(No Model.) 2 Sheets—Sheet 1.

A. C. BROWN.

TELEPHONE TRANSMITTER.

No. 539,163. Patented May 14, 1895.

Fig. 1.

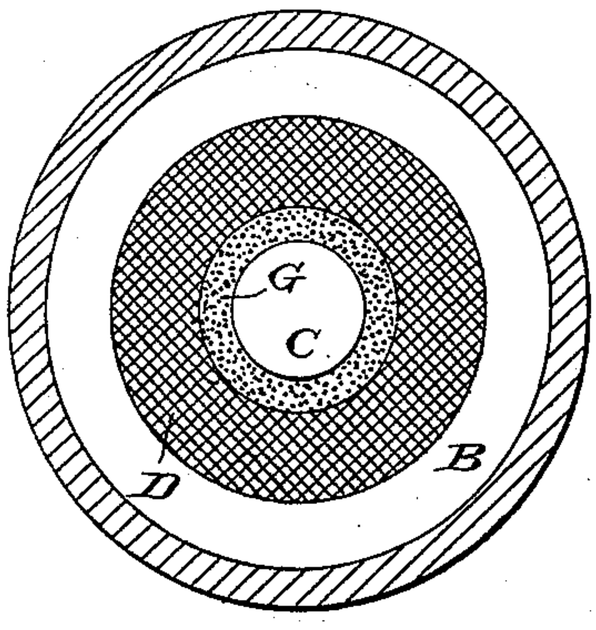


Fig. 2.

Fig. 3.

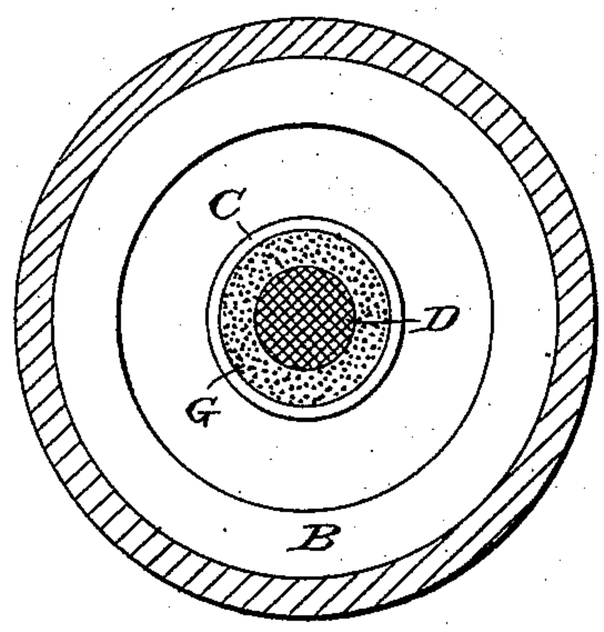
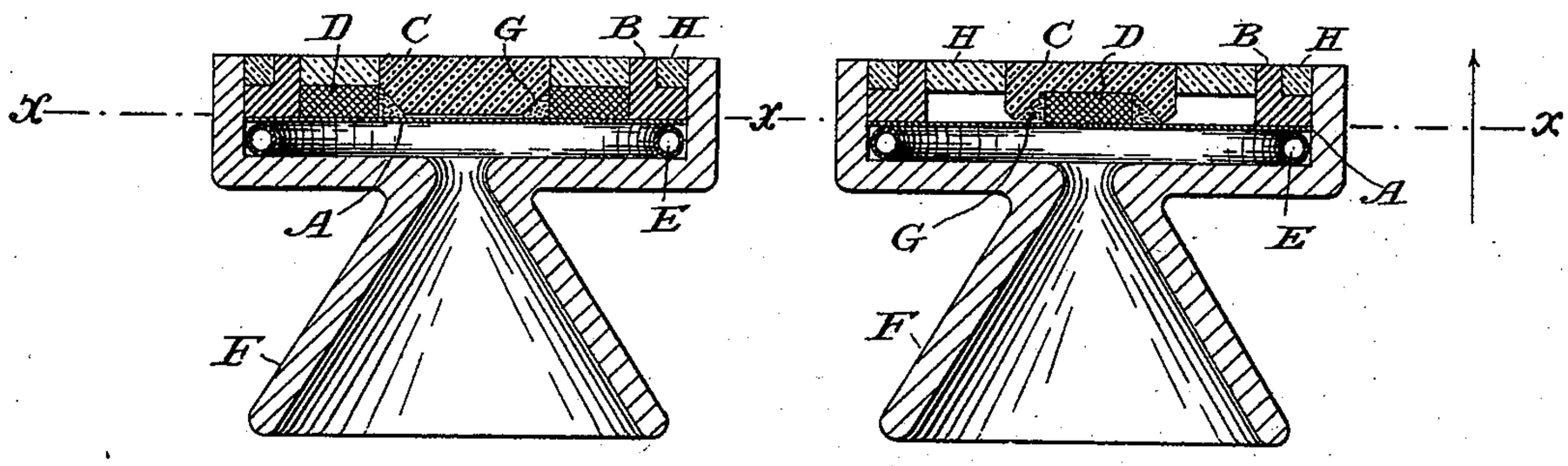


