(No Model.) 2 Sheets—Sheet 1.

C. EWING.

TELEPHONE TRANSMITTER.

No. 258,040. Patented May 16, 1882.

Fig. 1.

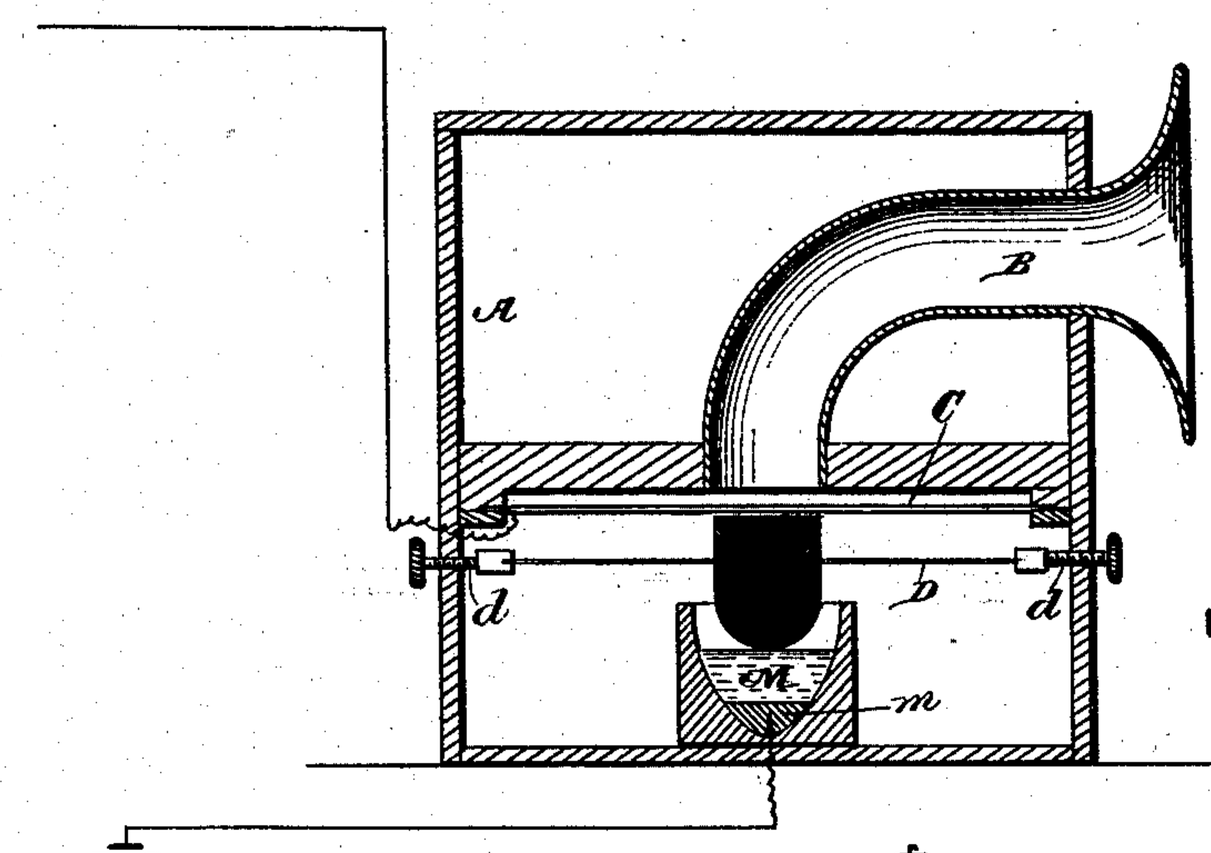
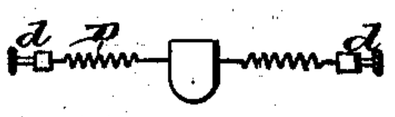


Fig. 7.



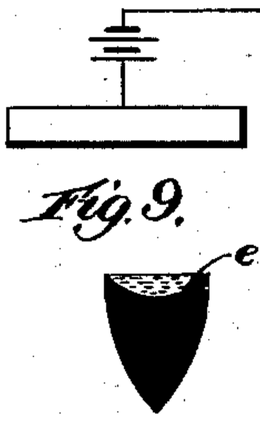


Fig. 9.

Fig. 6.

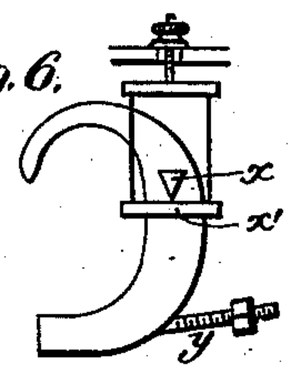


Fig. 8.

