(No Model.) 2 Sheets—Sheet 1.

J. W. McDONOUGH.

TELEPHONE TRANSMITTER.

No. 353,694. Patented Dec. 7, 1886.

Fig. 1.

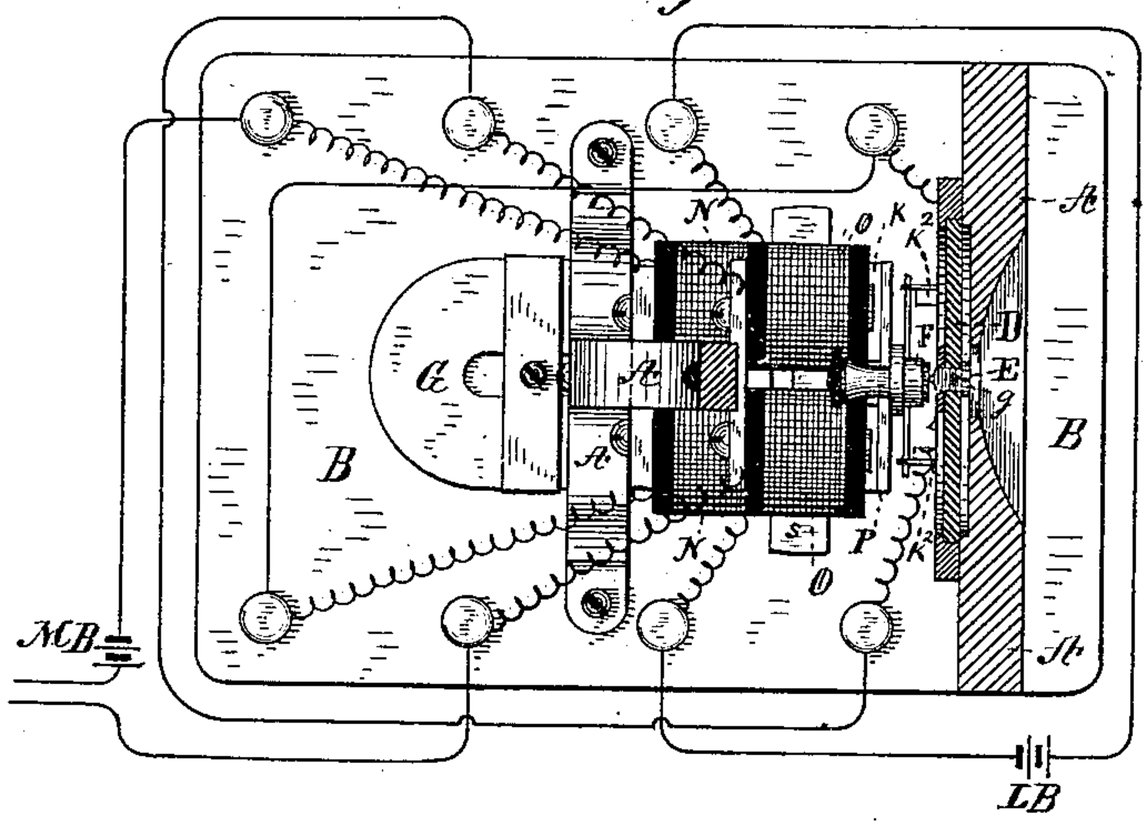


Fig. 2.

