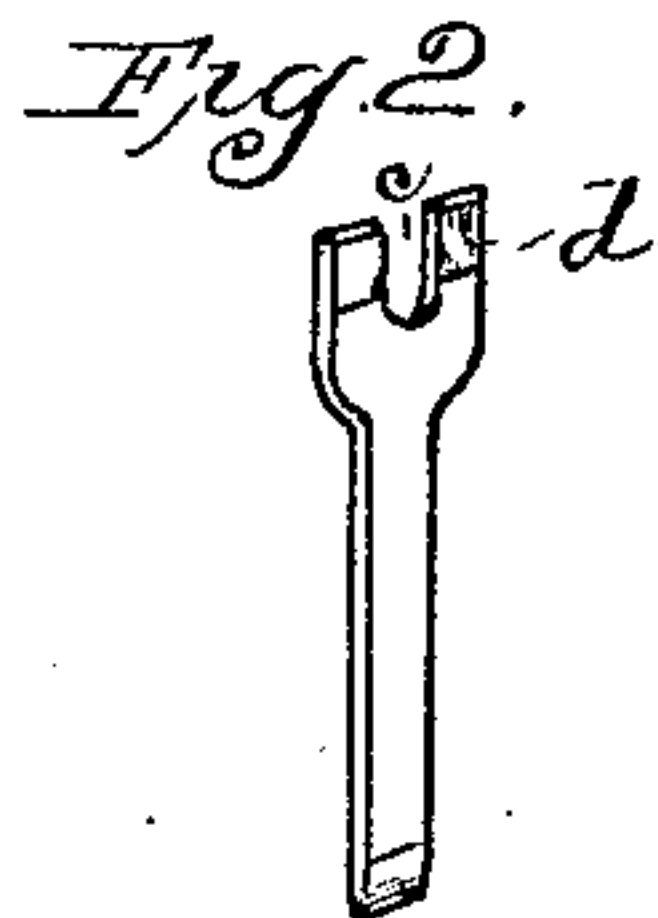
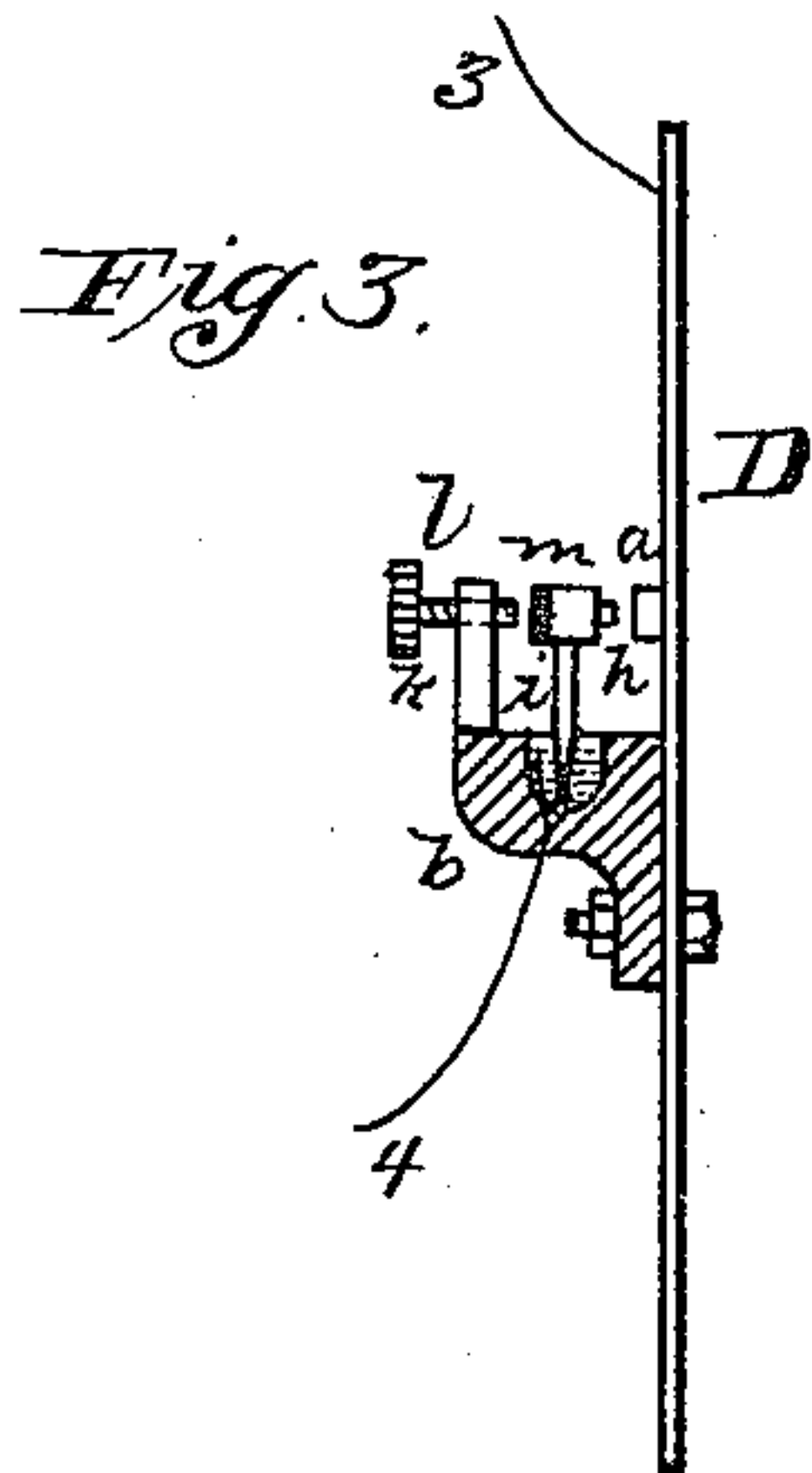
