

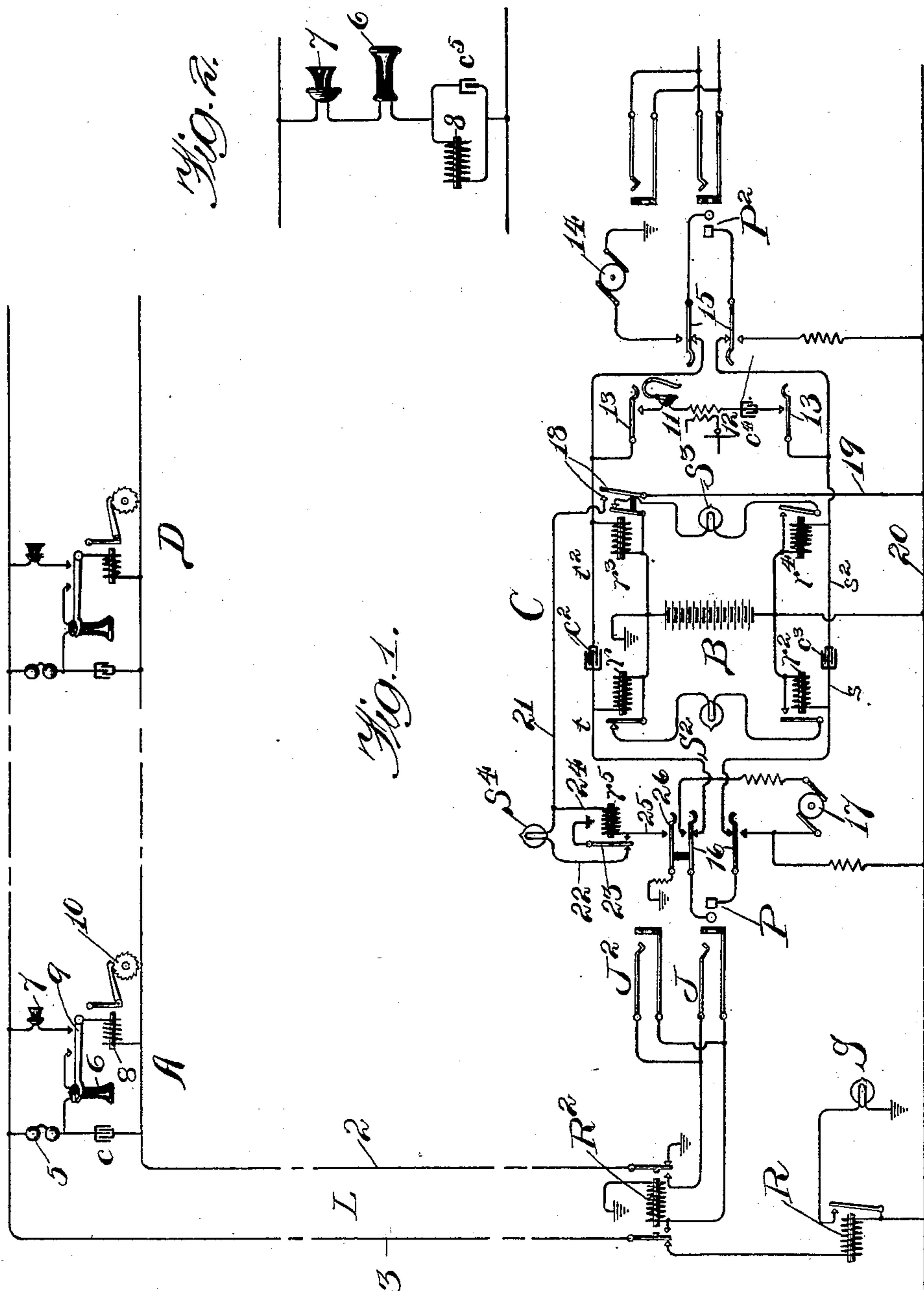
No. 886,498.

PATENTED MAY 5, 1908.

J. HARRISON.

SYSTEM FOR MEASURED TELEPHONE SERVICE.

APPLICATION FILED MAY 10, 1905.



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SYSTEM FOR MEASURED TELEPHONE SERVICE.

No. 886,498.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed May 10, 1905. Serial No. 259,793.