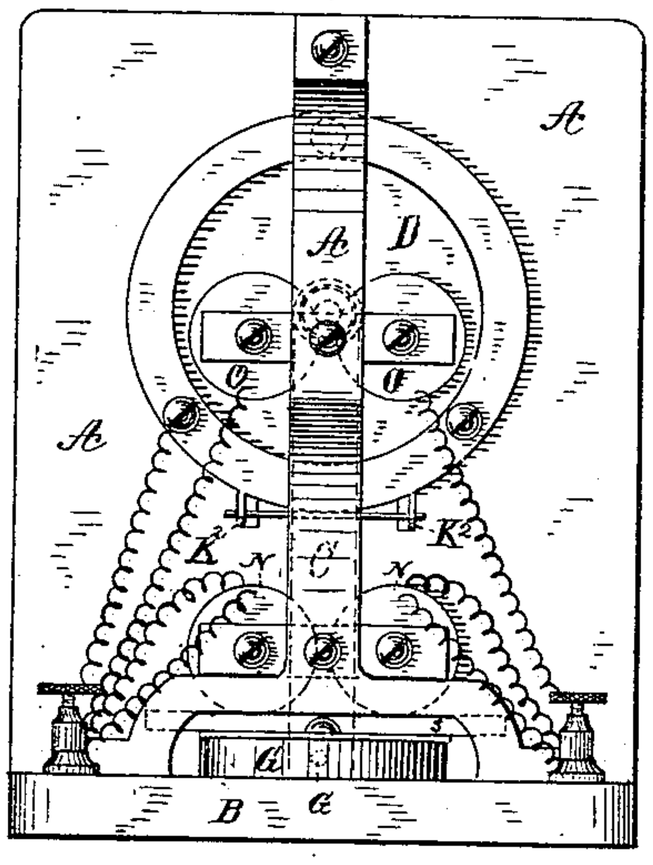
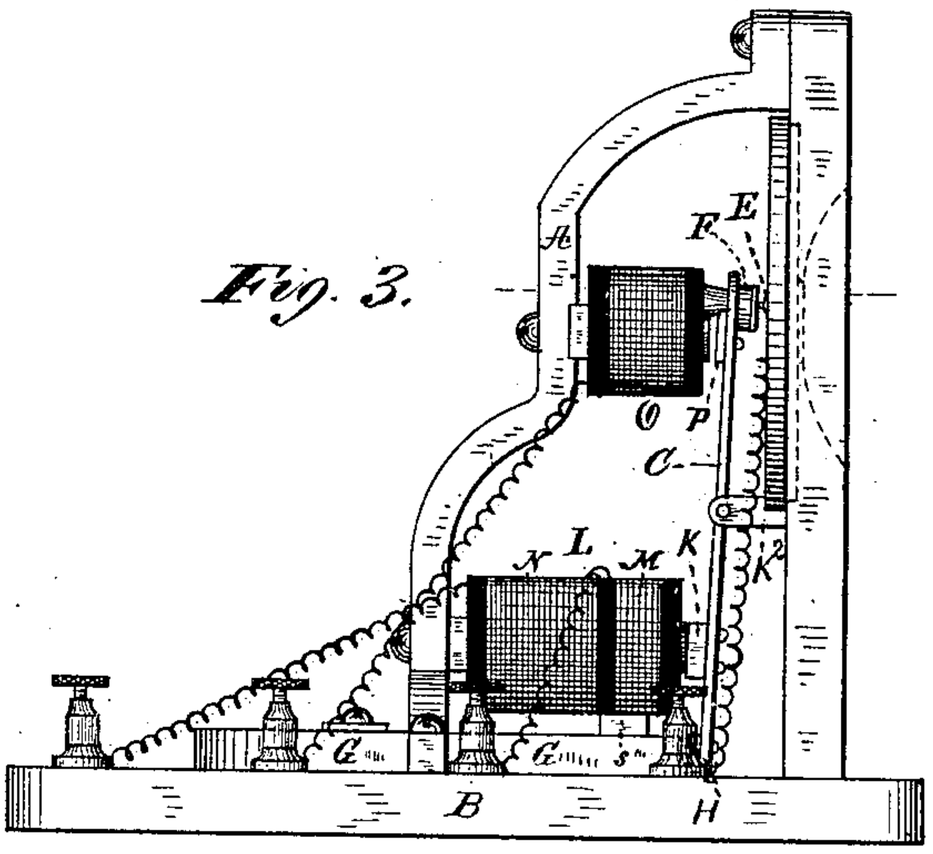


Fig. 3.



