No. 749,448. PATENTED JAN. 12, 1904.

P. G. RANDALL.

TELEPHONE TRANSMITTER.

APPLICATION FILED FEB. 9, 1903.

NO MODEL.

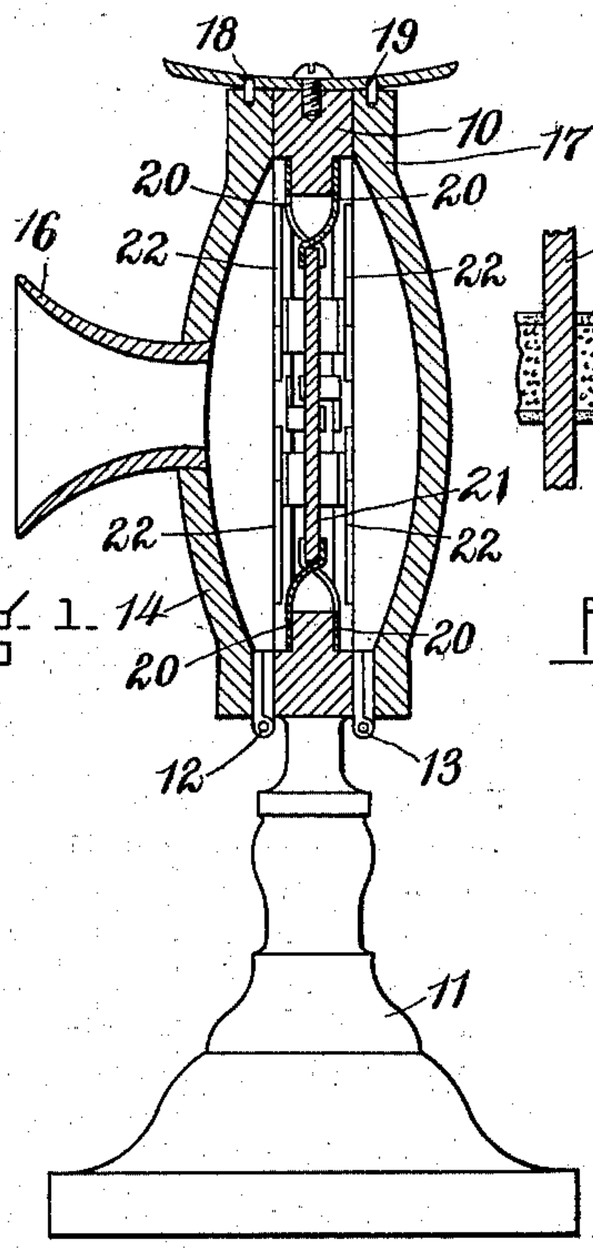

Fig. 1.

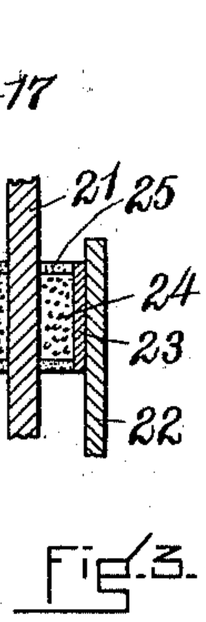

Fig. 3.

