(No Model.)

H. M. & J. GOODMAN.

TELEPHONE TRANSMITTER.

No. 520,306. Patented May 22, 1894.

Fig. 1.

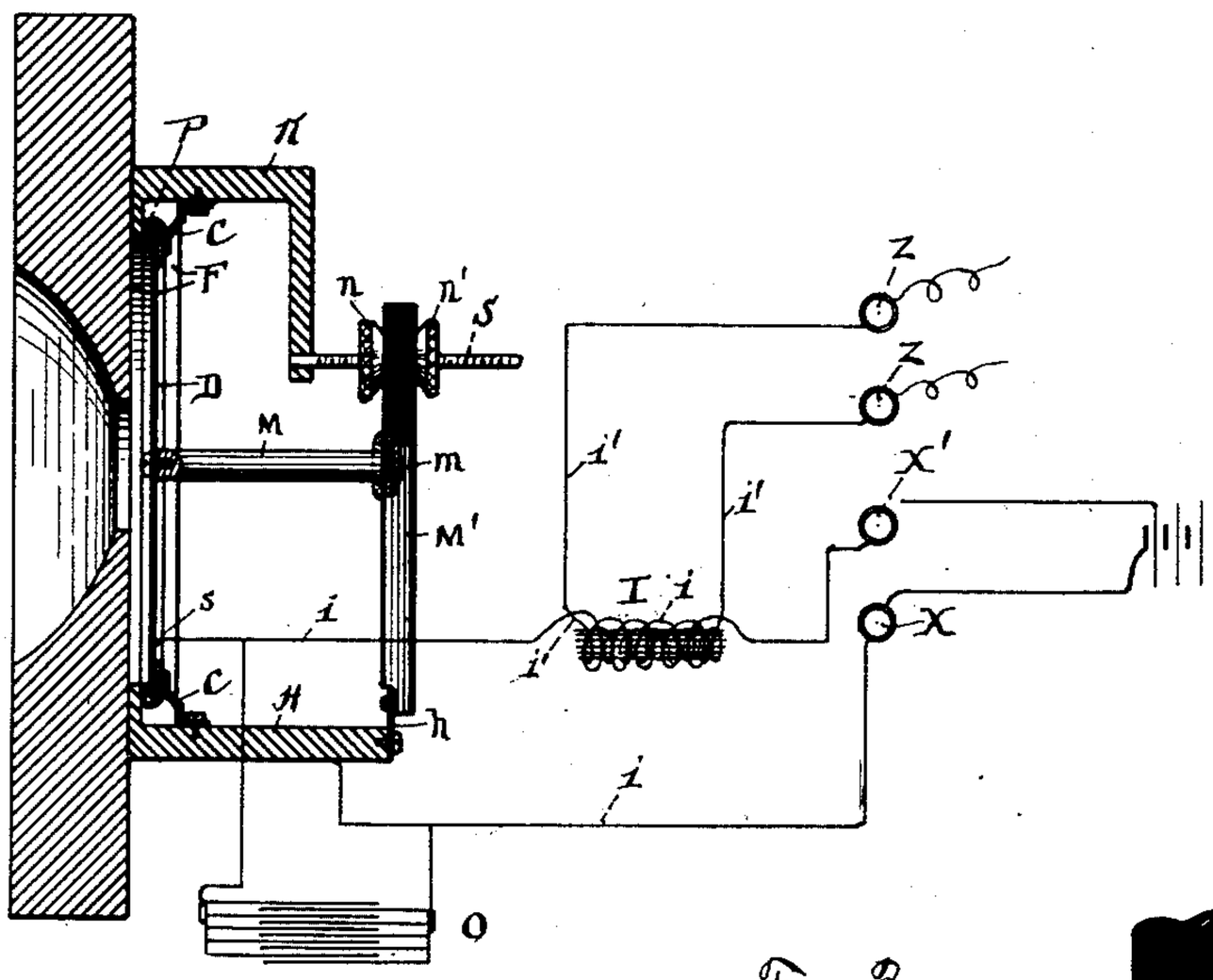

Fig. 2.

