

(No Model.)

G. F. PAYNE & W. D. GHARKY.
TELEPHONE TRANSMITTER.

No. 600,991.

Patented Mar. 22, 1898.

FIG. 1.

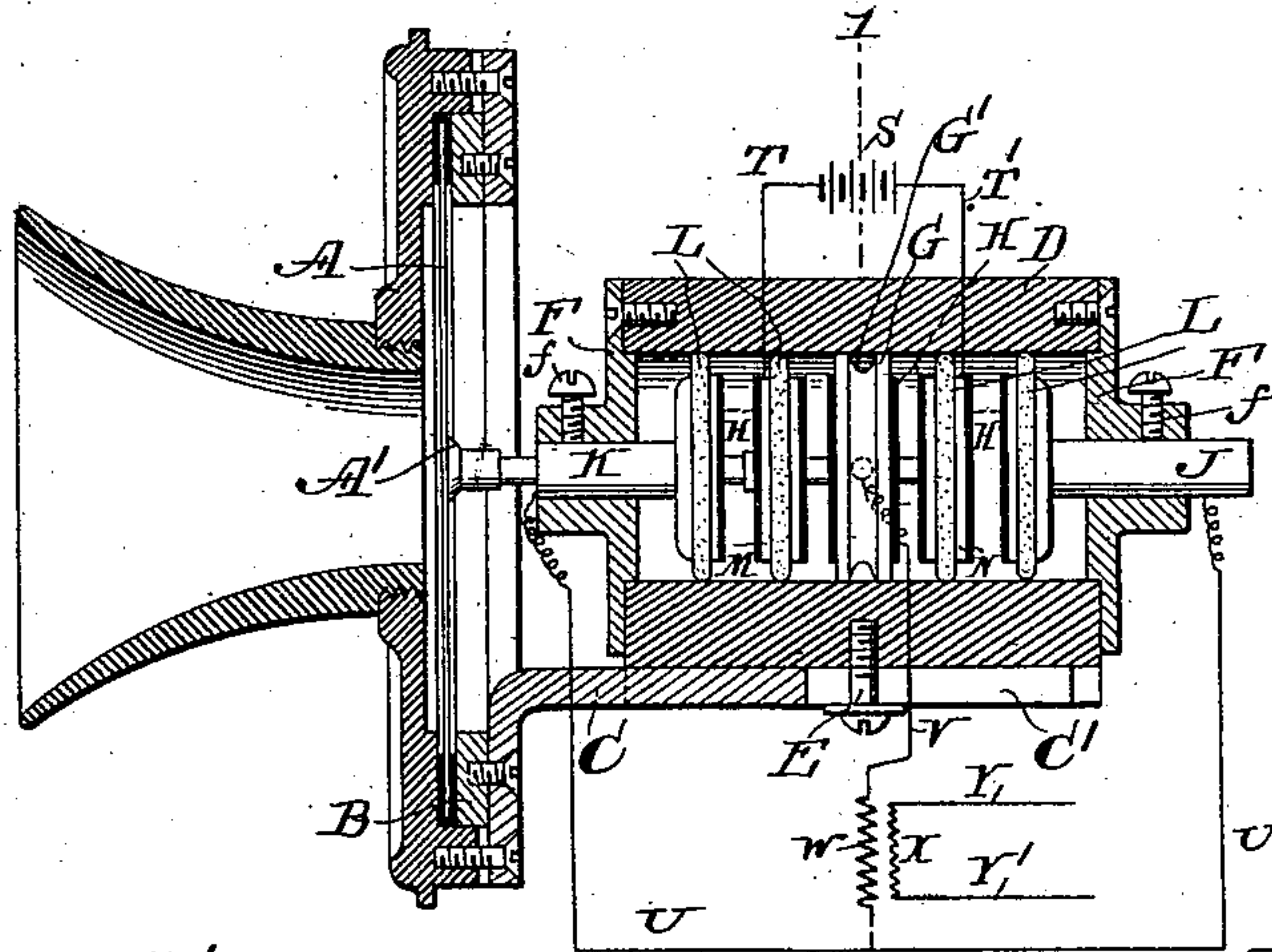


FIG. 6.

