No. 622,645. Patented Apr. 4, 1899.

F. H. BROWN.

ELECTROHARMONIC SIGNALING APPARATUS FOR TELEPHONE SYSTEMS.

(Application filed May 3, 1897.)

(No Model.)

Fig. 1.

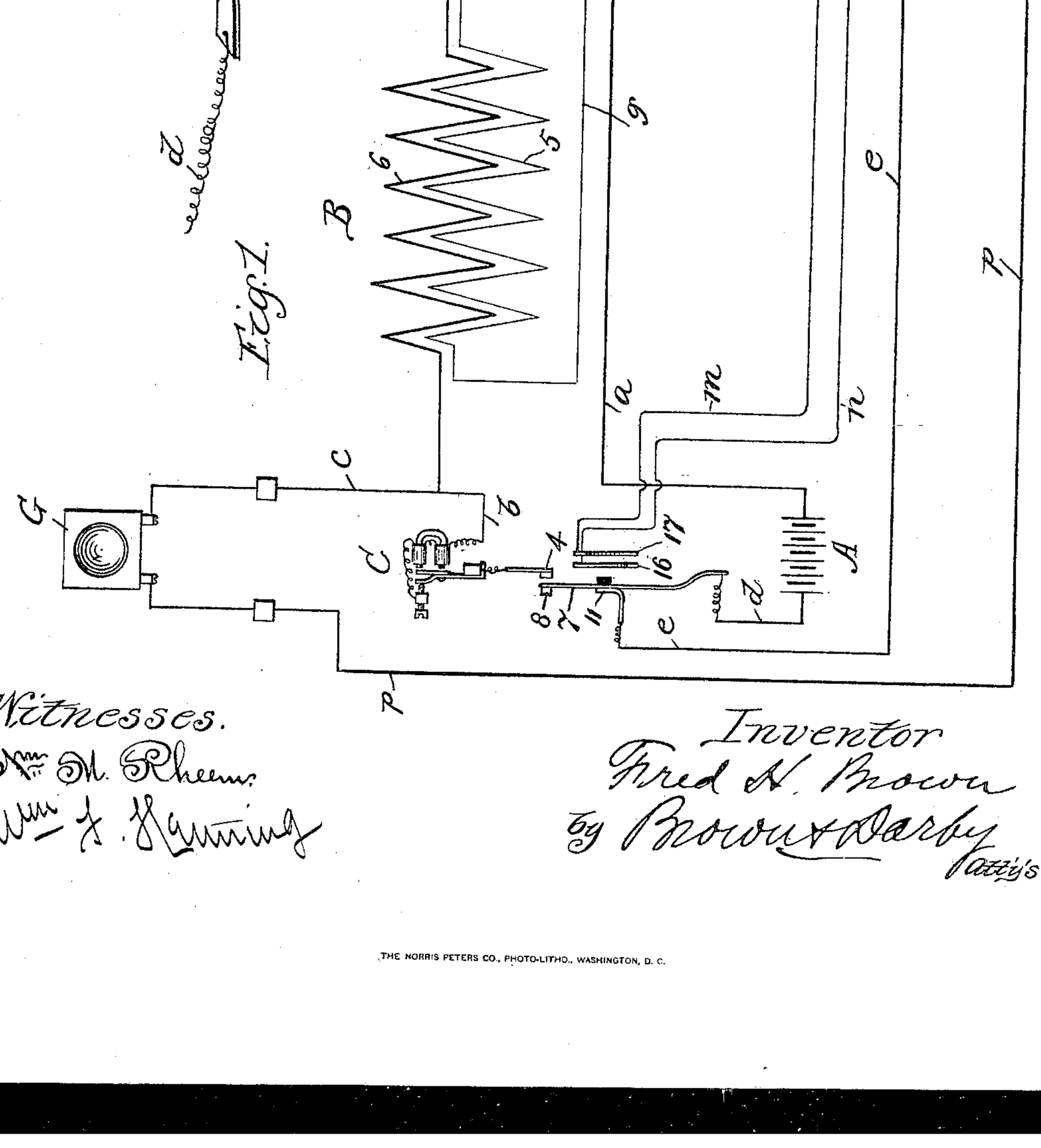


Fig. 2.