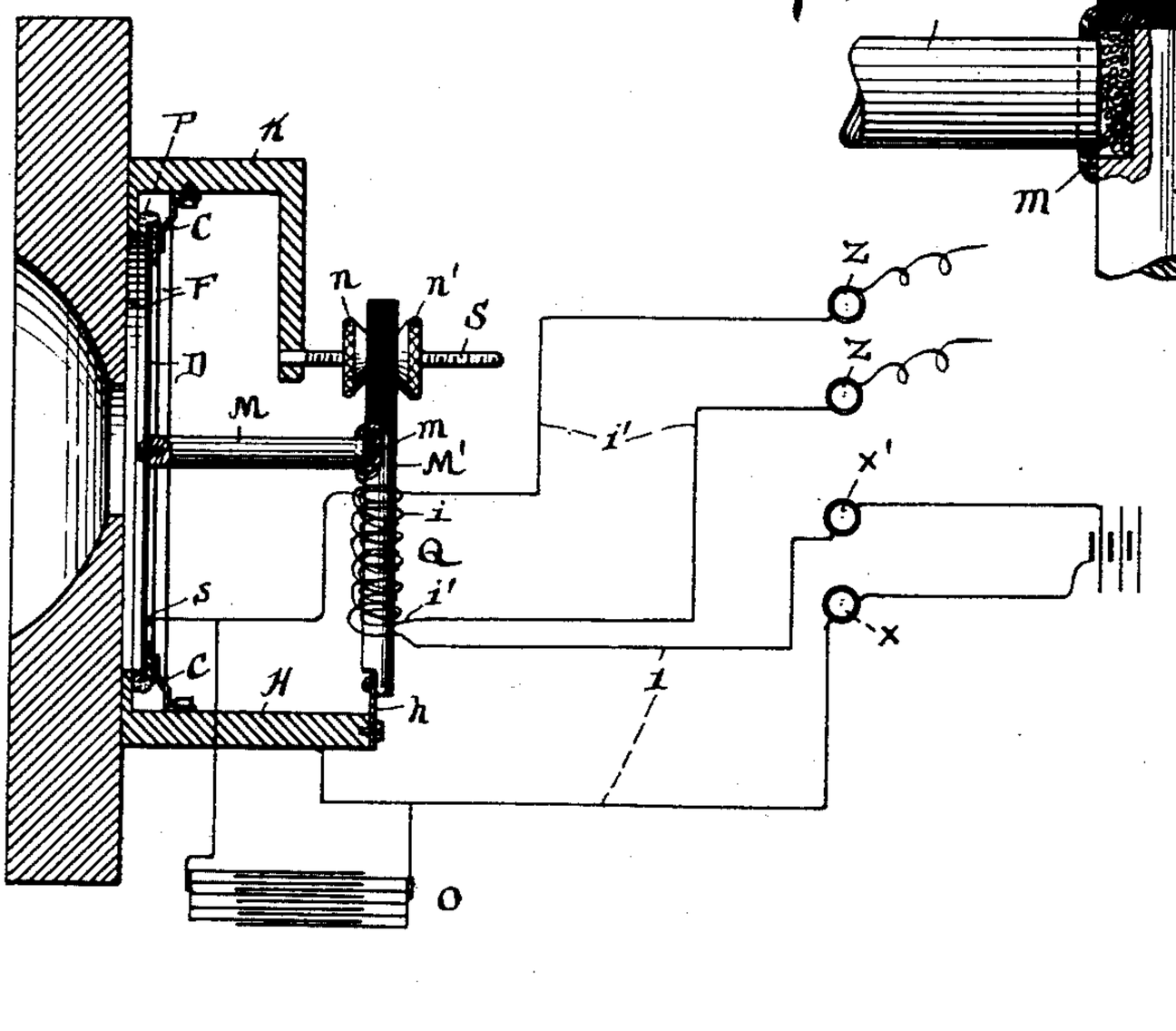

Fig. 3.

WITNESSES

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TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 520,306, dated May 22, 1894.

Application filed January 25, 1894. Serial No. 498,019. (No model.)