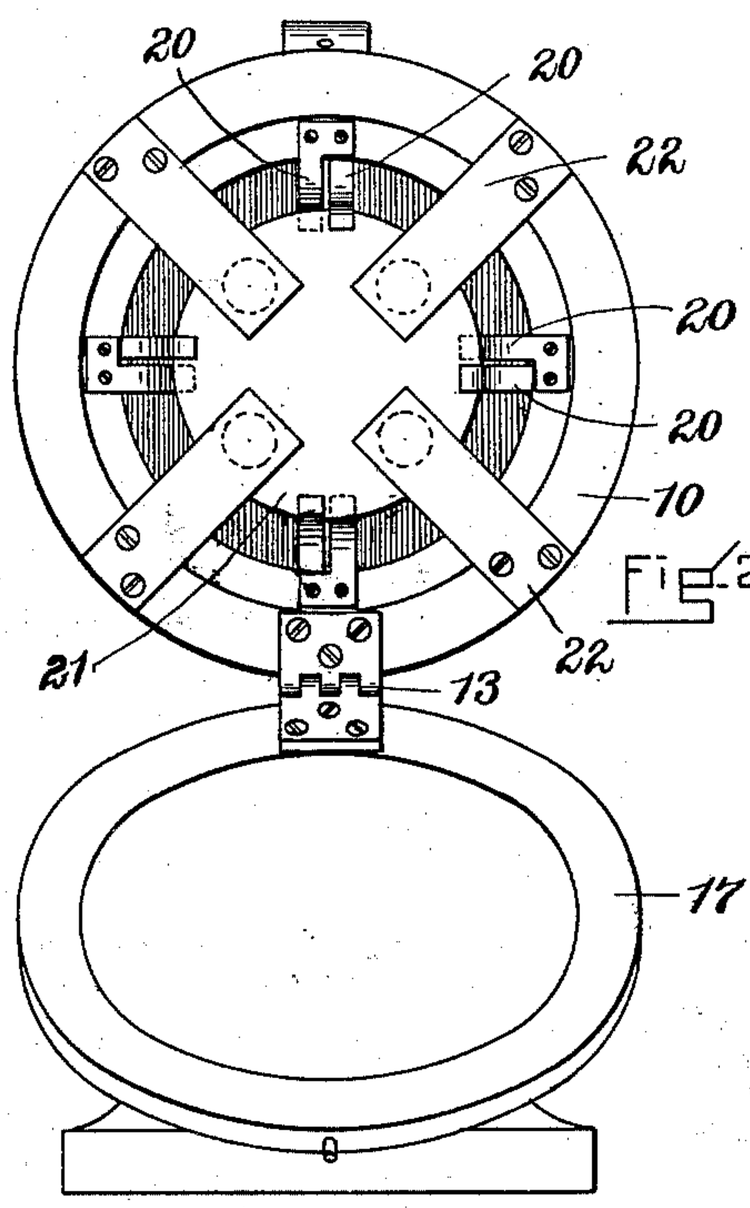

Fig. 2.

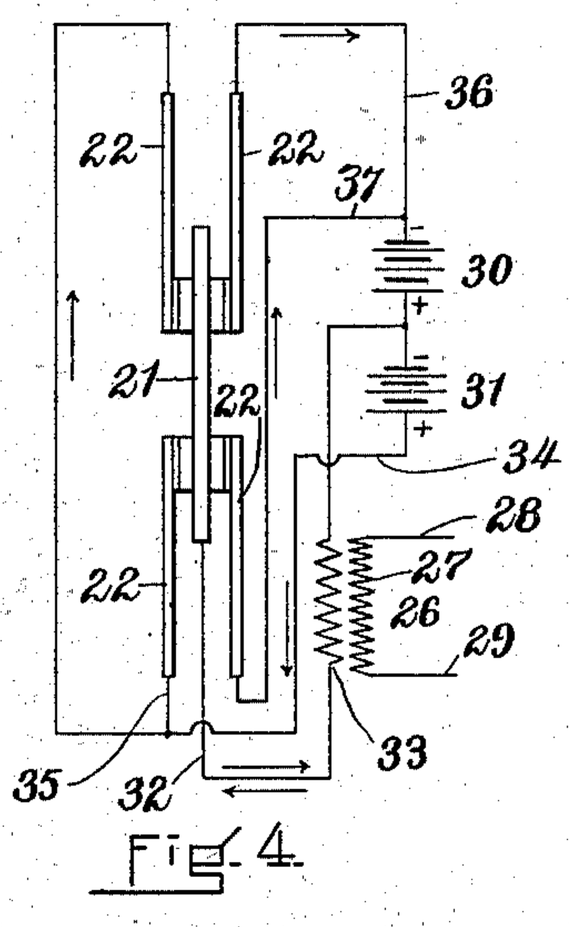

Fig. 4.