WITNESSES:
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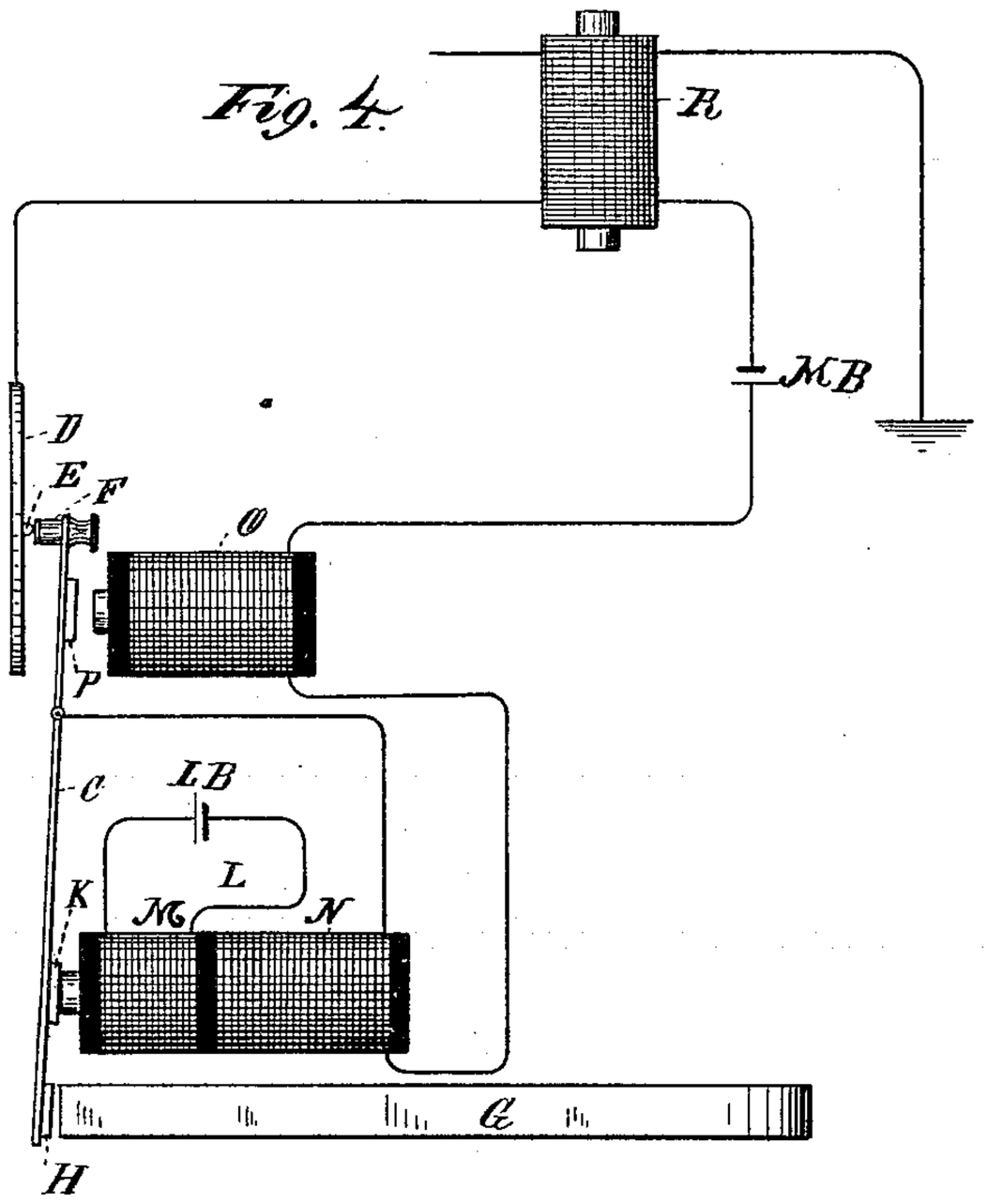
Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES W. McDONOUGH, OF NEW YORK, N. Y.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 353,694, dated December 7, 1886.

Application filed August 28, 1885. Serial No. 175,543. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. McDONOUGH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Telephone-Transmitters, of which the following is a specification.

My invention relates to certain improvements in telephone-transmitters; the object of which improvements is to secure increase of telephonic action at the contacts of the instrument when the same is actuated by sound-waves, and to produce consequently greater changes in the electric circuits controlled by the instrument and correspondingly louder sound in the receiver.

My invention consists in the combination, with the electrodes for a telephone-transmitter, of a magnet so applied and arranged that variations in its influence shall tend to affect the position of the electrodes with relation to one another, and circuits and connections for a coil of said magnet combined and arranged to be under the control of the transmitting-instrument itself, and operated in such way that, coincidently with a movement of separation of the electrodes by a mechanical action of the transmitter, there shall be a change in the influence of the magnet such that there shall be developed an increased counteracting influence opposing such separation, and the electrodes shall be immediately forced into contact.