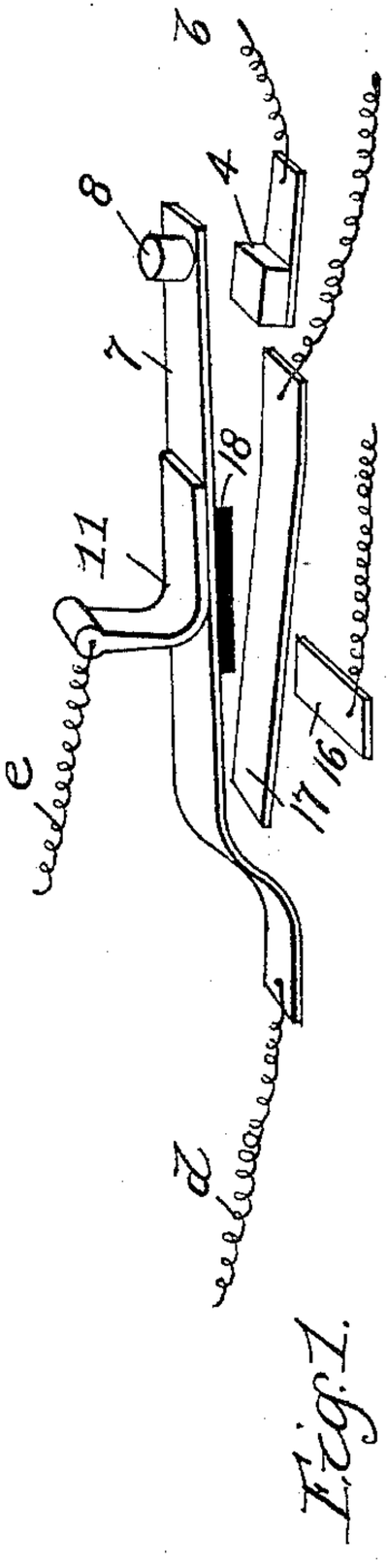
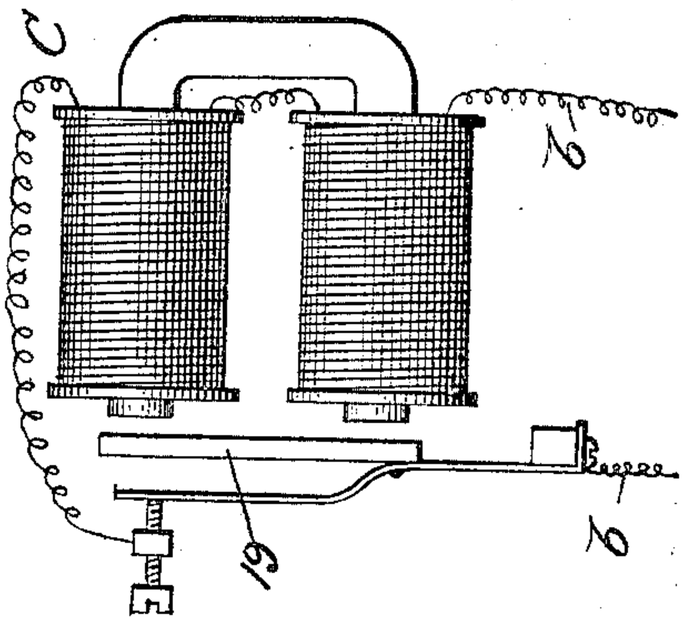


Fig. 3.



Witnesses.
Wm. M. Rheems.
Wm. F. Fleming

Inventor
Fred H. Brown
by Brown & Darby
Atty's

UNITED STATES PATENT OFFICE.

FRED H. BROWN, OF CHICAGO, ILLINOIS.

ELECTROHARMONIC SIGNALING APPARATUS FOR TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 622,645, dated April 4, 1899.

Application filed May 3, 1897. Serial No. 634,853. (No model.)

To all whom it may concern:

Be it known that I, FRED H. BROWN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Electroharmonic Signaling Apparatus for Telephone Systems, of which the following is a specification.

This invention relates to electroharmonic signaling apparatus for telephone systems.

The object of the invention is to provide a signal for telephone systems wherein the use of a call or signal bell is avoided and wherein the signal is made by producing a harmonic sound.

The invention consists, substantially, in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally specifically pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference-signs appearing thereon, Figure 1 is a view in diagram illustrating the principles of my invention. Fig. 2 is a detail view, slightly in perspective, showing the arrangement for cutting out of circuit the receiver at the local station when a signal is sent therefrom. Fig. 3 is a detail view showing a form of rheotome employed in connection with my invention.

