

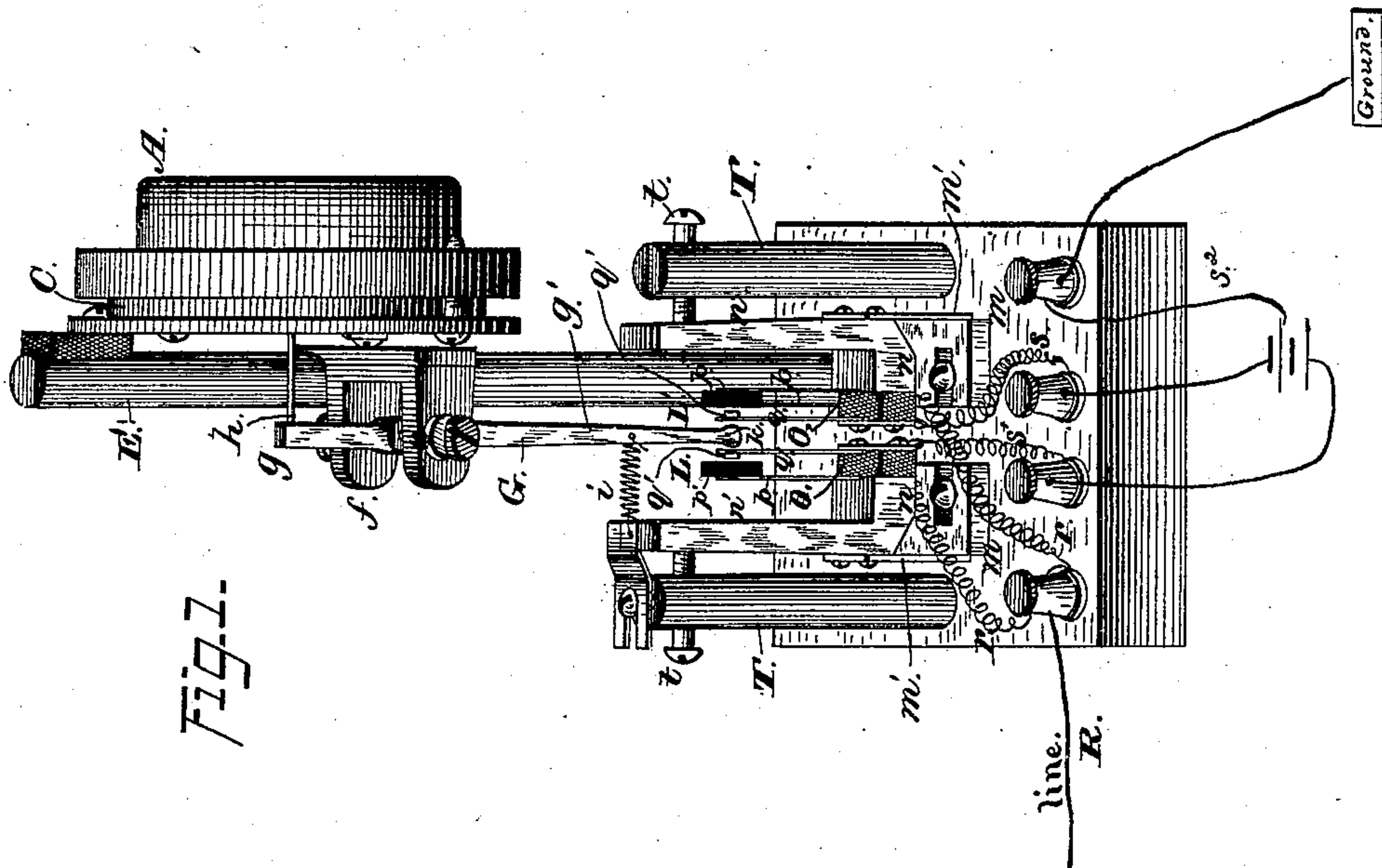
