(No Model.)

C. A. RANDALL.

Telephonic Transmitter.

No. 237,596. Patented Feb. 8, 1881.

Fig. 1.

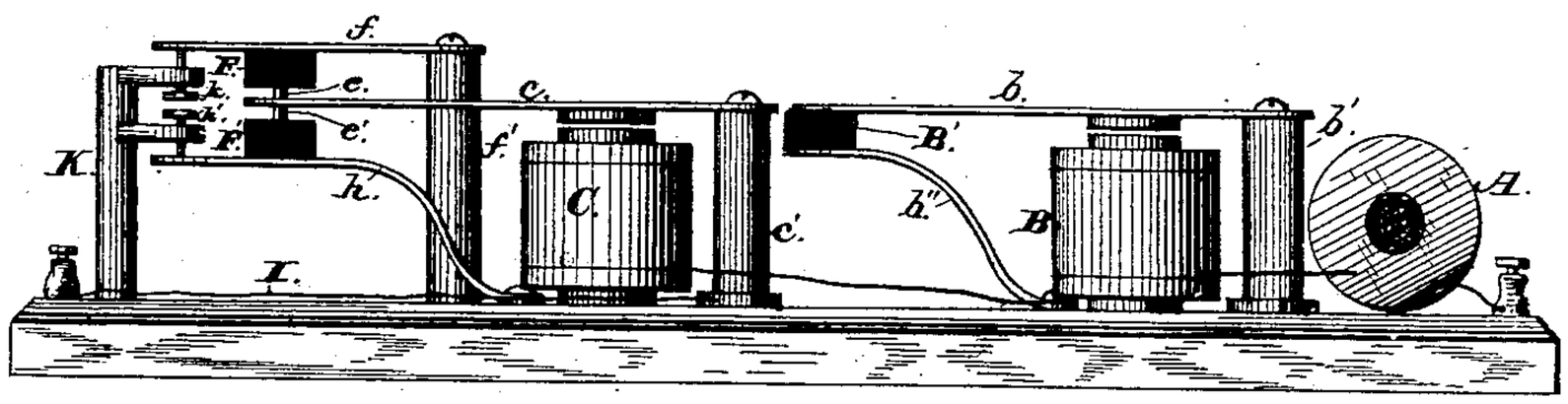
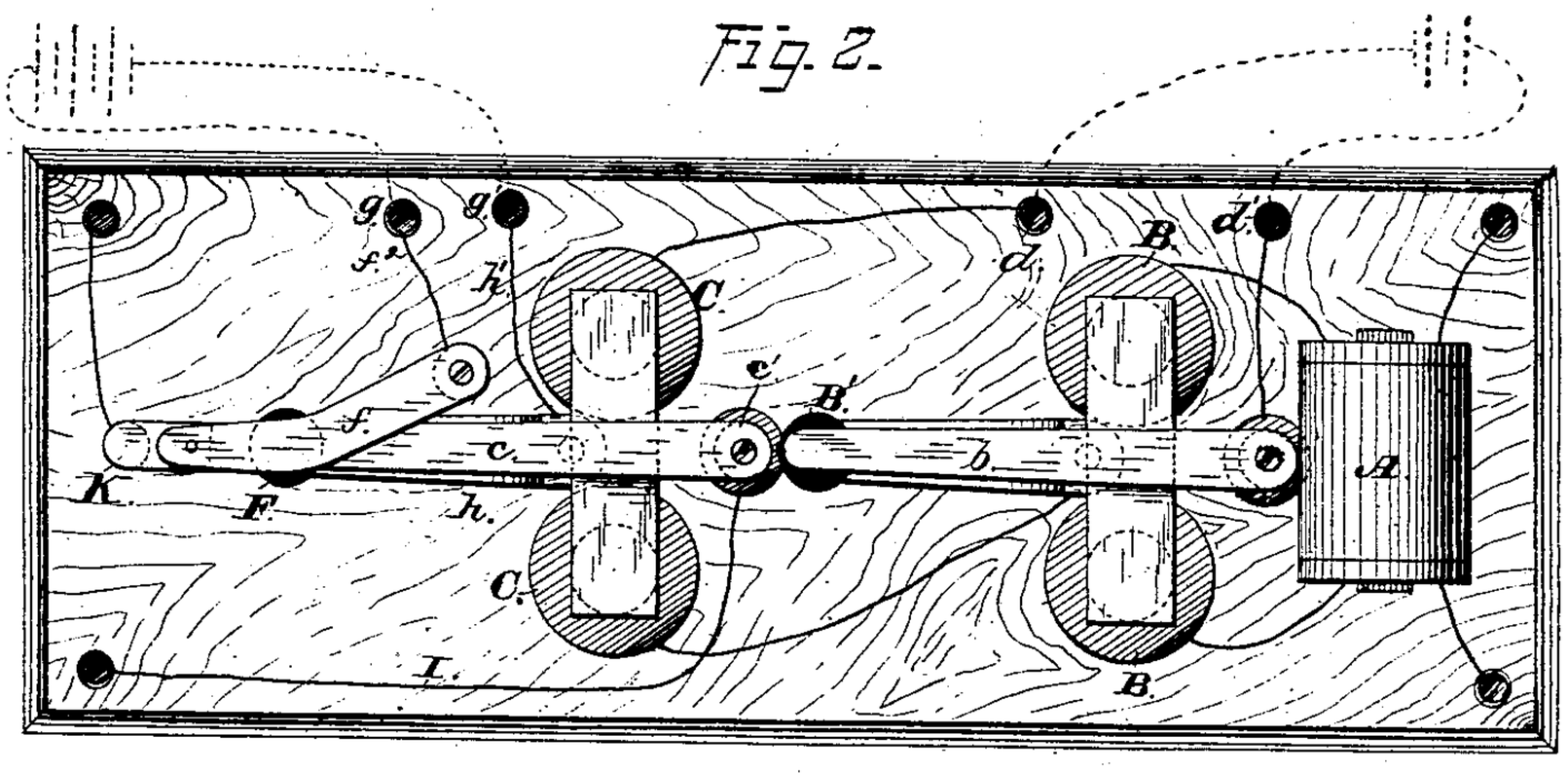


