No. 801,780. PATENTED OCT. 10, 1905.

C. E. EGAN.

TELEPHONIC APPARATUS.

APPLICATION FILED AUG. 16, 1905.

2 SHEETS—SHEET 1.

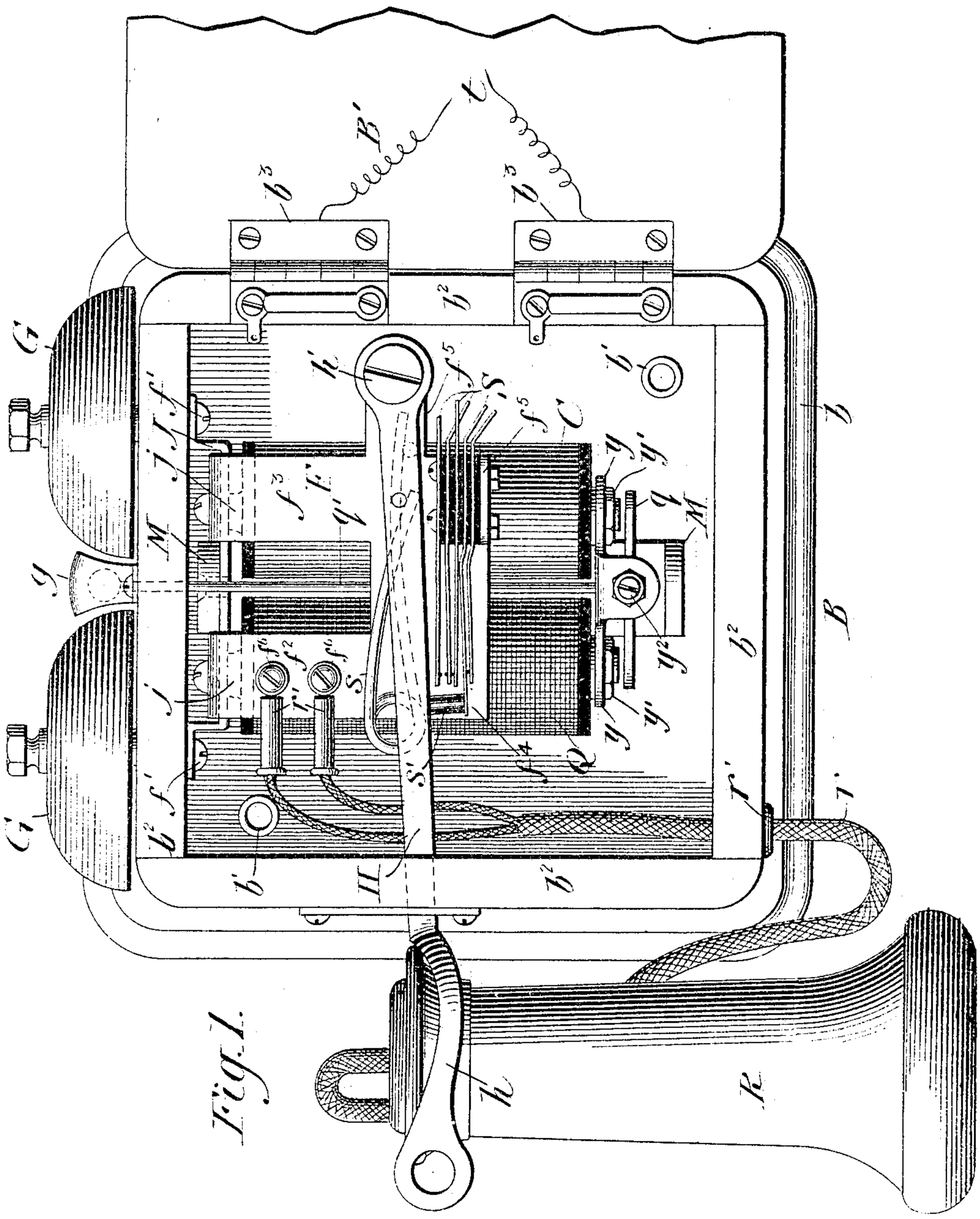

Fig. 1.

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2 SHEETS—SHEET 2.