My invention consists further in certain improved combinations, that will be more particularly specified in the claims.

In carrying out my invention I may arrange the magnet so that it shall normally tend to produce a separation of the electrodes, its influence being counter to another force—such as that of a spring, a weight, or another magnet—so that the resultant force impelling the electrodes together shall be the difference of the two forces, in which case the power of the magnet is decreased by devices acting simultaneously with the movement of the parts that carry the electrodes in a direction away from one another. In this case the diminution of the magnetic influence has the obvious effect of permitting the oppositely-acting force to operate with less hinderance, so as to produce an increase in the resultant force tending to bring the electrodes together; or I may employ the magnet in such way that it shall act in the same direction as a spring, weight, or other magnet that normally tends to draw the electrodes together, the resultant force that impels the electrodes together, when the magnet acts, being in such case the sum of the two forces. In this instance the circuit should be combined and arranged that the magnetic influence will be increased by a movement of the electrodes away from one another, the total counteracting influence to separation of the electrodes being thereby increased, with the obvious result of bringing them together again.

The control of the circuit in my invention is effected by the mechanical agency of the transmitter itself under the action of sound vibration, and I preferably utilize the telephonic circuit proper in the operation—that is to say, the circuit-controller affecting the flow of current in the magnet consists of the telephonic contacts controlling the line-circuit or the primary circuit of the usual induction-coil.

In the accompanying drawings I have shown a simple form of instrument embodying my invention.

Figure 1 is a plan and partial horizontal section of the instrument. Fig. 2 is a rear elevation of the same. Fig. 3 is a side elevation, and Fig. 4 is a diagram, of the circuits and connections.

B is the base, and A the frame, on which the parts are mounted.

D is a plate or diaphragm of any usual or desired construction, through which sound vibrations falling upon the instrument are made to vibrate electrodes. The latter are shown in the present case as mounted, one, E, on the diaphragm, and the other upon a movable support, movable with relation to the first, and consisting of a lever, C, pivoted at K^2. The lever carries at H an armature upon which a magnet, G, acts, so as to tend to draw the electrodes together and secure the desired initial contact. A keeper, S, that slides on the magnet, permits an adjustment of the magnetic influence of the magnet G, when it is de-

sired to vary the contact or action of the electrodes under sound vibration. Any other agency or influence might be used in place of the magnet G for producing the same action.

L indicates an electro-magnet whose influence is normally such as to tend to keep the electrodes F E together. Said magnet for this purpose acts upon an armature, K, secured to lever C. The magnet is preferably charged by a local battery, though it might be a permanent magnet, and its influence is varied at the proper instant by the operation of current in a second coil wound upon it.

The normal charging-coil is indicated at M, and at L B is indicated the local battery whose current passes through the coils M. The second coil, N, is so connected that the current flowing in it tends to diminish the effective magnetism produced by the local battery L B, leaving, however, under normal conditions, a margin sufficient to give a positive action upon the armature K. At the proper instant, however, the influence of coil N is decreased, so that the effective magnetism is increased, thus increasing the tendency to contact between the electrodes F E. It will be observed, however, that if the current in coils N should cease entirely the coil M would be unopposed, and would tend strongly to establish contact at F E. This is an important feature of my invention, since it prevents undue separation of the electrodes, as will be presently seen, owing to the fact that a complete rupture of current passing through them will stop entirely the flow of current in the coils N.

The flow of current in coils N, whereby the variations of the magnetic influence upon the armature are secured, is controlled by the operation of the transmitter in any suitable way when influenced by sound-waves, the arrangement being made such that simultaneously with the backward movement of the electrode F—that is, in a direction away from E—the current-flow in N shall decrease, thereby changing the magnetism of the magnet L, so as to produce an increase in the total or resultant force tending to bring the electrodes together. This action can be easily and simply secured by utilizing the action of the electrodes themselves, and by placing the coils N in a circuit with said electrodes and with the transmitting-battery M B, as shown more clearly in the diagram, Fig. 4. The result of this arrangement obviously is that when by the impact of a sound wave or vibration the electrode F is driven backward away from its opposite electrode the flow of current in N will decrease or cease entirely, according to the extent of relative movement, the total magnetism of L will be increased, and the electrodes will be brought together by a resultant force whose measure is the sum of the actions of the magnet L, as thus increased in power, and the other device whose influence normally tends to keep the electrodes in contact.