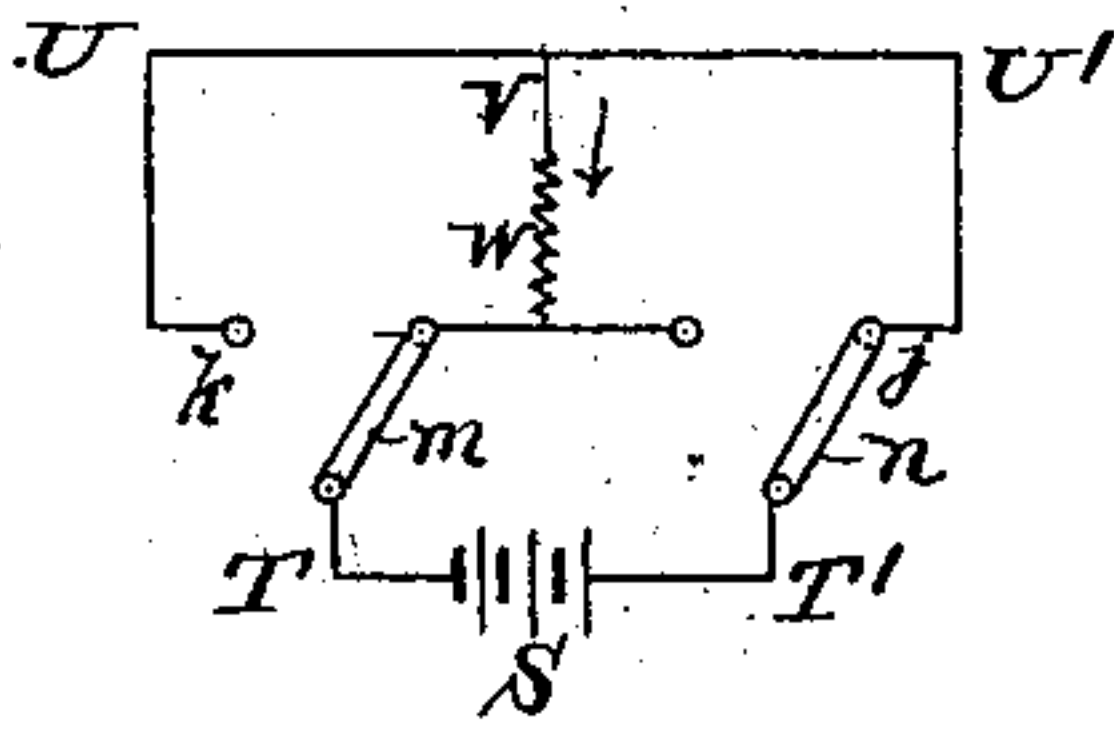


FIG. 2.

