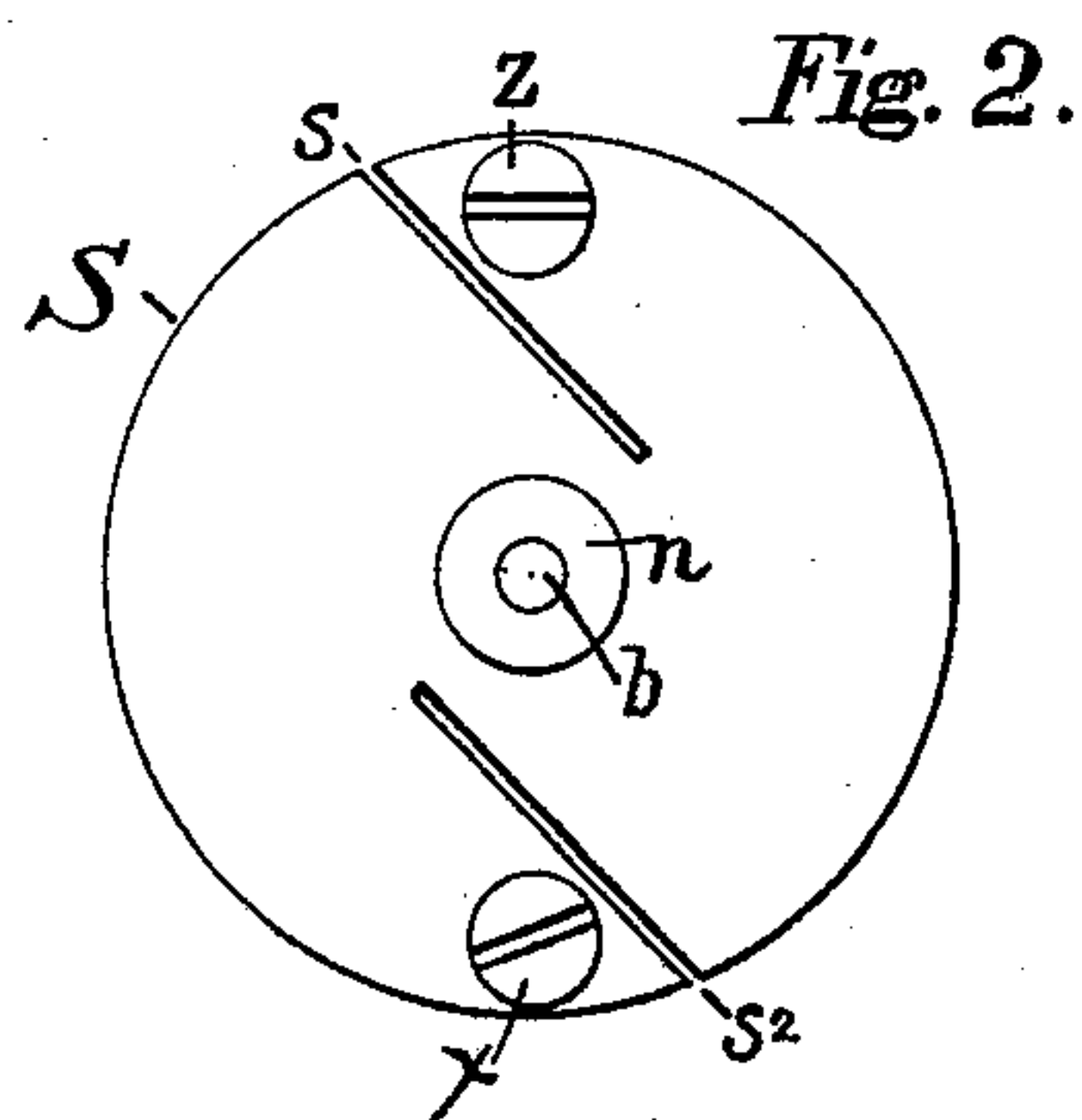