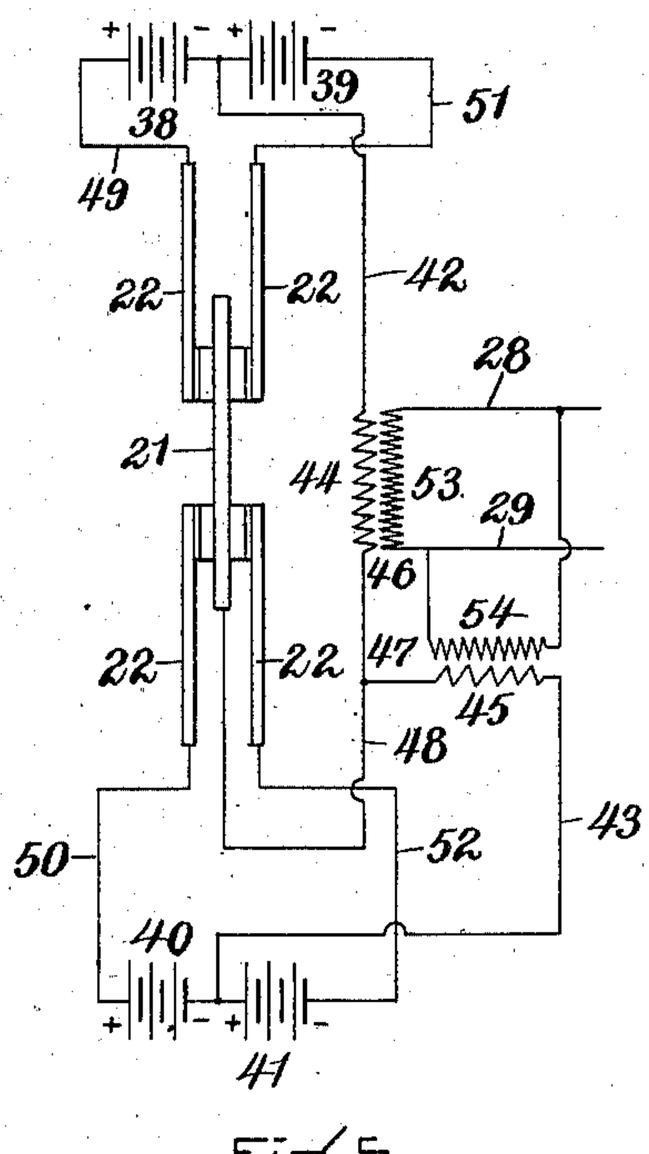

Fig. 5.

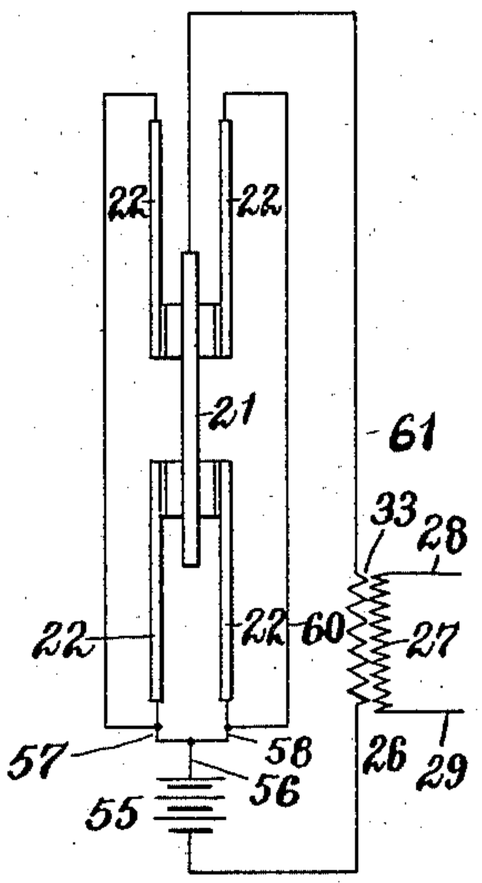

Fig. 6.