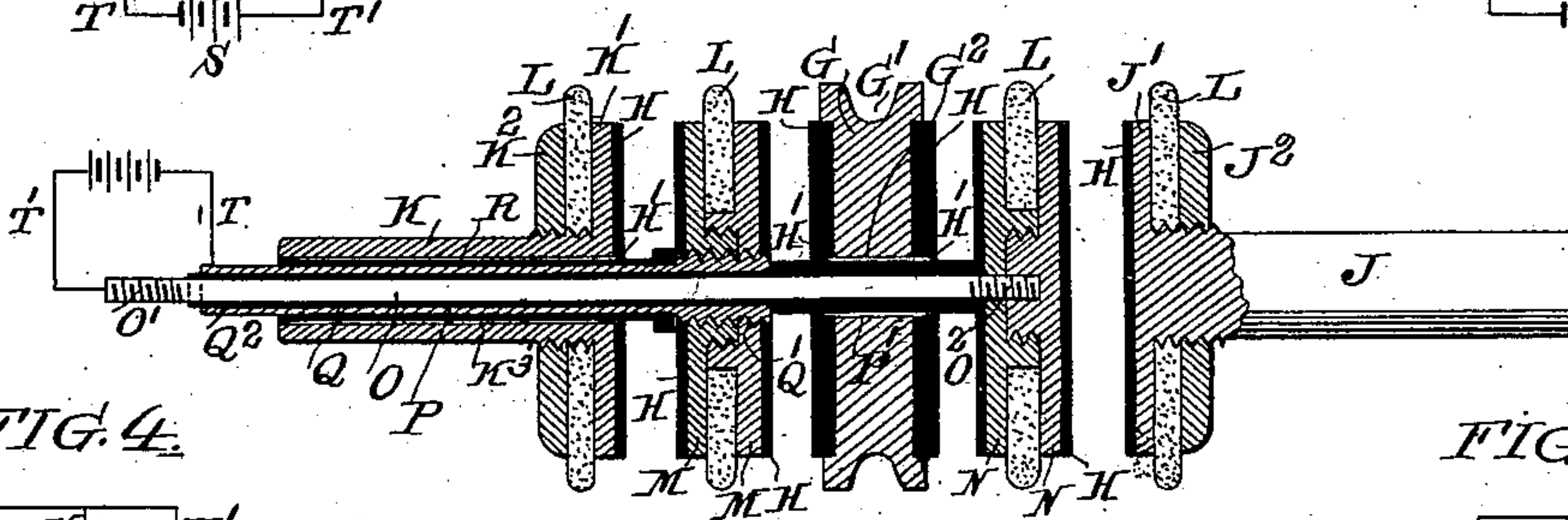


FIG. 4.

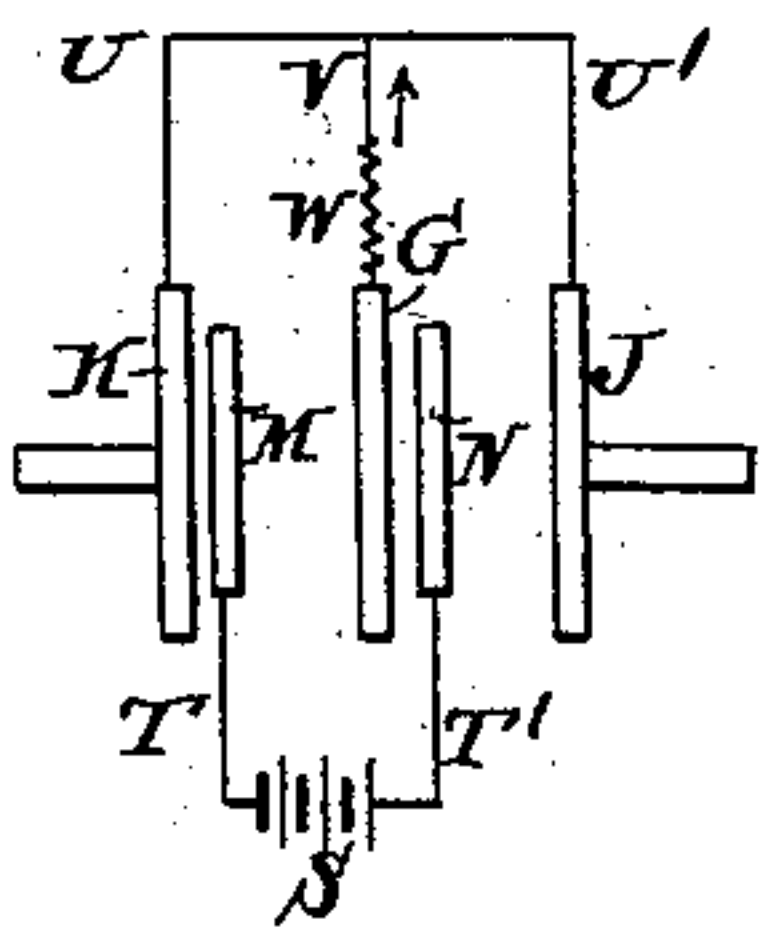


FIG. 3.