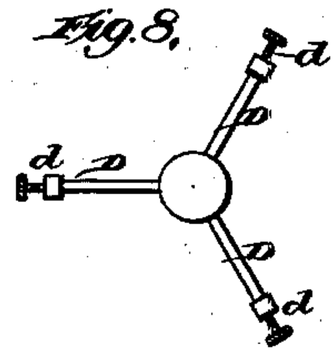


Fig. 2.

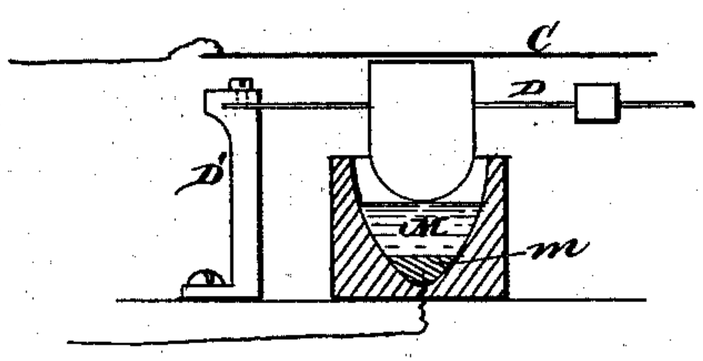


Fig. 3.

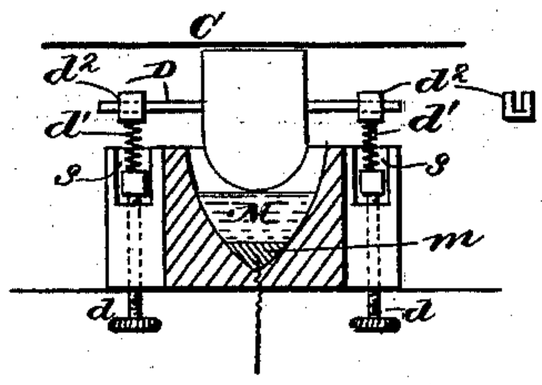


Fig. 4.

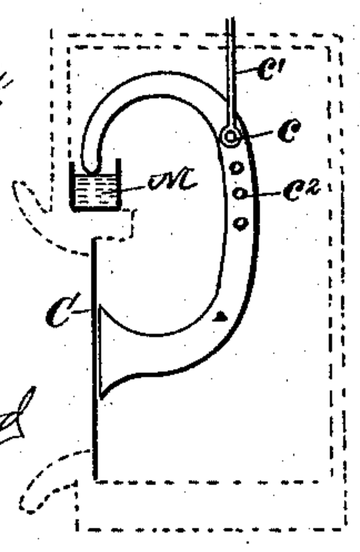
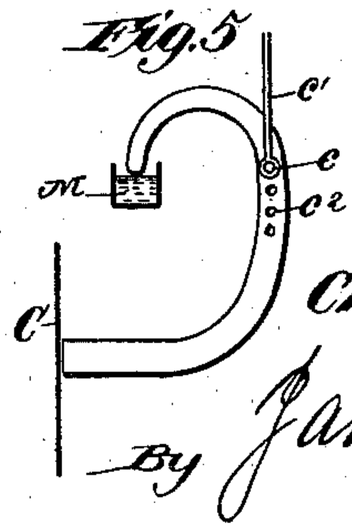


Fig. 5



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Atty.

(No Model.) 2 Sheets—Sheet 2.

C. EWING.

TELEPHONE TRANSMITTER.