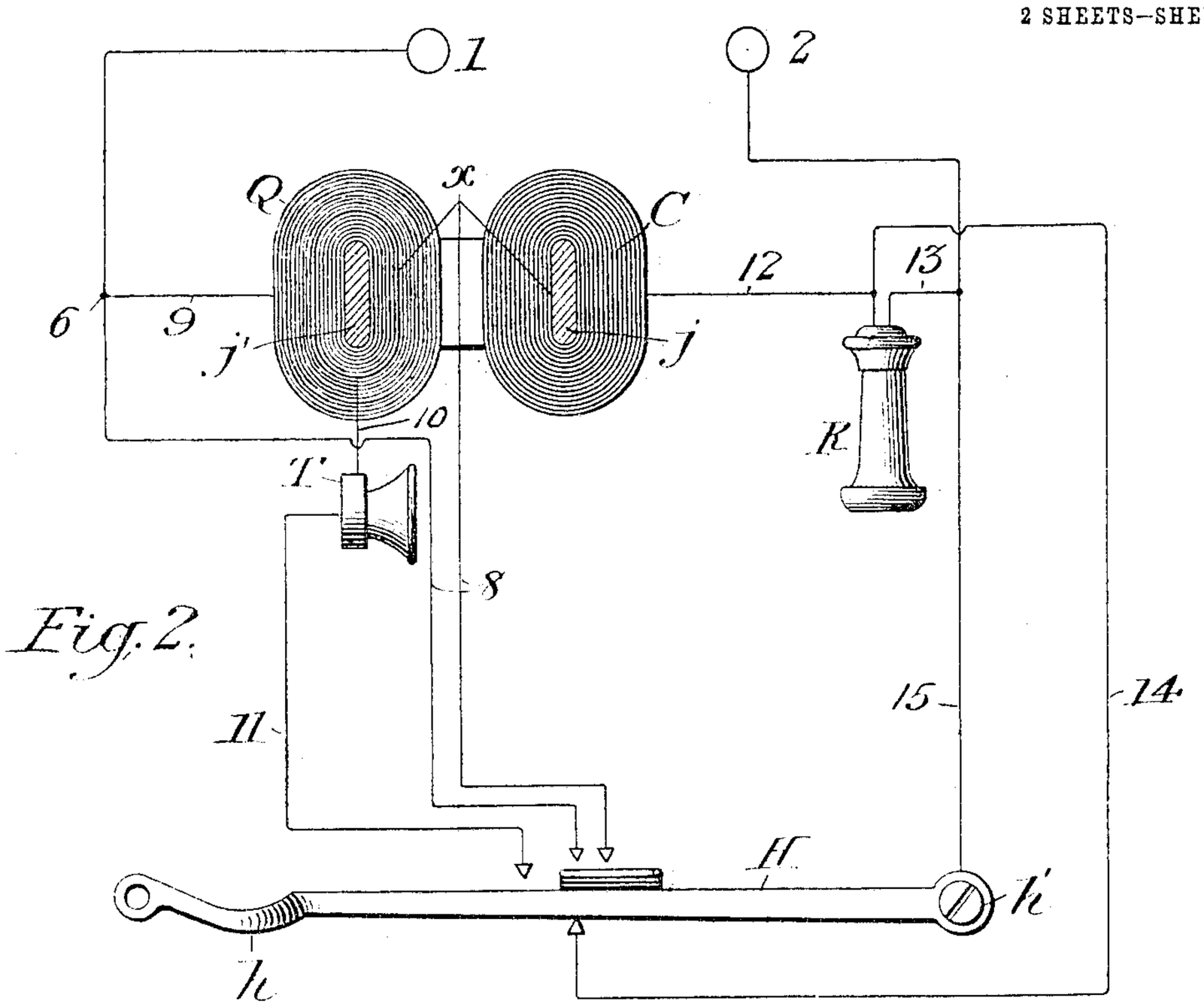


Fig. 2.

Fig. 3.