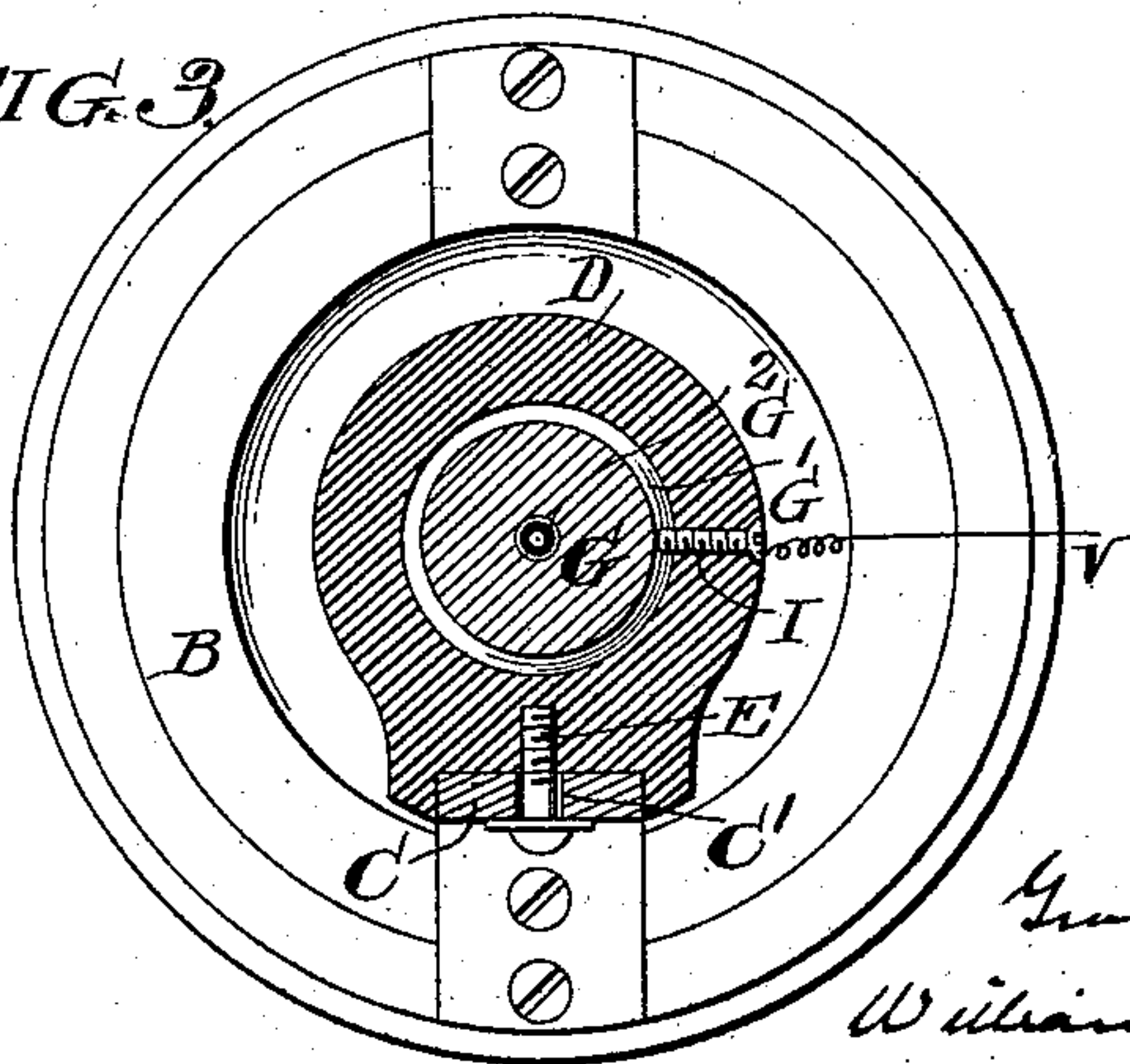


FIG. 7.