Fig. 4.



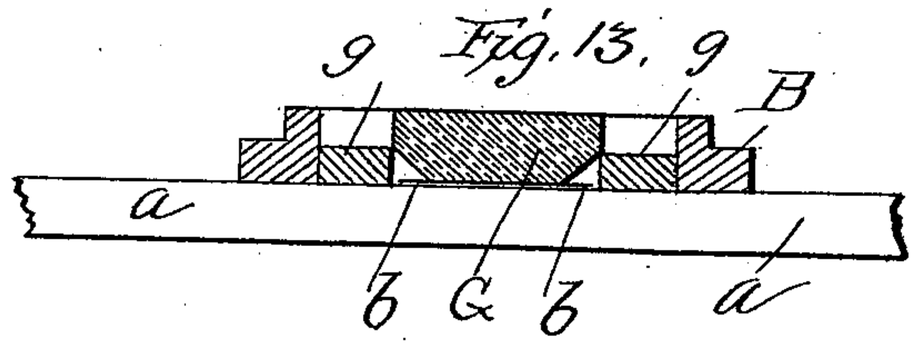


Fig. 13.

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H. van Oldenneel

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(No Model.) 2 Sheets—Sheet 2.

A. C. BROWN.

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Fig. 5.

Fig. 7.

Fig. 9.

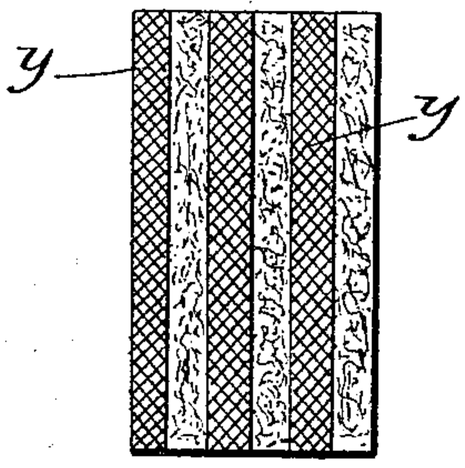


Fig. 6.

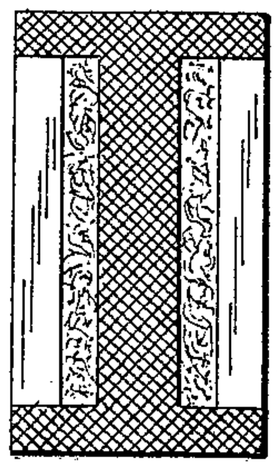


Fig. 8.

Fig. 10.

Fig. 11.