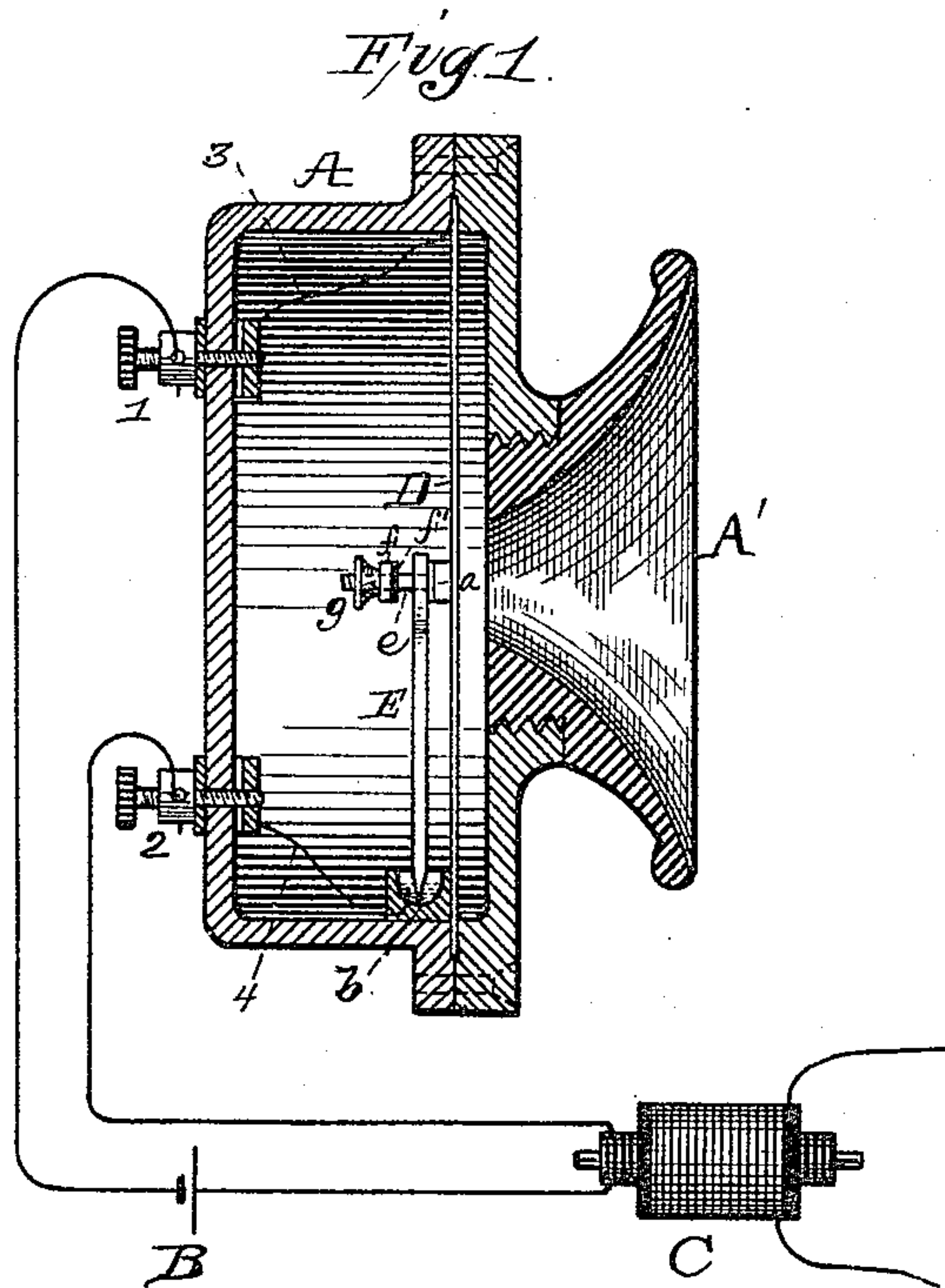