In the drawings reference-sign A designates a suitable battery, and B an induction-coil, one terminal of the primary 6 of which is in circuit through connection *a* with one pole of the battery A. The other terminal of the primary 6 of the induction-coil is in circuit respectively through connections *b* and *c* with a contact 4 and the local transmitter G. A suitable rheotome C is arranged in circuit with the connection *b*, whereby when said circuit is closed between the poles of the battery A an interrupted current of high speed of interruption is sent through the primary 6 of the induction-coils. The other pole of battery A is in circuit through connection *d* with a suitable circuit-closing device, which, as shown, may comprise an arm or lever 7 normally held out of contact with contact 4 and which may be provided with a push-button 8, by which said arm or lever may be moved to make contact with point 4 and close the battery-circuit therethrough, and hence through the primary 6 of the induction-coil. Of course it will be understood that I do not confine myself to this specific construction and arrangement, as many other forms of circuit-closing devices may be employed and still fall within the spirit and scope of my invention. The local transmitter is in circuit through connection *p* with a contact 9, through which circuit is made or broken by a contact 10, carried by, but insulated from, a suitable lever D. The insulated contact 10 is included in circuit through connection *e* with a contact 11, with which the arm or lever 7 contacts when said arm or lever is in its normal position.

From the foregoing description it will be seen that when the battery-circuit is completed through contact 4—that is, when the lever or arm 7 is depressed to make the contact therewith—the circuit is broken through arm 7 and contact 11, and the full strength of the battery-current energizes the primary coils 6 of the inductorium, the current being interrupted by means of the rheotome C. It will also be seen from the foregoing description that when the circuit is broken through contact 4—that is, when the arm or lever 7 is released and is permitted to return to its normal position—circuit is completed through contact 11, and now if circuit should be completed through contacts 9 and 10 it will be seen that the battery-circuit is closed through the transmitter of the local station and thence through the primary coils 6 of the inductorium.

I will now describe the leads of the secondary 5 of the induction-coils and the arrangement of the receiver and the receiver cut-out. One of the terminals of such secondary 5 is included in circuit through connection *f* with the line-wire. The other terminal of the secondary is included in circuit through connection *g* with the coils of receiver E, said connection *g* leading first to lever D, and thence through connection *h* to and through the receiver E, and thence to the return or ground wire connection *k*. The lever D, as shown, and preferably, is pivotally mounted, and one arm 12 thereof serves as a support for the receiver E. Another arm 13 of said lever carries the insulated contact 10. Still

another arm 14 of said lever is arranged to make and break circuit through said lever and a shunt connection *l* from line-wire connection *f*. The arrangement of lever D is such that when the weight of the receiver E is imposed on the arm 12 of said lever circuit is made through shunt connection *l* and said lever and circuit is broken between the contacts 9 10. Means—such as a spring 15, for instance—may be provided for normally maintaining a completed circuit between contacts 9 10 and breaking circuit through shunt connection *l*, the force of said spring being effective for accomplishing these results when the weight of the receiver is released from arm 12. Of course it will be readily seen and understood that my invention is not limited or confined to the specific details and arrangement shown and described in this regard, as many mechanical variations in such details would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention, the important and essential feature being that when the receiver is hung up the circuit is broken between contacts 9 10 and is completed through shunt-circuit *l*, and when said receiver is removed from its support circuit through such shunt connection is broken and circuit through the contacts 9 10 is completed.

Two normally-separated contacts 16 17 are respectively included in circuit through connections *m n* with connections *h* and *k*, the point of communication of connections *m* and *h* being intermediate the terminal of the secondary coil 5 of the induction-coil and the coils of the receiver, while the point of communication of connections *n* and *k* is intermediate the coils of the receiver and the return line or ground wire. From this it will be seen that when circuit is completed between contacts 16 and 17 the receiver is cut out or shunted from the circuit of the secondary of the induction-coils. In practice, and as clearly shown in Fig. 2, I prefer to arrange the contacts 16 and 17 in position to be closed upon each other when the lever 7 is depressed to break the circuit through contact 11 and to complete the circuit through contact 4. It is important, however, that the contacts 16 and 17 be insulated from said lever 7, and therefore I mount a strip or block of insulation 18 on said lever, and I arrange one of the contacts to be engaged by said insulation when said lever is depressed and thereby made to contact with the other of said contacts.