WITNESSES.

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No. 749,448. Patented January 12, 1904.

UNITED STATES PATENT OFFICE.

PHILIP G. RANDALL, OF BOSTON, MASSACHUSETTS.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 749,448, dated January 12, 1904.

Application filed February 9, 1903. Serial No. 142,526. (No model.)

To all whom it may concern:

Be it known that I, PHILIP G. RANDALL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Telephone-Transmitters, of which the following is a specification.

This invention relates to telephone-transmitters; and its principal object is to allow a stronger current to be sent through the instrument, thus increasing its power and ability to operate long and difficult circuits or a number of distinct circuits.

Other incidental objects accomplished are an increase in the sensitiveness of the instrument and the distinctness of articulation obtained therethrough.

Of the accompanying drawings, Figure 1 represents a vertical transverse section of a transmitter constructed in accordance with my invention, the circuit connections being omitted. Fig. 2 represents a rear elevation of the instrument with the back cover thrown down to expose the interior. Fig. 3 represents a detail section showing the electrode construction. Fig. 4 represents a diagrammatic view of one arrangement of circuits. Fig. 5 represents a similar view showing another arrangement of circuits. Fig. 6 represents a similar view showing a third arrangement of circuits.

The same reference characters indicate the same parts in all the figures.

In the drawings I have shown, for the purpose of illustrating my invention, one of the several structural forms which the body of the instrument may assume and which, as shown, comprises a casing including an annular support 10, mounted in an upright position upon a base or standard 11 and having hinged thereto at 12 13 a front cover 14, in which a mouthpiece or concentrator 16 is fixed, and a back cover 17, said covers being secured in normal position by spring-catches 18 19. In the center of the annulus 10, suspended by a plurality of pairs or groups of springs 20 20, is a plate, diaphragm, or primary sound-receiver made of such a material and thickness as to be in itself comparatively stiff or unbending and preferably made of a conductive material. Each group of springs, as shown, consists of two springs pressing on opposite sides of the diaphragm 21. The material of the diaphragm may permissibly be carbon, which would render the diaphragm suitable to act in different portions as an electrode or electrodes operating in conjunction with spring-supported electrodes, such as those presently to be described.

22 22 are electrode-springs supported by their outer ends on the annulus 10 and converging or radiating toward a center, their ends, as shown, being arranged in pairs on opposite sides of the diaphragm 21, four of such pairs being illustrated. The number of electrodes cooperating with the diaphragm may be more or less than the number here shown. The electrodes or resistance-contacts at the ends of the springs may be of any desired material suitable to produce a marked variation in resistance of an electric circuit including such electrodes when the pressure against the electrodes is increased or diminished by the vibratory movements of the diaphragm. A suitable construction is shown in detail in Fig. 3, in which an electrode-disk 23, of carbon, is secured to the end of the spring 22, and in a cell between the disk 23 and diaphragm 21 is placed a small body of loose granular resistance-varying material 24, such as carbon. The side walls of the cell are formed by an annulus 25 of a yielding material, such as felt. Any other well-known form of resistance-varying unit may be employed, as my invention does not reside in the particular construction of the electrodes, contacts, or resistance-varying devices. The resistance-varying points are not necessarily placed opposite each other, but are so shown for the sake of convenience and symmetry. It is evident that when sound-waves are sent through the mouthpiece 16 onto the diaphragm 21 the waves will vibrate said diaphragm as a whole in parallelism to itself and cause the electrical resistance between said diaphragm and the electrode-springs 22 to increase and diminish alternately on opposite sides of said diaphragm.

With the above construction of diaphragm and electrodes various arrangements of circuits may be employed. In Fig. 4 I have shown electrode-springs arranged in parallel

and adapted to transmit currents of alternating or opposite polarity to the line in obedience to the vibrations of the diaphragm.

26 is the conventional induction-coil with secondary 27 included in the line 28 29.

