(No Model.)

G. F. MILLIKEN.

TELEPHONIC TRANSMITTER.

No. 266,043. Patented Oct. 17, 1882.

Fig: 1.

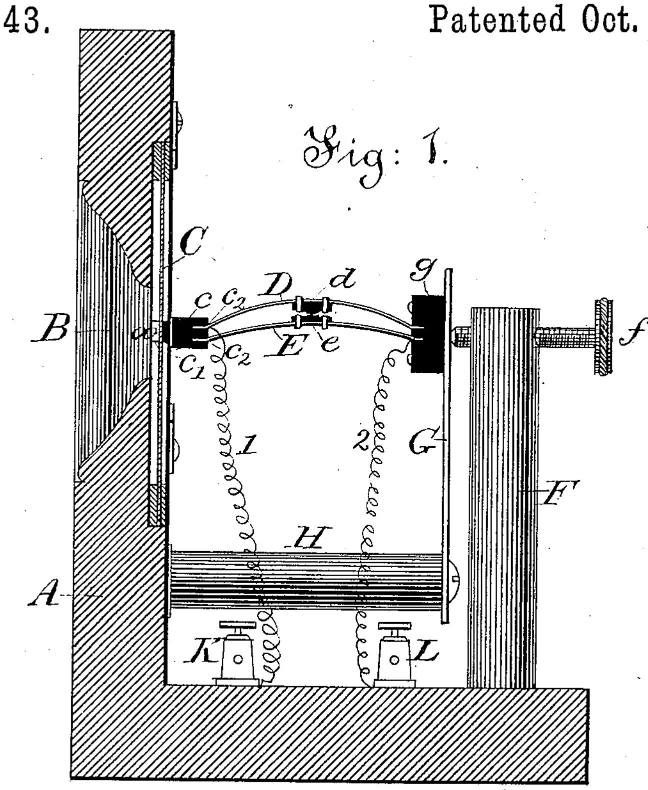


Fig: 2.

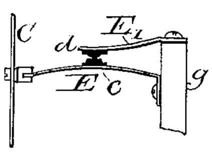


Fig: 3.

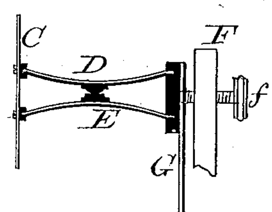


Fig: 4.

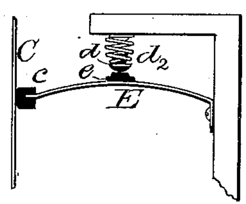


Fig: 5.

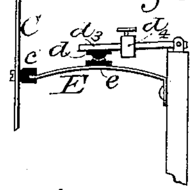
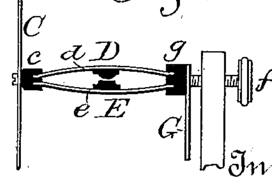


Fig: 6.



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UNITED STATES PATENT OFFICE.

GEORGE F. MILLIKEN, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS TO JAMES WENTWORTH BROWN AND HENRY D. HYDE, BOTH OF SAME PLACE.

TELEPHONIC TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 266,043, dated October 17, 1882.

Application filed February 11, 1882. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. MILLIKEN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Telephonic Transmitters, of which the following is a specification.

My invention relates to certain improvements in that class of telephonic transmitters, technically termed "variable-contact" telephones or microphones, which are employed for converting sonorous vibrations into correlative undulations, produced by variations in the strength of an electric current. This result is effected by interposing in the circuit an imperfectly-conducting medium, the actual conductivity of which varies in proportion to the pressure exerted thereupon through the mechanical agency of a diaphragm acted upon by the sonorous atmospheric vibrations. In telephonic transmitters of this construction more or less difficulty has hitherto been experienced in so applying the mechanical force of the diaphragm to the variable resistance that the strength of the current traversing it shall be caused to vary in exact proportion to the movements of the diaphragm, and shall be unaccompanied by irregular and extraneous variations due to the friction of the interposed mechanism and other like causes.

The object of my invention is to introduce an artificial resistance into the circuit traversed by the electric current, and to subject it to variations of pressure strictly proportionate to the vibrations of the diaphragm, but to produce this result by mechanical vibrations having an amplitude much greater than those of the diaphragm.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of a telephonic transmitter embodying my improvements, and the remaining figures represent in outline certain modified forms of construction.

Referring to Fig. 1, A represents a base or standard for supporting the mouth-piece B and other parts of the transmitter. A diaphragm, C, of thin metal, membrane, or other suitable flexible material, is supported at its edges against the frame surrounding the mouth-piece B, its center being left free to vibrate in front of the central opening, *a*, of the mouth-piece.