The operation will be readily seen and understood from the foregoing description and is as follows, supposing the parts to be in their normal position and the receiver hung upon the arm 12 of the lever D: Now suppose it is desired to signal the local from a distant station, the current sent over the line-wire from the distant station will take the following course: through connection *f*, shunt connection *l*, lever D, connection *h*, the receiver, and thence to the return or ground wire connection *k*. Now if the transmitting-current is an interrupted current and such current is interrupted with sufficient rapidity a harmonic sound is produced in the receiver dependent in pitch upon the rapidity of break of the passing current, and this harmonic sound forms the signal at the local station. Thus it will be seen that the signaling-current is shunted around the secondary of the induction-coils and passes directly through the receiver, the entire energy thereof being utilized to effect the production of the harmonic sound in the receiver. When the signal has thus been given, the receiver is removed from its support, thereby breaking the circuit through shunt connection *l* and completing the circuit through contacts 9 10. This action completes the local-transmitter circuit as follows: from the battery A, through connection *d*, contact 11, connection *e*, contacts 9 10, connection *p*, the local transmitter G, connection *c*, the primary 6 of induction-coils B, and connection *a* to the battery. At the same time the receiver-circuit is completed as follows: from line-wire connection *f*, the secondary 5 of induction-coil B, connections *g h*, the coils of the receiver, and to return or ground wire connection *k*. Under these conditions a message may be received or transmitted, the variable resistance interposed in the transmitter-circuit, which is the circuit of the primary coils of the inductorium, by reason of the vibrations of the diaphragm under the influence of the sound-waves of the voice against the variable contact of the transmitter in the well-known manner, effecting the required variation of the current through the primary to reproduce or induce electrical undulations in the secondary and hence in the line-circuit, and hence also in the receiving instrument at the distant station.

Now suppose it is desired to send a signal from the local station. The receiver is first removed from its support, thereby breaking the circuit through shunt connection *l* and completing circuit through contacts 9 10. Circuit-closer lever or arm 7 is then depressed—as, for instance, through push-button 8—thereby breaking circuit, including said lever and contact 11, and completing the circuit from the battery A, through lever or arm 7, contact 4, the rheotome C, connection *b*, the primary of the induction-coil, and back to the battery through connection *a*. Thus the full strength of the battery-current is utilized in energizing the primary of the induction-coils, and by reason of the interruptions in said circuit due to the location therein of rheotome C an interrupted current is induced in the secondary, the circuit of which includes the line-wire connection *f* from one terminal of such secondary and connection *g*. Now it will be remembered that the depression of the circuit-closer 7 effects a closing of the contacts 16 17 upon each other. Therefore instead of this induced current passing

through the local receiver such current is shunted around the receiver from connection *g h*, through connection *m*, contacts 16 17, and connection *n* to the return or ground wire connection *k*, thereby effecting a signal at the distant station. The removal of the receiver at local station from its support also completes the circuit through contacts 9 10, and therefore as soon as the distant station is signaled the releasing of the lever 7 again establishes circuit through said lever and contact 11, and hence the conditions are suitable to send or to receive a message.

In order that the signaling-current from the battery through the primary of the induction-coil may be interrupted with sufficient rapidity, it is necessary to employ a rheotome of such construction as to accomplish the desired object. I have shown in Fig. 3 a form of rheotome suitable for the purpose, and which consists simply of an ordinary buzzer the armature 19 of which is capable of vibrating with great rapidity.

From the foregoing description it will be seen that I provide an exceedingly simple signaling apparatus for telephone systems, one which is thoroughly efficient and economical wherein the use of a magneto or other form of generator operated by hand is avoided and entirely dispensed with, and wherein the signal is a harmonic sound and wherein a signal or call bell is dispensed with.

In my companion application, Serial No. 634,854, filed of even date herewith, I have shown, described, and claimed the generic principles of my invention. In said application I have also shown, described, and claimed a specific arrangement wherein the principles of my invention are applied to a system employing a signal-bell. I do not, therefore, claim such specific arrangement herein.