Fig. 2.



WITNESSES.

Jas. E. Hutchinson.

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INVENTOR.

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Atty.

UNITED STATES PATENT OFFICE.

CHARLES A. RANDALL, OF NEW YORK, N. Y.

TELEPHONIC TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 237,596, dated February 8, 1881.

Application filed April 19, 1880. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. RANDALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Telephonic Transmitters and Systems, of which the following is a specification.

This invention relates to a telephonic transmitter and system designed to utilize to a maximum degree the force of a line-battery connected with a receiving apparatus, to cause an extended range of variation in the strength of the line-battery in correspondence with the variations of the transmitter-diaphragm, and to consequently effect an increased amplitude and force of vibration in the diaphragm of the receiver.

In the accompanying drawings, Figure 1 is a side elevation, and Fig. 2 a plan view, of a transmitting apparatus constructed according to my invention.

The letter A designates an induction-coil, preferably constructed for quantity, in the primary circuit of which is to be arranged a transmitter, preferably constructed to send alternate currents of different polarities, and which in the present apparatus I term the "primary transmitter." In the secondary circuit of the induction-coil is included an electro-magnet, B, which I term an "auxiliary magnet," the armature-lever *b* of which is, in the present instance, an elastic metallic arm having one end secured to the metallic post *b'* and its other end in contact with a carbon button, B', supported by a metallic arm, *b''*, which is also preferably elastic. The levers *b* and arm *b''* may, however, either or both, be rigid, the lever in such case being pivoted or otherwise arranged to move slightly when the armature attached to it is attracted by the magnet.

The letter C indicates an electro-magnet, one of the coil-terminals of which is connected with the arm *b''* and the other with a screw-post, *d*, from which a wire is intended to lead to one pole of a local battery, as indicated in dotted lines, the other pole of which should be connected with screw-post *d'*, from which a wire leads to post *b'*. The armature-lever *c* of magnet C is constructed similarly to that of the magnet B, and has one end secured to metallic post *c'*, while the other end carries metallic studs *e e'*, projecting in opposite directions and in contact respectively with carbon buttons F F', the former of which is carried by an elastic metallic arm, *f*, secured to a metallic post, *f'*, from which a wire, f^2, leads to a screw-post, *g*, to be connected with one pole of a line-battery, as shown in dotted lines, while the latter is carried by an elastic metallic arm, *h*, connected by a wire, *h'*, with screw-post *g'*, to be connected with the opposite pole of said line-battery, the main-line wire I being connected with post *c'*, which supports armature-lever *c*. The post K is intended to be connected with the ground, and is provided with projections carrying adjustable contact-screws *k k'*, which are in contact with the arms *f* and *h*, respectively. The lever *c*, arms *f* and *h*, and the several contact devices controlled by them, compose, as will be seen, a current-reversing tension-changer.

