G. M. PHELPS.

MICROPHONE TRANSMITTER.

No. 380,925. Patented Apr. 10, 1888.

Fig. 1.

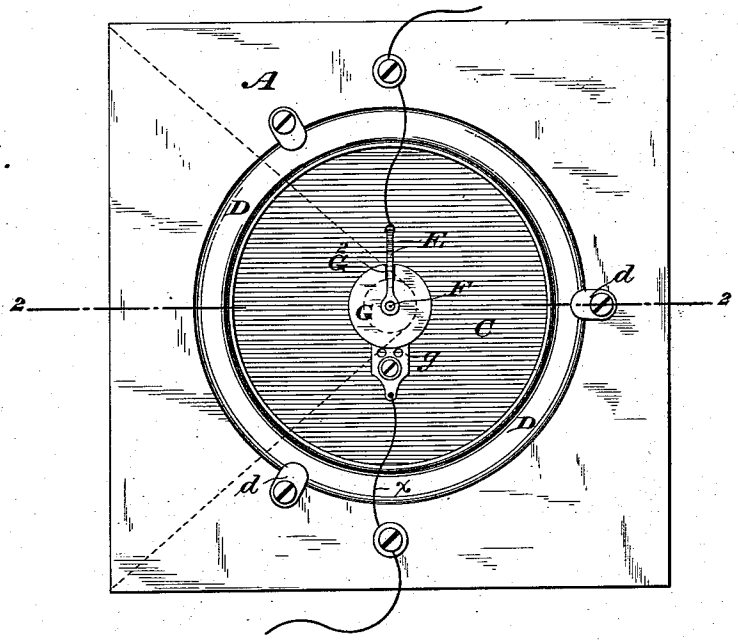


Fig. 2.

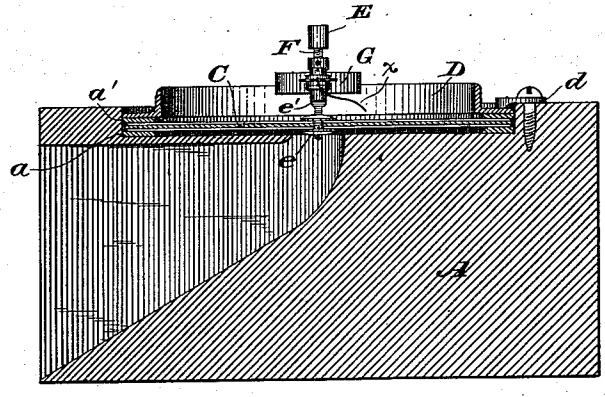
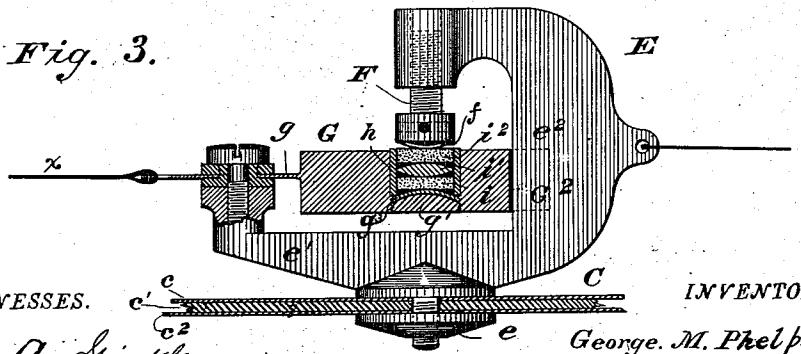


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MICROPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 380,925, dated April 10, 1888.

Application filed October 2, 1879.

To all whom it may concern:

Be it known that I, GEORGE MAY PHELPS, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Microphone-Transmitters for Electric Speaking-Telephones, of which improvements the following is a specification.

The first part of my invention relates to the mouth-piece or speaking-tube. Its object is to enable the diaphragm to lie in a substantially horizontal position when the instrument is in use or in position for service, thereby protecting the cavity under the diaphragm from saliva and moisture from the mouth of the speaker, which end I attain by arranging the diaphragm in a substantially horizontal plane and causing the mouth-piece to flare downward and outward therefrom, so that the air waves or vibrations are deflected upward against the under side of the diaphragm.

