

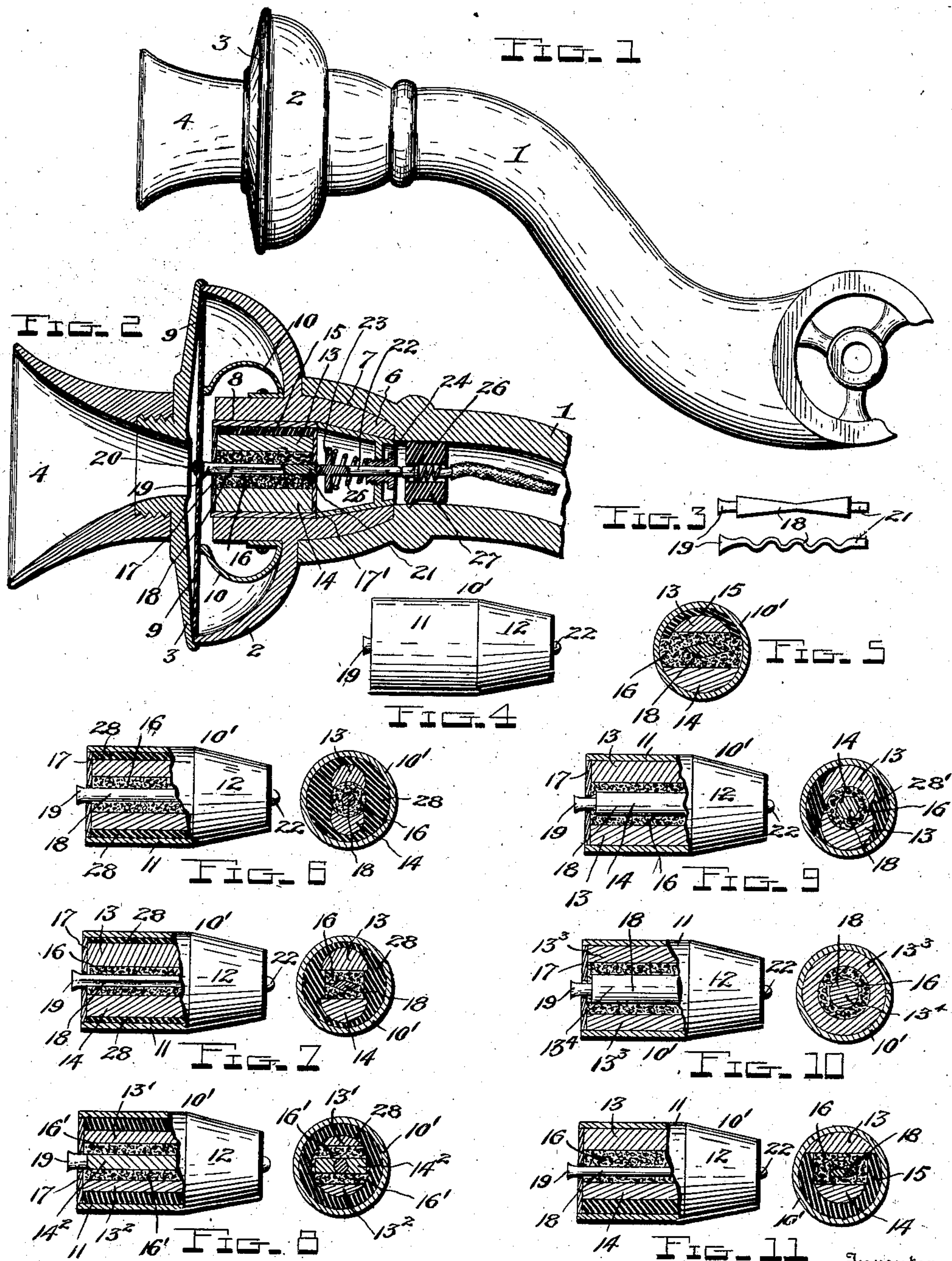
No. 728,344

PATENTED MAY 19, 1903.