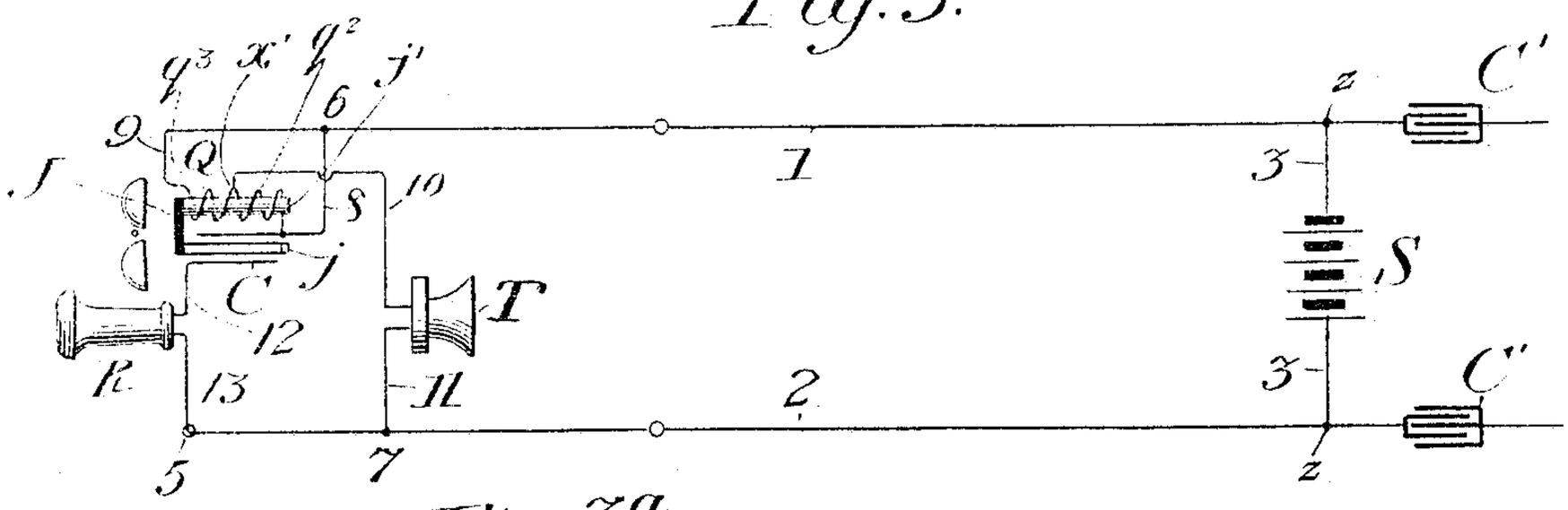
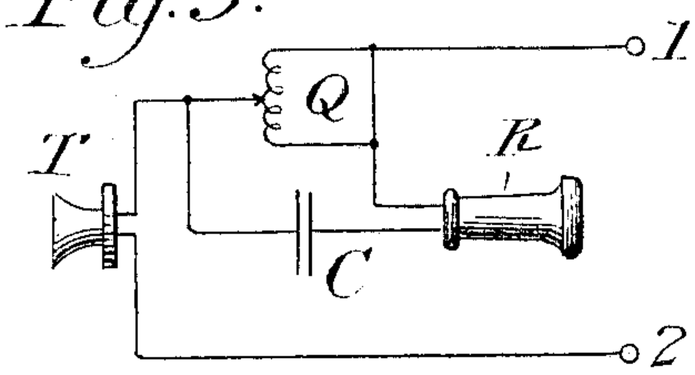


Fig. 3a.



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UNITED STATES PATENT OFFICE.

CHARLES E. EGAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EGAN ELECTRIC AND TELEPHONE MANUFACTURING COMPANY, OF PETERSBURG, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONIC APPARATUS.

No. 801,780. Specification of Letters Patent. Patented Oct. 10, 1905.

Original application filed September 29, 1904, Serial No. 226,504. Divided and this application filed August 16, 1905. Serial No. 274,638.

To all whom it may concern:

Be it known that I, CHARLES E. EGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephonic Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to telephones and telephone systems, and particularly to such as are adapted for use with so-called "common-battery" or "central-energy" supply.

It is the object of my invention to produce an instrument and a circuit therefor which shall be simple and adaptable for use with any central-office circuit, while the instrument set itself shall be very compact and the number of its parts reduced to a minimum, all this without sacrifice of commercial efficiency.