The next part of my invention relates to the construction of the diaphragm itself, its objects being to get rid of the harsh or rattling sound incident to microphone-transmitters as heretofore constructed, so far as my knowledge extends, and to secure the transmission of a soft smooth tone, which ends I attain by making the diaphragm of alternate thin metal plates or thin sheets of soft paper or other suitable material. One disk of thin metal and a disk of soft paper cemented together answer a good purpose; but I prefer to use two metal disks with an interposed disk of soft paper, all three being cemented together.

The objects of the next part of my invention are to secure a proper tension of the diaphragm while allowing it a slight degree of play in its fastenings and to prevent the transmission of rattling or harsh sounds, which ends I attain by combining a diaphragm, a ring of soft paper or other suitable material lying loose under its bottom, a corresponding one lying loose on its upper surface, and a weighted metal ring resting on the top of the loose paper ring.

The next part of my invention relates to the method of mounting the contact points or pieces. Its object is to enable the operator to vary their degree of contact or pressure, which end I attain by mounting a standard on the center of the diaphragm and securing an inertia-weight to a spring fastened on the standard, the weight carrying suitable carbons, (or other proper material for contact-surfaces,) with devices for adjusting the degree of pressure or area of the contact-surfaces mounted on the standard.

The subject-matter claimed is hereinafter stated.

The accompanying drawings represent all my present improvements as embodied in a single instrument. Obviously, however, some of them may be used without the others and in machines differing in their details of construction from those herein shown. It is also obvious that the details of the machine as to form, materials, and construction may be varied to a certain extent in various well-known ways without departing from the spirit of my invention.

Figure 1 represents a plan or top view of my improved instrument, with the cover removed to show the internal arrangements. Fig. 2 represents a vertical transverse section through the instrument on the line 2 2 of Fig. 1; and Fig. 3 represents a detail view on an enlarged scale, partly in section, through the diaphragm and contact-points to show the details of construction more clearly.

In order to carry out the first part of my invention to the best advantage, I preferably form the case, frame, holder, or support of the telephone of a solid block, A, of wood or other suitable material, having a mouth-piece or speaking-tube formed in one side. This mouth-piece, it will be observed, is substantially flat or horizontal on top, while its sides flare outward. Its bottom flares outward and downward, a transverse central opening being left at the point of convergence of these different sides or surfaces for the passage of the air or sound-waves to the diaphragm.

The orifice of the mouth-piece by the construction above described, it will be observed, is much larger than usual in instruments of this class, thus enabling a larger area of sound-waves to be concentrated on the diaphragm, which latter under this organization lies flat or horizontal when in use, the air-waves im-

pinging on its under side, which construction prevents the deposition of saliva or moisture from the mouth of the speaker upon the diaphragm or the inner cavity of the mouth-piece.

For the purposes of this branch of my invention the diaphragm may be mounted or secured in its support in any of the usual well-known ways. In order, however, to carry out the next branch of my invention, I construct the diaphragm preferably of thin plates of metal and of thin sheets of soft paper or other equivalent material—such as felt or soft "vulcanized fiber," for instance.

A disk of thin metal and a disk of soft paper cemented together in well-known ways answers a good purpose; but I prefer to use thin metal disks c c^2 with an interposed disk, c', of soft paper, all three being cemented together.

The soft-paper disk between the two metal disks, forming the compound diaphragm C, should be slightly greater in diameter than the metal disks, in order to protect the latter from a harsh contact with the case, thus securing the production of a purer tone or more perfect articulation. This diaphragm, so far as the purposes of this branch of my invention are concerned, may be clamped and held in any of the usual well-known ways. In order, however, to carry out the object of the next branch of my invention in the best way, I form a cavity or recess in the top of the telephone-case support or holder, in which recess I place a ring, a, of soft paper or other well-known equivalent material, which lies loosely on the bottom of the cavity. The diaphragm C is then placed on this ring and a corresponding ring, a', of similar material to the other one is placed on the diaphragm. A weighted metal ring, D, (shown in this instance as a flanged ring,) is placed on top of this diaphragm and held in position by turning-buttons d or other suitable fastenings, by which mode of construction the diaphragm, while loosely clamped to allow a slight degree of play either vertically or laterally, is securely held in position, the pressure exerted upon it being mainly due to the weight of the ring resting on its periphery.

