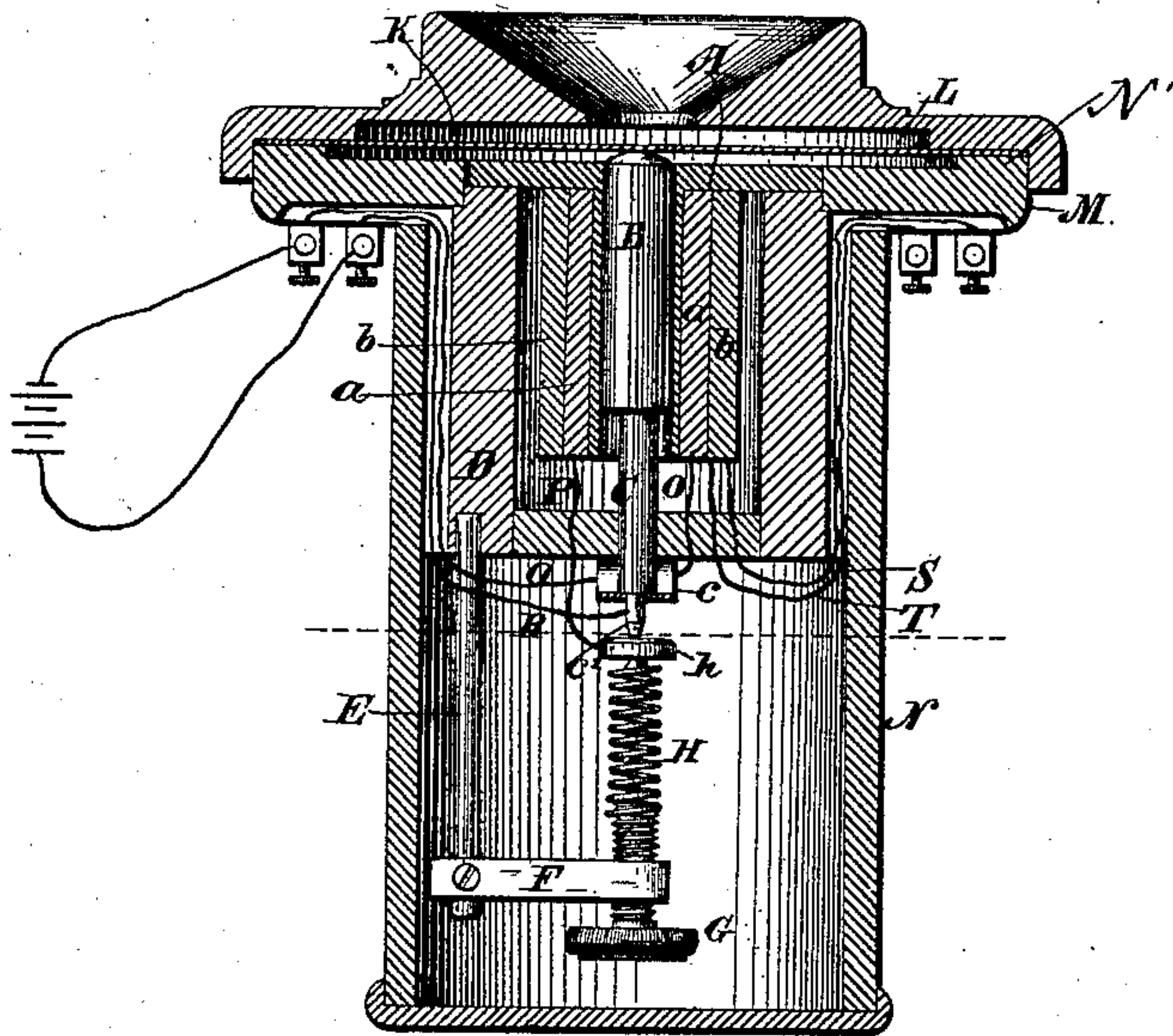


C. A. RANDALL.  
