

(No Model.)

2 Sheets—Sheet 1.

D. DRAWBAUGH.
TELEPHONE.

No. 514,916.

Patented Feb. 20, 1894.

Fig. 1.

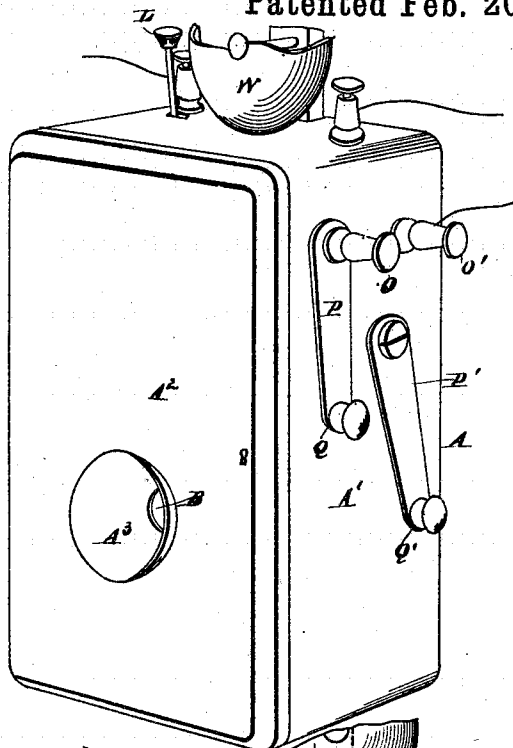
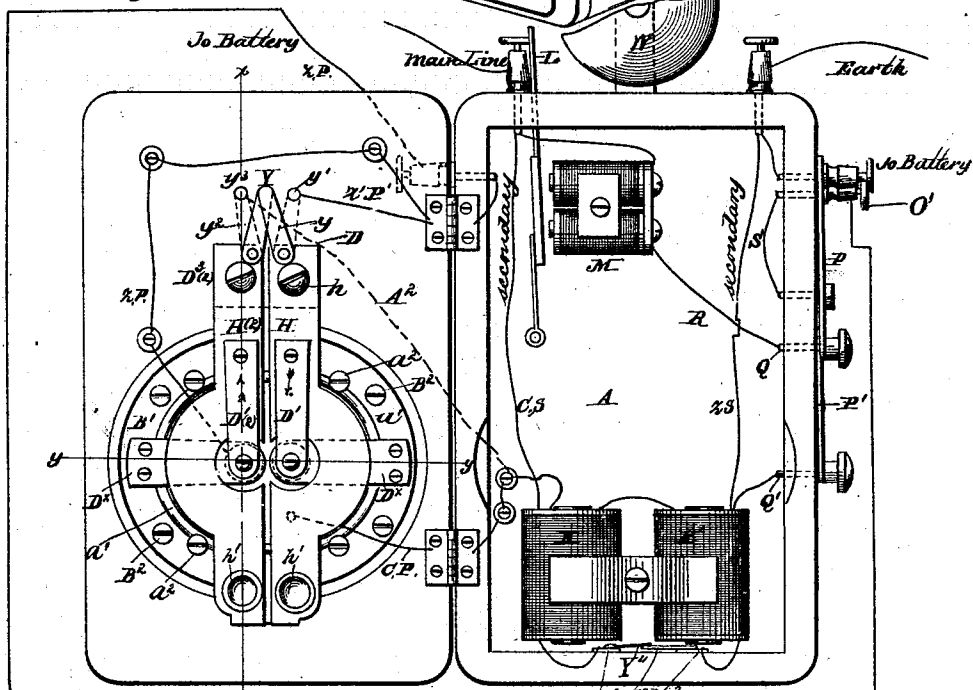


Fig. 2.



WITNESSES

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Fig. 4.