The diaphragm fits somewhat loosely in its cavity, so as to allow a slight degree of lateral play without cramping its edges.

The diaphragm may be removed, if desired, by loosening the screws of the buttons d and turning the buttons out of the way. Experience has demonstrated that this method of construction will produce a very smooth pure articulation, free from the usual harsh or rattling sounds to which this class of instruments is liable. The diaphragm thus constructed and mounted is capable of efficient use in the ordinary manner. In order, however, to carry out the next part of my invention, I mount a metallic standard, E, centrally upon the diaphragm by means of a screw and nut, e, or in any other equivalent well-known way. This standard is forked or bifurcated, one branch or arm, e', constituting a support for the inertia-weight G, and the other, e^2, constituting a support for the screw F, which adjusts the pressure of the contact surfaces or points. The inertia-weight G is mounted on a plate-spring, g, secured to the arm e'. A radial slot, G^2, on the side of the inertia-weight opposite its point of attachment to the spring, fits over the other arm, e^2, which thus serves as a guide to prevent the lateral displacement of the inertia-weight, while allowing it to move freely up and down within the limited range incident to instruments of this class.

The plate-spring g, which supports the inertia-weight, is electrically insulated by well-known means at its point of attachment to the arm or standard e'. One of the line-wires, x, is connected to this insulated spring, while the other is connected to the other arm, e^2, of the standard, the circuit passing through the contact-surfaces hereinafter mentioned. The inertia-weight is preferably made of an annular shape, its central opening being closed at bottom by a plug, g', the inner end of which plug is made of convex shape and faced with platinum, g^3.

A short piece of tubing, h, of vulcanite, hard rubber, or other suitable insulating material, is inserted in the hole, its bottom resting on the plug, while its top is flush with the surface of the inertia-weight. A thin disk, i, of carbon, of the usual construction is then laid on the convex surface of the plug and inside the insulating-tube h. A double convex lens-shaped piece of platinum, i', is then laid on the carbon disk and another carbon disk, i^2, laid on this piece, thus filling the hole flush with the upper surface of the weight.

The adjusting-screw head F is made convex on its under side and faced with platinum f and bears directly on the upper carbon disk above mentioned. In the arrangement I have shown all the carbon surfaces are plane and the platinum surfaces convex; but it is obvious that substantially the same result might be obtained by making the platinum surfaces plane and the carbon surfaces convex, or by making the plane surfaces slightly concave, without departing from the spirit of the invention.

Under the organization above described the circuit passes through the connecting-wire x, the spring inertia-weight, its plug, carbons, and the adjusting screw and arm e^2 to the other connecting-wire, y.

The pressure upon the contact-surfaces, and consequently the area of the points of their surfaces in contact, may be varied by means of the set-screw F in a well-known way.

The organization above described secures a very permanent adjustment, as when once adjusted the resilience of the spring upon which the inertia-weight is mounted tends to compensate the very slight variations in pressure

incident to wear of the contact-surfaces from use.

The operation of the apparatus will readily be understood from the foregoing description. As the diaphragm vibrates under the impulse of the sound-waves, the pressure between the contact-surfaces, and consequently the area of the points of their surfaces in contact, will be varied, thus producing corresponding variations in the current passing through the line-wire, as is well understood.

The inertia of the weight prevents it from following rapidly the minute vibrations of the diaphragm, while its resilience, due to its spring-connection, compensates the coarser shocks and jars, which tend to produce the harsh and rattling sounds so common in this class of instruments.