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Fig. 10

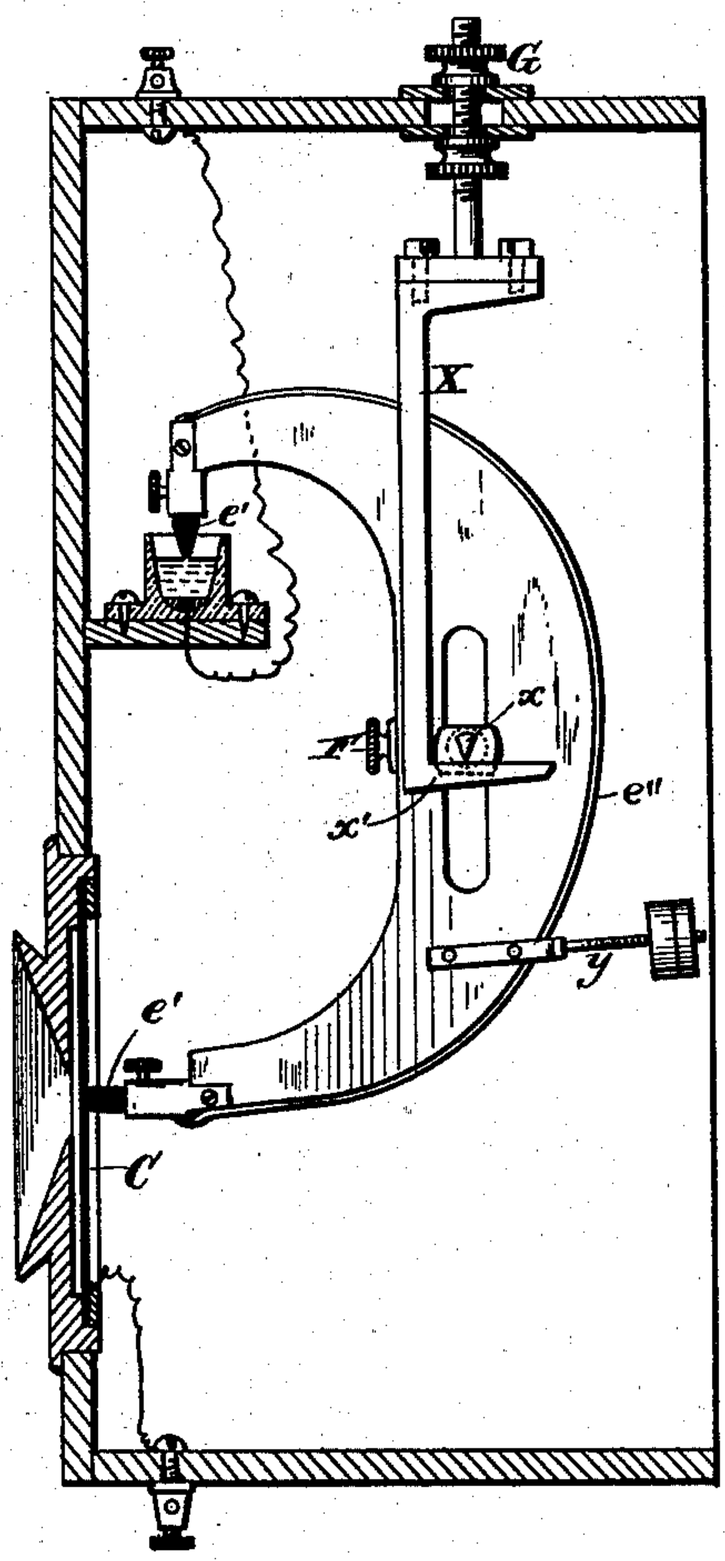
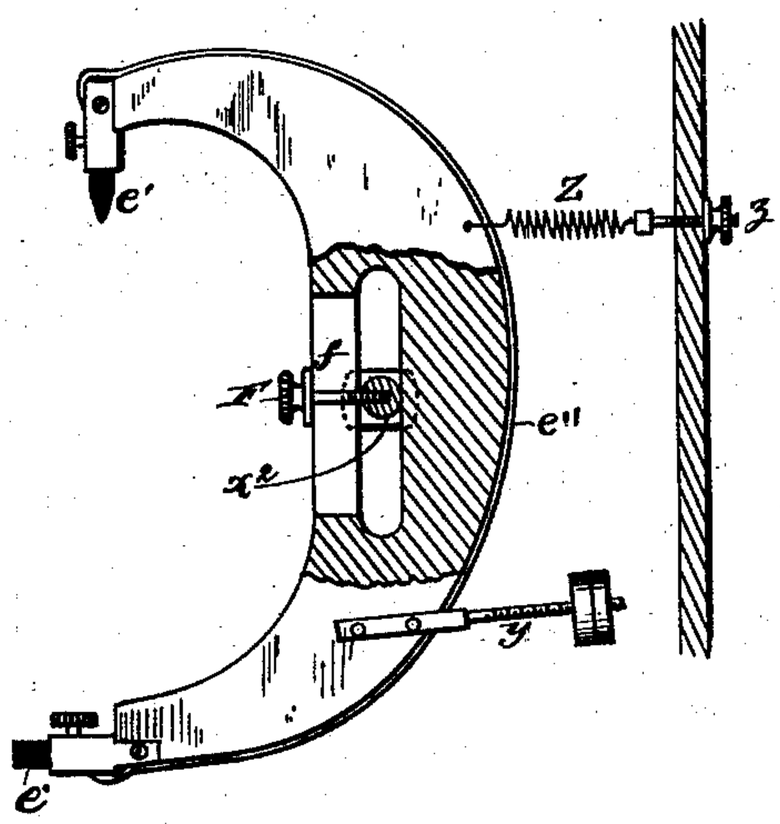


Fig. 11.



