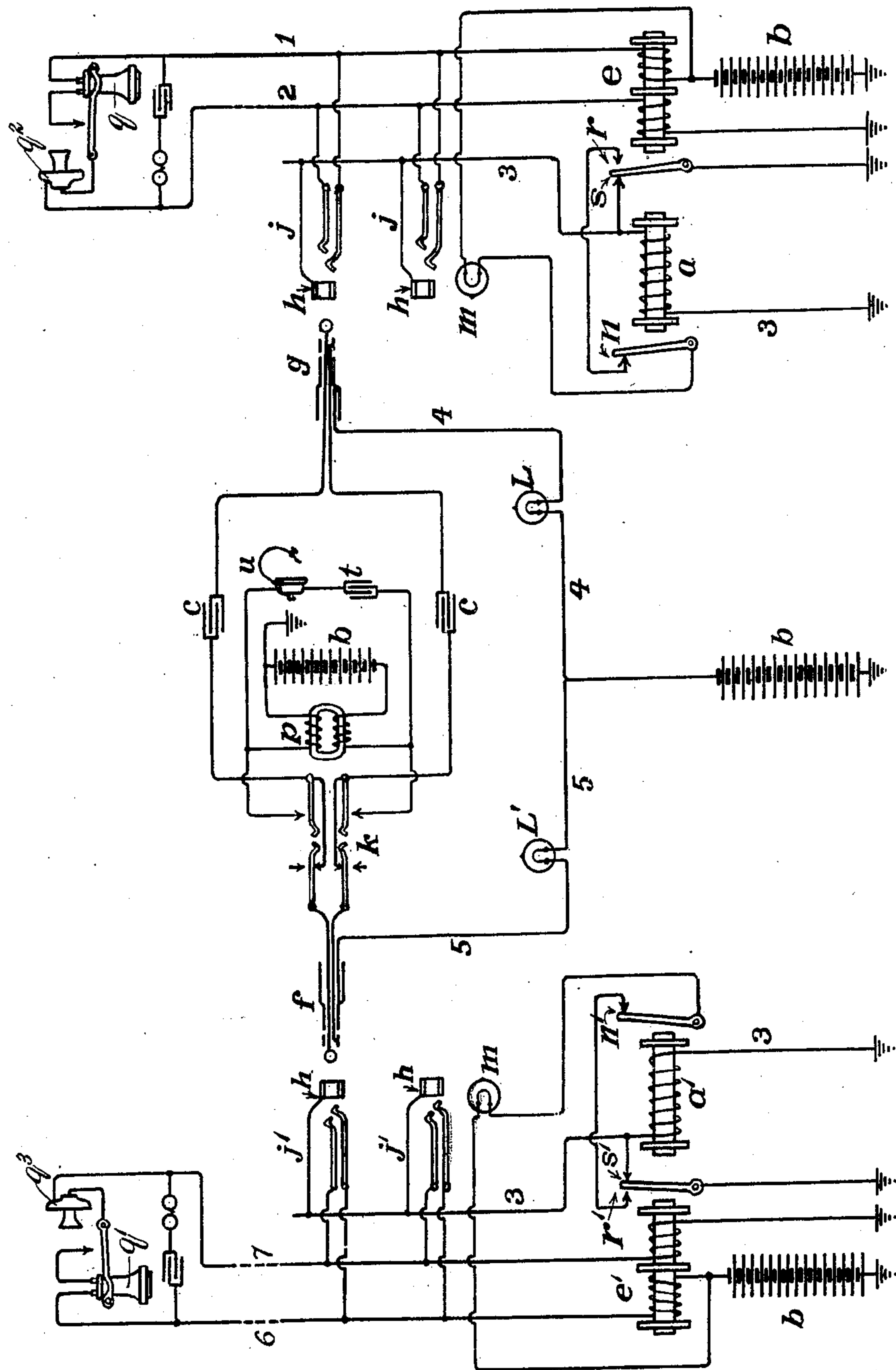


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T. W. GARDNER.  
 SIGNALING DEVICE FOR TELEPHONE EXCHANGES.  
 APPLICATION FILED FEB. 15, 1906.



Witnesses.

*Wm. Hunter for*  
*H. E. Green*

Inventor.

*Thomas West Gardner*  
 per *Lawson*  
 Attorneys



# UNITED STATES PATENT OFFICE.

THOMAS WEST GARDNER, OF NASHVILLE, TENNESSEE.

## SIGNALING DEVICE FOR TELEPHONE-EXCHANGES.

No. 897,731.

Specification of Letters Patent.

Patented Sept. 1, 1908.

Application filed February 15, 1905. Serial No. 245,728.

*To all whom it may concern:*

Be it known that I, THOMAS WEST GARDNER, a citizen of the United States, and a resident of Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Signaling Devices for Telephone-Exchanges, of which the following is a specification.

My invention relates to improvements in signaling devices for the equipment of telephone exchanges of the common battery type, the objects of the invention being:— first, to make provision for obtaining the busy test click in systems in which the cord circuit transmission is of the condenser type.

It is further desired to provide a novel combination of apparatus for controlling the operation of the supervisory signal.

I attain these objects by the arrangement of apparatus and connecting wires, illustrated in the accompanying drawing, in which:—

The figure is a diagrammatic view illustrating my invention as applied to a telephone system in which the cord circuit is of the condenser transmission type.