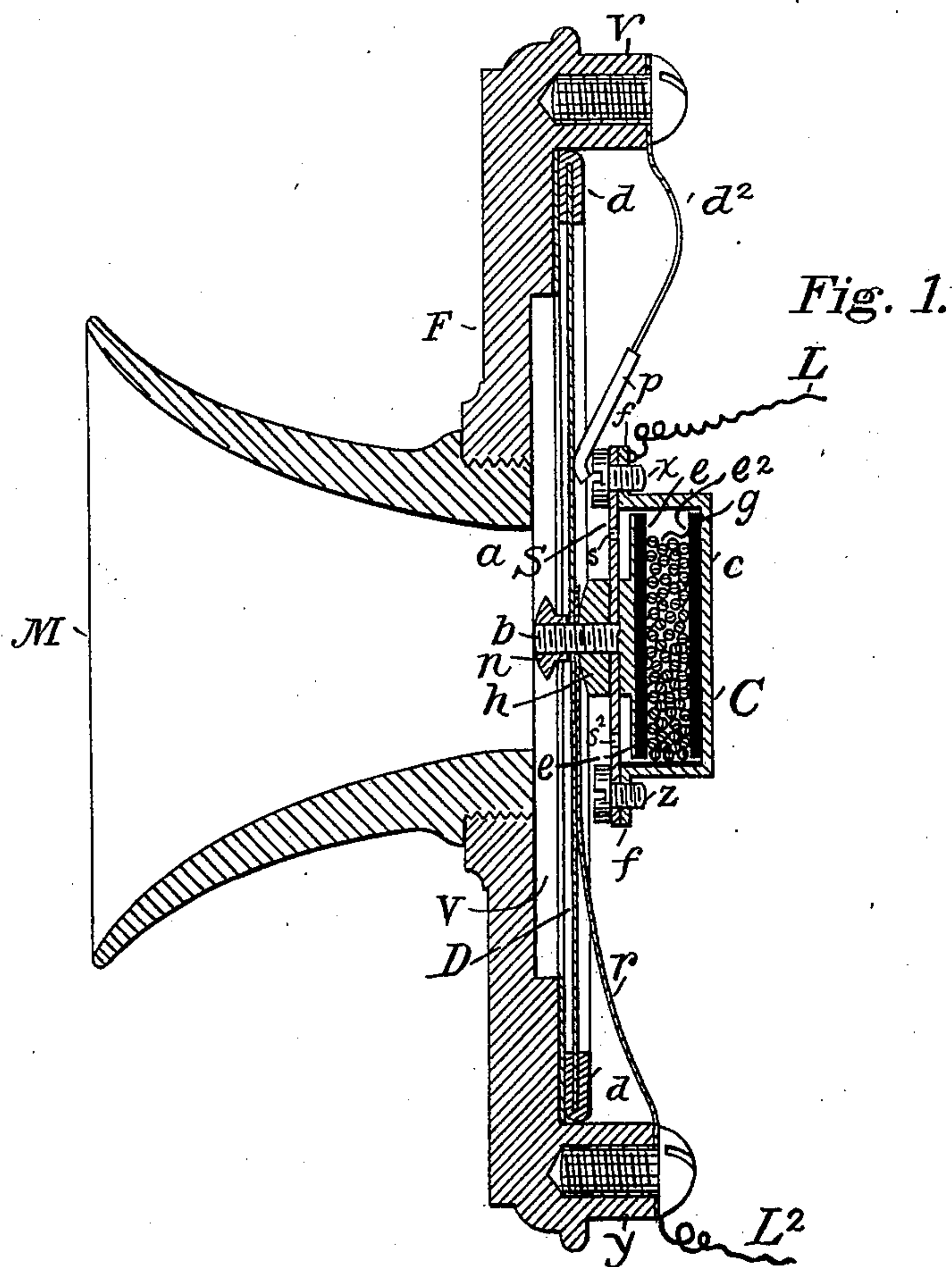