To all whom it may concern:

Be it known that we, HENRY M. GOODMAN and JOHN GOODMAN, citizens of the United States, and residents of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Telephone-Transmitters; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form part of this specification.

Figure 1 of the drawings is a representation of the invention partly in section and partly diagrammatic. Fig. 2 is a view of the modification partly in section and partly diagrammatic, and Fig. 3 is a detail view of the intersection of the two magnets.

This invention has relation to certain new and useful improvements in telephone transmitters, and it consists in the novel construction and combination of parts, all as hereinafter described and pointed out in the appended claims.

The invention is more particularly designed as an improvement upon that class of telephone transmitters, described and claimed in our pending application, Serial No. 497,539, filed January 20, 1894. In this application we have laid stress upon the fact that when two magnets, with their opposite poles in juxtaposition, having interposed some magnetic metal in a state of comminution, are approximated, the particles of metal converge laterally, thus subjecting the mass to condensation in two directions, first in the direction of the movement of the magnet or magnets, and secondly from side to side. This lateral convergence is also caused by an increase in the strength of either or both magnets.

It is the object of the present invention to utilize this principle to the greatest possible extent. It is well known that the true poles of a magnet are not at their terminations, but at points near them; also that magnetism resides chiefly upon the longitudinal surface of the iron or steel. If the end of a magnet be sprinkled with iron filings, they form a fringe around its margin, very few if any remaining in the central field. If the magnet be dipped deeply into the filings, upon its withdrawal it will be thickly and uniformly covered for some distance up its sides. So, when for any purpose we wish to use the sustained mass as a conductor of electricity, that portion on the sides, being more dense and uniform, will answer best. We find that the most practical way of bringing these facts into practical utility in the construction of a telephone transmitter is to place the magnets at or nearly at right angles to each other, with their opposite poles adjacent, the extremity of one magnet approaching the side of the other near its extremity, whereby we obtain a greatly increased lateral condensation of the magnetic comminuted mass interposed between the magnets.

The accompanying drawings represent an instrument embracing the principles above outlined.

In the drawings, D represents the diaphragm, supported on a metallic frame F, from which it is insulated by a pad P of oiled silk, soft rubber, vulcanite, or other non-conductor, said diaphragm being retained in position by clips or lugs C, or other suitable means. One extremity of the magnet M is attached to this diaphragm, its other extremity approximating the opposite pole of a second magnet M′, placed at or nearly at right angles thereto, and separated therefrom by a mass of comminuted magnetic metal *m*.

H is an arm extending from the frame F, and to which the magnet M′ is movably attached by means of a flexible strip of metal *h*, or it may be by a hinge or pivot.

K is a second arm of the frame, having its extremity bent at right angles to receive a screw S, said screw also having a bearing in an extension E of the magnet M′, said magnet terminating at *a*, at the farther side of the magnet M, the extension being of some non-magnetic material.

n, *n′* are adjusting taps on the screw S, whereby the distance between the two magnets may be regulated. The means for mechanical adjustment may however be infinitely varied, it being necessary in all devices for the purpose, to provide means which will act firmly and accurately. If the terminal surface of the magnet M is plain, the corresponding surface of the magnet M′ must be flat and

smooth, or if said surface of the magnet M is cylindrical, the extremity of M′ should be rendered concave in order to adapt it to M. The end of magnet M however may be round, conical, or angular, in any of which events, there must be a like depression *d* in M′ to receive it.

I is an induction coil, the primary wire *i* of which is soldered to the diaphragm at *s*, and terminates at the binding post X′. The other branch of the primary wire is connected to the frame F, and runs to the binding post X, said binding posts X, X′, being connected respectively with the terminals of the battery. The terminals of the secondary wire I′ of the induction coil lead to the binding posts Z, Z, to which are also connected the line wires.

O is an electric condenser similar to that employed in our application hereinbefore referred to, and electrically connected with the binding post X, and with the diaphragm D, the two series of plates of which the condenser is composed, being thus on opposite sides of the comminuted mass of metal by which the current is varied.