To all whom it may concern:

Be it known that I, JAMES HARRISON, citizen of the United States, residing at St. Louis and State of Missouri, have invented
5 a certain new and useful Improvement in Systems for Measured Telephone Service, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part
10 of this specification.

The object in general of the present invention is to provide means whereby the service is materially improved, particularly in the respects of quickening the service and rendering the same more certain and satisfactory, and whereby the initial and maintenance cost as well as the cost of operation is greatly reduced.

In my invention I seek to provide a system in which there is quick and standard service for the subscriber, and very little waiting by the operator; in which it is possible for the operator to ascertain if the proper connection has been obtained before registering the call, and which can also be used
25 on party lines with any number of parties on the line or on mixed lines of measured and unlimited service; in which there are no contacts or mechanism at the subscribers station to affect the reliability of the telephone service; in which the subscriber may see at any time the number of calls registered at his telephone and in which there is no additional operation to be made by the subscriber and a minimum amount of switchboard equipment is required. To the accomplishing of these various objects and such others as may hereinafter appear, I provide a system and apparatus for the purpose
40 specified in which the meter is located preferably at the subscribers station and which when so located is responsive to current in the line or over the line only when the subscribers telephone is in use, whereby the same may be applied to party lines since only
45 the meter at the calling subscribers station is affected by the current sent out over the line from the central office to register the call, and which for the same reason may be
50 applied to mixed lines because if there is no measured service device at the calling party's station, no harm is done by the registering current.

In connection with the operator's outfit at
55 the central office I provide suitable instru-

mentalities whereby the registering current may be sent out on the telephone line at the desired time, and I also preferably provide in connection with the operator's cord circuits suitable signaling devices which I term
60 register signals to positively indicate to the operator when the connection is completed so that after establishing the conversational circuit she is not required to listen in and wait until the called party answers to determine if
65 the connection has been satisfactorily completed. In connection with the subscribers circuits, the arrangement is such that the retardation coil or magnet coil already employed in some systems may be utilized as
70 the operating magnet of the registering meter. The invention further includes a novel manner of including the meter magnet in any telephone circuit.

The invention may be employed with various types of telephone lines and various subscribers circuits.

Referring to the accompanying drawing, Figure 1 is a diagram of a telephone system to which the invention may be applied, and
80 Fig. 2 is a diagram showing how the meter may be applied to any telephone circuit.

Referring to Fig. 1, L indicates a telephone line of the exchange extending in two limbs 2 and 3 from one or more substations, such as
85 A and D, to the central office C, where it is fitted with the usual devices including an answering jack J and a plurality of multiple jacks J² in any desired number, a line relay R controlling the circuit of the line signal S,
90 preferably in the form of a small incandescent lamp, and a cut-off relay R² having its winding legged to ground from the sleeve side of the switchboard section of the line and serving when operated to disconnect the line
95 relay from the telephone line to retire the line signal or render it inoperative and to connect the external portion of said line with the switchboard section for conversational purposes.

At the subscribers station any usual apparatus may be provided, that shown including a bell 5 and a condenser c normally in a bridge of the telephone line, a receiver 6,
105 transmitter 7, and a retardation coil 8, arranged to be suitably connected in circuit when the receiver is lifted from the switch hook 9. In the specific arrangement shown when the receiver is so taken up the condenser c and receiver 6 are in a parallel path
110

with the retardation coil 8, and both are in series with the transmitter 7 across the line, whereby the battery current from the central office is confined by the condenser c to the path through the retardation coil 8 and transmitter 7, while the voice currents are compelled by the retardation of coil 8 to traverse the path through the condenser c , receiver 6 and transmitter 7. The meter 10, of any desired type is also located at the subscribers station, and in the specific arrangement shown, is adapted to be operated by the magnet 8 although it is apparent that any suitable magnet located in any suitable place may be employed. By thus employing the magnet 8 both as a retardation coil and as an operating magnet of the meter it is obvious that in the combined apparatus a reduction of one coil for each station results. This magnet 8 is adjusted either mechanically or electrically in a manner well understood by those skilled in the art so as not to respond to currents normally flowing over the telephone during conversation or ringing but to respond to the registering current impressed upon the line at the central office when it is desired to register the call.