More specifically stated, it is the object of my invention to construct a compact subscriber's instrument for central-energy lines, in which the ringer and condenser are combined in a unitary piece of apparatus with all the other parts mounted or carried thereon. I am thus enabled to inclose my entire set in a very small box or casing, to reduce the cost of manufacture materially, and to render the handling and adjustment of the instrument much easier as well as more certain than in the prior type of instruments of this class.

A further object of the invention, also specifically stated, is to obviate the necessity for an impedance-coil separate from the other parts in the transmitter-circuit. This I accomplish by using a portion of the ringer-winding tapped off to the transmitter branch.

The present application is a division of my previous application filed September 29, 1904, Serial No. 226,504.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a front view of my box or casing with the parts mounted therein. Fig. 2 is a diagram of the same as it is actually wired. Fig. 3 is a diagram showing the parts connected to a line-circuit during use of the apparatus. Fig. 3ª is a diagram showing modified connections.

Referring to the drawings, B is a box substantially square in shape and comprising a base *b*, having a bushed orifice *b'* for the admission of the circuit-wires, inclosing sides b^2, and a hinged lid B'. I mount my transmitter preferably upon the outside of this lid with a knuckle-joint and connect its circuit-wires *t* to the hinge-leaves b^3, which are provided with the usual leaf-springs to insure a good connection. The inside wiring is taken to the transmitter through the twin leaves of the hinges, although it is to be understood that I do not limit myself to this, as I can substitute a flexible cord or other connection to the transmitter, if desired.

Upon the top of the box are the gongs G, between which plays the usual clapper, protected by a cap *q*. This clapper is carried upon the end of a rod *q'*, rigidly attached to and vibrating with the armature *q*, which is pivoted at y^2 in a yoke *y*, supported upon the lower ends of the cores *j j'* by means of the nuts *y'*. These cores lie parallel to each other and have their upper ends attached to and magnetically connected by the yoke J. This yoke also serves as a supporting means for the entire structure, being attached to the upper wall of the box by two screws or bolts *f'*, preferably having terminal nuts on the outside of the box. The armature *q* is polarized, as are normally the cores, by a permanent magnet M, also carried on the yoke J.

Upon the core *j'* I place a winding Q of insulated wire in most cases to a resistance of approximately one thousand ohms. This winding is shown, and the core is supposed to be approximately cylindrical in shape; but I wish to state that an important feature in the structure is the production of a high winding or a winding of large bulk in a space which shall not require the cores to be widely separated. I therefore make the winding in many cases and the core also oval or elliptical, with the short axis pointing toward the other core. The long axis would then be in the line of sight of Fig. 1. This elliptical form is indicated in Fig. 2. Upon the twin core *j* I place a wrapping of thin tin-foil sheets separated by paraffined paper or similar material to form a condenser. This is rolled up to approximately the same size as the winding Q and is marked C in all the figures. I contemplate making this also oval or elliptical in cross-

section, whereby the flat sides of the coil and condenser lie together, the long axes of the two ellipses being parallel. In this way a very considerable capacity can be obtained with small lateral dimensions.

Secured upon the yoke J is a side plate F, provided with two upwardly-extending arms f^2 f^3, having their upper ends bent over upon the yoke and screwed or otherwise secured thereto. Upon the arm f^2 I mount the two binding-posts or terminals f^6, which are bushed in the plate and insulated therefrom, as shown in Fig. 1. These binding-posts receive the tips r' of the flexible cord r, leading to the receiver R. This cord passes out through a bushed opening r' in one side of the box. The lower part of the plate F has a side extension f^5, into which is threaded a shoulder-screw h', constituting the pivot for the hook-lever H, whose outer end extends through the side of the box and is bifurcated at h to hold the receiver, whose weight normally holds it down against the force of the spring s, one end of which rests against a pin on the lever and the other end upon a pin set into the plate F. Beneath the lever and mounted upon a forward extension or flange f^5 of the plate F are the terminal contact-springs S, formed, preferably, of German silver with platinum contacts. One of these springs is longer than the other and is engaged by a stud s' of insulating material on the hook-lever, so that when the latter is down the lower springs are in contact; but when the lever is up the lower springs are separated and the upper springs are forced together. Circuit connections of these springs are shown in Fig. 2.