(No Model.)

T. A. EDISON & E. T. GILLILAND.  
TELEPHONE.

No. 438,306.

Patented Oct. 14, 1890.



ATTEST:

*E. T. Rowland.*  
*Att. Fiddler.*

INVENTORS:

*Thomas A. Edison*  
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*By [Signature]*  
*att.*

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY, AND EZRA T. GILLILAND, OF NEW YORK, N. Y.

## TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 438,306, dated October 14, 1890.

Application filed February 19, 1886. Serial No. 192,487. (No model.)

*To all whom it may concern:*

Be it known that we, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, and EZRA T. GILLILAND, of New York city, in the county and State of New York, have jointly invented a certain new and useful Improvement in Telephones, of which the following is a specification.

10 The object of our invention is to produce a telephone-transmitter which shall efficiently transmit speech by variations in contact of electrodes, such variations being effected by the vibrations of a diaphragm against  
15 which the sound-waves are projected.

In the construction which constitutes our invention the electrodes are moved in both directions by the diaphragm, being thrown  
20 apart when the diaphragm is vibrated forward and brought back again when the diaphragm vibrates back. Thus the movements of the contacts must be in precise accord with those of the diaphragm, whereby the sound vibrations are precisely transformed into  
25 electrical vibrations on the line.

Our invention consists in the novel devices and combinations of devices employed by us in carrying the above-named objects into effect, as hereinafter set forth and claimed.

30 Our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view of a telephone embodying said invention with the case in section; Fig. 2, a perspective view of the back electrode; and Fig. 3 illustrates a modified form of the invention.

A is a suitable case provided with mouth-piece A' and having binding-posts 1 2, to which the wires from battery B and primary  
40 of induction-coil C are connected.

D is the diaphragm, which, as shown, is of metal, though it may be of mica or other suitable insulating material.

Referring to Figs. 1 and 2, at the center of the diaphragm is secured a contact or electrode *a*, which is preferably of platinum or  
45 faced with that metal.

E is an arm of any suitable metal, whose lower end rests loosely in a mercury-cup *b*.

50 When placed in contact with the metal diaphragm, as shown, the cup *b* must be of insu-

lating material. At its upper end the arm E is forked at *c*, Fig. 2, and near this end it is preferably faced with platinum foil *d*. Projecting from the contact *a* is a metal stem *e*,  
55 which passes through the fork of arm E and has upon it a collar *f*, which is of insulating material or faced with such material, as at *f'*. Behind this collar is a thumb-nut *g*, which permits the position upon the stem of the collar to be adjusted. Connection from binding-post 1 is by wire 3 to the diaphragm, and from binding-post 2 by wire 4 to the mercury in cup *b*. If the diaphragm is of insulating material, the connection of wire 3 is directly to  
65 contact *a*, as will be well understood.

It will be seen that arm E rests freely in the mercury-cup and could move backward to any extent were it not for the collar *f* on rod *e*. When the diaphragm moves forward,  
70 the arm E is thrown back and the desired separation of the electrodes is effected. This movement is of course a very slight one, being limited by the end of the arm striking the collar *f*. When the diaphragm moves back  
75 again, bringing rod *e* and collar *f* with it, said collar of course immediately throws arm E back to its original position of contact with electrode *a* and in readiness to respond from its normal position to the next vibration. In  
80 the normal transmission of speech the degree of contact will be varied but not absolutely broken. In the transmission of musical sounds the circuit may be made and broken. Thus all the movements of the contacts accord ex-  
85 actly with the vibrations of the diaphragm, and these vibrations are effectively transmitted, to be reproduced at the other end of the line by a receiver of any suitable character.

90 In the form of instrument shown in Fig. 3 mercury-cup *b* is attached directly to the diaphragm; contact *a* is upon the diaphragm, and the back contact is a point *h*, carried at the end of a short arm *i*, resting in the mer-  
95 cury. An arm *k*, rising from the mercury-receptacle, carries a screw *l*, which being situated behind the contact *h* takes the place of the collar *f* of Fig. 1. Being carried directly by the diaphragm, it moves therewith to bring  
100 the contact *h* back to its normal position with the return vibration of the diaphragm.



In both Figs. 1 and 3 the distances between the contacting parts are shown considerably exaggerated. In practice the movement of the upper ends of arms E and i will not be  
5 more than one-fiftieth of an inch.

What we claim is—

1. In a telephone, the combination, with a diaphragm and an electrode carried thereby, of a loosely-supported electrode and a limiting-stop therefor rigidly connected with the  
10 diaphragm, substantially as set forth.

2. In a telephone, the combination, with a diaphragm and an electrode carried thereby, of a rigid arm extending from said diaphragm,  
15 a loosely-supported electrode, and a limiting-stop on said arm, said loose electrode being situated between said diaphragm-electrode and said stop, substantially as set forth.

3. In a telephone, the combination of a diaphragm, an electrode carried thereby, a mercury-cup, an arm standing in said cup, an electrode carried by said arm, and a stop behind said arm carried by the diaphragm, substantially as set forth. 20

4. In a telephone, the combination of a diaphragm, an electrode carried thereby, a stem projecting from said electrode, a loose electrode moving on said stem, and a stop on said stem, substantially as set forth. 25

This specification signed and witnessed  
this 22d day of December, 1885. 30

THOMAS A. EDISON.

EZRA T. GILLILAND.

Witnesses:

JOHN C. TOMLINSON,

H. W. SEELY.