Many variations, changes, and alterations in the details of construction and arrangement would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention. While, therefore, I have shown and described a specific construction and arrangement as illustrative of an operative embodiment of the principles of my invention and as embodying the best form and arrangement in which I at present contemplate carrying my invention into practice, I do not desire to be restricted thereto; but,

Having now set forth the object and nature of my invention and a form of apparatus embodying the same and having explained the construction, arrangement, function, and mode of operation thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent of the United States, is—

1. In an electroharmonic signaling apparatus for telephone systems, an induction-coil, a line-wire included in circuit with the secondary of said induction-coil, a battery having one of its poles connected to one terminal of the primary of said coil, a switch-lever connected to the other terminal of said battery, contacts arranged to be respectively engaged by said lever, a circuit including one of said contacts and connected to the other terminal of the primary of said coil, an electromagnetic interrupter arranged in said circuit, an auxiliary circuit including the other of said contacts, a local transmitter arranged in said auxiliary circuit, means for normally holding said lever in position to open said interrupter-circuit and to close said auxiliary circuit, in combination with a distant receiver arranged in the line-circuit whereby when said lever is moved to close said interrupter-circuit, the diaphragm of said distant receiver vibrates harmonically and synchronously with the interruptions in the interrupter-circuit, as and for the purpose set forth.

2. In an electroharmonic signaling apparatus for telephone systems, an induction-coil, a line-circuit including the secondary of said induction-coil, a battery having one of its poles connected to one terminal of the primary of said coil, a switch-lever connected to the other pole of said battery, contacts arranged to be respectively engaged by said lever, a circuit including one of said contacts and connected to the other terminal of the primary of said coil, an electromagnetic interrupter arranged in said circuit, a local transmitter, an auxiliary circuit including said local transmitter, the other of said contacts and the primary of said coil, a local receiver and a distant receiver arranged in the line-circuit, a shunt-circuit for shunting the local receiver, means for normally holding said lever in position to open said interrupter-circuit and to close said transmitter-circuit, and contacts arranged to close the shunt-circuit of the local receiver, said contacts arranged to be actuated by the movement of said lever into position to open said transmitter-circuit and to close said interrupter-circuit, whereby when said interrupter-circuit is closed the diaphragm of the distant receiver vibrates harmonically and synchronously with the interruptions in the interrupter-circuit to produce the signal, as and for the purpose set forth.

3. In an electroharmonic signaling apparatus for telephone systems, an induction-coil, a line-circuit including the secondary of said induction-coil, a battery having one of its poles connected to one terminal of the primary of such coil, a switch-lever connected to the other pole of said battery, contacts arranged to be respectively engaged by said lever, a circuit including one of said contacts and connected to the other terminal of the primary of said induction-coil, an electromagnetic interrupter arranged in said circuit, a local transmitter, an auxiliary circuit including said transmitter, the other of said contacts and the primary of said coil, a local re-

ceiver and a distant receiver arranged in the line-circuit, supports for said receivers, a circuit for shunting said receivers around the secondary of said induction-coil and contacts controlled by said supports for opening and closing said shunt-circuits whereby when said receivers are placed upon said supports said shunt-circuits are closed, and when said receivers are removed from said supports said shunt-circuits are opened, and when said switch-lever is moved to close said interrupter-circuit and to open said local transmitter-circuit the diaphragm of said distant receiver is harmonically vibrated synchronously with the interruptions in said interrupter-circuit, as and for the purpose set forth.

4. In an electroharmonic signaling apparatus for telephone systems, an induction-coil, a line-circuit including the secondary of said coil, a battery having one of its poles connected to one terminal of the primary of such coil, a switch-lever connected to the other pole of said battery, contacts arranged to be respectively engaged by said lever, a circuit including one of said contacts and connected to the other terminal of the primary of said coil, an electromagnetic interrupter included in said circuit, a local transmitter, an auxiliary circuit including said transmitter, the other of said contacts and the primary of said coil, said switch-lever normally opening said interrupter-circuit and closing said transmitter-circuit, a local receiver and a distant receiver arranged in the line-circuit, the diaphragm of said distant receiver adapted to vibrate harmonically and synchronously with the interruptions in said interrupter-circuit to produce the signal, a circuit arranged to shunt the local receiver out of said line-circuits, means actuated by the movements of said switch-lever into position to close said interrupter-circuit for closing said shunt-circuit, a circuit for shunting the secondary of the induction-coil out of line-circuit, a support for the receiver, said support adapted to close said last-mentioned shunt-circuit when the receiver is placed on its support and to open said circuit when the receiver is removed from its support, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 30th day of April, 1897, in the presence of the subscribing witnesses.

FRED H. BROWN.

Attest:

J. R. BELL,

S. E. DARBY.