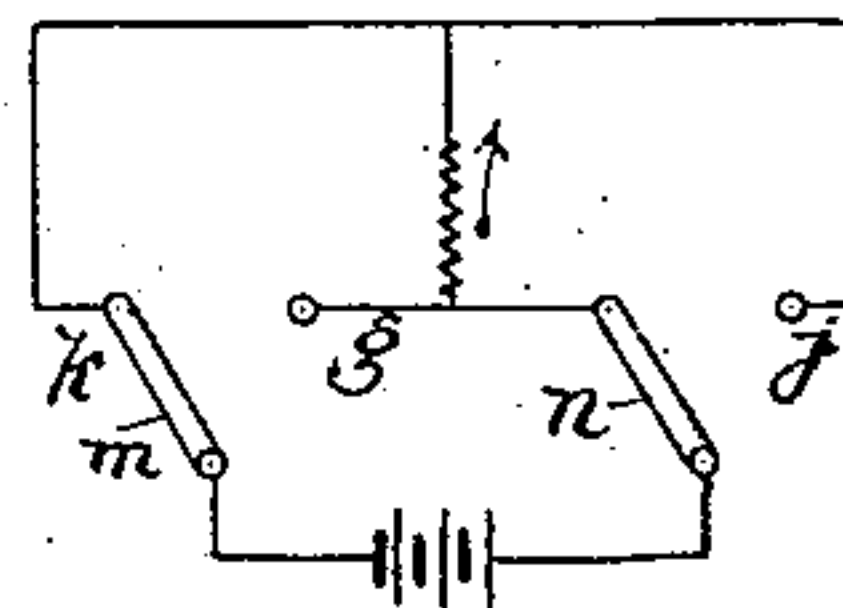
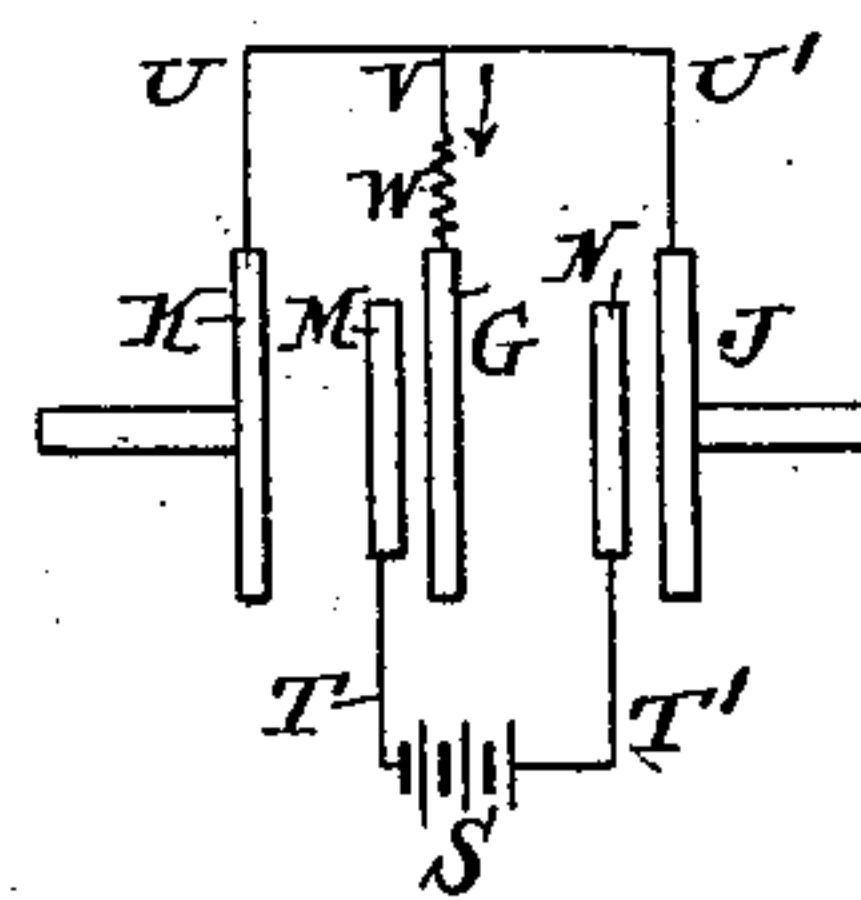


FIG. 5.