At the central office each operator is provided with a plurality of cord circuits of the desired type, that indicated in the drawing including an answering plug P and a calling plug P^2 each having tip and sleeve contacts adapted to register with the corresponding contacts of the spring jacks when inserted therein. The tip contacts of these plugs are joined by the flexible strands t and t^2 , and the interposed condenser c^2 , while their sleeve contacts are similarly united by the strands s and s^2 , and interposed condenser c^3 . The supervisory relays r and r^2 are bridged across the answering end of the cord circuit upon opposite sides of the common battery B and together control the local circuit of the supervisory signal S^2 associated with the answering plug P . Similar supervisory relays r^3 and r^4 are bridged across the calling end of the cord circuit with the battery B , and in like manner control the supervisory signal S^3 associated with the calling plug P^2 . The operator's head receiver 11, the secondary of her induction coil 12 and a suitable condenser c^4 , are adapted to be bridged across the calling end of the cord circuit by the operation of the listening key 13, 13, and a suitable ringing generator 14 is arranged to be connected with the calling plug by the ringing key 15, 15 when it is desired to call the wanted subscriber.

In order to impress suitable current upon the telephone line to operate the service meter at the subscribers station, an additional key 16 is provided in the answering cord which when operated connects a suitable high potential generator 17 with the calling telephone line to impress current upon

said line to operate the meter magnet 8, this being done when the desired connection has been completed.

In order to positively indicate to the operator the response of the called party to remind her that it is time to operate the key 16 to register the call at the subscribers station, I preferably associate a suitable signaling device with said registering key and answering plug, which signaling device I term a register signal and which is preferably initially operated when the called subscriber responds and is retired upon the depression of the registering key and then remains inert throughout the continuance of the connection. In connection with the particular cord circuit shown in the drawing, this is accomplished in the following manner: An additional set of normally open contacts 18 are provided for the supervisory relay r^3 which is energized when the called subscriber responds. One of these contacts is connected with the battery, as by suitable conductors 19 and 20, while the other is joined by conductor 21 with one terminal of the signal S^4 , preferably in the form of a small incandescent lamp. The other terminal of said lamp is connected by wire 22 to the normal contact of the grounded spring 23 of relay r^5 ; this relay is connected upon one side by conductor 24 with the conductor 21 and upon the other side by conductor 25 with the alternate contact of an additional spring 26 provided for the registering key 16, this spring 26 being grounded. This arrangement obviously results in the lighting of the signals S^4 when the called subscriber answers and the relay r^3 is energized, and the retirement of said signal when the register key 16 is operated; it is to be observed also that as soon as the relay r^5 is energized to retire said signal it is thereafter locked and maintained actuated through the grounded spring 23 and its front contact.

The operation of the system and apparatus is as follows: A subscriber desiring a connection takes up his receiver thereby completing a path for current over the telephone line from the battery B through the line relay R , at the central office and thence through the substitution devices, thereby lighting the line signal S ; upon noticing the signal the operator inserts the plug P into the answering jack J of the telephone line and depresses her listening key 13 to receive the order from the subscriber. The insertion of the said plug at once energizes the cut-off relay R^2 thereby rendering the line signal S inoperative and placing the line in condition for conversation. The registering magnet 8 at the subscribers station as stated is adjusted to be unresponsive to current in the line from the battery B . Upon learning the number of the party wanted, that line is tested in the usual manner and if found idle the calling plug P^2 is inserted in the multiple jack of that line which

is before the operator, and the ringing key 15 is operated to connect the ringing generator 14 with the calling plug to call the said party. Upon the response of the said party the supervisory relay r^3 is actuated by current from battery B flowing over the called telephone line, thus closing its contacts 18 and completing a path of current through the register signal S^4 via conductors 19, 20, 21 and 22, and spring 23 of relay r^5 to ground. The lighting of this signal indicates to the operator that the called subscriber has responded and after listening to determine whether it is the desired party wanted the operator depresses the registering key 16 in the answering side of the cord circuit thereby connecting the generator 17 with the calling line and sending a strong current thereover to the subscribers station and through the register magnet 8 to operate the same to register the call upon the meter 10. The operation of the registering key 16 at the same time closes through its spring 26 a path for current through the relay r^5 , over conductor 25 and through spring 26 to ground. This relay r^5 is therefore energized and opens the circuit of the signal lamp S^4 thus rendering the same inert and at the same time locking itself by closing said spring 23 upon its forward contact which completes a path for current through its winding to ground, thereby maintaining the same energized and the signal S^4 inert during the remainder of the connection. When the subscribers hang up their telephones the corresponding supervisory relays r and r^3 are deenergized to close the circuits of supervisory lamp S^2 and S^3 to indicate the fact of the termination of the conversation to the operator. At the same time the path for current through the relay r^5 is opened at contacts 18 of relay r^3 thereby deenergizing relay r^5 and permitting the locking circuit to open. Upon observing the supervisory signals S^2 and S^3 the operator takes down the connection and returns all parts to normal condition.