G. E. WHEELER.
TELEPHONE TRANSMITTER.
APPLICATION FILED JULY 31, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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Witnesses
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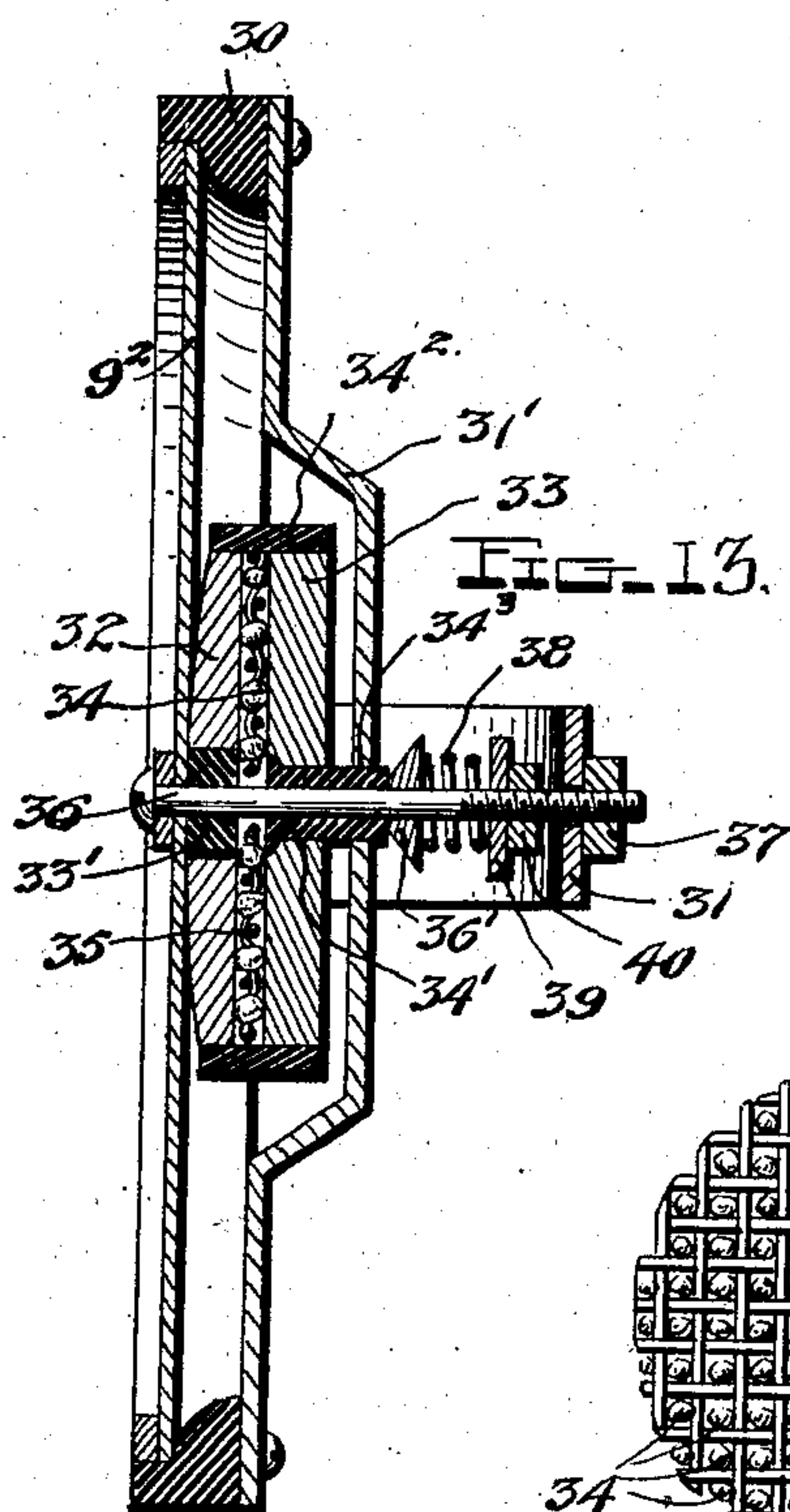
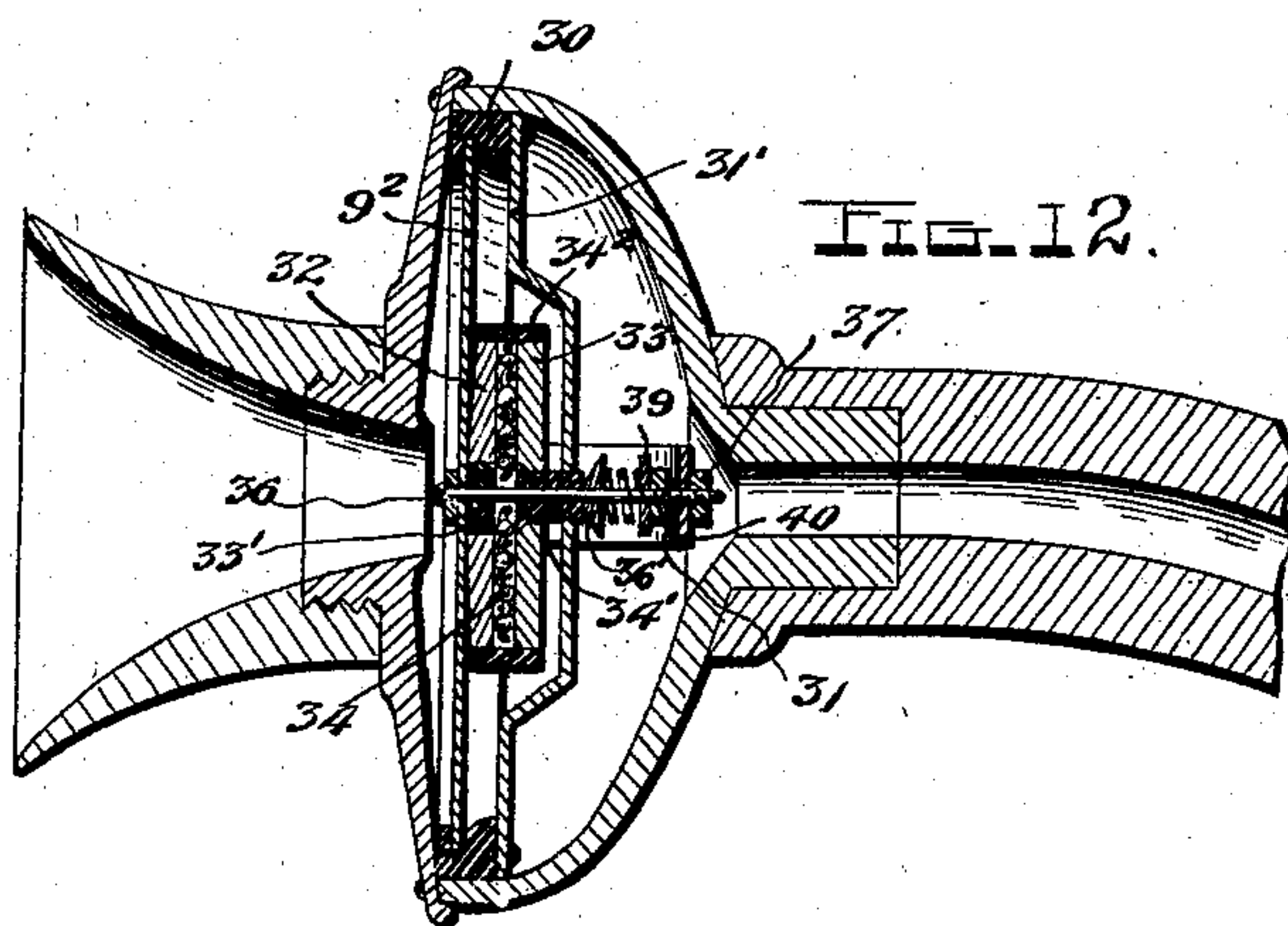