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UNITED STATES PATENT OFFICE.

GEORGE F. PAYNE AND WILLIAM D. GHARKY, OF PHILADELPHIA, PENNSYLVANIA; SAID GHARKY ASSIGNOR TO SAID PAYNE.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 600,991, dated March 22, 1898.

Application filed September 11, 1897. Serial No. 651,286. (No model.)

To all whom it may concern:

Be it known that we, GEORGE F. PAYNE and WILLIAM D. GHARKY, citizens of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Telephone-Transmitters, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

Our invention relates to telephone-transmitters, and has for its object to provide a transmitter in which the form and amplitude of the vibrations of the diaphragm will be converted into alternating electrical impulses more nearly approximating the sound-vibrations than has heretofore been practicable. Various attempts have heretofore been made to increase the amplitude of the electrical vibrations produced by a transmitter; but in all cases of which we are aware the mechanism provided and having for its object to increase the amplitude of the vibrations has been of such a character as to avail itself only partly and in varying amount of the power of the battery or other generator, and for this reason the electrical vibrations necessarily differed to a considerable degree with the sound-vibrations.

The broad purpose of our invention is to provide an arrangement of electrodes in the transmitter which will be in their operation upon the electrical current approximately similar to a pole-changing switch having two movable portions, and we accomplish this by providing four resistance-cells containing granular conducting material, electrically coupling said cells in pairs and connecting the coupling-conductors, then electrically coupling the cells in two other pairs the members of which are not coupled by the first conducting connections, and, again connecting the second set of coupling-conductors, we place a battery in the connection between one set of couples and an induction-coil in the connection between the other set of couples, and we provide mechanical connections from the diaphragm to the cells, whereby the vibrations of the diaphragm simultaneously in-

crease pressure on the material in one of each coupled pair of cells and relaxes the pressure on the other cells, as a result of which action the battery-current, following the lines of least resistance, is for the most part switched in alternately opposite directions through the induction-coil connection.

In practice we have used two sets of electrode-faces, four in each and grouped to form the walls of four resistance-cells containing granular material, electrically coupling the faces of one set in pairs and of the other set also in pairs, but in such manner as not to couple the same cells coupled by the connections of the first set. One set of faces we secure in fixed position, while the other set is movable and mechanically connected to vibrate with the diaphragm, and our preferred construction is that shown, having three stationary electrode-buttons arranged one behind the other and the central button having two faces, while the end buttons have each one inwardly-turned face and are wire-connected, the metal center of the central button serving to couple its two faces and a wire coupling it with the connection between the outer buttons. Two movable buttons, each having two faces coupled through their metal backs, are placed one on each side of the central button and wire connection made from one to the other, the battery and coil being connected as above described and the movable buttons attached to the diaphragm.

Reference being now had to the drawings in which our invention is illustrated, Figure 1 is a central longitudinal section through a transmitter including our invention; Fig. 2, an enlarged sectional view of the electrodes of the transmitter; Fig. 3, a transverse section on the line 1 1 of Fig. 1; Figs. 4 and 5, diagrammatic illustrations of the operation of our transmitter, and Figs. 6 and 7 diagrammatic comparative illustrations of a pole-changing switch of analogous character.

A indicates the diaphragm of the transmitter, to the center of which a nut A' is secured.

B indicates the framing of the transmitter, and C an extension of the framing slotted, as indicated at C', and to which is secured the

box D, in which the electrodes are situated, E indicating a binding-screw working in the slot C' and acting to hold the box D to the frame extension C.