The magnet coil 8 at the subscriber's station serves during the conversation as the ordinary retardation coil for talking purposes. It will be observed that the register magnets 8 at the subscriber's stations are capable of being operated only when the telephone is in use, whereby as many of such devices may be placed upon the telephone line as is desired, since only the one at the station in use can be operated by the registering current. In case any of the stations upon the line are not provided with a registering device or meter the throwing of registering current upon the line does no harm, and hence the service may be uniform for lines of measured and unlimited service.

Fig. 2 shows the method of connecting the register in any circuit, by placing a condenser c^5 in parallel with the magnet whereby the

latter is not operated by alternating current but is operated by direct current and whereby voice currents are unimpeded by the retardation of the coil.

It is apparent that by means of this invention a subscriber is furnished with quick and simple service of the usual or standard kind so that he is not required to bear in mind any special code of signaling or to perform any different acts or sequence of acts than is done in the use of the ordinary instrument. In other words the service for the subscriber is standard. In addition there are no contacts or mechanisms at the subscriber's station which could affect the reliability of the service or which would put the instrument out of service in case the meter was out of order and could not be used. The meter is preferably arranged in the ordinary or desired manner so that the subscriber may see at any time the number of calls registered at his telephone. There is very little waiting on the part of the operator and it is possible to avoid the registering of improper connections since the operator may ascertain before registering if the connection has been correctly established. The service thus permits each operator to handle a greater number of lines thereby reducing the number of operators required in an exchange as well as the number of operators' positions. It also results in reducing the size of the switchboard and the amount of the switchboard equipment required.

While the invention has been thus described with reference to a particular mode of utilizing the same in connection with one type of circuit, it will be understood that it is not to be so limited, but that it may be used with various types of circuit and in various arrangements. It also is apparent that many alterations and modifications may be made therein without departing from the scope or principle of the invention.

Having thus described the invention what I desire to claim and secure by Letters Patent is:

1. The combination with a calling and a called telephone line, of a cord circuit to loop the lines together for conversation, a manually operated key or switch to send current out over the calling line, an electromagnetic device upon the calling line operated by the current so sent thereover, a pair of relays, a signal and a circuit therefor, normally open contacts of one of said relays and normally closed contacts of the other of said relays in the circuit of said signal, the first of said relays being operated when the called subscriber responds to thereby operate the said signal and the other relay being operated when the said key or switch is depressed to thereby retire the said signal, and a locking circuit for the latter relay to suitably maintain said signal inert, said locking circuit in-

cluding contacts of the first named relay whereby when the latter is again deenergized the second relay is also deenergized.

2. In a telephone system, the combination
5 with a calling and called telephone line, of a cord circuit to connect the lines together for conversation, a manually operated key or switch in the answering end of the cord circuit to send out current over the calling line,
10 an electromagnetic device upon the calling line adapted to be operated by the current so sent thereover, a relay associated with the cord circuit actuated when the called subscriber responds, a signal initially operated
15 by said relay to indicate the response of the called subscriber, a second relay associated with the cord circuit to retire said signal when actuated, the circuit of which relay includes the normally open contacts of the first
20 named relay and normally open contacts of said key or switch, whereby when the first relay is energized and the key operated the second relay is also operated.

3. In a telephone system, the combination
25 with a calling and a called telephone line, of a cord circuit to connect the lines together for conversation, a manually operated key or switch in the answering end of the cord circuit to send out current over the calling line,
30 an electromagnetic device upon the calling line adapted to be operated by the current so sent thereover, a relay associated with the cord circuit actuated when the called subscriber responds, a signal initially operated
35 by said relay to indicate the response of the called subscriber, a second relay associated with the cord circuit to retire said signal when actuated, the circuit of which relay includes the normally open contacts of the first
40 named relay and normally open contacts of said key or switch, whereby when the first relay is energized and the key operated, the second relay is also operated, and a locking circuit for said second relay to maintain the
45 same energized as long as the first named relay is actuated.