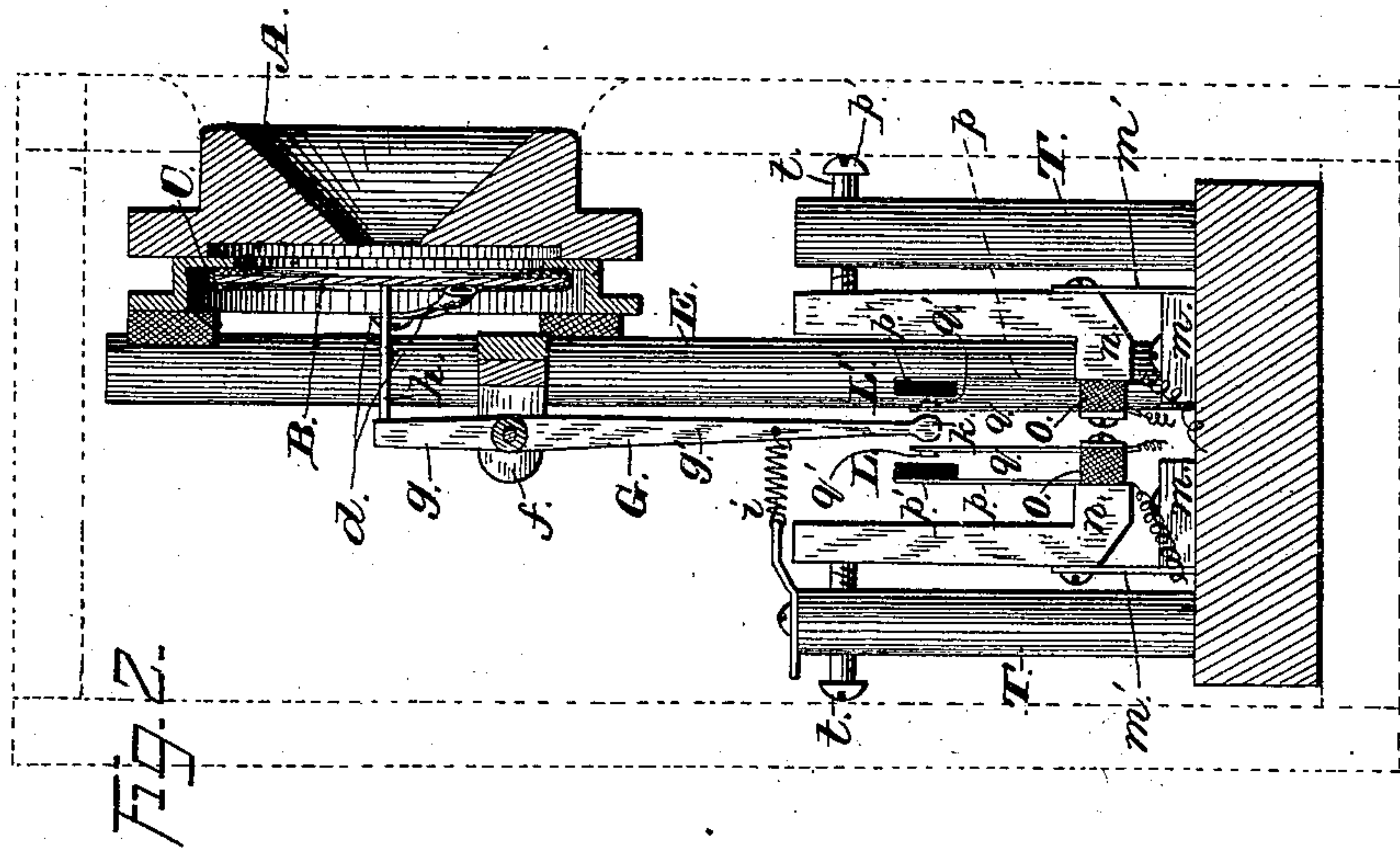
(No Model.)