Affixed to the center of the diaphragm by a screw, c', or other suitable means, or maintained in contact with the diaphragm, is a small block, *c*, of insulating material, such as hard rubber. Two parallel grooves, c^2, are cut in the face of the block *c*, into which are respectively inserted the ends of two flat strips, D and E, of brass or other flexible and resilient conducting material. The opposite ends of the springs D and E are supported in parallel grooves in a second block of insulating material, *g*, which is held in a position opposite or nearly opposite to the center of the diaphragm C by means of a flexible upright arm, G, which is supported from the frame A by a post, H. At the center of the length of these springs are mounted carbon buttons *d* and *e*, normally pressed lightly against each other by means of the resiliency of the springs. The latter are normally deflected from a direct line between their points of support by means of an adjusting-screw, *f*, mounted upon a standard, F, and which acts to force the flexible arm G and supporting-block *g* toward the diaphragm. The springs D and E are both deflected in the same direction from a direct line joining their respective extremities, and are preferably constructed of unequal length, so that the normal flexure of the one will exceed that of the other. Hence the space intervening between their centers will be greater than that between their respective ends. Any approximation of the supporting-blocks *c* and *g* toward each other will thus increase the deflection of the springs, and at the same time diminish the distance between their centers, thereby increasing the pressure between the carbon buttons *d* and *e*, and vice versa.

The springs D and E are electrically insulated from each other, except at the point of contact of the carbon buttons *d* and *e*. One of these springs, D, is connected through a wire, 1, and binding-post K with a battery, while the other spring, E, is connected through a wire, 2, and binding-post L with the return-wire.

It will now be understood that whenever the diaphragm C is caused to vibrate the direct to-and-fro motion of the same will produce proportionate lateral vibrations of the springs D and E, and these vibrations will, up to a certain point, necessarily be of much greater amplitude than the corresponding vibrations of the diaphragm. The lateral movements of the springs D and E, by varying the pressure upon the carbon buttons, will vary the resistance offered to the electric current traversing the wires 1 and 2 at the point of contact and cause undulations in that current corresponding to the sonorous vibrations which actuate the diaphragm. These undulations or variations in strength of current may be transmitted over a line-wire and again converted into sound vibrations by means of any suitable telephonic receiver of well-known construction, either with or without the interposition of an induction-coil, as circumstances may render desirable.

It should be observed that the radius of curvature in the springs D and E does not vary in direct proportion to the variations in the length of the chord which subtends the arc formed by the spring. The length of the radius increases less rapidly as its ratio to the chord diminishes. Hence the actual pressure exerted upon the carbon contact-surfaces by the vibrations of the diaphragm may be adjusted with reference to the amplitude of the latter by varying the normal deflection of the springs by means of the adjusting-screw *f*. The same effect would be produced by varying the relative lengths of the springs.

In Fig. 2 is represented a modified form of my invention, in which the upper spring, D, is replaced by a spring, E′, secured at one end only and independent of the diaphragm, and which exerts a constant pressure upon the lower spring, E, through the carbon buttons *e* and *d*.

In the construction represented in Fig. 3 the pressure-springs are attached to the diaphragm at points equidistant and diametrically opposite from its center, and are attached at their opposite ends to a block, *g′*, in a like manner. The normal deflection of each spring in this modification is toward the axial line, and the vibrations of the diaphragm vary the pressure exerted upon the carbon buttons in the same manner as hereinbefore described with reference to Fig. 1.

Figs. 4 and 5 represent different devices for supporting the upper carbon button. In the former it is supported by a helical spring, d^2, which exerts a slight downward pressure, and in the latter upon the end of a pivoted arm, d^3, the pressure in this instance being adjustable by means of a weight, d^4, movable along the arm to a greater or less distance from its fulcrum.

In Fig. 6 I have shown a construction in which two flexible springs are supported, as in the first instance, between the diaphragm and the flexible arm, but are deflected in opposite directions from the axial line of the diaphragm. The operation of the instrument when constructed in this form is similar to that hereinbefore described in connection with Fig. 1, except that the vibration of the diaphragm in the direction of the springs causes a decrease of the pressure upon the contact-surfaces, while its vibration in the opposite direction increases in the pressure.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a diaphragm, a curved flexible spring, one end of which bears against the vibrating portion of the diaphragm and the other against a stationary support in line with the axis of the diaphragm, a contact-surface mounted upon said spring at a point intermediate between its points of support, and a second contact-surface mounted upon a yielding support.

2. The combination, substantially as hereinbefore set forth, of a diaphragm, two curved flexible springs, each of which bears at one end against the vibrating portion of the diaphragm and the other against a stationary support, and two adjacent contact-surfaces, mounted respectively upon said springs at points intermediate between their points of support.

3. The combination, substantially as hereinbefore set forth, of a diaphragm, one or more curved flexible springs bearing at one end against the vibrating portion of the said diaphragm and at the other against a stationary support in line with the axis of said diaphragm, a contact-surface mounted upon one of said springs at a point intermediate between its points of support, a second contact-surface mounted upon a yielding support, and means for adjusting the distance of said stationary support from the diaphragm, whereby the normal curvature of the spring or springs may be increased or diminished.

In testimony whereof I have hereunto subscribed my name this 8th day of February, A. D. 1882.

GEORGE F. MILLIKEN.

Witnesses:
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