4. In a telephone system, the combination
50 with calling and called telephone lines, of a cord circuit to connect the lines together for conversation, a manually operated key or switch in the answering end of the cord circuit to send out current over the calling line, an electromagnetic device upon the calling
55 line operated by current so sent thereover, a relay associated with the cord circuit and actuated when the called subscriber responds, a signal initially operated by said relay to indicate the response of the called subscriber, a source of current for said signal, a
60 second relay initially operated from the same source as said signal by the operation of said manual key or switch, said latter relay serving when operated to retire said signal, and means for maintaining said signal in retire-
65 ment during the remainder of the connection.

5. In a common battery telephone system, the combination with calling and called telephone lines, of a cord circuit to connect the lines together for conversation, a common source of current at the central office to provide the subscriber's lines with current for conversational purposes and for the operation of various telephonic apparatus at the central office, a manually operated key or switch in the answering end of the cord circuit to send out current over the calling line,
75 an electromagnetic device upon the calling line operated by the current so sent thereover, a relay operated by current from said common source over the called line, a signal
80 controlled by said relay and actuated by current from said source to indicate the response of the called subscriber, a second relay also initially energized from said source and operated when current is sent out over the
85 calling line to operate said electromagnetic device, the latter relay serving to retire said signal, and a locking circuit for said latter relay to maintain said signal in retirement during the connection.

6. In a telephone system, the combination
90 with calling and called telephone lines, of a cord circuit to connect the lines together for conversation, a common source of current at the central office to furnish current over
95 the telephone lines for conversational purposes, an electromagnetic device upon the calling line unresponsive to the normal working current from said source, a source of current adapted to be connected with the answering end of the cord circuit to send out
100 current of greater strength than the normal working current, switching means for disconnecting said common source when said stronger current source is connected, said
105 electromagnetic device being responsive to such stronger current regardless of the direction of flow of the same, a signal associated with said switching means operated by the response of the called subscriber, and means
110 operated by said normal working current for retiring said signal.

7. In a telephone system, the combination
115 with a calling and a called telephone line, of a cord circuit to connect said lines together for conversation a manually operated key or switch in the answering end of the cord circuit to send out current over the calling line, an electromagnet device upon the calling line operated by the current so
120 sent thereover, a signal associated with said key or switch operated by the response of the called subscriber, and means independent of the current sent out over the calling line for retiring said signal.

8. In a telephone system, the combination
125 with a calling and a called telephone line, of a cord circuit to connect said lines together for conversation, a manually operated key or switch in the answering end of the cord
130

circuit to send out current over the calling line, an electromagnetic device upon the calling line operated by the current so sent thereover, a signal associated with said key or switch operated by the response of the called subscriber, and means controlled by said key independent of the current sent out over the calling line for retiring said signal.

9. In a telephone system, the combination with a central exchange, of calling and called telephone lines extending therefrom, a common source of current at the central exchange to furnish current for conversational purposes, an electromagnetic device upon the calling line irresponsive to the normal working current from said source, a source of current for furnishing current to operate said electromagnetic device, a signal operated by the response of the called subscriber, means operated by the normal working current for retiring said signal, and a switch for connecting said stronger current source to the line and closing the circuit of said retiring means.

10. In a telephone system, the combination with calling and called telephone lines,

of a cord circuit to connect said lines, a supervisory signal, a circuit therefor, a relay controlling the continuity of said supervisory circuit and operated upon the connection of the cord circuit with the called line, a second relay controlling the continuity of said supervisory circuit and operated by switch mechanism upon the called line, an auxiliary signal, a circuit therefor controlled by said second-named relay, an auxiliary relay having contacts interposed in said auxiliary circuit, a common source of current for operating said signals and said relays, an electromagnetic device on the calling line irresponsive to said current, an auxiliary source of current for operating said electromagnetic device, and a switch for connecting said auxiliary source to the calling line and for closing the circuit through said auxiliary relay.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

JAMES HARRISON.

Witnesses:

H. LINTON REBEY,
JOHN M. STUART.