2 Sheets—Sheet 1.

C. A. RANDALL.  
Telephone System.

No. 235,019.

Patented Nov. 30, 1880.



WITNESSES=

Jas. E. Hutchinson,  
 Wm. Beale Hale.

INVENTOR.

Charles A. Randall,  
 by James L. Norris,  
 Att'y.

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Fig. 3.

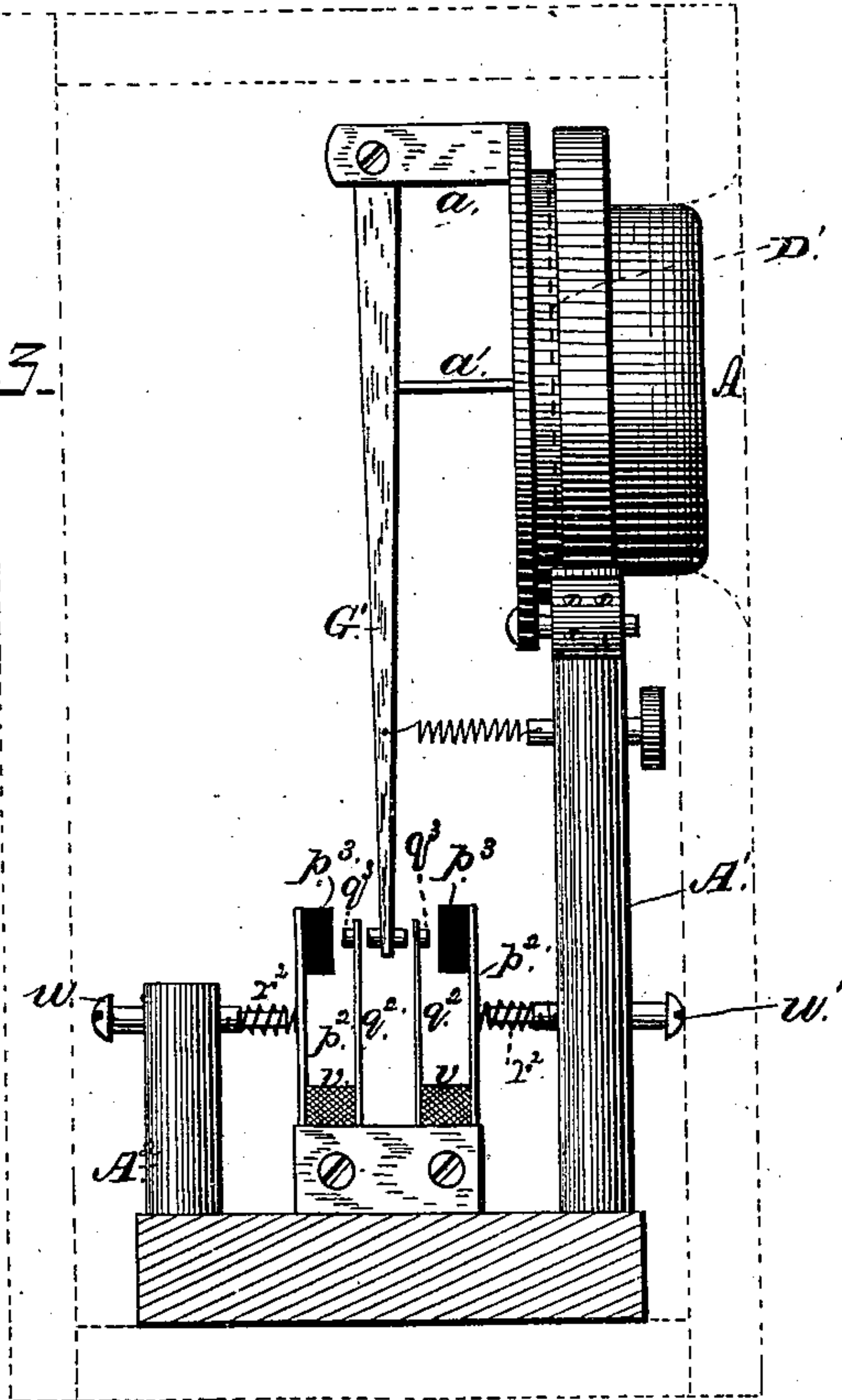
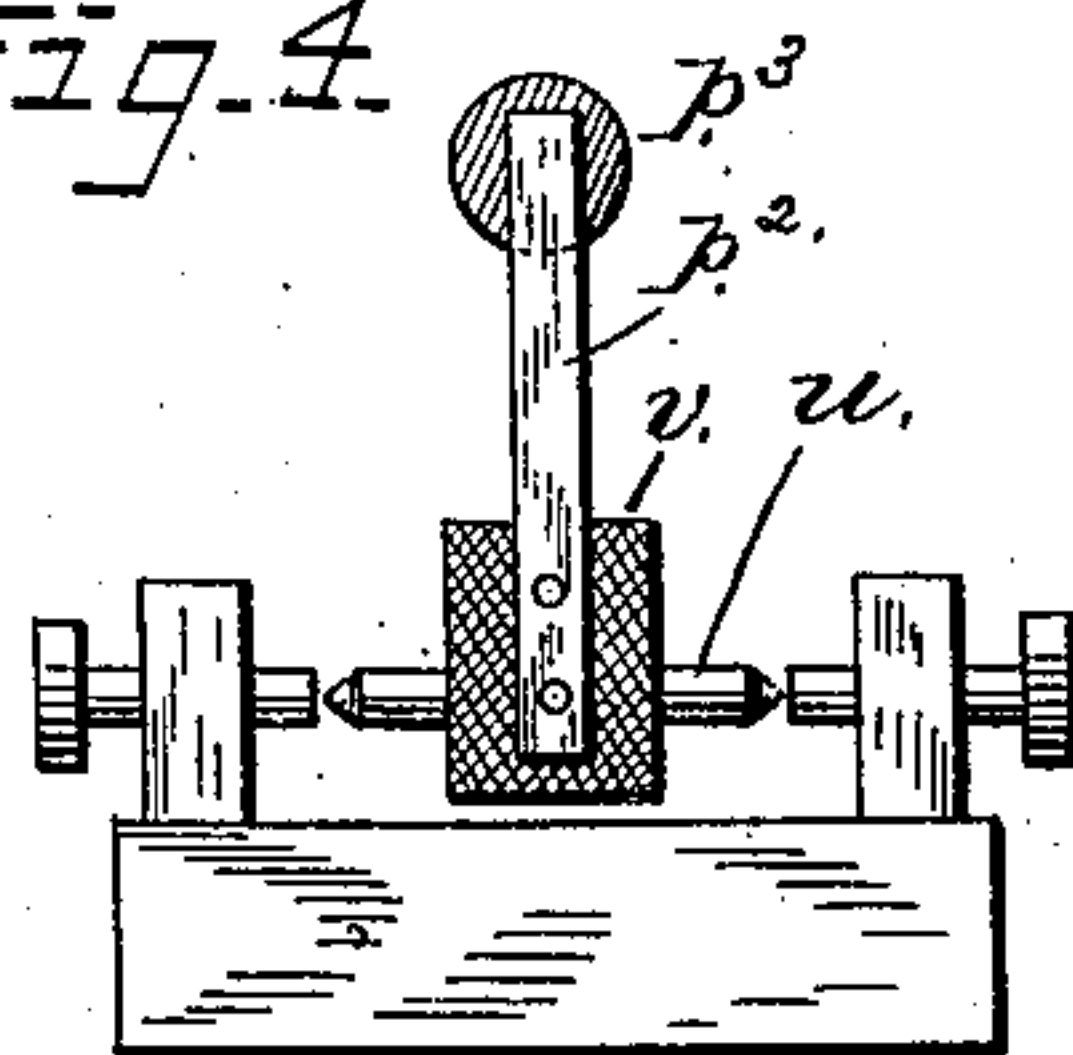