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By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

CHARLES EWING, OF WASHINGTON, DISTRICT OF COLUMBIA.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 258,040, dated May 16, 1882.

Application filed April 4, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES EWING, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Telephone-Transmitters, of which the following is a specification.

My invention relates to that class of telephones in which the current on the line is varied by variations of surface-contact between the electrodes of the transmitter, which variations are caused by the action of the sound-vibrations on the transmitter-diaphragm.

The object of the invention is to produce a transmitter of great sensitiveness and delicacy, and one which can be readily adjusted and is adapted for practical use.

The special features of my improved instrument will be fully described, and particularly claimed hereinafter.

In the accompanying drawings, Figure 1 is a vertical section through my improved instrument. Figs. 2 and 3 are sectional diagrammatic views, indicating modifications of the instrument. Figs. 4, 5, and 6 are similar views, indicating other modifications. Figs. 7 and 8 are views of modifications of the spring which supports the carbon. Fig. 9 is a modification of the carbon contact-point. Figs. 10 and 11 are further modifications of the form shown in Fig. 6.

Referring specially to Fig. 1, A is the boxing or casing of the instrument. A speaking-tube, B, is secured in the casing, and is curved so as to convey or direct the sound-vibrations onto the horizontal metallic diaphragm C, which is secured in place in any suitable and well-known way. Just below the diaphragm a small flat spring, D, connected at each end to the adjusting-screws *d d*, is stretched. This spring passes through and carries a ball, block, pencil, or fragment of carbon or other similar and suitable material, the upper side of which is held in contact with the diaphragm. The lower side or end of the carbon is preferably rounded, as shown in the drawings, and rests upon and barely touches the surface of a quantity of mercury, M, contained in a cup or vessel within the casing of the instrument. This mercury constitutes one electrode of the instrument and the carbon the other, and the circuit-wires are respectively connected with the metallic diaphragm, which is in contact with the carbon and with the mercury.

In order to insure full and complete connection between the line-wire and mercury, and obtain the necessary conductivity between them, I place a metallic plate, *m*, in the bottom of the mercury-cup, and connect the wire with that. The tension of the spring and the force of contact between the mercury and carbon may be regulated by the adjusting-screws. The upper side of the carbon and the diaphragm may be said to constitute a secondary pair of electrodes, between which variations of contact are necessarily produced by the adjustment of the spring and the vibrations of the diaphragm. Now, if a sound be spoken in the mouth-piece the sound-waves will produce vibrations of the diaphragm and consequent variations of surface-contact between the mercury and carbon, which changes cause corresponding variations of current on the line, as is well understood. The carbon being delicately and elastically suspended between the mercury in contact with it and the diaphragm, gives an elasticity of action and delicacy and promptness of movement of the parts that render the instrument exceeding sensitive to sound-vibrations and capable of being practically used with very great advantage. When once adjusted it will transmit the lowest and loudest tones equally and without the jarring or grating sound so often heard from transmitters when they are loudly spoken to.

In Fig. 7 is shown a modification of the spring D to be used in the form of instrument shown in Fig. 1. In this figure the spring is spiral at each end and straight only in the middle, where it passes through the carbon. The tension of the spirals is increased or diminished by turning the adjusting-screws *d*.

Another modification for the same form of instrument is shown in Fig. 8, where the carbon is held in a central clasp, from which three springs, D, project radially, and are provided with adjusting-screws *d*, as in Fig. 1. These springs may be spirals, either in whole or in part, as the spring shown in Fig. 7. The object of the construction is to give the carbon a better support in all directions.

Fig. 2 shows a modification in which one end of the spring supporting the carbon is rigidly secured to a bracket or standard, D′,

its other end being free and carrying a sliding adjusting-weight, by means of which the contact of the carbon with the mercury may be varied.

Fig. 3 shows another modification, in which the spring or arm D, supporting the carbon, is carried by two vertical spiral springs, d' d'. The spring D, which in this case may or may not be elastic itself, rests in two small blocks, d^2 d^2, secured to the upper ends of the spiral springs. The spiral springs are placed in vertical sockets s s, either formed in the sides of the mercury-containing cup or in blocks at the sides of the cup, and are carried by the adjusting-screws d d. The adjustment will be well understood.