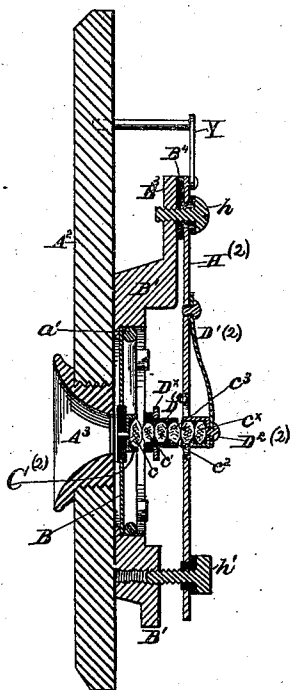


Fig. 8.

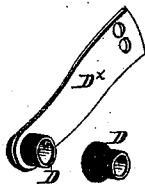


Fig. 5.

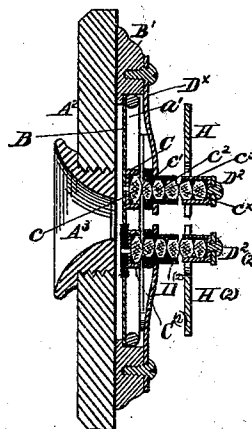


Fig. 3.

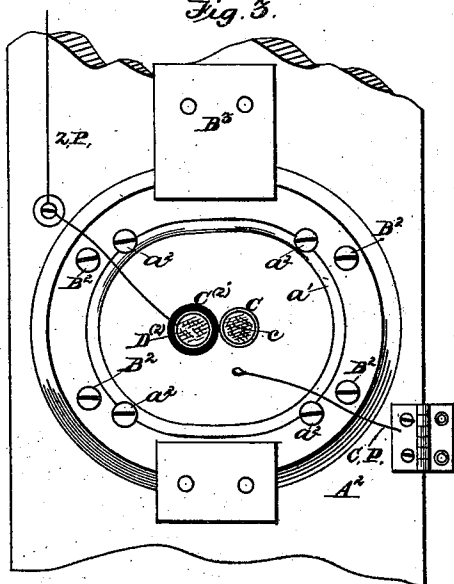
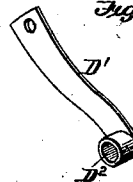


Fig. 6.



Fig. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

DANIEL DRAWBAUGH, OF EBERLY'S MILL, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO FRANK JONES, OF PORTSMOUTH, NEW HAMPSHIRE, AND JOHN R. BARTLETT AND HENRY C. ANDREWS, OF NEW YORK, N. Y., TRUSTEES.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 514,916, dated February 20, 1894.

Original application filed July 26, 1880, Serial No. 14,040. Divided and this application filed October 26, 1880. Serial No. 19,531. (No model.)

To all whom it may concern:

Be it known that I, DANIEL DRAWBAUGH, of Eberly's Mill, Cumberland county, Pennsylvania, have invented a new and useful improvement in Telephones, of which the following is a specification.

The invention relates to that class of telephones known as transmitters, in which the undulations or variations in the strength of the electric current necessary for reproducing speech in a receiving telephone, are produced by varying the resistance in the circuit, through changes of pressure caused by sound waves due to the voice acting upon low conductors interposed in the circuit.

The invention consists in the several devices, mechanical combination and sub-combination herein described, and their practical equivalents.

In the drawings, Figure 1 is a perspective view of the inclosing case of the instrument with its attachments. Fig. 2 is a front elevation of the instrument open. Fig. 3 is a rear view of the diaphragm, its support and electric connections. Fig. 4 is a vertical section through a portion of the instrument on the line xx of Fig. 2. Fig. 5 is a horizontal section through a portion of the instrument, on the line yy of Fig. 2, and Figs. 6, 7 and 8 show certain details of construction.

Similar letters of reference indicate like parts.

This application is a division of an application for telephones, filed by me, July 26, 1880, and now pending.