FIG. 14.

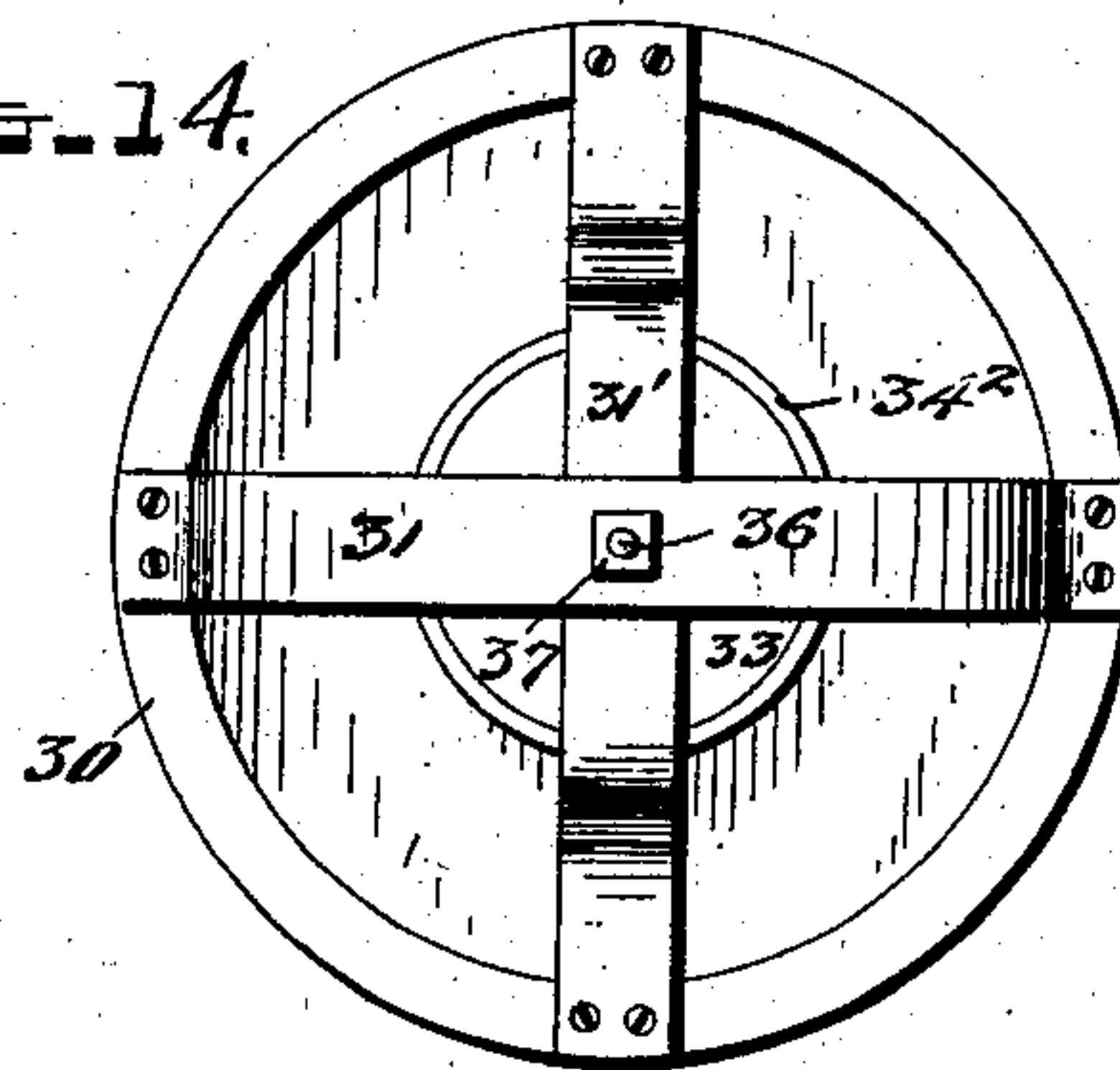