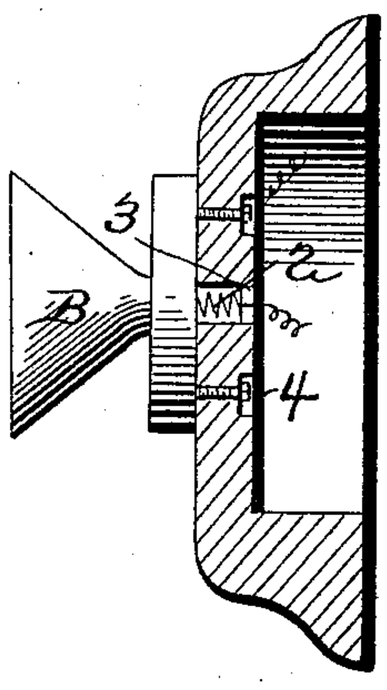
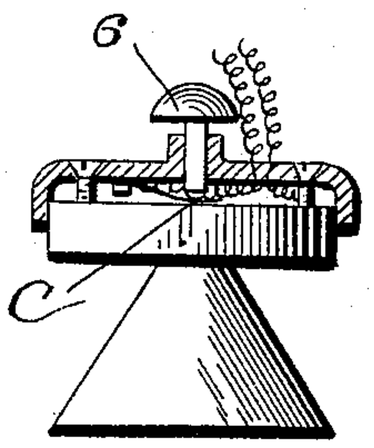


Fig. 12.



Attest
Wm. F. Hall
F. L. Middleton

Inventor
Alfred C. Brown
by Richards & Co
Attys.

UNITED STATES PATENT OFFICE.

ALFRED CHARLES BROWN, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO GEORGE RICHARD NEILSON, OF SAME PLACE.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 539,163, dated May 14, 1895.

Application filed September 27, 1894. Serial No. 524,282. (No model.)

To all whom it may concern:

Be it known that I, ALFRED CHARLES BROWN, a subject of the Queen of Great Britain, residing at Lewisham, London, England, have invented certain new and useful Improvements in Telephone-Transmitters, of which the following is a specification.

My invention relates to telephone transmitters, and while particularly adapted to that class comprising a diaphragm and back electrodes with granulated carbon compressed between the electrode and diaphragm as to certain features, it is not limited as to others to this class of transmitters, being applicable to transmitters using any form of variable resistance.

My invention consists first of a telephone transmitter having a chamber or cell triangular in cross section filled with the compressed granules of conducting material, said triangular chamber having one wall or face composed of hard conducting material, inclined to the plane of the diaphragm or other part of the instrument which exerts a pressure upon the mass of granules and another wall opposite said hard inclined face or wall composed of a springy packing material pressing on the mass of granules in a direction to cause them to ride up the inclined face of the opposite wall away from the angle at the base and toward the diaphragm or third wall of the said chamber, and which transmitter has no granules in any other position, or capable of affording roads for the current other than through those which are in the above described effective state of compression for varying the resistance in response to sound waves.

My invention consists further in a telephone transmitter in which the diaphragm is seated on one side against an elastic bearing at the edge of said diaphragm and further of a diaphragm having a rigid seat on one side and an elastic bearing composed of a springy or elastic ring forming a seat for the edge of the diaphragm upon the other, and which elastic ring is compressed exactly to a predetermined extent and set so as to remain invariable.

In the drawings accompanying and forming part of this application, I have illustrated my invention, in which—

Figure 1 is a sectional view of line X-X of Fig. 2. Fig. 2 is a central section at right angles to the section of Fig. 1. Figs. 3 to 10 are similar views of modifications. Figs. 11 and 12 show details of the manner of supporting and using the transmitter. Fig. 13 illustrates one step in the improved manner of constructing the instrument.

