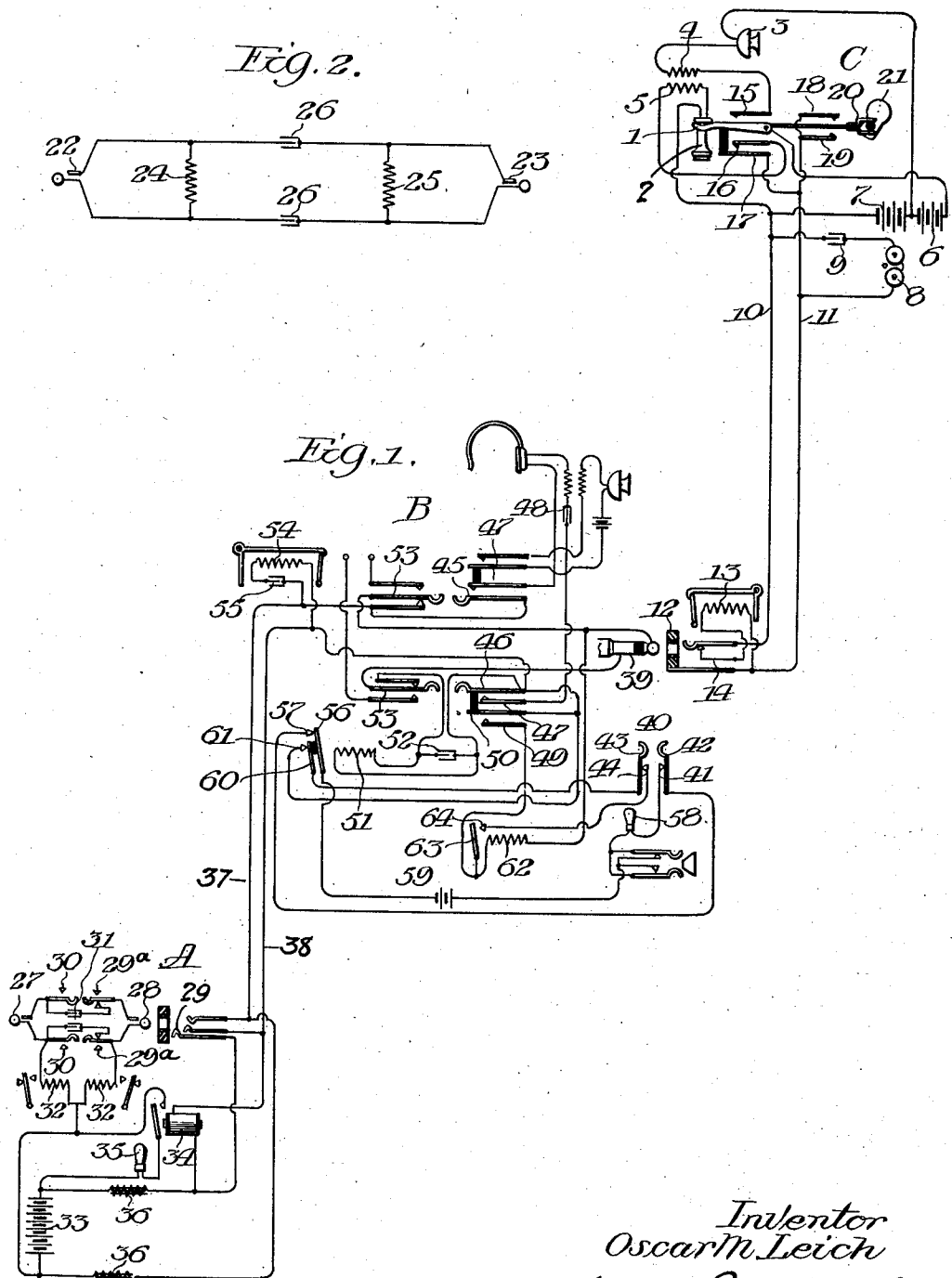


O. M. LEICH.  
 TELEPHONE SYSTEM.  
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Patented May 28, 1912.



Witnesses  
 Chas. W. Smith  
 Hazel Jones

Inventor  
 Oscar M. Leich  
 by May W. Zabel  
 Atty

# UNITED STATES PATENT OFFICE.

OSCAR M. LEICH, OF GENOA, ILLINOIS, ASSIGNOR TO CRACRAFT, LEICH ELECTRIC COMPANY, OF GENOA, ILLINOIS.