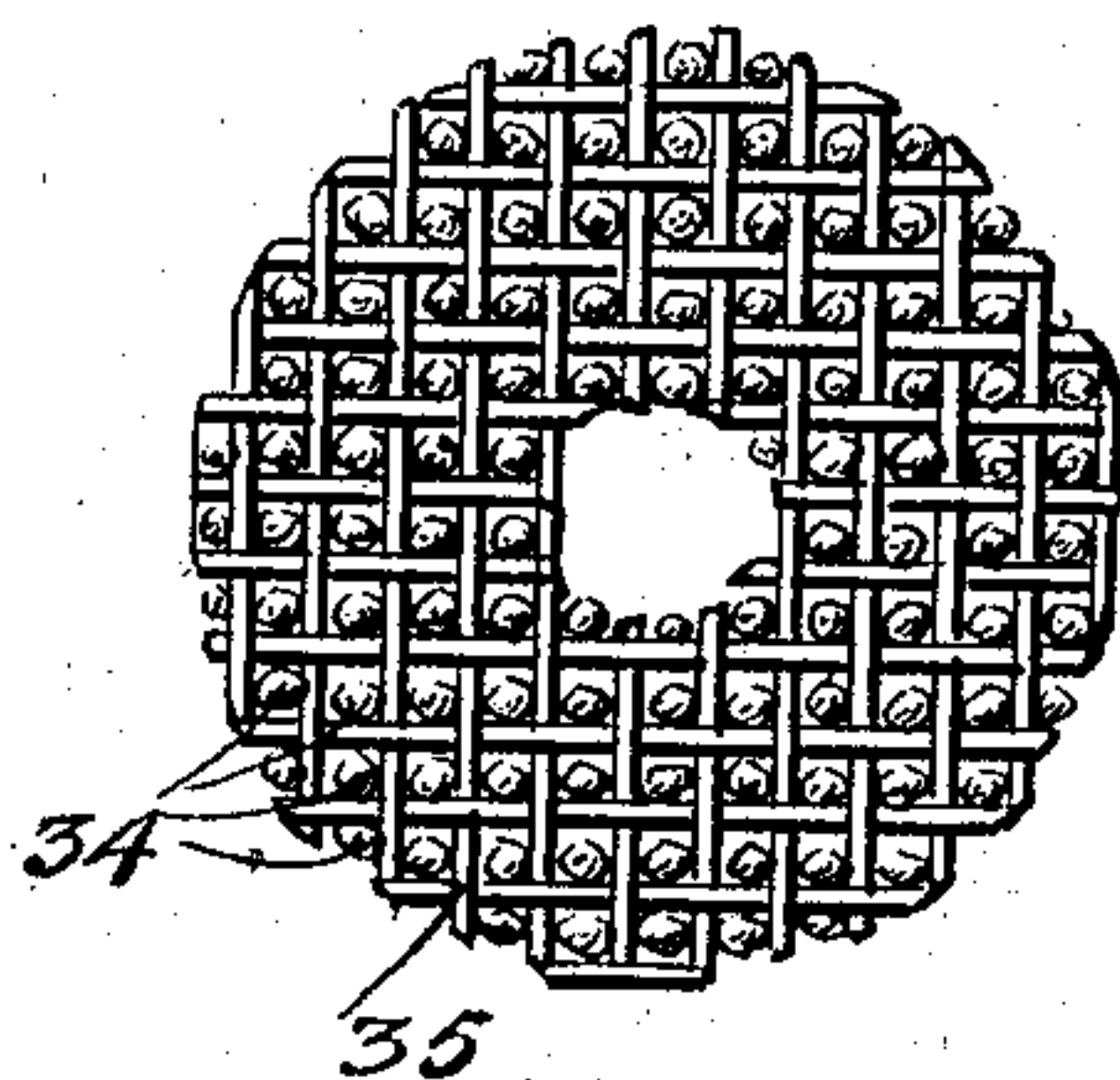