Telephone-Transmitter.

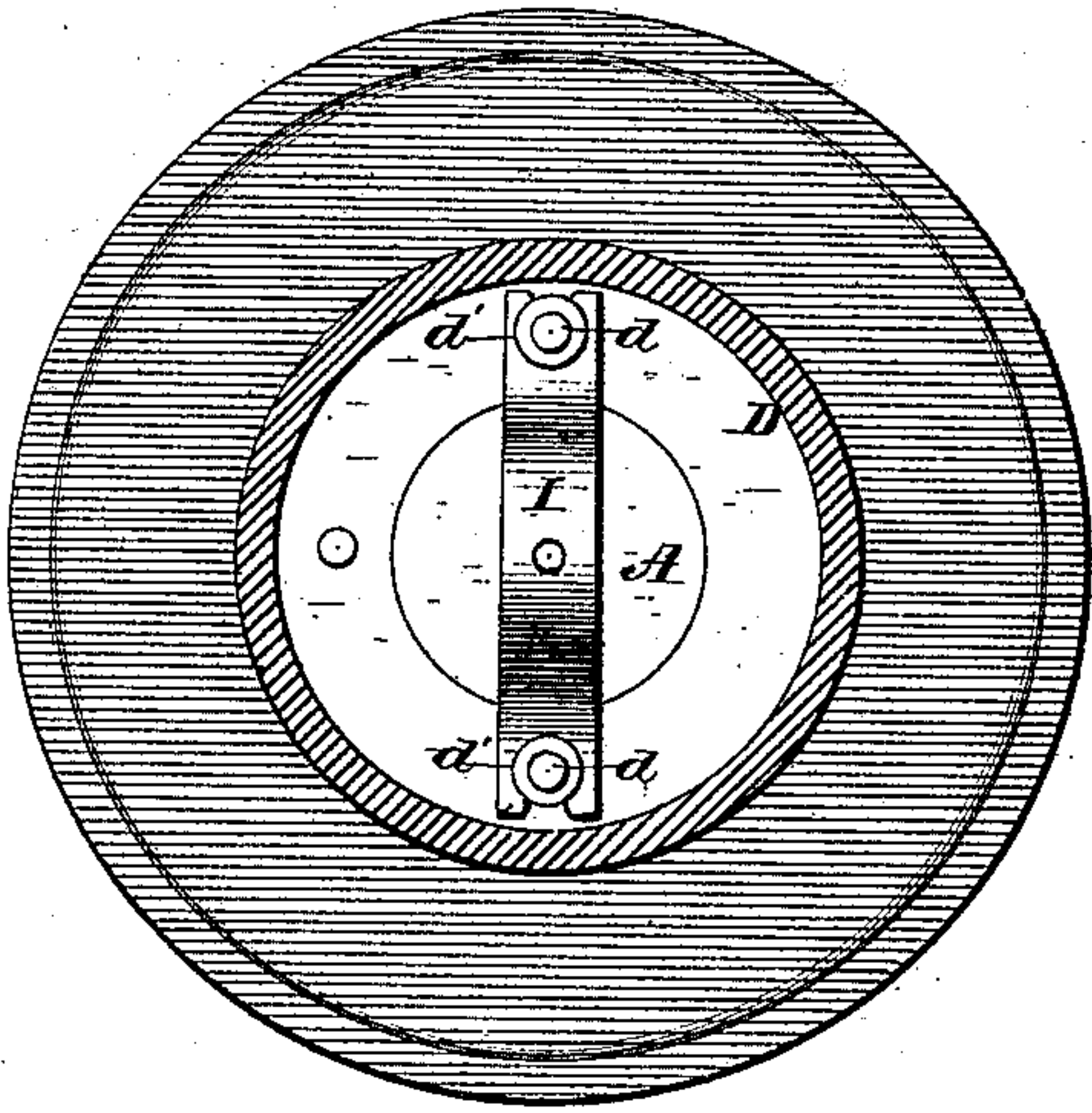
No. 221,355.