## TELEPHONE SYSTEM.

1,027,485.

Specification of Letters Patent.

Patented May 28, 1912.

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*To all whom it may concern:*

Be it known that I, OSCAR M. LEICH, a citizen of the United States, residing at Genoa, in the county of Dekalb and State of Illinois, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone systems and is designed more particularly for use in connection with intercommunication between telephones connected to a local battery exchange and telephones associated with a common battery exchange. The system is such that the local battery exchange apparatus may be much simpler.

In the preferred form of the invention I utilize a local battery telephone which may be connected by means of a common battery trunk circuit with a common battery exchange, and which local battery telephone has facilities for furnishing the proper clearing out signals to the common battery exchange. In the preferred form shown herein the local battery telephone has means for automatically calling the local battery exchange when the receiver is removed from the hook.

I will explain one embodiment of my invention more in detail by reference to the accompanying drawing in which:

Figure 1 illustrates a system constructed in accordance with my invention, and Fig. 2 is a diagrammatic view of a cord circuit which may be employed at the local battery exchange for the local service.

It will of course be understood that I am describing specifically one embodiment of my invention herein, but this specific description is not intended to limit the broad features of my invention, the specific devices and apparatus shown herein being merely illustrative of my invention.

In the drawing I show a part of the exchange apparatus of a common battery exchange A, and apparatus at a local battery exchange B which is necessary for an understanding of my invention.

At C I illustrate a substation instrument circuit which I prefer to employ in connection with this system. This particular substation circuit is more specifically set forth and claimed in my copending application Se-

rial No. 561,651, filed May 16, 1910. At the substation C I have a switchhook 1 carrying the receiver 2, the transmitter 3, the secondary 5 of an induction coil, the primary 4 of an induction coil, the transmitter battery 6 and an auxiliary signal sending battery 7. I also show a polarized ringer 8 which through the agency of a condenser 9 is bridged across the line wires 10 and 11 which connect the substation instrument with the private branch exchange B. The line wires 10 and 11 terminate in a jack 12 with which is associated a line drop 13 so arranged to be disconnected by the spring 14 whenever a plug is inserted in the jack. The transmitter circuit is connected to one pole of the battery 6 and the spring 15. The other terminal of the battery 6 is connected to the switchhook proper 1. One terminal of the receiver circuit is connected to the spring 16 and the line wire 11 is connected to the spring 17 and the springs 18 and 19. A spring 20 is a part of and moves with the switchhook 1 and is under the control of a weight 21. The receiver circuit thus extends from line wire 10, receiver 2, secondary 5, spring 16, spring 17, and line wire 11 whenever the receiver is removed from the hook. In such cases the transmitter circuit extends from the battery 6, transmitter 3, primary 4, spring 15, hook lever 1 to the other terminal of the battery 6. When the receiver 1 is upon the hook the circuit between line wires 10 and 11 is open so far as direct currents are concerned at the substation. Alternating currents for operating the signal 8 through the condenser 9 can be received, however, as is well understood. Whenever the receiver is removed from the hook or replaced thereon a momentary contact is established between the spring 20 and either of the springs 18 and 19, which contact is of sufficient duration to operate the line drop 3 or the clearing out drop of the local battery cord circuit which will be explained later. This momentary contact is, however, broken due to the influence of the weight 21 when the switchhook lever 1 has finally come to rest in either its uppermost or lowermost limiting position, so that normally while talking or normally when the receiver is on the hook, no circuit is complete through the springs 18 or 19 and 20. The local battery cord circuit set forth in Fig. 2 comprises the plugs 22 and 23 which

are adapted to unite various substations and are adapted to receive clearing out signals by means of the clearing out drops 24 and 25. Condensers 26 may be employed so as

5 to get double clearing out service.