FIG. 15.



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UNITED STATES PATENT OFFICE.

GEORGE E. WHEELER, OF BURLINGTON, IOWA, ASSIGNOR TO MODERN
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TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 728,344, dated May 19, 1903.

Application filed July 31, 1902. Serial No. 117,864. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. WHEELER, a citizen of the United States, residing at Burlington, in the county of Des Moines and State of Iowa, have invented certain new and useful Improvements in Telephone-Transmitters; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in telephone-transmitters of that kind employing a granular material in connection with electrodes for promoting the vibratory action under the sound-wave impulses imparted to the diaphragm.

The invention has for its objects, first, to provide an improved construction and arrangement of the electrodes whereby both electrodes may be arranged in the circuit to the exclusion of the diaphragm; second, to provide means whereby the parts may be adjusted to respond sympathetically to the most delicate sound-waves without harshness from those of high intensity; third, to provide simple and effective means for preventing packing of the granular material; fourth, to mount the electrodes and coacting parts in compact form and in such manner that they may be simultaneously removed from their casing for adjustment, renewal, or repairs, and, finally, to generally simplify the construction and increase the practical efficiency of transmitters of this type.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in certain novel features of construction and combination and arrangement of parts, as will be hereinafter fully described, defined in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a transmitter embodying my invention. Fig. 2 is a vertical longitudinal section through the mouthpiece and diaphragm-chamber, on an enlarged scale. Fig. 3 shows in edge view two forms of agitators. Fig. 4 is a side elevation of the cartridge containing the electrodes, &c. Fig.

5 is a cross-section of the same. Figs. 6 to 11, inclusive, are views illustrating various modifications in the construction and arrangement of the parts within the cartridge-shell, each figure showing a longitudinal and a transverse section of the form of cartridge represented thereby. Fig. 12 is a similar view showing a modification of the general construction wherein the cartridge-shell is dispensed with and the electrodes are arranged vertically instead of horizontally. Fig. 13 is an enlarged vertical section through the diaphragm, electrodes, and coöperating parts removed from the casing. Fig. 14 is a rear elevation of the same. Fig. 15 is a plan view of the open-work retainer for the granular material, showing the manner in which the granules are held separated thereby.

Referring now more particularly to the drawings, the numeral 1 represents the transmitter-arm, which may be either fixed or pivoted and which is provided with the diaphragm-casing 2, closed by the cap or cover 3, carrying the horn or mouthpiece 4. The casing 2 has a tapered rear portion 6 to fit within a corresponding socket 7 on the free end of the arm 1, and in the form shown in Figs. 1 and 2 this portion is extended forwardly to form a longitudinal chamber 8 for the reception of the electrodes and coöperating parts. The diaphragm 9 is suitably mounted within the casing 2 and is pressed upon by the damper-springs 10, which may be of any preferred construction.

The rear portion of the chamber 8 is interiorly tapered, and arranged within said casing is a metallic shell or container 10', composed of a section 11 of uniform diameter, which fits snugly within the front part of the chamber 8, and a section 12, tapered to fit within the rear portion of said chamber, whereby rearward displacement of the shell is prevented, the said two sections of the shell being rigidly or detachably united in any preferred manner. Inclosed within the shell are two carbon electrodes 13 and 14, the electrode 13 being insulated from the shell by a layer of non-conducting material 15, while the electrode 14 is in direct contact with the wall of the shell, as clearly shown in Fig. 5.

The granular material 16 is interposed between the electrodes and is in contact therewith and with the shell. The electrodes, the granular material, and the insulation are held in proper relation by caps or disks 17 17', of mica or other non-conducting material, which close the ends of the section 11 of the shell.

Extending through the filler of granular material, which is in a more or less loose state, is a reciprocatory agitator 18, which has at its forward end a contact-piece 19, which projects through the front disk 17 and is adapted to be engaged by a button 20 on the diaphragm, and at its rear end a projection 21, which extends through the rear mica disk 17' and is in engagement with a stem 22, formed at its forward end with a head or collar 23 and mounted to slide at its rear end in an adjusting-nut 24, suitably mounted in the rear end of the tapered section 12 of the shell. A coiled variable-resistance spring 25 surrounds the stem 22 between the head or collar 23 and the nut 24 and is adjustable to vary its resistance to the rearward movement of the agitator through the medium of said nut. Electrical connection with the electrode 13 is made through a spring-pressed contact 26, insulated from the casing by a non-conducting block 27, while electrical connection with the electrode 14 is made through the shell, diaphragm-casing, and transmitter-arm. Thus the electrical connections with the two electrodes are made without the necessity of including the diaphragm in the circuit.