Referring to the instrumentalities shown in the accompanying drawings, A represents the box or case of the instrument of any adequate construction for containing and supporting the several parts. The box is preferably provided with a hinged door, A^2 , which can be opened to inspect or adjust the instrument. The mouth-piece A^3 is of funnel form, opening in the case of the instrument, and having its smaller end in close proximity to the diaphragm. The diaphragm is shown at B, and is preferably supported by an annular plate or casting B' attached by screws B^2 , or other

suitable means to the door A^2 . The diaphragm is preferably composed of a sheet metal metal disk of about two or three inches diameter secured in any suitable manner to the supporting plate or casting, as for example by a small ring a' extending around and bearing laterally against its edges, and clamped against them by screws a^2 , the heads of which bear against the outer face of the ring.

Attached to the diaphragm at or near its center, by a rivet or otherwise, is a metal cup or tube C half an inch more or less in diameter, in which is held a block or ball c , composed of some low conductor, preferably carbon or the carbonaceous compound herein after described. Directly in rear of this carbon block or ball is a small non-conducting tube D, supported by means of a bracket D^x extending from the case or from the casting B' . The office of this tube is to contain a series of carbon blocks or balls c', c^2, c^3 &c. lying in contact with each other and the inner ones c' lying in contact with the carbon ball c . In rear of the extreme outer carbon block of the said series, is another similar carbon block or blocks c^x held in a metallic tube D^2 supported by a metal spring D' . The spring D' is attached to a larger metal plate H, one end of which is fastened by a screw h to a bracket B^3 extending out from the casting B' , but insulated therefrom by a non-conducting material B^4 , while the other end is connected to the opposite edge of the casting B' by an insulated adjusting screw h' . The plate H, Fig. 6 is preferably provided with an aperture h^2 , through which passes the tube D^2 . The spring D' can be bent by hand and thus adjusted to cause it to hold the carbon blocks c to c^x all in constant contact, and the degree of normal pressure with which they all bear against each other, is regulated by the adjusting screw h' which advances or retracts the plate H toward or from the diaphragm.

The transmitting apparatus above particularly described is designed for use in connection with a voltaic circuit and is placed in the circuit which is normally closed and con-

tinuously in operation. The current comes in through a wire Z, P, and thence in either directly or through a switch as hereinafter explained to the insulated plate H, thence through the spring D' and low conductor balls c^x , c to the diaphragm, and thence through or on the diaphragm to the wire C, P, or it may equally well come in through the wire C, P, and thence in a reverse direction through the instrument and out through the wire Z, P. The wires Z, P, C, P, form part of a continuous electric circuit extending to and through the receiving instrument.

For the low conductors used for the blocks or balls c to c^x , many different materials may be employed such as plumbago, plumbago mixed with bronzing powder, or other finely divided metal, coal, coke, lamp-black, lead, certain kinds of clay, earth, stone, but I prefer either coke or the incrustation of gas retorts, in which latter case, the incrustations should preferably be taken from the outer stratum or layer directly exposed to the retort fire. With coke or the incrustation aforesaid, it will only be necessary to cut the substance into suitable forms; but with plumbago and many other materials, it is best to use a cement and mold or press the material into cakes.

I do not limit myself to any particular form of the low conducting blocks, balls or plates, nor to any particular number of said blocks, or plates in the series. I prefer a series of low conducting plates or balls for the reason, that I have found by experiment that by increasing the number of contacts, the instrument becomes more sensitive, and more completely adjustable with reference to its capacity for producing the undulations in the electric current. It is necessary, however, not to use too many contacts as the resistance will thereby be unduly large; with the blocks of coke or retort incrustation above-referred to, I find from six to eight contacts to give the most satisfactory results, and this is effected by the use of from seven to nine blocks.