In Figs. 1 and 2 the casing of the transmitter is shown at F, having a flaring mouth piece, with the walls extending to the rear sufficiently to form a casing for the back electrode and securing means therefor. The diaphragm is shown at A, with an elastically compressible ring E between it and the face of the casing F. Upon the opposite side of the diaphragm is the electrode C secured in place as hereinafter explained by cement or plaster of paris H, extending between the same and a block or ring B which forms a bearing for the diaphragm, and which block is secured by cement or plaster of paris to the wall of the casing. The electrode C is in the form of the frustum of a cone and on the angular faces are located the carbon granules, these granules being prevented from escaping by packing D, of silk, wool, cotton, or the like, surrounding the granular field as shown in Fig. 1. This packing has the further property of always exerting a continuous elastic pressure on the granules tending to hold them against the incline toward and on to the diaphragm.

I prefer to make the diaphragm of carbon, or of thin platinized or silvered glass or glass covered with any other conductor, but I do not limit myself to any particular composition for the diaphragm.

In Figs. 3 and 4 a modification is shown, the packing D being arranged centrally in a depression of the electrode, with an inclined depression extending around outside the line of the packing and in this annular channel the granules are located.

As a further illustration as to how the invention can be carried out, reference is made to Figs. 5 and 6, in which the electrode is channeled as at *x* with V shaped channels forming angular walls, and in these channels the packing *y* is placed sufficient in quantity to fill substantially one half of the space, and in the other on the opposite incline the granules are placed, thus securing precisely the same relative arrangement and action.

In Figs. 7 and 8, the back electrode is channeled or recessed its length with inclined walls facing, and along the bottom of the recess the packing is laid thus forming a triangular shaped channel on each side thereof.

In Figs. 9 and 10, the recesses or channels instead of being V-shaped as in Figs. 5 and 6, have one straight side, a horizontal bottom and an inclined side opposite the straight side, with the packing filling the space bounded by the right-angled side and bottom it is obvious that these recesses or channels may be made in any shape. The essential feature of this part of my invention consists in confining carbon granules within a chamber formed by a diaphragm, a back electrode and a springy packing material, the back electrode, whatever its shape, presenting a face or faces inclined to the diaphragm at an angle of forty-five degrees and having always approximately parallel to the same in a longitudinal direction a layer of the above mentioned springy packing material thus forming a channel or channels taking any desired longitudinal direction but always approximately triangular in cross section, formed by the diaphragm on the one side, the inclined surface of the electrode on the second, and the springy packing material on the third side and the said electrode having no other faces in contact with granules. In this channel the granules are confined and are by the springy packing yieldingly compressed against the inclined face and the diaphragm so that the springy pressure of the packing will constantly tend to cause the granules to shift their position by moving up the incline toward the diaphragm instead of toward the angle at the base of said incline. This construction permits of the entire space between the diaphragm and back electrode, remaining after the introduction of the packing, being filled with granules while avoiding any possibility of granules falling between two rigid opposing surfaces or into grooves or recesses between projections both opposing faces of which are hard, rigid and unyielding, and thereby becoming packed or jammed and practically short circuiting the transmitter an objection to which existing transmitters are subject. The top of the projections or small space between the upper edge of the inclined faces of the back electrode and the diaphragm may also be packed with similar light packing, but if the distance be carefully limited by the process hereinafter described and the granules carefully sifted so as to make quite sure that each individual particle used is too large to pass through the small intervening space, I do not find any such packing necessary or desirable.

In order to fix the carbon back electrode into the ring, or back-block in such a way as the upper surfaces or top edges of the projections or inclined faces of the electrode shall approach very closely without quite touching the diaphragm, I prefer to place the ring face downward upon a sheet of glass or other flat surface, with a piece of writing paper or metal of requisite thickness, say about one one-hundredth of an inch, between it and the electrode. Around this I place a core capable of being afterward removed from the front, to produce the requisite hollows and then fill in with plaster of paris, or other rigid cement, which is allowed to thoroughly set before the cores are removed.