As the diaphragm 9 vibrates under the action of the sound-waves the button 20 on each inward movement of the diaphragm taps the contact 19 on the agitator 18, thereby forcing said agitator rearwardly and transferring sympathetic motion to the granular material 16, the resistance of the agitator to such movement under the impulses of the diaphragm being regulated by the spring 25, which returns the agitator to its normal position on each outward movement of the diaphragm. By this means the parts are made to respond to the most delicate sound-waves and also to sound-waves of high intensity without indistinctness or harshness, but, on the contrary, with the greatest clearness, while the particles of the granular material are kept constantly in a free or loosened-up state and prevented from packing.

The tension of the spring 25 may be regulated by means of the nut 24 to vary its resistance to the movement of the agitator and at the same time to adjust the transmitting parts to any desired degree of sensitivity. Upon removing the cap and diaphragm the shell or cartridge with all the parts contained therein may be simultaneously removed from the chamber 8 for repairs, substitution, or removal of any of the parts without liability of disarrangement of said parts.

The granular material is preferably composed of particles of carbon of a desired size, but may be of particles of any other suitable equivalent substance or material.

As shown in Fig. 3, the agitator 18 may be of double-wedge form or fluted or corrugated in order to give the particles of the granular material an undulating or irregular motion, thus preventing the particles from adhering or packing. This motion causes a change in the position of all the granules of the material by the alternate rise and fall of the same. Hence the outer particles or those most remote from the agitator are not allowed to pack, as might be the case if the agitator communicated motion only to the layers in immediate contact therewith. The agitator may, however, be of diamond form in cross-section, as shown in Figs. 5 and 7, or of any other approved form.

In Figs. 6 to 11, inclusive, I have shown modifications in the arrangement of the electrodes and granular material to suit various conditions of service, according to the voltage and amperage and the character of the telephone, whether of the local or long-distance type. In Figs. 6 and 7 the electrodes are insulated from the shell by a block or ring 28, of insulating material, which receives the electrodes and granular material, the two structures differing only in the form of the electrodes and arrangement of the granular material. In Fig. 8 the insulating-ring 28 is also used; but three carbon electrodes 13', 13², and 14² are employed and are arranged alternately with two layers 16' of the granular material. In Fig. 9 the arrangement of the electrodes and granular material is substantially that shown in Fig. 6; but both electrodes are in contact with the shell at diametrically opposite points, while the insulation 28' merely acts as a filler. In the construction shown in Fig. 10 the outer carbon electrode 13³ is of ring form and contacts with the shell and receives the inner electrode 13⁴ and the interposed granular material. Fig. 11 shows an arrangement similar to that shown in Figs. 2, 4, and 5, the only essential difference being that both the granular material and the inner electrode are insulated from the shell by the layer of insulating material. The electrical connections must necessarily be varied according to the form used. In each instance, it will be observed, a cartridge is provided, which carries the granular material and electrodes and which is insertible and removable at will within and from the chamber 8.

Figs. 12 to 15, inclusive, disclose a modification of the invention in which the essential variation consists in arranging the electrodes vertically instead of horizontally. In this embodiment of the invention the diaphragm 9² is carried by a supporting-ring 30, of insulating material, to the rear face of which are secured yokes 31 31'. The electrodes 32 and

33 are, as stated, vertically arranged, and the electrode 32 bears against the rear face of the diaphragm 9², while the electrode 33 is held spaced therefrom by the interposed granular material 34, the granules or particles of which are made of comparatively large size and are retained within the cells or meshes of an open-work or foraminous holder or retainer 35, which is preferably, though not necessarily, constructed of crossed or intertangled strands of wire. An insulated ring 34² closes the space between the electrodes and secures the retainer 35 against undue vertical play and also prevents any loss of particles of the carbon. The two electrodes and the interposed retainer are apertured for the reception of non-conducting bushings 33' 34', the latter being slidably mounted upon a bolt 36 and in a guide-opening 34³ in the yoke 31'. This bolt 36 extends through the diaphragm, bushings, and central portion of the yoke 31, with its head bearing against the front surface of the diaphragm and its rear threaded end loosely projecting through an opening in said yoke 31 and engaged by a clamping-nut 37, which bears against the yoke and holds the diaphragm seated within the supporting-ring 30.

