F. C. UNGER.

TELEPHONE SYSTEM.

APPLICATION FILED OCT. 22, 1908.

936,495. Patented Oct. 12, 1909.

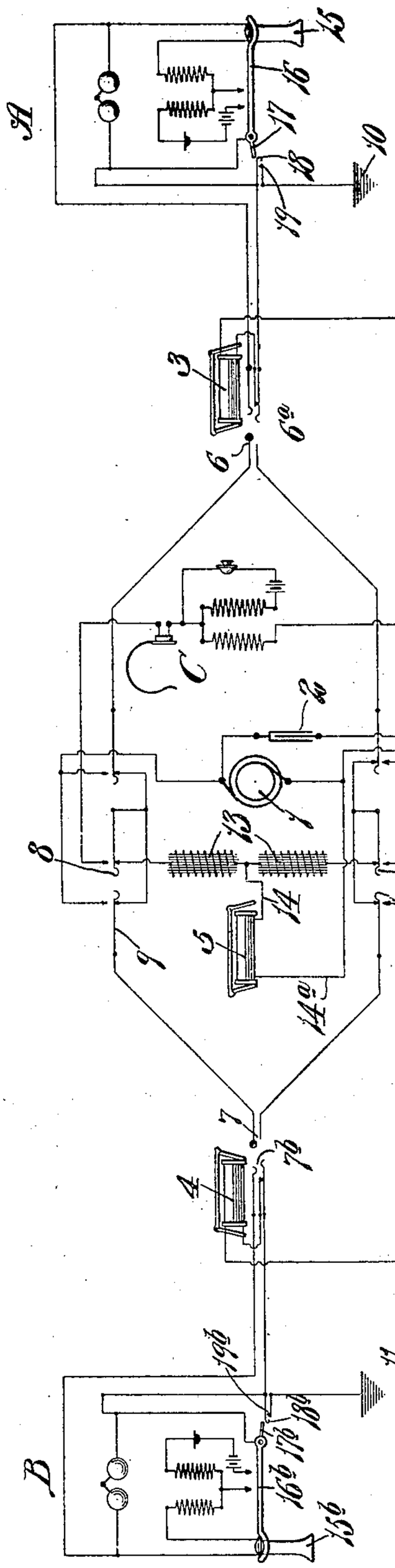

Fig. 1.

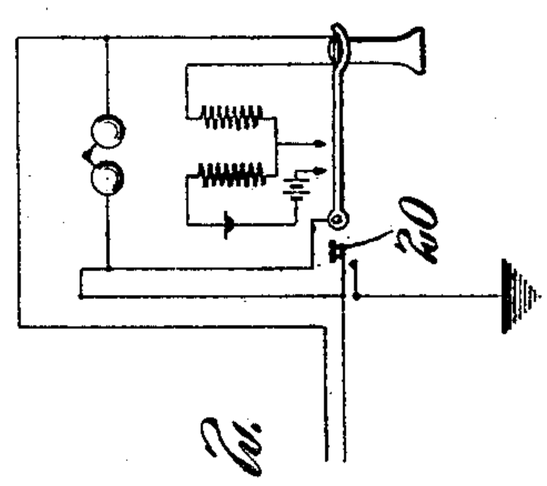

Fig. 2.

Witnesses:
George Ladson.
Wells L. Church

Inventor,
Frank C. Unger.
By Bakewell Cornwall Attys.

UNITED STATES PATENT OFFICE.

FRANK C. UNGER, OF ST. LOUIS, MISSOURI.

TELEPHONE SYSTEM.

936,495. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed October 22, 1908. Serial No. 459,035.

To all whom it may concern:

Be it known that I, FRANK C. UNGER, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a diagrammatic view of a telephone system constructed in accordance with my invention; and Fig. 2 is a detail diagrammatic view showing a different means for operating the line drop and the clearing-out drop at the central exchange.

This invention relates to telephone systems and is an improvement on the local battery or magneto telephone systems now in general use in small towns and in the country.

Prior to my invention the telephone of each subscriber of a magneto telephone system was provided with a generator or ringing machine that the subscriber had to turn or actuate to operate his line drop at the central office or exchange so as to notify the operator at the central office that he desired to talk to another subscriber. After he had finished his conversation he also had to actuate the generator or ringing machine of his telephone to operate the clearing-out drop at the central office and thus notify the operator that he was through talking to the other subscriber.

The main object of my invention is to provide a local battery telephone system comprising a ringing machine or pole changer at the central office, and means for causing the subscriber's line drop at the central office to expose a subscriber's number when he takes the receiver of his telephone off its supporting hook, the system being so constructed that the clearing-out drop at the central office is operated automatically when the subscriber has finished his conversation and has hung up his receiver. By constructing a telephone system in this manner I eliminate the expense of equipping the telephone of each subscriber with a ringing machine, generator, or kick coil, and I also overcome the necessity of requiring the subscriber to turn a crank on generator to notify the operator at the central office when he wants to talk to another subscriber and when he has finished his conversation.