In accordance with my invention, I may make the clearing out drops of the local battery cord circuit very low wound, say for instance, fifty ohms, and I find that for

10 local service such a low winding is not prohibitive. In this event, I may dispense with the auxiliary signal sending battery 7 and obtain signals merely through the

15 agency of the talking battery 6 as will be readily apparent, and this aids me in constructing a very inexpensive branch exchange switchboard for this service. In the

20 magneto cord circuit of Fig. 2, I have omitted the ringing and listening keys and also their connections extending to the signaling device and the operator's talking circuit, the connection of which devices is well understood and need not be given at length herein. At the common battery exchange

25 A I have also shown a cord circuit having the plugs 27, 28, which cord circuit is used in connection with jacks 29 of which there may be a great number for the various lines entering the exchange, but of which

30 but one is illustrated. These jacks at the common battery exchange may, of course, be multiplied as desired. In this common battery cord circuit I show the terminals

35 29<sup>a</sup>, 29<sup>b</sup> for the ringing generator and 30, 30 for the operator's talking circuit. Condensers 31 are likewise shown and clearing out relays 32, 32. At this common battery exchange I have a common battery 33 which

40 furnishes the current for all entering lines, all of which entering lines may be provided with a line relay 34, line lamp 35 and impedance coils 36, 36.

Whenever a receiver is removed from the hook the relay 34 is energized to light the

45 line lamp and when the cord circuit is connected the line lamp is extinguished, as is well understood, and the corresponding clearing out relay 32 is under the control of the substation switchhook or other circuit closing device.

To provide for talking service between the common battery exchange A and the local battery exchange B, I employ a trunk circuit having the line wires 37, 38 for uniting the two exchanges and this trunk circuit

55 37, 38 ends at the common battery exchange in the usual apparatus as explained. The trunk circuit ends at the local battery exchange in a plug 39 adapted for use in connection with the jack 12. The plug 39 controls the plug switch 40 having springs

60 41, 42, 43 and 44 so arranged that when the plug is withdrawn springs 41 and 42 are connected and springs 43 and 44 are

65 nected, whereas when the plug 39 is in its

normal seat switch 40, contact between springs 41 and 42 is opened and likewise the contact between springs 43 and 44.

A ringing and listening key is provided having the listening springs 45 and 46

70 which through the interposition of springs 47 and a condenser 48 connect with the operator's set. The spring 46 coöperates with springs 49 and 50 whose purpose will be presently explained. A relay 51 is serially

75 associated with the plug ended cord circuit and a condenser 52 is bridged around its terminals. Ringing springs 53, 53 are provided, the ringing circuit, however, not being shown for the sake of clearness. At

80 the end of the trunk circuit in the local battery exchange a drop 54 is provided which is bridged across the said trunk through the interposition of a condenser 55. The relay 51 has an armature 56 which controls a back contact 57 connected with a

85 clearing out lamp 58, which clearing out lamp is also associated with the spring 41 of the plug seat switch 40. A battery 59 for clearing out purposes is included in this lamp circuit. The relay 51 also has a

90 second armature 60 having a back contact 61 which controls a circuit through the holding relay 62, which holding relay has its circuit likewise controlled by the springs

95 43, 44. This holding relay 62 has an armature 63 having a front contact 64.

Assume now that the subscriber at station C wishes to communicate with the common battery exchange, the said subscriber at this station removes the receiver which through

100 the agency of the springs 19 and 20 sends an automatic signal to operate the drop 13. The operator at station B uses preferably at first hand the local battery cord circuit

105 and upon finding that the call is not a local one but a long distance one, removes the local cord circuit and inserts the plug 39 of the plug ended trunk leading to the exchange A. As the circuit for direct current

110 is closed at station C through the receiver and the secondary winding 5, this insertion of the plug 39 on the part of the operator at station B operates the relay 34 and signals the operator at the station A. The

115 operator at this station inserts the plug 28 and then completes the connection. When the plug 39 is inserted relay 51 is energized to attract its armatures and thus opens the circuit through the lamp 58. Now when