Bearing against a head or collar 36' on the stem-bolt 36 is a coil-spring 38, which surrounds the bolt between said head and a disk 39, loosely mounted upon the bolt, the said disk 39 being adjustable through the medium of an adjusting-nut 40, working on the threads of the bolt for regulating the tension of said spring. By reference to Fig. 14 it will be seen that the spring 38 exerts its resistance to the rearward movement of the diaphragm 9² and through the head 36, bearing on bushing 34', also forces the rear electrode 33 forwardly, thereby holding the carbon granules clamped with greater or less force between the two electrodes, so that said spring thus performs the dual function of regulating the vibration of the diaphragm and the sensitiveness of the granular material, adapting them to be keyed or tuned to respond sympathetically to the most delicate sound-waves. By simply adjusting the nut 40 toward or from the diaphragm the tension of the spring may be increased or diminished at will to suit the character of the instrument. This mode of operation is also carried out in the construction shown in Fig. 2 by the action of the corresponding resistance-spring 25, which opposes the resistance to the rearward movement of the diaphragm and at the same time regulates the action of the agitator, which by the degree of motion imparted thereto regulates the sensitiveness of the particles or granules of the granular material in sympathetic accord with the vibrations of the diaphragm.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the construction, mode of op-

eration, and advantages of my improved telephone-transmitter will be readily apparent without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a telephone-transmitter, the combination with a diaphragm, of electrodes, granular material between the electrodes, a reciprocatory agitator operated in one direction by the diaphragm and adapted to impart motion to the particles of the granular material, and means for opposing an adjustable yielding resistance to the movement of the diaphragm and agitator and operating the latter in the reverse direction, substantially as described.

2. In a telephone-transmitter, a diaphragm, electrodes, granular material between the electrodes, and an agitator operated by the impulses of the diaphragm and adapted to impart undulatory movement to the particles of the granular material, substantially as described.

3. In a telephone-transmitter, the combination of a diaphragm, electrodes, granular material between the electrodes, a stationary holder for the electrodes and granular material, and means for opposing a variable resistance to the inward movement of the diaphragm and regulating the sensitiveness of the granular material, said means comprising an independently-movable agitator, a resistance-spring acting thereon, and means for regulating the tension of said spring, substantially as described.

4. In a telephone-transmitter, the combination with a diaphragm, of electrodes, granular material between the electrodes, a stationary inclosure for the electrodes and granular material, and means for opposing a resistance to the inward movement of the diaphragm and regulating the sensitiveness of the granular material, said means comprising a reciprocatory agitator, and a cooperating threaded member, a resistance-spring regulating the movement of the agitator to correspondingly regulate the vibrations of the diaphragm and the sensitiveness of the granular material, and a nut upon the threaded member for varying the tension of said spring, substantially as described.

5. In a telephone-transmitter, the combination with a diaphragm, of electrodes, granular material between the electrodes, a stationary casing for the electrodes and granular material, an agitator in the casing actuated by the vibrations of the diaphragm for regulating or maintaining the sensitiveness of the granular material, and means for opposing an adjustable yielding resistance to

the movement of the diaphragm and agitator, substantially as described.

6. In a telephone-transmitter, a diaphragm, electrodes, granular material between the
5 electrodes, a holder inclosing the electrodes and granular material, an agitator for the granular material, operated from the diaphragm and independently movable within the holder, a spring opposing a resistance to
10 the movement of said agitator and means for adjusting the tension of said spring, substantially as described.

7. In a transmitter, a diaphragm, electrodes, granular material, a relatively stationary
15 holder for the electrodes and granular material, a member movable under the impulses of the diaphragm to regulate the sensitiveness of the granular material, a resistance-spring acting on said movable member, and

means for adjusting the tension of said spring, 20 substantially as described.

8. An appliance for telephone-transmitters, comprising a cartridge-shell open at each end, electrodes therein, granular material between the electrodes, disks closing the ends of the
25 shell and confining the electrodes and granular material, and an agitator extending through the granular material and having portions projecting through the disks, substantially as described. 30

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE E. WHEELER.

Witnesses:

JAS. FITZGERALD,
J. B. WOODSIDE.