Referring to Fig. 1 of the drawings which illustrates the preferred form of my invention, A and B designate the telephones of two subscribers, and C designates the operator's telephone at the central exchange or office. The central office is equipped with a ringing machine consisting of an alternating or pulsating current generator or pole changer 1, and in some cases, a condenser 2 will also be used. Said central office is also equipped with line drops 3 and 4 for the subscribers A and B, respectively, and a clearing-out drop 5 for notifying the operator when either subscriber has hung up his receiver, all of said devices being of well-known construction.

While I prefer to use an alternating current ringing machine at the central exchange, equally good results will be produced with a pulsating current ringing machine, and therefore I do not wish it to be understood that my broad idea is limited to a system provided with an alternating current ringing machine; the term alternating current being used in the claims merely in contradistinction to direct current and not for the purpose of limiting the invention to a system in which the ringing machine is operated by alternating current for the same results would be produced with a pulsating current ringing machine.

The reference characters 6 and 7 designate the plugs at the central exchange that are used in connection with the telephones A and B, respectively, and the reference characters 8 and 9 designate, respectively, the key of the listening circuit and the ringing key at the central office. The subscribers' telephones A and B are provided with contacts that are grounded at 10 and 11, respectively, and the ringing machine at the central office is grounded at 12, as shown in Fig. 1. Two impedance coils 13 are bridged across the cord circuit at the central office, and one side 14 of the clearing-out drop 5 is connected to the middle contacts of said impedance coils, the other side 14^a of said clearing-out drop being connected to one side of the ringing generator or pole changer at the central office.

The operation of the system is as follows: When one of the subscribers, the subscriber A for example, wants to call subscriber B,

said subscriber A removes the receiver 15 of his telephone from its supporting hook 16 which is raised automatically by a spring or some other suitable means, not shown. The receiver hook 16 is provided at its inner end with an extension 17, and when said hook moves said extension engages a contact 18 and forces it into engagement with a coöperating grounded contact 19 and thus throws a temporary ground on the sleeve side of the line by completing a circuit through the ground, through the condenser and generator or ringing machine at the central office, and through the winding of the coil in the subscriber A's line drop 3, said circuit causing the line drop 3 to operate and thus expose the subscriber A's number. The operator at the central office is thus notified that the subscriber A desires connection with some other subscriber and she inserts the plug 6 between its coöperating contacts 6^a, the insertion of the plug 6 automatically cutting the line drop 3 out of service so that current does not pass therethrough. The operator at the central office then actuates the key 8 of the listening circuit to connect the telephone C at the central office with the telephone of subscriber A and after she has ascertained that subscriber A wants to talk to subscriber B she inserts the plug 7 between its coöperating contacts 7^b and operates the key 9 of the ringing circuit so as to notify subscriber B that some one wants to talk to him. After the connection between subscribers A and B has been effected the operator releases the key 9 of the ringing circuit and the key 8 of the listening circuit so as to cut out the telephone at the central office and thus establish direct connection between the two subscribers.

While the two subscribers are conversing through the cord circuit at the central switchboard no current from the ringing machine or pole changer at the central office will be passing out over their lines, but when the conversation has been completed and either subscriber hangs up his receiver the extension on the inner end of the hook on which the receiver is placed will engage its coöperating contact and move same into engagement with its coöperating grounded contact so as to throw a temporary ground on the sleeve side of the line and thus actuate the clearing-out drop 5, thereby notifying the operator that the subscribers have completed their conversation so that she can withdraw the plugs 6 and 7, it being understood that the telephone B is provided with a receiver 15^b adapted to rest on a hook 16^b which has an extension 17^b that moves a contact 18^b into engagement with a coöperating grounded contact 19^b. By having the clearing-out drop 5 cut in between the two impedance coils 13 and also arranged in series with the generator 1 and condenser 2 to the ground, the lines do not become unbalanced, the resistance of either impedance coil depending upon certain well-known conditions. By keeping the lines balanced or as near equi-potential as possible no apparent noise or flow of ringing current is perceptible in the receivers of the subscribers' telephones when they are talking. The two impedance coils offer a high resistance to the high frequency voice current but they allow the low frequency ringing current to pass out over the lines of the cord circuit when either subscriber hangs up his receiver.

While I have herein stated that two impedance coils 13 are bridged across the line I do not wish it to be understood that my broad idea is limited to such a construction for incandescent lamps or any other suitable resistance can be substituted for the impedance coils without departing from the spirit of my invention, it being necessary, however, to have both coils or other resistance devices offer the same impedance or resistance so as not to unbalance the line. The object of using a condenser which is cut into the ground side of the ringing machine is to flatten out the low frequency ringing current and cause its sine wave to become opaque. This condenser also has the effect of causing the low frequency current to die down slowly, thus causing no apparent noise in the subscribers' receivers.