In Fig. 13 *a* indicates the sheet of glass or other flat surface upon which the ring or back block is supported and *b* is a piece of writing paper or metal or other material sustaining the electrode and separating it by a narrow space from the plate of glass. After the ring B and the electrode have been rigidly and immovably secured in the relative position shown in this figure wherein the diaphragm is represented by the sheet of glass or other surface, they may be removed and the ring seating fastened against the diaphragm in the frame of the instrument. By this method of construction, I secure an instrument wherein the separation of the back electrode from the diaphragm is made exact and uniform for any number of instruments and without the difficulty which would necessarily arise from the attempt to secure the desired separation by fastening the electrode in place by means of its back surface in the usual way; or instead of being cemented into the back block B, the back electrode may be formed solid therewith out of one piece of carbon, but in this case a ring of insulating material preferably composed of mica, or similar hard substance, of definite thickness must be interposed between the diaphragm and back block to prevent direct electrical connection.

In order to develop the maximum power of telephone transmitters of this kind, I find it also important to clamp the diaphragm between a hard and a rigid seat on the one side, and a resilient compressible or elastic spring ring on the other, the said ring being compressed to a certain definite pressure (depending on the composition, thickness and diameter of the diaphragm used) and no more, and to provide that such pressure shall thereafter remain absolutely invariable. In carrying out this part of the invention, I place near the edge of the diaphragm on the front side, opposite to the rigid seat, a compressible but resilient spring ring E, which I preferably make of a small hollow india-rubber tube, having rather thick sides compared to the diameter of the hole, so that the latter may not be flattened quite together or collapsed by the amount of clamping pressure used.

I desire it to be understood that I do not limit myself to any special form of ring for the purpose described, it being understood that the ring described and shown is simply representative of any form of spring bearing for the diaphragm, which will give the necessary resilient action and apply an invariable spring pressure at all points near the edge of

the diaphragm, and at the same time allow a little movement of the diaphragm under heavy vibration and slight contraction without causing any appreciable variation in the amount of the pressure or the permanent set of the parts.

In arranging the parts, the back block or ring B with the electrode and packing attached, is laid face upward on a flat horizontal surface. The granules which may consist as heretofore of any hard form of carbon or similar substance, are then put into their proper space over the back electrode, care being taken that the quantity of granules is not sufficient to jam or bulge the diaphragm. The latter is then placed on its seating, the spring ring laid on top of it and the front casing inverted thereover. The whole together is then carefully inverted, so that the front casing lies on the horizontal surface. A weight of definite amount is then put on top of the back block, the exact amount depending on the composition and thickness of the diaphragm. If the latter be of carbon, and about one-half millimeter thick by about fifty-five millimeters or two and three-sixteenths inches in diameter (which I find to be a very good construction), a weight of about two pounds should be applied. While this weight is on the back block, the cement is run around the edge of the latter so as to firmly unite it to the backwardly projecting flange of the front casing, the said cement being allowed to thoroughly set before the weight is removed, when it will be found that the clamping pressure on the diaphragm is of the exact amount and quality to give the maximum speaking power, and the latter will thereafter remain invariable.

Spring pressure may of course be substituted for the weights during cementing if the same amount of pressure be obtained, but I prefer weights as being more simple and less liable to accidental variation.

As will be obvious the clamping pressure must be determined for each different construction of instrument but the best pressure having been once exactly determined by the use of the weight, spring or other device the pressure of which may be weighed or measured, any number of instruments may be rapidly and easily constructed by using the same weighed or measured pressure and the best results obtained from each instrument.

The diaphragm, granules, and back electrode are connected in series in circuit with a battery and preferably the primary coil of an induction coil, the secondary coil of which is to line and receivers, or in any other usual well understood way of connecting telephone transmitters, and contact with the various parts of the transmitters may be secured in a variety of well understood ways. If the back-block and ring seating is a conductor and has a separate back electrode fixed therein by an insulating cement, I prefer to make these pieces respectively, the positive and negative poles of the transmitter. If the back ring seating be not made of a conductor connection with the diaphragm may be established through the spring ring where the latter is metallic, or in other obvious or usual ways.