Any tendency to overvibration is automatically corrected, owing to the fact that a separation more or less complete of the electrodes cuts down the current in the coils N below normal, thus allowing the coil M to act more fully and to cause a stronger pull to take place upon the armature. The effect of this is to promptly bring the electrodes together again.

With the parts thus far described is combined an electro-magnet, O, which is arranged so as to tend normally to separate the electrodes. P is the armature of said magnet, connected to lever C. The flow of current to the coils of this magnet is controlled in the same way as the flow to coils N, and is made to decrease under the same conditions. This may be simply effected by placing the coils of O in the circuit with the transmitter-battery, as indicated more clearly in the diagram. When, therefore, the magnet L increases in power, the magnet O decreases, and the two re-enforce one another in their action, being applied at opposite sides of the fulcrum for lever C. In the case of the electro-magnet O, the influence tending to bring the electrodes together is a resultant of the force of magnet O tending to separate them, and of the other magnets or devices applied to the lever in such way as to tend to bring them together. It is quite obvious that by decreasing the effect of O such resultant force is increased in amount, the assumption being that in the normal conditions the magnet O applies less force tending to separate the electrodes than do the other devices tending to bring them together. In applying the variations of influence of magnet O to bring the electrodes together, it is obvious that substantially the same principle is utilized, as has been before explained, such variation being caused to take place at the instant of any movement of the electrodes in a direction that would tend to separate them. The magnet O might be omitted.

In the diagram an ordinary induction-coil is indicated at R, its primary being connected into the local circuit with M B and the other parts described, and its secondary connected to line, as usual in the art. Any desired means of adjustment may be employed for adjusting the flow of current in the various coils to secure the best action.

The instrument is used in the ordinary and well-known way, but by the connecting action of the magnet or magnets employed as described a large movement of the electrodes is permitted and the operation of the instrument in transmitting sound is greatly improved.

I do not limit myself to the employment of any particular form of magnet, nor to any particular construction of device for controlling the flow of current through the same. The particular form shown is selected as the simplest and is to be taken as typical of all magnets which could be applied to produce the same mechanical action upon the electrode.

What I claim as my invention is—

1. The combination, in a telephone-transmitter, of two electrodes and a differential

magnet normally tending to press one of them against the other, the said magnet having one of its coils in circuit with both electrodes, whereby the separation and approach of the electrodes cause variations in the effect produced by the magnet, substantially as and for the purpose set forth.

2. The combination, with the electrodes in a telephone-transmitter, of a magnet tending to separate or bring said electrodes together, and a circuit including the said magnet and controlled by the movements of the electrodes, whereby the movements of the electrodes vary the effect of the magnet thereon, substantially as and for the purpose set forth.

3. The combination, with the electrodes for a telephone-transmitter, of a magnet tending to draw the electrodes together, a coil acting in opposition to the tendency of said magnet, and a circuit-controller controlled by the action of the transmitter on a movement of the electrodes in a direction to cause separation for diminishing the action of said coil simultaneously with such movement.

4. The combination, with the electrodes for a telephone-transmitter, of two electro-magnets, one normally tending to prevent and the other to establish contact, and a counteracting-coil for the latter, said counteracting-coil and the coil of the first-named magnet being controlled in their action by the transmitter under the influence of sound-waves.

5. The combination, with the electrodes in a telephone-transmiter, of a magnet whose action tends to impel the electrode toward the other, an electro-magnetic coil whose influence tends to diminish the action of said magnet, and means for decreasing the flow of current in said coil controlled or brought into action by a movement of the electrodes in a direction to be separated, as and for the purpose described.

Signed at Lake Geneva, in the county of Walworth and State of Wisconsin, this 15th day of August, A. D. 1885.

JAMES W. McDONOUGH.

Witnesses:
FRANK L. EASTMAN,
C. E. BUELL.