30 31 are two batteries or two sections of a battery having a common connection by a wire 32 through the primary 33 of the induction-coil to the transmitter-diaphragm 21. The left-hand electrode-springs 22 are connected through wires 34 35 with the positive pole of battery 31 and the right-hand springs through wires 36 37 with the negative pole of battery 30.

The operation of the device with circuit connections arranged as in Fig. 4 is as follows: Assuming a movement of the diaphragm 21 to the right, which will increase resistance between it and the left-hand electrode-springs 22 and diminish resistance between it and the right-hand electrode-springs, a current begins to flow from the positive pole of battery 30 through the induction-coil primary 33, wire 32, diaphragm 21, and in parallel through the right-hand electrode-springs 22 and wires 36 37 back to the negative pole of said battery. As soon as the diaphragm moves in the opposite direction the current then finds its path of least resistance through the left-hand electrode-springs, and accordingly flows from the positive pole of battery 31 through wires 34 35 in parallel through the left-hand electrode-springs 22, through the diaphragm 21, and through wire 32 and primary 33 back to the negative pole of the battery. In this case the current flows through the primary in the opposite direction from what it did before, so that a series of alternating impulses are produced in the primary by the vibrations of the diaphragm.

In Fig. 5 I have shown an arrangement in which the pairs of electrode-springs are arranged in independent circuits. I show four batteries or battery-sections 38 39 40 41, and the said batteries have, respectively, common connections through wires 42 43, the primaries 44 45 of two induction-coils 46 47, and a wire 48 with the diaphragm 21. Wires 49 50 lead from the positive poles of batteries 38 40 to the left-hand springs 22 22, and wires 51 52 lead from the negative poles of batteries 39 40 to the right-hand springs 22 22. By this arrangement each pair of springs sends alternating impulses through its primary 44 or 45 in the same manner as I have described in connection with Fig. 4. The secondaries 53 54 of the coils are shown as connected in parallel with the line 28 29, so that the several sets of electrode-springs actuate the same line-circuit; but by keeping the secondaries 53 54 separate the one instrument would obviously supply as many line-circuits as there are secondaries and pairs of electrodes.

In Fig. 6 I have shown an arrangement for transmitting unidirection currents through a primary circuit as in an ordinary transmitter. A battery 55 is connected by wires 56 57 58 59 60 in parallel with all of the springs 22, and the diaphragm 21 is connected by a return-wire 61 through the primary 33 of the induction-coil with the opposite side of the battery.

Various other plans of connections in addition to the foregoing might be employed, as it will be understood that I have not attempted to give all the possible arrangements. By mounting a comparatively stiff or unbending diaphragm in a flexible support, so as to move in parallelism with itself, I allow the sound-waves to have substantially the same effect throughout the whole area of the diaphragm, all of the resistance-varying units being affected in equal degree by each wave, no matter what their position on the diaphragm. This enables me to employ a large number of electrodes or resistance-varying units, if desired, and thus send a greater strength of current than heretofore through a single instrument. The construction shown in Figs. 1 and 2 allows either or both sides of the sound-affected mechanism within the interior of the instrument to be reached for inspection, adjustment, or repair by swinging down the corresponding cover 14 or 17, said covers closing openings in the annular body 10 inclusive of the whole limits of said sound-affected mechanism.

I claim—

1. In a telephone-transmitter, a comparatively stiff or unbending vibrator or diaphragm, a plurality of groups of springs yieldingly supporting the same at different points around its margin and each comprising springs pressing against opposite sides of said diaphragm, and a plurality of electrodes forming parts of different resistance-varying units co-operating with said diaphragm.

2. In a telephone-transmitter, a comparatively stiff or unyielding vibrator or diaphragm of electrically-conductive material constituting the primary sound-receiver and yieldingly mounted to vibrate in parallelism with itself, and a plurality of different resistance-varying units located on each side of said diaphragm, said units utilizing the material of the diaphragm as an electrical return.

In testimony whereof I have affixed my signature in presence of two witnesses.

PHILIP G. RANDALL.

Witnesses:
R. M. PIERSON,
A. C. RATIGAN.