In the above drawings,  $q$  and  $q^2$ , and  $q'$  and  $q^3$ , are the receivers and transmitters, respectively, of two subscribers, while  $j$  and  $j'$  are jacks connected in the well known manner. One of the talking wires, as 1, is connected to a source of electrical energy  $b$  (in the present instance a battery) through a winding of a relay  $e$  which has a second winding interposed between the second talking wire 2 and the ground. These two windings being on a common core form a balanced impedance coil and actuate an armature, serving as a double pole switch whose pivoted terminal is grounded. Another terminal  $r$  of this switch is connected through a second switch  $n$  with the line signal lamp  $m$  while the third terminal  $s$  is connected to a line 3. This line connects at one end with the test rings  $h$  of all the jacks  $j$ , while its other end is grounded through a winding  $a$  of relatively high resistance which also serves to actuate the switch  $n$ . In the operator's circuit are the customary supervisory signal lamps  $L$  and  $L'$ , together with a condenser  $t$  in series with the operator's telephone and balanced impedance coils  $p$ , two of which terminals are respectively connected to the terminals of the operator's talking circuit while the other two terminals of said coils are respectively connected to the terminals of the generator  $b$ . There is also the

well known combination ringing and listening key  $k$  and the second cord plug  $f$ . The apparatus employed in connection with the second subscriber's instruments  $q'$  and  $q^3$ , being a duplication of that previously noted in connection with the instruments  $q$  and  $q^2$ , will not be described in detail.

When the receiver is removed from its hook, a circuit is completed from battery  $b$  through the windings of relay  $e$ , drawing up armature of said relay. The motion of this relay causes the opening of contact  $s$  and the closing of local contact  $r$ . The closing of contact  $r$  completes a local circuit from battery  $b$  through line signal  $m$  by way of back contact  $n$  of relay  $a$ , which illuminates said line signal. The operator in response inserts plug  $g$  in jack  $j$ , which operation, in addition to making metallic connection with "talking wires" 1 and 2, closes a circuit from battery  $b$  by way of wires 4, through supervisory signal  $L$  and sleeve of plug  $g$ , said sleeve making metallic contact with "test ring"  $h$  of jack  $j$ , incidentally providing change of polarity, thence through wires 3 and winding of relay  $a$ . Now, winding of relay  $a$  is sufficiently high in ohmic resistance to prevent illumination of supervisory signal  $L$ , when said supervisory signal and winding are thrown in series relation, but relay  $a$  is sufficiently sensitive to operate quickly and positively in the same series circuit with supervisory signal  $L$ . The operation of said relay opens contact  $n$ , thus disconnecting and extinguishing line signal  $m$ . After learning the desired number, the operator inserts the calling plug  $f$  into the jack  $j'$  of the line wanted and operates ringing key  $k$ , ringing subscriber's bell in the usual manner, said line being indicated by 6 and 7. The placing of plug  $f$  in jack  $j'$  closes a circuit from battery  $b$  by way of wire 5 through supervisory signal  $L'$ , sleeve of plug  $f$ , test ring  $h$ , and back contact  $s'$  of relay  $e$ , thus causing the illumination of said supervisory signal  $L'$ . Upon the removal of receiver  $q'$  and the subsequent operation of relay  $e'$ , the shunt path around relay  $a'$  is broken by opening of contact  $s'$ , thus placing winding of relay  $a'$  in series relation with supervisory signal  $L'$ . As before stated, the ohmic resistance of said winding is sufficiently high to prevent the illumination of supervisory signal, and in this manner said signal is extinguished. These various operations having been gone through with, the two subscribers receive



transmission of speech electrically through a scheme of bridged impedance coils (incorporated in design of relays  $e$  and  $e'$ ) and interposed condensers  $c$  in the manner well understood in the art. Upon completion of conversation, and replacing of receivers upon their respective hooks, armatures of relays  $e$  and  $e'$  fall back, closing contacts  $s$  and  $s'$ , thereby shunting out the windings of relays  $a$  and  $a'$ , and illuminating supervisory signals  $L$  and  $L'$ . The operator upon the illumination of said signals withdraws the plugs  $f$  and  $g$ .

Provision for obtaining the busy test "click" in connection with the condenser transmission method is made by the insertion in the operator's telephone circuit of the bridged impedance coil  $p$ . This coil is of high ohmic resistance and impedance, consisting of two balanced windings on the same core and designed to operate in connection with the battery  $b$  to keep the condenser  $t$  (which is in series with operator's telephone  $u$ ) charged continually. Upon throwing listening key  $k$  the tip of the plug  $f$  is brought into metallic connection, through one winding of the coil  $p$ , with the same pole of battery  $b$  as is connected with the test rings  $h$  of all the jacks  $j, j'$ , etc., of the idle lines. Thus, upon "testing" the ring  $h$  of the jack of an idle line no current is caused to flow, but, as before stated, the polarity of said test rings is reversed while line is in use. After this reversal, upon making the "test" with the tip of the plug, a circuit is completed through a winding of coil  $p$  which, since this latter is of high impedance,

does not result in any sudden flow of current. The momentary drop of potential, however, causes the discharge of condenser  $t$  through the operator's head telephone, giving the "busy click".

I claim as my invention:—

1. A telephone system including a source of electrical energy, a central exchange, an operator's set, two balanced windings having a common core, a condenser in series with the operator's head receiver, and connections between said apparatus such that the condenser is maintained in a charged condition by the battery and said windings, substantially as set forth.

2. A telephone system including a source of electrical energy, a central exchange, an operator's set, two balanced windings having a common core, a condenser in series with the operator's head receiver, and connections between said apparatus such that the condenser is maintained in a charged condition by the battery and said windings, and means for connecting a terminal of the operator's plug to one of said windings, the connections of the system being such that a terminal of a jack in use has a polarity different from that of said plug terminal, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

THOMAS WEST GARDNER.

Witnesses:

J. W. HUNTER, Jr.,  
H. G. GREEN.