In the simple arrangement of apparatus herein above described, only a single voltaic circuit is employed, but I have found important results to be obtained by using two circuits, viz: a continuous primary voltaic circuit in which the transmitting instrument is placed and a continuously closed induction circuit in which the receiving instrument is placed, the variable current operating through an induction coil to induce variable currents in the secondary circuit. In this case the wires Z, P, and C, P, of the primary voltaic circuit run to an induction coil K or induction coils of any approved construction and the wires Z, S, C, S, forming the induction circuit extend from the induction coil or coils to the receiver and through metallic or ground connections complete the circuit. With this combination of currents, the action of the apparatus is more vigorous and positive than when only a single circuit is employed.

In the form of transmitting instrument shown in the drawings, to which this division of my application more particularly relates, I have divided the low conducting plates into two series by arranging another plate H^2 , spring D'^2 , tube D'^2 , intermediate tube D'^2 and cup C'^2 , similar to those already described, and similarly containing and supporting the low conducting balls except that the tube or cup C'^2 is insulated from the diaphragm, while the adjustable plate H^2 is insulated from the diaphragm and its supports and also may be insulated from its companion plate H. With this construction, a switch Y may be arranged by which through the switch levers y and y^2 and posts y' and y^3 to put the two plates H, H^2 in or out of connection with each other and in or out of the circuit; and the wire Z, P, is connected to the inner low conductor in the insulated cup C'^2 . The current will then when the switch arms y and y^2 are in contact as shown in Fig. 2, connecting the plates H, H^2 pass in through the wire Z, P, to the inner carbon ball in cup C'^2 thence out through the several carbon balls, to the spring D'^2 and plate H^2 ; thence across the switch to the plate H through the spring D' and carbon balls c^x to c and thence to the receiving instrument or to the induction coil or coils K, as above described. Or, the current may pass through in the reverse direction equally as well. When the switch Y that connects the two plates H H^2 is opened by separating the levers y and y^2 the plates H H^2 and their connections will be cut out of the local circuit and the instrument will go out of operation. If the switch arm y be then closed against the post y' the plate H and its connections will be put into the local circuit independently of the plate H^2 . When the switch arm y^2 is placed in contact with the post y^3 , and the switch arm y is left out of contact with the post y' , the current entering by the wire Z, P, will pass through the left hand series of carbons shown in Fig. 2, thence to the plate H^2 , to the arm y^2 , and thence may be led by a wire shown in dotted lines connected to said post y^3 directly to the induction coil. In this case, it is obvious that no current will pass upon the diaphragm, and that by this arrangement, the carbons in connection with the plate H^2 may be used independently of the carbons in connection with the plates H. When the switch arm y^2 is placed in contact with the post y^3 and the switch arm y in contact with the post y' , the entering current then branches at the hinge, part of said current proceeding by the wire Z, P, to the left hand electrodes, and thence passing to the arm y^2 and thence by the wire shown in dotted lines to the induction coils and another part of said current proceeding by the wire Z', P' to the right hand set of electrodes, diaphragm and lower hinge and induction coils. The two sets of electrodes are then arranged in multiple arc.

It will be seen from the foregoing that the

diaphragm in vibrating, may act upon both sets of carbons or upon either of them, and that by means of the adjusting devices already described, the initial pressure between the carbons of each series can be adjusted, that is to say, each set of carbons can be adjusted as to its initial pressure independently of the other set. I find it preferable to use two induction coils in the instrument, as shown in Fig. 2, the primary wires of these coils being connected together. After the local battery current has passed through either one or both of the sets of carbons as above described, it proceeds through the primary wires of both the coils K and thence by the wire to the contact point Q' on the inside of the case. The contact point Q' is the end of a metallic bar or post which extends through the side of the case, and has its outer extremity so placed that a switch lever P' may be placed in contact with it. The current then passes along the switch lever P' to the pivot of said lever, thence to a wire S inside of the case, thence to a binding post O' and thence back to the other pole of the battery. The secondary wires of the induction coil are united when the switch Y' Y², Y³ Y⁴ is so arranged that its levers are in contact. The ends C. S. and Z, S, of the secondary wires proceed respectively to the binding posts on the top of the case marked "main line" and "earth" Fig. 2. To these binding posts respectively are also connected the main line and ground wires, so that by this arrangement the secondary wire of the induction coil communicates with the line.