In the several forms of instrument described the diaphragms have been horizontal. In Figs. 4 and 5 an arrangement is shown by which vertical diaphragms may be used.

Referring to Fig. 4, the diaphragm C is secured vertically in the casing, as usual, and the mercury-cup is placed above and in line with it. The carbon in this case is formed somewhat in the shape of a Roman **C** reversed, and is delicately pivoted at c in a bracket, c', secured in the casing. When suspended in position one end of the carbon is in contact with the diaphragm and the other with the mercury. Of course the vibration of the diaphragm will produce changes of contact between the carbon and mercury. The carbon may be adjusted by changing its pivotal point, and for this purpose a series of holes, c^2, are made in it. In Fig. 5 substantially the same organization is shown, except that the mercury-cup is placed back of and out of line vertically with the diaphragm.

Fig. 6 shows another modification of the form of instrument seen in Figs. 4 and 5. In this figure the carbon electrode is pivoted between the arms of the depending bracket by lugs x, having knife-edges which rest on the cross-pieces x' of the open bracket-arms. The point at which the electrode will properly balance should be determined and then the bearing-lugs should be properly "seated" in the cross-pieces of the bracket-arms to prevent displacement of the parts by the vibration of the diaphragm. In order to give adjustment of balance, however, I secure a screw-stem, y, on the lower part of the electrode and put a nut on it. By adjusting the nut the center of gravity may be shifted until it falls at the knife-edge.

While the ends of the **C**-shaped electrode (shown in Figs. 4, 5, and 6) which are in contact with the mercury and diaphragm should be of carbon or some similar material, the intermediate part may be made of some other suitable material.

Fig. 9 shows a modification of the carbon electrode in which a small depression or cavity, e, is made in that end which is next the diaphragm to be filled with mercury, thereby much increasing the sensibility of the instrument.

In Figs. 10 and 11 is shown a modification of the form described in Fig. 6. It consists of a suspended **C**-shaped carbon-holder having carbon contact-points e' e', held in suitable clamps and caused to bear against the diaphragm C, and just impinge on the surface of the mercury in the cup. This **C**-shaped carbon-holder may be of metal, carbon, wood, or other suitable material, and may have its contact-points of carbon or any other suitable conductor of electricity. When the carbon-holder is made of wood or other non-conductor of electricity the carbon points are joined by a wire, e'', as shown in Figs. 10 and 11. It is suspended by a hub, x^2, extending through a slot in the crescent, and having lugs x, with knife-edges, that rest on the cross-piece x' of the bracket X, on each side of it. The carbon-holder is clamped to the hub x^2 by a set-screw, F, working in the slot f. This adjustment is best seen in Fig. 11, where the side of the carbon-holder is shown partially broken away, exposing the mechanism. By clamping the hub x^2 higher or lower in the slot the center of gravity of the holder may be raised or lowered with respect to the pivotal point, and the sensibility of the apparatus greatly increased. To regulate the pressure between the contact-points e' e' and the diaphragm C, I employ the same device as that shown in Fig. 6—a screw-stem, y, with a nut on the lower part of the holder, by adjusting which the center of gravity of the holder may be thrown to the front or rear or directly under the center of support, and the normal pressure exerted by the carbon contact press against the diaphragm, and the surface contact of the carbon with the mercury be increased or diminished with the greatest nicety to secure the best mode of working. To further this adjustment I have shown in Fig. 11 a retractile spring, Z, and set-screw z, which may be used. The bracket X, to which the carbon-holder is suspended, is raised or lowered, and with it the holder, by the screw and nut G. In this way the contact of one carbon point with the surface of the mercury in the cup and of the other with center of the diaphragm may be secured without disturbing any delicate adjustment that may have been arrived at in the pivoting of the carbon-holder itself.

I am aware that a transmitter having a diaphragm, a mercury electrode, and carbon placed loosely between the diaphragm and mercury is old, and I make no claim, therefore, to any such subject-matter.

What I claim is—

1. The combination of a transmitting-diaphragm, a mercury electrode, and a carbon block or pencil suspended between and in contact with the diaphragm and mercury, substantially as set forth.

2. The combination of a transmitting-diaphragm, a mercury electrode, and a carbon block or pencil elastically suspended between and in contact with the diaphragm and mercury, substantially as set forth.

3. The combination of a transmitting-diaphragm, a mercury electrode, a carbon block or pencil suspended between and in contact with the diaphragm and mercury, the spring or other suitable device, such substantially as described for supporting the carbon, and the adjusting-screws.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES EWING.

Witnesses:
JAMES L. NORRIS,
J. A. RUTHERFORD.