Fig. 11 shows one way of making the connections in which contact with the back carbon electrode is secured by means of a spring 2, the spring being affixed to a back plate 3, or base, and to this base the transmitter is bodily mounted. The mounting is effected by screws 4, passing through the back plate and screwing into the brass ring seating B, which screws will also form a means of getting an electrical connection from the diaphragm, or the connections may be made and the transmitter fixed to a support in any other convenient way.

As shown in Fig. 12 when the transmitter is to be held in the hand, I provide on the back or other part, a small key 6, adapted to be pressed by the finger while speaking so as to contact with the back electrode C, and complete the circuit. The transmitters can be laid on a desk when not in use, and picked up and conveniently applied to the mouth for speaking, and any station out of a number in series on one line can be spoken to by simply calling into the transmitter the proper name, the sound being loud enough to attract attention without any bell or other signal.

I claim—

1. In a transmitter, an electrode in the form of the frustum of a cone in combination with an elastic packing forming a ring around said electrode, and a mass of granules filling the triangular space between the cone, the ring, and the diaphragm, and subjected by said ring to an elastic pressure exerting a constant tendency to cause the granules to move up the incline of the cone and away from the angle at the base thereof, and the said electrode carrying no granules on any other surfaces.

2. In a telephone transmitter, the combination of a diaphragm, a back electrode, a mass of granulated material held in place between said diaphragm and back electrode, a rigid ring seating on one side of said diaphragm and an elastic support on the other side acting to press the diaphragm toward the granulated material and compressed to a predetermined weighed or measured pressure and thereat permanently fixed by means independent of those employed in applying the said weighed or measured pressure, substantially as described.

3. In a telephone transmitter provided with a mass of granulated or subdivided conducting material such as carbon, a containing chamber therefor having a hard and conducting wall inclined to the line of pressure exerted on the material by the sound waves, and means for exerting an elastic pressure on the mass of carbon tending to press it toward or against the inclined wall.

4. In a telephone transmitter, a mass of granular or subdivided conducting material

compressed between the diaphragm and the back electrode in a chamber one wall of which comprises an electrode inclined to the line of pressure exerted by the diaphragm in combination with means for exerting a continuous elastic pressure transverse to the line of the diaphragm so as to tend to cause the granules to ride up said inclined wall in a direction away from the angle at the base thereof and without any other granular conducting material in such position as to be capable of short circuiting or connecting across the poles of the transmitter or of preventing the free motion of the diaphragm by becoming packed between other hard surfaces.

5. In a telephone, a containing chamber having an inclined wall or face, a diaphragm, a mass of carbon granules approximately filling said chamber, and means for yieldingly pressing the granules toward the inclined face in a direction to cause them to shift or move thereon toward the diaphragm or wall of the chamber which is transverse to the line of pressure exerted by the sound waves, and without any other granular conducting material in such position as to be capable of short circuiting or connecting across the poles of the transmitter or of preventing the free motion of the diaphragm by becoming packed between other hard surfaces.

6. In a telephone transmitter, the combination, substantially as described, of a back ring or piece having a back electrode fastened to it, a diaphragm, an elastic seating for the edge of the same, and a frame or case in which said back piece is cemented to hold the said diaphragm in place between the frame and back piece and against the elastic seating with the measured pressure to which the said back piece is subjected at the time of cementing.

7. In a telephone transmitter, the combination of a diaphragm, a back electrode, conducting granules compressed between the diaphragm and back electrode, a frame or case, an elastic ring seating at the front of the diaphragm between the same and the case, and means for fastening the diaphragm and back electrode in the frame and at the same time holding the said diaphragm pressed from its rear against the said ring.

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

ALFRED CHARLES BROWN.

Witnesses:

WILLIAM WALLACE WHITE,

EDWARD K. STURTEVANT.