Referring now more particularly to the switch Y' Y² Y³, Y⁴; Y' and Y³ are two fixed plates connected respectively to an end of the secondary wire of each of the coils K. These plates do not touch each other, and are rigidly fastened to the bottom of the box or case of the instrument. On the plate Y' is a pivoted lever Y⁴ and on the plate Y³ is a pivoted lever Y². When the levers Y² and Y⁴ are brought into contact as shown in Fig. 2, the secondary wires of the two induction coils K, are electrically connected, and circuit is established through both coils. When they are separated, this secondary circuit is broken. W is a signal bell secured on the upper side of the box or case. L is a pivoted hammer, the shank of which forms the armature of the electro magnet M. One end of the coil of the electro magnet M connects with the line binding post. The other end of said coil connects by a wire R, to the post Q, which extends through the side of the case and with the outer end of which a switch lever P may be brought in contact. The pivot of the switch lever P extends through the side of the case and may connect with a wire, as shown which leads to the earth binding post on the top of the case, and so to the earth.

When the instrument is not in use, the primary circuit through the local battery may be broken by moving the switch lever P' out

of contact with the bar Q'. The secondary circuit may also be broken by moving the pivoted lever Y⁴ and the pivoted lever Y² out of contact. If the switch lever P is then placed in contact with the bar Q, any current coming over the main line will proceed through the electro magnet M and thence to earth, and in passing through the electro magnet it will cause the latter to vibrate the bell hammer L and so sound the bell W to attract attention.

In using the instrument, the lever P is moved out of contact with Q, thus breaking the bell circuit, the lever P' is moved into contact with the bar Q' to establish the primary circuit and the levers Y² and Y⁴ are moved into contact to establish the secondary circuit.

In an application already pending for a patent for the telephone, filed July 26, 1880, Serial No. 14,040, I have shown and described precisely the same instrumentalities herein shown and described. The object of the present application is to secure by a division of the said application of July 26, 1880, a separate patent for the invention hereinafter claimed. All other improvements made by me and embodied in the devices, combinations and sub-combinations described in said original application, are herein disclaimed, since they form the subject-matter of said application and other divisions thereof, filed simultaneously herewith and numbered respectively 19,567 and 19,568.

I claim as my invention—

1. In a telephone transmitter, a diaphragm carrying two resistance varying electrodes electrically insulated from each other, in combination with opposing electrodes mounted upon vibratory supports and provided with means for adjusting the initial pressure between said electrodes.

2. In a telephone transmitter, two series of resistance varying electrodes, electrically insulated from each other, and a diaphragm; the outer electrode of each series being vibrated by the diaphragm, in combination with circuit wires and switch mechanism, whereby either or both series may be put in or out of the battery circuit, substantially as described.

3. In a telephone transmitter and in combination with the diaphragm thereof, two independent series of resistance varying electrodes and means whereby either of such series may be switched separately or both operated consecutively in the same circuit.

4. In a telephone transmitter, a diaphragm and two independent series of resistance varying electrodes in combination with circuit connections and switches, substantially such as described, for throwing the resistance varying electrodes into one continuous circuit or in separate branches of the same circuit.

5. In a telephone transmitter, a diaphragm in combination with two series of resistance varying electrodes, operated thereby, one of said series being electrically insulated from

the diaphragm and the other in circuit therewith, substantially as described.

6. In a telephone transmitter, a diaphragm supporting two resistance varying electrodes electrically insulated from each other, in combination with opposing electrodes mounted upon springs and provided with means for adjusting the tension of the said springs, substantially as described.

7. In a telephone transmitter, a diaphragm 10 carrying two electrodes insulated from each other, in combination with opposing electrodes held in contact with the first mentioned electrodes by an elastic pressure device.

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Witnesses:

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F. N. BOUMAN.