(No Model.)

H. COTTRELL.

TELEPHONE TRANSMITTER.

No. 518,916. Patented Apr. 24, 1894.

Fig. 1.

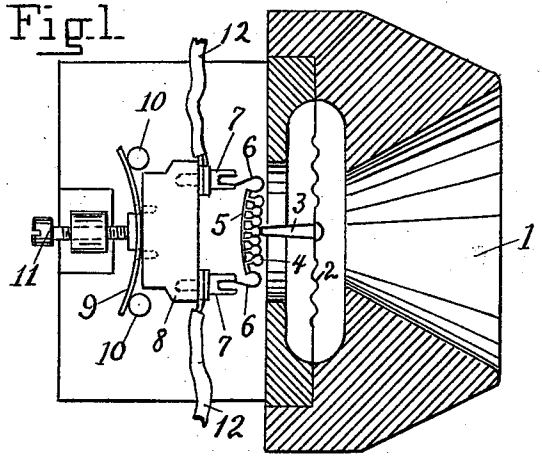


Fig. 2.

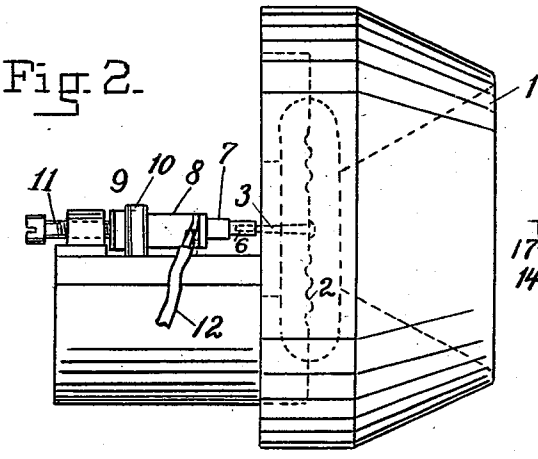


Fig. 5.

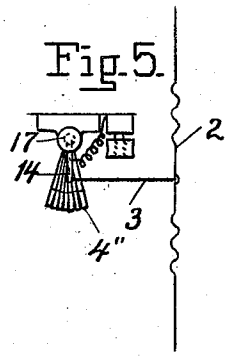


Fig. 3.

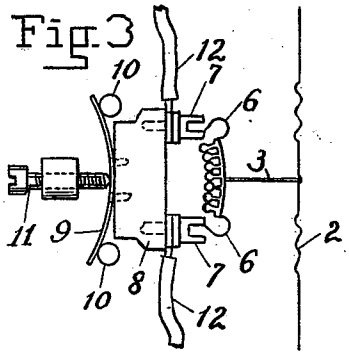


Fig. 4.

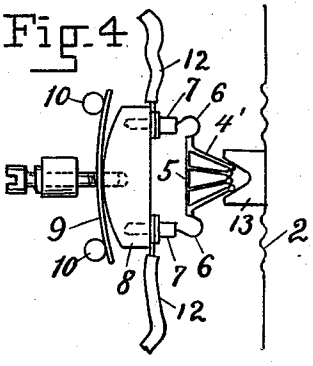
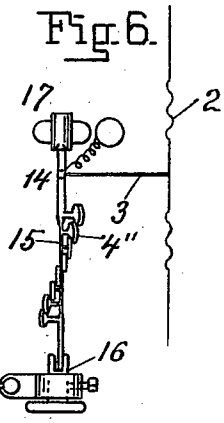


Fig. 6.



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UNITED STATES PATENT OFFICE.

HERBERT COTTRELL, OF NEWARK, NEW JERSEY.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 518,916, dated April 24, 1894.

Application filed March 15, 1894. Serial No. 503,707. (No model.)

To all whom it may concern:

Be it known that I, HERBERT COTTRELL, a citizen of the United States of America, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Telephone-Transmitters, of which the following is a specification.

My invention consists in producing a novel resistance piece for telephonic transmitters, its most important feature being that it is so constructed that there is an unbroken connection through it in all conditions of the instrument, and a second connection parallel with the first, which latter is opened and closed or varied in resistance by vibrations of the diaphragm of the transmitter. I preferably arrange the two connections on one common piece. To do this I provide a suitable strip or rod of some conducting material, as a thin strip of carbon or of some carbonized substance, from which project knobs or points that are but lightly if at all in contact with each other when the strip is straight, and are brought more or less intimately in contact through the operation of the diaphragm. These projecting points or knobs on the strip may be brought together by flexure of the strip or may be crowded together by being pushed against the walls of a cone which fits over the points or knobs and cams them together. The flexure may be produced by pushing and pulling on a knob or point or on the rod or strip; and instead of flexure which operates to bow a flat strip the operation may be to twist a rod, around the periphery of which knobs or projections of suitable shape are arranged, preferably in a sort of spiral. This latter I call my torsional form. As to the material, I may use any suitable substance of large electrical resistance, carbon or some preparation of carbon being preferable; as, for example, manila paper carbonized by the process used to prepare the filament of the familiar incandescent lamp. The whole constitutes a resistance piece of which the rod or strip is the base and the knobs or points are the projections. There is nothing novel in the manner of connecting this resistance in the telephonic circuit. The novelty lies in the resistance piece itself, as already stated. The telephonic circuit may be of any one of the forms which are adapted to use with a variable resistance.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a top view of one form of my variable resistance, in which the movements of the diaphragm are communicated to the resistance by a direct connection with one of the knobs of the resistance piece. The mouth piece is shown in cross section. Fig. 2 is a side view of the device shown in Fig. 1, but with the mouth piece shown in full. Fig. 3 is a modification of the device of Fig. 1, in which the diaphragm is connected with the strip of the resistance piece by a string or wire. Fig. 4 is a side view of a modification in which the camming cone is used. This cone is attached to the diaphragm. Figs. 5 and 6 are end and side views respectively, of the torsional form of transmitter.