I do not broadly claim herein what is known as an "inertia-telephone," nor mounting the contact-surfaces upon the diaphragm, those devices being old; but it will be observed that the organization of this instrument is such that the diaphragm carries the supporting standard and spring of the inertia-weight with it. The diaphragm therefore may be thrown into vibration by the impact of the sound-waves without being impeded in its vibrations by the inertia of the weight, as it is when the action of the sound-vibrations is to deflect the diaphragm from its normal position directly against the weight instead of away from it. The advantage of my arrangement in enabling the apparatus to respond accurately to the more delicate and rapid vibration is obvious.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, with a diaphragm, of a mouth-piece constructed, substantially as hereinbefore set forth, with a flat top confronting said diaphragm and an outwardly-flaring bottom to deflect the sound-waves upward and prevent the deposit of moisture in its inner cavity, as described.

2. The combination, substantially as hereinbefore set forth, of a diaphragm, a casing for supporting the same, and the mouth-piece formed in said casing and terminating in a flat top beneath said diaphragm and flaring laterally and downwardly, substantially as described.

3. The compound diaphragm hereinbefore described, consisting of the combination of a thin metal disk or disks with a disk or disks of soft paper or equivalent material, the metal and paper disks being arranged alternately and all cemented together to produce a smooth pure articulation.

4. The combination, substantially as hereinbefore set forth, of a metal disk or diaphragm, a disk of soft paper or equivalent material cemented to and projecting beyond the metal disk at its periphery, and a ring clamping said disk or disks at or near the edges, substantially as described.

5. The combination, substantially as hereinbefore set forth, of the case or holder, the ring of soft paper or equivalent material resting thereon, a diaphragm resting on the ring, another similar ring resting on the diaphragm, and a weighted tension-ring resting upon the whole to allow slight play of the diaphragm while clamping it securely in place, as described.

6. The combination, substantially as hereinbefore set forth, of the case or holder, the downwardly-flaring mouth-piece in one side thereof, the diaphragm in the top of the case, its soft-paper rings, and the weighted metal tension-ring on that side of the diaphragm opposite the mouth-piece.

7. The standard mounted upon the diaphragm and provided with two arms, one carrying by means of a yielding support the inertia-weight, the other the adjusting-screw for the contact-surfaces, substantially as hereinbefore set forth.

8. The combination, substantially as hereinbefore set forth, of the diaphragm, the standard mounted thereon, the plate-spring mounted on the standard, and the inertia-weight supported solely by the spring and containing a seat for the electrode, whereby the diaphragm may be thrown into vibration by the impact of the sound-waves without being impeded by the inertia of the weight.

9. The combination, substantially as hereinbefore set forth, of a diaphragm, a standard, a yielding spring, disks or buttons of carbon or other suitable material interposed between said standard and spring, a weight modifying the pressure upon the carbon, and adjusting mechanism for regulating the normal pressure upon the disks or buttons, substantially as described.

10. The combination, substantially as herein set forth, of a diaphragm, a weight, its flexible support, an electric-circuit regulator composed of carbon or other suitable material, and a connection at or near the center of the diaphragm in line with the carbon and weight.

11. The combination, substantially as hereinbefore set forth, of the standard and the annular inertia-weight for modifying the pressure in a microphone-transmitter mounted upon a spring and provided with a guide-slot moving over the standard, substantially as hereinbefore set forth.

12. The combination, substantially as hereinbefore set forth, of the case, the downwardly-flaring mouth-piece in the side thereof, the weighted clamping-ring, the diaphragm in the top of the case, the standard mounted on the diaphragm, and the inertia-weight and its supporting-spring mounted on the standard.

13. In a microphone-transmitter, the combination, substantially as hereinbefore set forth, of the convex platinum-faced screw with the convex platinum-faced plug, carbon disks, and interposed platinum lens.

14. The combination, substantially as hereinbefore set forth, of the forked standard, the

inertia-weight and its contact buttons or electrodes mounted on one branch thereof, and the adjusting-screw mounted on the other branch.

15. The combination, substantially as hereinbefore set forth, of the diaphragm, the forked standard, the inertia-weight, its insulated supporting-spring, contact buttons or electrodes, and connecting-wire mounted on said standard.

In testimony whereof I have hereunto subscribed my name.

G. M. PHELPS.

Witnesses:
FRANK L. POPE,
WM. ARNOUX.