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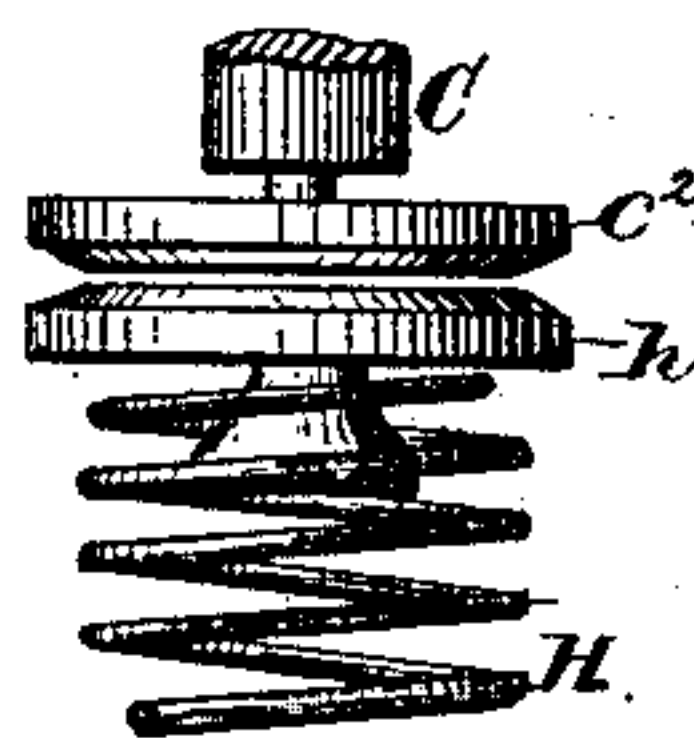
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



*Attest.*

*Henry Kaiser.*  
*Charles L. Combs*

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*Charles A. Randall*  
*by James L. Norris.*  
*Atty*



# UNITED STATES PATENT OFFICE

CHARLES A. RANDALL, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN TELEPHONE-TRANSMITTERS.

Specification forming part of Letters Patent No. 221,355, dated November 4, 1879; application filed April 7, 1879.

*To all whom it may concern:*

Be it known that I, CHARLES A. RANDALL, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Acoustic Telegraphy or Telephonic Transmitters, of which the following is a specification.

This invention relates, especially, to that branch of acoustic telegraphy which pertains to the transmission of articulate speech; and it consists in an improved method of generating the electric current, by means of which greater electro-motive force is obtained, so that the lesser or more delicate air-vibrations will not fail to produce their corresponding electric vibrations and transmit the same to the receiving-instrument, whereby more perfect articulation in louder and more distinct tones is obtained at said receiving-instrument.

It is not deemed necessary to herein explain the principles involved in speaking-telephones, as they are now generally well known. It is simply sufficient to say that in all telephones capable of transmitting the sounds of articulate speech serious difficulties have been encountered, resulting from extreme sensitiveness, difficulties in adjustment, and want of proper electro-motive power.

A slight increase of power has been obtained in the later forms of telephones by the use of a battery and an induction-coil, in the primary circuit of which are located special contact-makers or "tension-changers;" but with this increase of power other difficulties are encountered, resulting from adjustments and imperfect articulation if the voice is too loud when speaking into the instruments, which arises probably from the too-sensitive adjustment of the circuit-closer and from the reciprocal vibrations set up by the circuit-maker, because of its construction.

In telephonic transmission the first essential object is to accurately convert the air-vibrations into electrical impulses, and the second, which is quite as important, is to preserve the delicate air-vibrations and obtain corresponding electrical vibrations of proper power to be transmitted to the receiving-instrument.

The present invention is designed to effect

these objects in a more perfect manner than heretofore by utilizing the well-known principle that a variable exposure of a movable iron core in the primary circuit of an induction-coil perceptibly affects and varies the intensity of the current in the secondary coil, as familiarly demonstrated in the ordinary galvanoelectric or "shocking" machines, by means of which shocks of varying intensity are obtained by shifting the core into and out of the coil.

To this end my invention consists, in combination with the diaphragm or vibrator, of a telephonic transmitter, an induction-coil having a movable core, a contact-maker or tension-changer located in the primary circuit, with mechanism whereby it may be adjusted and the movable core held against the diaphragm.