5 F F indicate the heads of the box D.

G is the central stationary electrode, which we preferably construct of brass with carbon faces, as indicated at H H. The brass center of this electrode is grooved, as shown at 10 G', for the purpose of engaging with a binding-screw I, which holds it in position and by which it is electrically connected with other parts of the apparatus. The outer stationary electrodes are each formed with stems, as 15 indicated at J and K, which extend through the heads F F of the box and are secured in proper position by the set-screws *f f*. At the inner end of each rod is a brass disk, (indicated at J' and K',) J² and K² indicating brass 20 disks screwing on the stems J and K and acting to clamp a light felt washer L between themselves and the disks J' and K'. Said disks J' and K' are each provided with a carbon facing H, as indicated. The movable 25 electrodes, of which one is situated on each side of the central stationary electrode, are conveniently made up, as shown, of two brass disks, such as are indicated at M M and N N, a light felt washer L being clamped between the 30 disks in each case. The electrode N is secured to the diaphragm by a light iron or steel rod O, one end O² of which is shown threaded and screwing into the electrode end, while the other end O² is threaded and screws 35 into the nut A'. This rod is covered by a non-conducting jacket P, which in turn is partly inclosed by a conducting-tube Q, which extends from a point on the rod lying outside of the hollow stem K to the point where the 40 movable electrode M is secured, said movable electrode being secured directly to this conducting-rod, which may conveniently be of brass, and the connection, as shown, through a threaded portion or head Q' of the brass 45 tube. Outside of the brass tube is a protecting non-conducting jacket R.

It will be noticed that the brass tubing does not pass through the central stationary electrode, and that we have indicated the non- 50 conducting jacket of the central rod as enlarged between the two movable electrodes, the enlarged portion being indicated at P'.

It will be understood, of course, that granular material, preferably carbon as commonly 55 used, is placed between each opposite pair of electrode-faces, there being thus four separate bodies of granular carbon, which are prevented from coming into physical contact with each other, or into electrical connection otherwise than through the electrodes, by the 60 light felt washers L, the said washers also serving to support and center the electrodes.

It will be noticed that the carbon facings of the central electrode and of the stationary 65 electrode K' through which the actuating-rod for the movable electrodes passes have cham-

fered edges to their perforations, making a nice fit with the rod which passes through, the purpose of this being to prevent the entrance of the granular carbon beyond the carbon facing of the electrodes, and the niceness 70 of the fit is to be determined by this purpose.

The two outer stationary electrodes are shown as connected together by wires U and U', extending from their stems J and K. The 75 connection of the outer electrodes with the central stationary electrode is shown as being made through a wire V, which extends from the connection U U' to the screw I and connects through said screw with the central 80 electrode. The connection between the movable electrodes is conveniently made, as indicated in Fig. 2, by wires T and T', connecting with the end Q² of the brass tube Q and with the end O' of the central rod O. 85

We have indicated at W an induction-coil in the wire V and at X the coacting coil in the secondary line Y Y', and at S we have indicated a battery. It will be understood, of course, that the positions of the battery and 90 induction-coil may be transposed, the operation remaining practically the same.

The operation of our device can be readily followed from the diagrams Figs. 4 and 5, in connection with the pole-changing switch dia- 95 grams indicated in Figs. 6 and 7. As the movable electrodes are by the action of the diaphragm impelled toward the left the resistance to the passage of a current between the electrodes N and G and M and K is di- 100 minished, while it is increased as between the electrodes N and J and M and G. Consequently the greater part of the battery-current will pass through the wire T', the movable electrode N, the stationary electrode G, 105 upward through the wire connection V, thence through the wire connection U to the stationary electrode K, and thence through the movable electrode M and wire T to the battery. An impulse to the right, as indicated in Fig. 110 5, reverses conditions, producing, as there shown, a downward current through the wire V, the changes from the one condition to the other being of course gradual and without 115 sensible interruption, and the result being that practically the whole battery-current is made to follow with the utmost nicety vibrations of the diaphragm of the transmitter.

The diagram Figs. 6 and 7 are simply supplied to show the familiar action of a pole- 120 changing switch with two movable members, and it will be noticed by comparing them with the diagrams Figs. 4 and 5 that the action is almost exactly parallel, the difference being simply that whereas the pole-changing switch 125 interrupts the current abruptly the action of the "transmitter-switch," as we may call it, produces no interruption.

Of course as electrical connection through any resistance-cell is never cut off entirely 130 there will be theoretically and no doubt in reality a division of current between the cells

of greater and lesser resistance; but we have found in practice and for the purposes of the transmitter that practically the whole current follows the lines of least resistance and that the device operates in close analogy to the pole-changing switch.