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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

## TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 235,019, dated November 30, 1880.

Application filed March 29, 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 Telephone Systems, of which the following is a specification.

This invention relates to that class of telephone systems in which a battery-current traverses the circuit, and is qualified by tension-changing devices operated by the vibrations of a transmitter-diaphragm.

It consists, mainly, in a telephone system in which, by means of a variable-contact pole-changing circuit-closer, operated by a diaphragm under the influence of sound-vibrations, electrical connection with a line-wire is alternately made and broken from opposite poles of a battery or batteries, the makes and breaks of the circuit being attended by varying pressure between the contact-points of the circuit-closer, and battery currents or impulses of alternately opposite polarities and varying force are caused to pass over the line-circuit in correspondence to sound-vibrations, as hereinafter more particularly described and explained.

It consists, also, in the combination, with a telephonic-transmitter diaphragm, a battery, and main circuit, of intermediate devices operated by the diaphragm for changing the polarity or direction of the currents passing from the battery to the main circuit, as will be hereinafter particularly described.

In the system now in general use, in which an undulatory electric current is employed upon the circuit, great trouble is experienced from induction from adjacent wires, which in many cases renders correct transmission difficult, especially upon long lines, and also enables persons controlling adjacent wires to overhear messages transmitted over others.

By the employment of alternating battery-currents upon the line-wire the effects of induction are to a great extent prevented, and the sounds produced by the diaphragm of the receiving apparatus are caused to be clear, sharp, and distinct.

In the accompanying drawings, with reference to which my invention will be particu-

larly explained, Figure 1 is a perspective view of an alternating battery-current telephonic transmitter. Fig. 2 is a view, partly in elevation and partly in section, of same. Fig. 3 is a side elevation of a modification of the apparatus. Fig. 4 is a detail view, illustrating the construction of the contact devices of the pole-changer.

The letter A indicates the mouth-piece, and Bits diaphragm. The mouth-piece is attached to the ring C, against the rear inner margin of which is arranged the diaphragm, having its margin enfolded by an elastic rubber washer, D, and pressed against the ring C by spring-fingers *d*, projecting inwardly from the rear margin of said ring. The mouth-piece and diaphragm are supported by a standard, E, near one side, and the standard also carries a bracket, *f*, in which is fulcrumed a lever, G, from the short arm *g* of which an arm, *h*, projects, and by means of an adjustable spring, *i*, is caused to bear against the center of the rear surface of the diaphragm.

The long arm *g'* of the lever (which is about three times the length of the short arm) terminates in a small head, *k*. On opposite sides of the head *k* are arranged the elastic contact terminals L and L' of the battery-circuit. Each of these terminal devices is composed of an adjustable base, *m*, having an upward-projecting spring-plate, *m'*, to which is secured a block, *n*, formed preferably of wood or other insulating material, and provided with an arm extending upward. To the inner face of the block *n* is secured a plate of rubber, O, or similar insulating material, from one side of which extends upward a metallic leaf, *p*, carrying at its tip a carbon button, *p'*, while from the other side of said rubber plate extends upward a similar metallic leaf-spring, *q*, carrying at its tip a platinum stud, *q'*, projecting toward the carbon button *p'*.

The springs *p* of both the contact devices are connected with the line-wire R by wires *r*, and the springs *q*, carrying the platinum studs *q'*, are connected by wire S S', respectively, with the opposite poles of the battery, the center of which, by a wire, S<sup>2</sup>, is connected with the ground.

Adjusting-screws *t t*, carried by standards



T T, bear against the carbon buttons  $p'$ , for regulating the pressure of the platinum studs upon said buttons when the former are actuated by the lever G. The head of the lever G is always in contact with the springs  $q$ , but is insulated therefrom.

In operating this transmitter the person transmitting speaks in front of the diaphragm in the usual manner, and, as the diaphragm vibrates in response to air-vibrations produced by the voice, the lever G is caused to oscillate by means of the arm  $h$ , bearing on the diaphragm. The movements of the lower end of the lever force first one platinum stud,  $q'$ , and then the other into contact with its adjacent carbon button  $p'$ , and as said platinum stud strikes the carbon buttons electric connection of the line-wire R is made with one or the other pole of the battery, as the case may be, and such connections are made with the respective battery-poles alternately in correspondence with the vibrations of the diaphragm as long as the speaking continues, and alternately positive and negative currents flow over said line-wire to the receiving apparatus at the other end or at the station in communication, and the tension of these alternate currents is qualified or varied in correspondence to the amplitude of the vibrations of the diaphragm, which, as they cause greater or less movement of lever G, produce greater or less pressure of contact between the platinum studs  $q'$  and carbon buttons  $p'$ ; the greater the vibration of the diaphragm, and consequent movement of lever G, the greater the pressure of contact between the platinum studs and the carbon buttons, and vice versa, the resultant modulations of the tones transmitted and delivered by the receiver being in accordance with theories too well established to require explanation here.