In the drawings, Figure 1 represents a longitudinal sectional view of my improved telephonic transmitter. Fig. 2 represents a cross-section of the transmitter. Fig. 3 represents a modification of the circuit-maker.

The letter A indicates an induction-coil, constructed of two helices, *a b*, one within the other, as in an ordinary induction-coil, except that the inner helix is constructed of fine wire and the outer one of coarse wire. At the center of the inner helix is located a movable iron core, B, which is, preferably, constructed of a series of soft-iron wires, secured together in the same or a similar manner to the soft-iron core of an ordinary induction-coil. Said core is made somewhat shorter than the coil, in order that it may have a slight reciprocating motion therein.

To the lower end of the core is secured a metallic rod, C, which passes through the bottom of a casing, D, in which the coil is located, and is provided at its lower end with a contact point or surface, C<sup>2</sup>, of platinum, or an imperfect electrical conductor, such as carbon, graphite, or the two combined.

The letter E indicates a downwardly-extending rod secured to the casing D, and having an adjustable arm, F, provided with a set-screw, G, which carries a spiral spring, H, having mounted on its free end a bearing-plate, *h*, of carbon or other poor conductor,



which is held in contact with the contact-point at the end of the rod C by said spiral spring, and which may be made to bear against said point with a variable yielding pressure by means of the set-screw for the purpose of adjustment.

The lower end of the rod C is shouldered, as shown at *c*, the said shoulder resting upon a very flexible spring, I, which extends transversely across the lower part of the casing D, and is adjustably secured to screw-studs *d* on the same by means of check-nuts *d'*. Said spring serves to take up the weight of the core and press said core against the diaphragm.

The letter K represents the diaphragm, which is confined in the air-chamber L in the enlarged disk M, forming part of the casing D, and the mouth-piece in any suitable manner, in the present instance being clamped between the disk and the mouth-piece.

The diaphragm is not magnetic, and may be made of metal or any other suitable material, and be held securely in place at the edges, or by means of a flexible washer or ring, N'.

The letter N represents a hollow casing attached to the casing D to protect the contact-maker from injury.

The primary coil is connected with the battery-wire O and to the carbon bearing-surface on the upper end of the spiral spring by a wire, P, the movable core being connected with the opposite pole of the battery by a wire, R.

The secondary coil is connected with the line-wire and the ground, as shown at S T.

The operation of my invention is as follows: Upon speaking into the mouth-piece the diaphragm is put into vibration, moving the soft-iron core in the induction-coil back and forth in exact accordance with the said vibrations, which increases and decreases the contact at the contact-maker, thereby changing the tension of the primary circuit. At the same time the vibrations of the iron core vary the intensity of the current in the secondary coil, which, acting in conjunction with the varying tension of the primary current over the primary circuit, produces very much more marked,

distinct, and powerful induced currents or electric impulses in the secondary circuit than can be obtained by the use of the contact-maker or tension-changer alone.

The special features of the contact-maker consist in so constructing it that large or small contact-points may be used, as occasion requires, and in the adjustable spiral spring carrying one of the points, which forms at once a yielding, yet comparatively firm, contact.

I do not claim, broadly, a spring forming or carrying one electrode of the circuit of a telephone and constantly pressing against the other electrode and diaphragm to maintain the required initial pressure between the electrodes and yield to the movements of the diaphragm.

What I claim is—

1. In combination with the diaphragm or vibrator of a telephonic transmitter, an induction-coil having a movable iron core, substantially as and for the purpose set forth.

2. In combination with the diaphragm or vibrator of a telephonic transmitter, an induction-coil having a movable iron core, a battery, and a contact-maker or tension-changer, substantially as described.

3. The combination, in a telephonic apparatus, of a diaphragm or vibrator, the movable iron core of an induction-coil, and a contact-maker or tension-changer having one or both of its contact-surfaces attached to or supported by a suitable elastic spiral spring, substantially as and for the purposes set forth.

4. In combination with the movable iron core of the induction-coil, a suitable spring for supporting the weight of the core and pressing or forcing the same against the diaphragm, substantially as specified.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

CHAS. A. RANDALL.

Witnesses:

JAMES L. NORRIS,

JAS. A. RUTHERFORD.