(No Model.)

H. E. SHREEVE.  
TELEPHONE TRANSMITTER.

No. 602,174.

Patented Apr. 12, 1898.



Attest,

Joseph A. Gately  
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Inventor,

Herbert E. Shreve.



# UNITED STATES PATENT OFFICE.

HERBERT E. SHREEVE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE  
AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

## TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 602,174, dated April 12, 1898.

Application filed August 26, 1897. Serial No. 649,600. (No model.)

*To all whom it may concern:*

Be it known that I, HERBERT E. SHREEVE, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephone-Transmitters, of which the following is a specification.

This invention relates to variable-contact telephone-transmitters employing finely-divided conducting material placed between two principal electrodes as a resistance-varying medium, and more particularly to that class of instruments wherein both of the said principal electrodes are attached to or mounted on the diaphragm, so as to vibrate therewith.

The invention consists, mainly, in certain features of construction whereby the tendency of the finely-divided conducting material to pack or settle, which presents itself in all transmitters of this general type, is resisted and largely overcome, and whereby the efficiency of the instrument as a transmitter, whether high or low battery power be employed in association with it, is materially enhanced, so that by the introduction of the said features the operation of inferior forms of transmitter is improved to such an extent that they become substantially as serviceable and efficient as transmitters of the best standard types.

In this invention the front and rear contact-electrodes are both mounted upon the vibratory diaphragm, the former rigidly and directly and the latter elastically, and the granular carbon which is held between them and in constant contact with both, to constitute the variable-resistance medium, is composed of carbon granules or particles of substantially spherical or rounded form. The contact-electrodes and the interposed spherical granulations of carbon are contained in a case or chamber supported wholly by the diaphragm, and the elastic or resilient attachment of the rear contact-electrode is secured by providing that it shall be formed of or carried by the rear wall of this chamber, which in turn is itself mounted upon the diaphragm by means of an elastic arm or spring-plate. Thus between the rear contact-electrode and the diaphragm which carries it there is an

interposed resilient mechanical connection which constitutes also a spring-back for the entire chamber or case.

Figure 1 of the drawings represents a vertical central section of a transmitter embodying the invention. Fig. 2 is a face view of a spring-disk, which in this instance forms the elastic diaphragm connection of the rear contact-electrode and likewise serves as the front wall of the variable-resistance chamber.

In the drawings, F is the face-plate or front of a telephone-transmitter, having a central aperture  $a$ , to which is attached a mouth-piece or sound-converging cone M and which widens on the interior surface of the face-plate to form the usual vocalizing-chamber V.

D is the vibratory diaphragm peripherally surrounded by a rubber cushioning-band  $d$  and pressed gently toward the face-plate by the dampening-spring  $d^2$ , whose end is padded by a sleeve  $p$ , of rubber or similar material.

C is the case or chamber, which contains the principal or contact electrodes and the finely-divided resistance-varying medium. It consists of a circular box  $c$ , of brass or other suitable metal or alloy, having a flange  $f$ , through which pass threaded holes for the reception of screws  $x$  and  $z$ , whereby it is attached to the plate S, which serves as a front plate to close the chamber.

The plate S is more fully illustrated in Fig. 2, which shows the face it presents toward the diaphragm. In the present instance it is formed as a disk slotted at  $s$  and  $s^2$ , as shown, to render it flexible and to give it resiliency to the end that it may constitute a spring-back for the case C or an elastic interposed connection between the said case and the diaphragm, which wholly supports the said case and its contents. The disk is preferably made of vulcanized fiber or similar elastic non-conducting material, but may, if desired, be of metal, provided it be formed as or mounted upon a spring or other elastic connection; but if made of metal a non-conducting bushing will be required at its center, through which the front electrode attachment passes. The said front electrode  $e$  is a conducting plate or disk, preferably of carbon, contained in the chamber C, but of course



insulated therefrom. It is fastened to a stud or bolt *b*, which extends through the resilient disk *S* and the diaphragm, being fitted with a shoulder or washer *h* between the said disk *S* and the diaphragm and having on the outside of the said diaphragm a nut *n*, which when screwed down securely attaches the electrode *e* and the containing-case *C* to the diaphragm center, the former directly and rigidly and the latter, through the intermediation of the spring-plate *S*, elastically. The rear or complementary principal or contact electrode *e*<sup>2</sup> is also preferably of carbon and is fastened to the interior back surface of the case *C*. Thus, while mounted, in common with the front electrode, on the diaphragm, its attachment thereto is elastic because of its being supported by the case *C*, whose connection with the said diaphragm is effectuated through the interposed spring-plate *S*.