Any of the ordinary and well-known receiving-telephones may be used in connection with my system and described transmitter.

The apparatus, as now described, may be inclosed in a suitable case, with the mouth-piece projecting through an aperture thereof.

In the modification shown in Fig. 3 the mouth-piece and diaphragm are supported by a standard,  $A'$ , and from the upper portion of the mouth-piece case projects an arm,  $a$ , to which is pivoted the upper end of lever  $G'$ , from which projects an arm,  $a'$ , in contact with the diaphragm  $D'$ . The lower end of the lever is provided, preferably, with insulating-studs, if the lever is metal. In each of the line and battery contact devices a rock-shaft,  $u$ , journaled in suitable bearings, has fixed thereto a block,  $v$ , of hard rubber or other suitable insulating material, and from this block project upward the plates  $p^2$  and springs  $q^2$ , carrying their carbon buttons and platinum studs  $p^3$  and  $q^3$ , respectively.

Springs  $r^2$   $r^2$  press against the plates  $p^2$  and have their tension controlled by screws  $w$   $w'$ ,

passing, respectively, through standards  $A'$  and  $A^2$ . The connections between the line-wire and battery are made in the same manner as shown and described in reference to Figs. 1 and 2.

By means of the screws  $w$   $w'$  it is obvious that the amount of pressure between the platinum studs  $q^3$  and carbon buttons  $p^3$ , under the action of the lever  $G'$ , may be regulated, as the plates  $p^2$  and their rock-shafts are alternately oscillated by the movement of lever  $G'$ , and the carbon buttons  $p^3$  are brought into varying degrees of contact-pressure with the platinum studs  $q^3$  on the springs  $q^2$ .

Having now described my invention, what I claim is—

1. A telephone system in which, by means of a variable-contact pole-changing circuit-closer operated by a diaphragm under the influence of sound-vibrations, electrical connection with a line-wire is alternately made and broken from opposite poles of a battery or batteries, the makes and breaks of the circuit being attended by varying pressure between the contact-points of the circuit-closer, and battery currents or impulses of alternately opposite polarities and varying force are caused to pass over the line-circuit in correspondence to sound-vibrations, substantially as set forth.

2. In a telephone system, the combination, with a main line and a main battery or batteries, of a pole-changing circuit-closer, a transmitting plate or diaphragm, and a suitable lever having a short arm connected with said plate or diaphragm and a long arm arranged to act upon said circuit-closer, for alternately making and breaking electrical connection between the line and ground and the opposite poles of one or more batteries with a varying contact corresponding in force and frequency with the movements of said lever and diaphragm or plate under the influence of sound-vibrations.

3. A telephone system in which a lever is caused to vibrate or oscillate by the transmitter-diaphragm, and to come in contact alternately with the opposite terminals or electrodes of a battery with a pressure-contact corresponding to the amplitude of the vibrations of the said transmitter-diaphragm, substantially as described.

4. The combination, with the diaphragm of a transmitting-telephone, of the lever G, provided with a projection bearing against said diaphragm, the carbon buttons  $p'$   $p'$ , both adapted for connection with the line-wire, and the springs  $q$ , adapted to be respectively connected with the opposite poles of a battery, substantially as described.

5. The combination, with the lever operated by the diaphragm, of the line and battery contact devices, each composed of a rocking insulating-block carrying on a suitable support a carbon button arranged for connection

with the line-wire, and carrying also a platinum stud supported adjacent to said carbon button and between it and the lever by a suitable spring, said springs of the contact devices being arranged respectively for connection with opposite poles of a battery, substantially as described.

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

CHARLES A. RANDALL.

Witnesses:

R. T. VAN BOSKERCK,  
G. E. FROST.