Referring to Fig. 2, I show two line-terminals No. 1 and No. 2. In case of a single-wire line one of these would be grounded. In wiring the instrument the first terminal is connected to the winding Q and also by branch 8 to one of the upper contact-springs S. The other terminal is connected to one of the receiver-terminals and also to the long spring of the hook-switch. The other connections of the coil and condenser, transmitter, receiver, and hook-switch are apparent without description. It will be observed that the winding Q and the condenser C are permanently connected in series and are thus bridged across the line in series with the receiver when the hook is up, a parallel bridge being then closed, however, through the transmitter. When the hook is down, the receiver is shunted by a path of no resistance and the transmitter branch is open. The principal feature of my circuit connections resides in the manner of utilizing the coil or bobbin Q on the ringer for two separate functions, usually performed by separate pieces of apparatus. When the hook is down—*i. e.*, when the instrument is idle and connected to line for signaling current only—the circuit is from No. 1 terminal through the wire 9 and the coil Q, through the condenser C and wires 12, 14, and 15, around the receiver to terminal No. 2. Continuous current cannot pass through this path by reason of the inclusion of the condenser C; but alternating or pulsating currents, which I have designated as "periodic" currents, can pass to actuate the ringer. From a point on the winding Q intermediate of its ends I take off a branch wire 10 to the transmitter T, from which a wire 11 passes to the hook-switch. A second intermediate branch wire 8 connects the No. 1 line-terminal with the point x between the coil Q and the condenser C. The continuity of this wire 8 is normally interrupted at the switch, but is completed when the hook goes up. The talking-circuits are then as shown in the diagram, Fig. 3. In this figure I have omitted the switch-hook and springs for the sake of clearness and simplicity and have shown the line-wires connected through points z z, representing jack and plug contacts, to the main battery S, supposed to be bridged across the cord at 3 3. Line-wire 1 extends from the central office to the substation, where it is connected to the extremities of the coil Q by wires 8 and 9. Line-wire 2 similarly extends to the substation and is there connected to the transmitter T and receiver R by the wires 11 and 13, respectively. From the receiver the wire 12 extends to the outside terminal of the condenser C, and from the transmitter the wire 10 extends to the point x' on the coil Q intermediate of its ends. The two portions of the winding marked q^2 and q^3 may be made anything desired by shifting the point of connection x'. If they are equal—that is, if in a coil having a total resistance of one thousand ohms—they are each of five hundred ohms resistance. Being in parallel in the transmitter-circuit, its resistance will be two hundred and fifty ohms plus the internal resistance in the transmitter—say fifty ohms—or a total of three hundred ohms. This can be made smaller to any desired degree by selecting a point x' near one terminal of the coil.

Obviously for talking-currents over the line the path 8, C, 12, R, 13 is closed, while for battery-current the transmitter-path alone—8, 9, q^2, q^3, 10, T, 11—is closed.

I may also so arrange the contacts on the switch-hook that the condition in Fig. 3^a is produced in talking with the hook up, the receiver and condenser then being in a shunt around the coil and in the direct path of speech-currents through the transmitter.

It will be observed that by my arrangement I utilize the ringer-winding as such for ringing and as an impedance-coil when the telephone is in use, saving thereby the separate impedance-coil commonly used. I also produce a self-contained telephone set without separate condenser or impedance-coil as commonly employed, thereby not only effecting

a marked economy, but reducing the size of the set and the number of parts and connections, making it much easier to transport, to install, and to maintain in order.

I am aware that many changes may be made in the apparatus I have illustrated and described without departing from the spirit of the invention, and I wish it understood that I contemplate all such changes as within the scope and purview of my claims.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a telephone set the combination of a ringer, a condenser, and an impedance-coil in one unitary structure, substantially as described.

2. In a telephone set the combination of a ringer, a condenser, and an impedance-coil in one unitary structure, the condenser and the winding of the ringer extending parallel and in close proximity to each other, and being elliptical in cross-section, with the major axes of the elliptical figures parallel, substantially as described.

3. In a telephone set the combination of a ringer, a condenser, and an impedance-coil in one unitary structure, the same comprising a pair of connected cores flat or elliptical in cross-section, a magnet-winding on one core, the condenser wound on the other, said magnet and condenser being also flat or elliptical with their flat sides together, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES E. EGAN.

Witnesses:

WM. J. BENNETT,

WILLIAM E. HANLON.