The operation of the apparatus is as follows: The tension of the current on the primary circuit of the induction-coil A being varied by the action of the transmitter-diaphragm in a well-known manner, corresponding variations occur in the induced current of the secondary circuit, and as the secondary circuit actuates the magnet B the impulses of said magnet will always be in unison, both as to frequency and variation of force, with the vibrations of the transmitting-diaphragm, and therefore the armature-lever *b* is caused to vary the pressure-contact between itself and the carbon button B', so that the flow of the local-battery current, which energizes the magnet C, will also be varied, and said magnet C will act upon its armature with varying force, and also in correspondence with the vibrations of the transmitter-diaphragm. By this arrangement it will readily be perceived that an increased movement of the armature-levers successively over the movement of the diaphragm is obtained, as well as great increase in the force of movement, the same depending almost entirely upon the size of electro-magnet C and the electro-motive force of the local battery from which it receives its energy. Said magnet and battery will, in practice, correspond approximately with an ordinary Morse sounder and its local battery.

As the armature-lever *c* moves under the influence of its magnet it alternately increases and decreases the pressure of the studs *e e'* upon the carbon buttons F and F', respectively—decreasing the pressure upon one while increasing that upon the other, it being understood that increase and decrease of pressure between two conductors in contact are practically equivalent to the positive making and breaking of contact between said conductors—a strong contact causing the current to flow freely from one to the other, and a slight contact resulting in a practical cessation of the flow. It will therefore be understood that while the variations of contact on the buttons F F' alternate the currents, they also vary the flow and strength of said currents, the contact being made gradually from minimum to maximum. When the increased pressure of lever *c* is such upon one of the carbons as to cause the current to flow from one pole of the battery to the line it forces the arm carrying said button out of contact with its contact-screw carried by post K, so that the other arm alone will be in connection with the ground, and thus a complete circuit is formed from the line-battery to ground in one direction and to line in the other, and the full force of said line-battery may then act upon a receiver at a distant station, and cause the diaphragm of said receiver to have a force of movement and range of amplitude far exceeding that of the transmitter-diaphragm, the feeble action of which, under the influence of sound-vibrations, can produce but slight pressure-contacts at most, and cause the induction of but weak currents in the secondary circuit of the induction-coil. These weak currents I cause to control a local battery, by the vigorous current of which the devices are operated which vary the main current, thus gaining power progressively from the transmitter-diaphragm to the final tension-changing devices.

It will be readily understood that by dispensing with one of the carbon buttons, with proper connections from the other, with the lever, line, battery, and ground, the circuit may be gradually opened and closed, or the circuit may be closed and the electro-motive force or tension of the current varied over the same by the action of the electro-magnet, and always in unison with the vibrations of the diaphragm of the primary transmitter.

I may dispense with the induction-coil and place the primary transmitter directly in the circuit with the auxiliary magnet B, or with the transmitting-magnet C, and may also dispense with the auxiliary magnet B and arrange the transmitting-magnet C directly in the secondary circuit of the induction-coil, all of which may be done without departing from the principle of my invention, the main object of which is to obtain electro-magnetic power acting in unison with a vibrating diaphragm or its equivalent, actuated by the air-vibrations of articulate tones to control a main-line battery, including in its circuit a telephonic receiving apparatus.

A telephonic telegraph heretofore constructed has comprised the combination of a primary vibratory diaphragm, a second diaphragm actuated by an electro-magnet located in a special local circuit, and an intermediate microphone or equivalent device, actuated by the first diaphragm and controlling the current of the electro-magnet, whereby the vibrations of the first diaphragm are caused to produce vibrations of greater amplitude or force, or both, on the part of the second diaphragm; and I do not claim such a combination, broadly.

What I claim is—

1. The combination of the electro-magnet B, the tension-changing devices controlled directly thereby, the electro-magnet C, included in a local circuit with said tension-changing devices, and a current-reversing tension-changer, arranged for connection with the circuit of a line-battery, and to be controlled by said magnet C, substantially as described.

2. The combination, with the electro-magnet C and its armature, of the lever *c*, arms *f* and *h*, and suitable contact devices arranged between said lever and arms, and contact-points arranged to connect said arms alternately with a common conductor, substantially as described.

3. The combination of induction-coil A, electro-magnet B, included in the secondary circuit of said coil, the arm *b*, connected to the armature of said magnet. arm *b''*, intermediate carbon block, B', electro-magnet C, included in a circuit with arms and carbon, and a tension-changer arranged to be controlled by said magnet C, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES A. RANDALL.

Witnesses:
JAMES L. NORRIS,
J. A. RUTHERFORD.