-conducting medium in the transmitting-instrument regularly under pressure, and in causing the action of the diaphragm, under the impulses of the sound-waves, to diminish the pressure thus regularly applied, whereby the resistance of the carbon or other conductor can be reduced and regulated at will, and greater sensitiveness and scope of the electrical undulations be obtained.

It consists, in the second place, of the special mechanism by which the pressure is applied, and the vibrations of the diaphragm are made to diminish the said pressure, all as hereinafter fully set forth, and particularly indicated in the claims.

The apparatus in which I have embodied my invention is shown in the accompanying drawings, in which—

Figure 1 is a perspective view, and Fig. 2 a central longitudinal section, of my improved transmitter.

In these figures, *a* is an ordinary mouthpiece attached to a plate, *b*, which clamps to the disk *c* an ordinary diaphragm, *e*, of iron or other elastic body. To this diaphragm are connected by small rivets the standards *k k'*, each one of which is located, preferably, about midway between the center and the edge of the diaphragm *e*. To the inner ends of these standards are connected the cups *m* and *n*. The cup *m* is of metal and in electrical connection with the wire *o*. It contains a disk of carbon fitted to the cavity, which disk is formed with a concave face, as shown in Fig. 2. The cup *n* is made of hard rubber or other non-conducting material, and is connected to the standard *k'*. It is provided with a carbon disk similar to that shown in the cup *m*. Underneath the carbon disk, and resting against the bottom of the cup, is a platinum plate, *p*, which is in electrical connection with the wire *o'*. Between the concave surfaces of the two carbon disks is a carbon button, *q*, having two convex surfaces, formed on a shorter radius than that of the concave surfaces of the disks, as clearly shown in the figure.

The cup *n* is fixed rigidly to its standard *k'*; but the cup *m* is adjustable in its standard, and is capable of being advanced or withdrawn by means of the threaded shank *r*, the end of which, for accessibility, is opposite the perforation *s* in the case *c*.

The button *q* is held loosely between the concave surfaces of the carbon disks, and may be subjected to compression to any required degree by turning the threaded shank *r*, the compression being applied alike to the carbon disks and to the carbon button held between them.

The standards *k k'* are set perpendicular to the plane of the diaphragm. Obviously, when the diaphragm is bent inwardly the inner ends of the standards are caused to diverge from each other, whereby the carbon medium is relieved from the pressure applied by means of the threaded shank *r*, and the amount of resistance of the said medium is increased, such increase being in proportion to the spread of the standards and the deflection of the diaphragm. Manifestly the amount of motion for a given deflection of the diaphragm in the inner ends of the standards will depend upon their length, so that by this construction any desired amount of motion can be produced by the ordinary or slight vibrations of the diaphragm.

Further, as the divergence of the standards increases from the diaphragm inwardly, and the surface of the button is formed on a smaller curve than that of the cups, it is plain that divergence of the standards, caused by a depression of the diaphragm, will tend to open the cups more upon that side farthest from the diaphragm, and that the amount of surface of the button in contact with the cups on each side will be diminished. This diminution of the surfaces in contact also increases the resistance of the medium, and tends to magnify, in the variations of the electrical current, the effect of the vibrations imparted to the diaphragm, caused by the sound-waves in contact therewith.

It will be observed, therefore, that the carbon conductor is in its normal condition under pressure. The amount of this pressure may be varied at will, and applied to any degree which may be desired, by means of the screw, so that there is no possibility of any difficulty arising from too great resistance in the imperfect conductor.

It will also be observed that the variations in the amount of resistance and in consequent electrical currents are caused by the diminution of pressure and the resulting increased resistance, so that the scope of the instrument is almost indefinitely enlarged.

The amount of motion and the leverage being dependent upon the length of the standards which support the cups, any desired degree of sensitiveness may also be obtained. I have found by actual experiment that the results are highly satisfactory in this respect.

In order to prevent repeated vibrations of the diaphragm after the first impulse is given, which itself is sufficient for the communication of the sound, I have provided a device to check these vibrations of the diaphragm. It is shown at *t*, and consists of a slender rod, threaded where it passes through the shell, and having upon its inner end a soft-rubber head, *u*, which may be in contact, or nearly in contact, with the base of one of the standards.

The head is sufficiently soft to yield under the impulse of the sound-wave; but it offers sufficient resistance to deaden the subsequent vibrations.

A modification of the standard is shown in Fig. 3, in which short posts *x x* are used, to the bases of which are fixed the ends of the light curved springs *y y*. These springs carry the cups, and are moved in or out to graduate the pressure on the carbon by means of screws *z z*, the heads of which, as in the form first described, are accessible through the holes in the shell.

What I claim as my invention is—

1. In a telephonic transmitter, the combination of an elastic diaphragm adapted to vibrate under the impulse of the sound-waves, of standards connected to said diaphragm, of an imperfectly-conducting medium held under constant pressure on said standards, and an electrical connection with a battery and a receiving-instrument, said devices being adapted to operate to cause the electrical pulsations by diminution of the constant pressure, as set forth.

2. The combination of the elastic diaphragm, the standards attached thereto, the carbon conductors, and the set-screw carrying one of the carbon conductors, by which the pressure on the carbon may be varied, as set forth.

3. The combination of the elastic diaphragm, the standards fixed thereto, carrying disks of carbon, formed with concave faces, and the double convex carbon button, said button being formed on a smaller curve than that of the cups, as set forth.

4. In a telephonic transmitter, a standard fixed to the diaphragm at some point between its center and edge, and acting in connection with another standard to hold the carbon under pressure, and to diminish said pressure by vibrations of said diaphragm, said carbon being in electrical connection, as set forth.

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

SIDNEY H. SHORT.

Witnesses:
WARREN SEELY,
L. P. ELWELL.