Our device, as shown, is capable of very many structural modifications without departure from the spirit of our invention, and our claims are not, therefore, to be read as limited on any other features of construction than those expressly called for therein.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephone-transmitter, a set of four resistance-cells containing granular conducting material, electrical connections coupling said cells in two pairs, an electrical connection between said pair connections, other electrical connections coupling said cells in two pairs the members of which are not connected by the first-pair connections, an electrical connection between the second-pair connections, a battery and an induction-coil, one situated in the connection between the one set of pairs and the other situated in the connection between the second set of pairs, and mechanical connections from the transmitter-diaphragm whereby the resistance of the cells is varied as described and so as to cause the greater part of the battery-current to traverse the induction-coil in alternately opposite directions.

2. In a telephone-transmitter, a set of four fixed electrode-faces in combination with a set of four electrode-faces attached to and movable with the diaphragm, said faces of the two sets of electrodes being arranged opposite to each other in pairs and so as to form walls of cells, the electrode-faces being so arranged that with each movement of the diaphragm two pairs will approach and two recede from each other, granular conducting material placed between each pair of coacting faces in the cell formed between them, electrical connections coupling one set of faces in pairs, an electrical connection between said connections, electrical connections coupling the other set of faces in pairs said coupled faces being those belonging to cells not coupled by the connections between the first set, an electrical connection between the connections last mentioned, and a battery and induction-coil one situated in the connection between the coupled faces of one set and the other in the connection between the coupled faces of the other set, all substantially as specified.

3. In a telephone-transmitter the combination with a set of four fixed electrode-faces arranged parallel to and one behind the other with a set of four synchronously-movable electrode-faces arranged in line with the fixed faces and so as to form with them the walls

of four resistance-cells, granular conducting material held in each cell, electrical connections coupling the two outer and two inner electrode-faces of one set in pairs, and a connection between said pair connections, electrical connections coupling the outer and adjacent faces of the other set in pairs and a connection between said pair connections, a battery and an induction-coil one situated in the one and the other in the other connection between the coupled pairs of faces aforesaid and mechanical means securing the movable electrodes with the transmitter-diaphragm so as to cause them to move therewith.

4. In a telephone-transmitter the combination of one set of electrodes, the outer ones having faces turned inward and the central one having two faces, and the two outer ones electrically connected together and with the central electrode, of a second set of electrodes, one situated on each side of the central electrode, an electrical connection between said movable electrodes, means for securing one set of electrodes in place, means for connecting the other set of electrodes with the diaphragm so as to move therewith, a battery and an induction-coil, one situated in the connection leading to the central electrode and one in the connection between the set of two electrodes, all substantially as specified, and so as to alternate the greater part of the battery-current through the coil.

5. In a telephone-transmitter the combination of three stationary electrodes, the outer ones having faces turned inward and the central one having two faces, and the two outer ones electrically connected together and with the central electrode, of two movable electrodes actuated by the diaphragm and one situated on each side of the stationary central electrode, an electrical connection between said movable electrodes, a battery and an induction-coil, one situated in the connection leading to the central electrode and one in the connection between the movable electrodes, all substantially as specified and so as to alternate the greater part of the battery-current through the coil.

6. In a telephone-transmitter the combination with the diaphragm of three stationary electrode-buttons arranged in line therewith and the two nearest to the diaphragm being formed with perforations, two movable electrode-buttons arranged between the stationary buttons one on each side of the central button, a rod attached to the diaphragm and to the two movable buttons said rod passing through the perforated stationary buttons, granular conducting material situated between the adjacent faces of each electrode-button and electrical connections as specified.

7. In a telephone-transmitter, substantially as specified, the combination with the electrode-box of the two stationary end electrode-buttons having electrical connections ex-

tending through the ends of the box and the central stationary electrode-button having an electrical conductor extending through the side wall of the box.

- 5 8. In a telephone-transmitter, substantially as specified, the combination with the electrode-box of the two movable electrode-buttons and an actuating-rod embodying two in-

sulated conductors one connected with each button.

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Witnesses:

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