While I prefer to construct the receiver hook of each subscriber's telephone in such a manner that it automatically closes a circuit whenever the receiver is removed or replaced, I do not wish it to be understood that my broad idea is limited to such a construction for, if desired, each subscriber's telephone could be equipped with a push button 20 or manually-operated contact, as shown in Fig. 2, adapted to be operated by the subscriber when he calls central to give her a number or to notify her that he has finished his conversation.

It will, of course, be understood that there is a certain amount of current leakage on account of induction, insulation and the peculiarities of alternating current but the main object of my invention is to have as little current leakage as is possible and cause alternating current to flow over either side of the line only when the circuit is completed through the ground; namely, one side of the grounded ringing machine through the ground to the grounded contacts on the subscribers' telephones.

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

1. A telephone system comprising a central exchange provided with line drops, subscribers' telephones, an alternating current ringing machine located at the central ex-

change, and means arranged adjacent the subscribers' telephones for completing a circuit through said line drops and ringing machine so as to notify the central operator that a subscriber desires to use his telephone; substantially as described.

2. A telephone system comprising a central exchange provided with an alternating current ringing machine and line drops, subscribers' telephones adapted to be connected with the cord circuits of the central exchange, and means under control of the subscribers for causing a circuit to pass through said ringing machine and line drop to notify the central operator that the subscriber desires to call a number; substantially as described.

3. A telephone system consisting of a central exchange provided with an alternating current ringing machine, a clearing-out drop, and line drops operated by said ringing machine, subscribers' telephones adapted to be connected with the cord circuits of the central exchange, a resistance device bridged across the cord circuit, and means under control of the subscribers for operating the line drops and the clearing-out drop; substantially as described.

4. A telephone system having a generator and condenser connected to the cord circuit and to the ground, a pair of resistance devices bridged across the cord circuit, and a clearing-out drop tapped into said resistance devices and also connected in series with said generator; substantially as described.

5. A telephone system comprising a central exchange that is equipped with an alternating current ringing machine, a clearing-out drop and line drops for the individual subscribers, subscribers' telephones adapted to be connected with the cord circuits at the central exchange, and means for causing a circuit to pass through the ringing machine and the line drop at the central exchange so as to cause said line drop to operate automatically when a subscriber removes the receiver of his telephone from its supporting hook and also cause the clearing-out drop to operate automatically when said receiver is replaced on the hook; substantially as described.

6. A telephone system comprising a grounded alternating current ringing machine located at the central office or exchange, a line drop connected to one side of said ringing machine, a subscriber's telephone, and means whereby a subscriber can connect the other side of said line drop with the ground so as to complete the circuit and thus cause the line drop to operate; substantially as described.

7. A telephone system comprising a grounded alternating current ringing machine located at the central office or exchange, line drops and a clearing-out drop connected to one side of said ringing machine, wires leading from said line drops to contacts which are arranged adjacent the telephones of the subscribers of the system, coöperating grounded contacts that are adapted to engage the contacts previously referred to and thus complete circuits through said line drops and clearing-out drop, a pair of resistance devices bridged across the cord circuit at the central exchange, and a conductor connected to one side of said clearing-out drop and to the middle contacts of said resistance devices; substantially as described.

8. A telephone system comprising a grounded ringing machine located at the central office or exchange, line drops and a clearing-out drop connected to one side of said ringing machine, wires leading from said line drops to contacts which are arranged adjacent the telephones of the subscribers of the system, coöperating grounded contacts that are adapted to engage the contacts previously referred to and thus complete circuits through said line drops and clearing-out drop, a pair of resistance devices bridged across the cord circuit at the central exchange, a conductor connected to one side of said clearing-out drop and to the middle contacts of said resistance devices, and means for completing a circuit through said ringing machine and one of said line drops when the receiver of a subscriber's telephone is removed from its hook and for completing a circuit through the clearing-out drop and said ringing machine when the receiver is replaced on said hook; substantially as described.

9. A telephone system consisting of a central exchange that comprises an operator's telephone, line drops, a clearing-out drop, and an alternating current grounded ringing machine, connections between said ringing machine and one side of the clearing-out drop and each of the line drops, a pair of impedance coils bridged across the cord circuit of the central exchange and connected to the other side of said clearing-out drop, subscribers' telephones adapted to be connected with the cord circuit of the central exchange, a grounded contact located adjacent each of the subscribers' telephones, and a coöperating contact connected to a conductor that leads from the subscriber's line drop at the central exchange; substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this twentieth day of October 1908.

FRANK C. UNGER.

Witnesses:

WELLS L. CHURCH,

GEORGE BAKEWELL.