120 the conversation is completed the receiver 2 is restored, and this opens the direct current circuit at the substation, thereby breaking the circuit through relay 32 and the operator at station A disconnected. Circuit

125 through the relay 51 is thereby also broken and its armature 56 contacts with the contact 57, thereby energizing the lamp 58 and notifying the operator at station B to disconnect. Now should the call be in the re-

130

verse manner, the operator at station A upon having a call for the local battery exchange B, or one of its subscribers, merely inserts the plug 28 into the jack 29 and sends the necessary ringing current over the trunk circuit 37, 38, which thereupon energizes the drop 54 to display a signal to the local operator at B. The local operator at B operates the listening key springs 45 and 46, thereby placing herself into communication with the operator at A and noting the connection desired. She thereupon completes the connection by inserting the plug 39 into the jack 12 of the desired line and calls the subscriber corresponding thereto by operating the ringing springs 53, 53. The removal of the plug 39 from the plug seat switch 40 closes the circuit through the lamp 58 and as the said relay 51 is still deenergized the operator at station B is provided with a clearing out signal. The clearing out relay 32 of the central station A, however, is operated to extinguish its associated clearing out lamp, immediately the operator at the station B operates her listening springs 45 and 46. This is due to the springs 49 and 50 being connected together when the spring 46 is operated as this closes a circuit from the conductor 38, spring 50, spring 49, relay 62 to conductor 37. The relay 62 thereupon attracts its armature 63 and closes a circuit extending from conductor 38, contact 61, armature 60, springs 43 and 44, contact 64, armature 63, relay 62, to conductor 37. The clearing out relay 32 thus remains in such a condition as to keep the clearing out lamp deenergized by virtue of the said holding relay 62. During this time the lamp 58, however, remains lighted. Now when the called subscriber at station C responds the removal of the receiver from the hook causes the energization of relay 51 which thereupon attracts its armature 56 to extinguish clearing out lamp 58 and also attracts its armature 60 to break the circuit through the holding relay 62. When the conversation is completed the subscriber at station C hangs up and this again operates the relay 32 so that the operator at station A breaks the connection. The consequent deenergization of relay 51 permits its armature 56 to retract, to thereupon operate the clearing out lamp 58 in response to which the operator at station B manually disconnects the cord circuit from the line circuit.

It will thus be seen that a highly efficient service condition is established between a local battery substation and a common battery exchange through the interposition of a local battery exchange. The local battery substation clears out similar to a common battery telephone and thus provides additional advantageous operating conditions. The general character of the invention

will thus be understood as will likewise the fact that many modifications may be made without departing from its spirit.

Having, however, thus described one embodiment of my invention, what I claim as new and desire to secure by Letters Patent is:

1. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid.

2. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange.

3. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid.

4. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange.

5. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid.

6. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone as-

sociated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange.

7. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid.

8. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange.

9. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, a local battery telephone associated with said local battery exchange, having provision for automatically controlling the common battery exchange signal receiving devices, and a source of current supply to automatically control the local battery exchange signal receiving devices.

10. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, a local battery telephone associated with said local battery exchange, having provision for automatically controlling the common battery exchange signal receiving devices, and a source of current supply to automatically control the local battery exchange signal receiving devices, through the agency of its switchhook lever.

11. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid, said

local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

12. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

13. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

14. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

15. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

16. A telephone system comprising a com-

mon battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

17. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is

sufficient so as to prevent operation of signal receiving devices aforesaid.

18. A telephone system comprising a common battery exchange, line and clearing out signal receiving devices thereat, a local battery exchange, line and clearing out signal receiving devices thereat, a trunk circuit between said exchanges, and a local battery telephone associated with said local battery exchange and having provision for automatically controlling the said signal receiving devices aforesaid, over a continuous conducting circuit including said trunk circuit and extending from said telephone to said common battery exchange, said local battery telephone having a local signal receiving circuit whose obstruction to direct current is sufficient so as to prevent operation of signal receiving devices aforesaid.

In witness whereof, I hereunto subscribe my name this 18th day of March A. D., 1911.

OSCAR M. LEICH.

Witnesses:

HAZEL JONES,  
O. M. WERMICH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."