Referring now particularly to Fig. 1, there is shown back of the mouth piece 1 a corrugated diaphragm 2, from the back of which projects inwardly a rod 3 which presses upon one of the knobs of the resistance. These knobs 4 are all arranged side by side along the front of the flexible and somewhat elastic strip 5, which is integral with them. These knobs and the strip form together the resistance piece. The resistance piece is shown supported at its ends by two springs 6 attached to screws 7 which are fastened to a block 8 of insulating material. This block is shown as attached to a spring 9, which bears at its ends against the posts 10 and is pressed at its middle point by the end of a set screw 11. By adjusting this screw the connection between the rod 3 and that one of the knobs 4 against which it rests can be varied so as to secure the proper flexure of the strip 5, and thereby obtain the desired normal contact between the knobs thereon.

Instead of the block 8 being attached to the spring 9, the latter may merely bear against it and the block be held in place by posts set on either side of it.

The connections to the circuit are made through the wires 12 which are in electrical contact with the screws that support the resistance piece.

In Fig. 3 the mouth piece is omitted. The diaphragm 2 is connected with the strip 5 by

a rod 3 which is firmly attached to both the diaphragm and the strip. The other parts are as in Fig. 1. The only difference between the arrangement of Fig. 1 and of Fig. 3 is that the position of the resistance piece is reversed from right to left and the rod 3 is attached to the back of the base of the resistance piece. But if the set screw 11 is screwed farther in in the arrangement of Fig. 3, it tends to separate the knobs of the resistance piece, whereas in Fig. 1, this movement of the set screw tends to bring the knobs together.

Fig. 4 shows the parts arranged substantially as in Fig. 3, except that the spring 9 is thrown on to the other side of the posts 10 and the screw 11 is shown as penetrating somewhat into the body of the block 8. The screw is of course a draw screw in this form. It is shown in this form to illustrate the fact that either a push screw or a draw screw can be used for any one of the arrangements shown. The resistance piece is somewhat different in Fig. 4 from that of Figs. 1 or 3, the projections being shown as rods 4′ which do not stand out at right angles from the flexible strip of the resistance piece, but converge toward each other from the strip outward. The diaphragm 2 has a cone shaped cap 13 attached on its rear side which fits over these points, and when moved in or out by the sound waves striking the diaphragm varies the contact in degree between these points.

In Figs. 5 and 6 the diaphragm 2 is shown as connected by a rod 3 with an arm 14, which extends at right angles from the thin rod 15, which is attached at its lower end in the bearing 16, and is supported also in a bearing 17 at its upper end, in which, however, it is free to turn. Arranged along the length of the rod 15 are projections 4″ having flat heads, the projections and heads looking not unlike ordinary flat headed tacks. These are not essentially unlike the knobs 4 or projections 4′. The heads overlap each other and are nearly or actually in contact, and when the diaphragm is pushed in or pulled out the contact between these heads is established or increased on the one hand, or broken or diminished on the other, thereby varying the resistance between the wires 12. As will be seen from the inspection of any one of these figures, no movement of the diaphragm can possibly rupture the circuit, since that is always complete through the base of the resistance piece, along which the variable-contact shunting projections are arranged. Obviously, the resistance will be greatest when the circuit is completed only through the base of the resistance piece. For, if the projections are brought in contact there is then established, in addition to the circuit through the base, a circuit through the two contacting projections, which shunts that portion of the strip or rod that lies between the points at which these projections join the base. Taking, for instance, Fig. 1, on which are shown seven projecting knobs, there are six spaces between pairs of adjacent knobs. These sections of the strip are all shunted through the knobs if all the knobs are in contact, each section being shunted through one pair of contacting knobs. The same statement is true of the arrangements shown in Fig. 3 and of that of Figs. 4 and 6. The resistance of the projections is preferably considerably smaller than the resistance of the base along which they are set.

It is very important, particularly in long distance telephony, that the line should never be broken, no matter how violent may be the vibration of the diaphragm. This point of advantage I secure as above explained, since I do not use separate electrodes held in contact with each other, the pressure between which is varied by movements of the diaphragm. Then too, the fact that there are a number of points in contact is of advantage, because, even though the sound may be violent enough to throw two or more of them out of contact, it still may not throw all of them out of contact. Doubtless the mere flexure or twisting of the base of the resistance piece itself produces some variation in its resistance, and consequently, in the resistance of the circuit. But it is the effect of shunting the sections of the base that I rely upon.

The receiver may be any telephonic receiver adapted for use in a circuit with a variable resistance transmitter.

Without limiting myself to the precise details shown, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a telephone transmitter, a variable resistance piece, consisting of a conducting base having projections extending therefrom, a diaphragm susceptible of being vibrated by sound waves, and means for varying the contact between the projections, in correspondence with the vibrations of the diaphragm, to produce variations in the current, substantially as described.

2. In a telephone transmitter, a variable resistance piece, consisting of a conducting base and projections extending therefrom, a diaphragm susceptible of being vibrated by sound waves, and means for varying the contact between the projections by communicating the vibrations of the diaphragm to the base of the resistance piece, to produce variations in the current, substantially as described.

HERBERT COTTRELL.

In presence of—
THOMAS EWING, Jr.,
CHAS. F. BISHOP.