The course of the current may be indicated as follows:—Entering at post X, it passes to the frame F at the point *r*. Disseminating through this and the magnet M′, it traverses the mass of magnetic metal *m*, and the magnet M, to the diaphragm D, from which it passes through the primary helix of the induction coil I to the post X′, and to the battery. A portion of the current, depending upon the variable conductivity of the metal *m* under the vibrations of the diaphragm, and the character of the circuits, passes to the condenser. In order to still further accelerate the lateral convergence or compression of the interposed magnetic particles, we place around one of the magnets a helix Q, which is traversed by the local current, care being taken if the magnet is a permanent one, that the poles of the helix correspond with those of the magnet; or if an electro magnet is employed with a soft iron core, that a polarity is induced opposite to that of the other magnet. When by the vibrations of the diaphragm, the magnets approach and the current is rendered stronger, there is a reciprocal action between the helix and the current. The stronger current through the helix augments the energy of the magnet, causing a greater condensation of the magnetic particles, and increasing the conductivity of the mass. Thus additional strength is imparted to the current.

The helix although illustrated as being upon the magnet M′, may be equally well applied to the magnet M, or there may be an accessory helix placed upon both of said magnets. We may use both this accessory helix and the induction coil I, but in order to render the resistance of the primary circuit as small as possible, the induction coil may be omitted, and the secondary wire wound around the helix which is thereby made to take the place of the induction coil, the path of the current being the same as before described. This accessory helix with or without the secondary coil is applicable to the forms of the instrument described in our said pending applications.

To prevent the oxidation of the magnetic particles, the same means may be had recourse to as stated in our said pending applications, viz.—the saturation of the mass with oil, or applying to its external surface a solution of caoutchouc. This should be done after the instrument is perfectly adjusted. In furtherance of this object also, the case in which it is contained, should be as nearly air tight as possible, and unslaked lime or other substance, with similar properties should be placed within to absorb moisture.

The magnets may be simple or compound, permanent or electro, or a combination of these.

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

1. In a telephone transmitter, two magnets at or nearly at right angles to each other, their opposite poles being approximated, a mass of magnetic material in a state of comminution between said magnets, and a diaphragm mechanically connected with one of said magnets, substantially as specified.

2. In a telephone transmitter, two magnets at or nearly at right angles to each other, their opposite poles being approximated, a mass of magnetic material in a state of comminution between said magnets, a vibratory diaphragm mechanically connected with one of said magnets, and an adjusting device in connection with the other whereby the distance between the two magnets may be adjusted, substantially as specified.

3. A telephone transmitter having a pair of magnets at, or nearly at, right angles to each other, a mass of magnetic material in a comminuted state between the adjacent poles of said magnets, and an induction coil in circuit with said magnets, substantially as specified.

4. In a telephone transmitter, the combination of two magnets at or nearly at right angles to each other, and having their opposite poles approximated, a diaphragm attached to one of said magnets, a mass of comminuted magnetic material between the said poles, and an electric condenser forming a shunt of the local circuit, substantially as specified.

5. In a telephone transmitter, the combination of two magnets, at or nearly at right angles to each other, and having their opposite poles approximated to each other, a diaphragm mechanically connected with one of said magnets, a mass of comminuted magnetic material interposed between said magnets, an induction coil whose primary is in the local circuit, and an electric condenser forming a shunt of the local circuit, substantially as specified.

6. In a telephone transmitter having two magnets at, or nearly at right angles to each

other, and made to approximate each other at their opposite poles, with magnetic material in a state of comminution between said poles, and a diaphragm mechanically connected with one of said magnets, the combination with the said magnets of an accessory helix or helices, in the primary or local circuit, and surrounding one or both of said magnets, substantially as specified.

7. In a telephone transmitter, the combination with a pair of magnets at, or nearly at right angles to each other, and having their opposite poles approximated, a diaphragm mechanically connected with one of said magnets, and a mass of comminuted magnetic material between the said poles, of an induction coil surrounding one or both of said magnets, said coil having its primary in the local circuit, and its secondary in the line circuit, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY M. GOODMAN.
JOHN GOODMAN.

Witnesses:
S. G. WALKER,
A. BERTELKAMP.