The space within the containing-chamber *C* between the contact-electrodes is filled or nearly filled with a mass of finely-divided and loose granulated carbon *g*, constituting, in association with the said contact-electrodes, (with which the said mass is constantly in contact,) the variable-resistance medium, and the grains or particles of the said mass are substantially spherical or rounded in form.

It is customary in the art to apply the term "electrodes" in transmitters of this class to the contact-surfaces *e* and *e*<sup>2</sup>; but since the electrical contact between these is maintained through a granulated conductor, wherein each grain or particle acts as a veritable electrode with respect to those touching it on all sides, the said surfaces in recognition of this fact are herein termed "principal electrodes."

The dampening-spring *d*<sup>2</sup> is attached to a binding-post *v* at the upper edge of the face-plate, and to a corresponding screw-post *y* at its lower edge is fastened a ribbon or strip of metal foil or a similar light conductor *r*, whose other end is bound between the shoulder or washer *h* and the diaphragm. This serves to secure a good circuit connection between the circuit-conductor *L*<sup>2</sup> and the front contact-electrode *e*, while the requisite connection between the other circuit-wire *L* and the back electrode *e*<sup>2</sup> may be made through the substance of the metal box *c*, to which the said wire *L* may be soldered, as shown, near the screw *x* or wherever convenient.

Transmitters of this class wherein the entire variable-resistance medium composed of the two principal electrodes and the granular carbon is contained in a chamber supported by the diaphragm alone, so that the whole chamber and its contents are shaken by the vibrations of the said diaphragm, have heretofore been strongly subject to the disadvantage of packing, resulting in diminished efficiency, because the entire tendency of such vibrations has inevitably been to shake the irregularly-shaped granulations to the bottom of the case. Instruments embodying the im-

provements described herein have, however, been found remarkably free from this disadvantage, and it is considered that such freedom and the practical improved efficiency resulting therefrom are attributable to the spring connection of the case and back electrode when employed in combination with granular carbon whose grains being spherical or rounded and therefore regular in form do not readily yield to that packing tendency which has heretofore been found so disadvantageous.

Having thus described the invention, I claim—

1. In a telephone-transmitter, the combination of the vibratory diaphragm, and front and back electrodes both mounted thereon, the former being rigidly, and the latter elastically attached thereto; with a variable-resistance medium composed of substantially spherical or rounded carbon granules or particles, held between and in constant contact with the said electrodes; substantially as specified.

2. In a telephone-transmitter, the combination with the vibratory diaphragm, a case or chamber elastically attached to the said diaphragm and wholly supported thereby, and two electrodes having adjacent contact-surfaces, inclosed in said case, one being mounted directly on the diaphragm and the other on the back of the case; with a variable-resistance medium constituted of spherical or rounded particles of granulated carbon held between the said electrodes, within the said chamber; substantially as set forth.

3. The combination in a telephone-transmitter, with a diaphragm carrying both electrodes, one mounted directly thereon, and the other through an interposed elastic arm or plate; of a mass of granular carbon held between and in contact with the said electrodes to constitute a variable-resistance medium; the grains or particles of carbon being spherical or rounded in form; substantially as set forth.

4. In a transmitting-telephone of the granular-carbon type, the combination with the diaphragm, of a case or chamber containing the electrodes, supported on the said diaphragm, and provided with a spring-back forming or carrying one of the said electrodes, the other being attached directly to the diaphragm, and a mass of rounded or substantially spherical carbon granules or particles held between the said electrodes within the said case; substantially as described.

5. In a transmitting-telephone of the granular-carbon type, the combination of the diaphragm, a resilient or elastic disk or plate secured centrally thereto, a containing case or chamber supported on the spring edges of the said plate and closed thereby, and a variable-resistance medium contained within the said chamber and consisting of a front electrode directly secured to the diaphragm,



a complementary electrode carried upon the rear wall of said chamber; and spherical or rounded carbon granulations held between the said electrodes; substantially as specified  
5 herein.

two subscribing witnesses, this 17th day of August, 1897.

HERBERT E. SHREEVE.

Witnesses:

GEO. WILLIS PIERCE,  
JOSEPH A. GATELY.

In testimony whereof I have signed my name to this specification, in the presence of