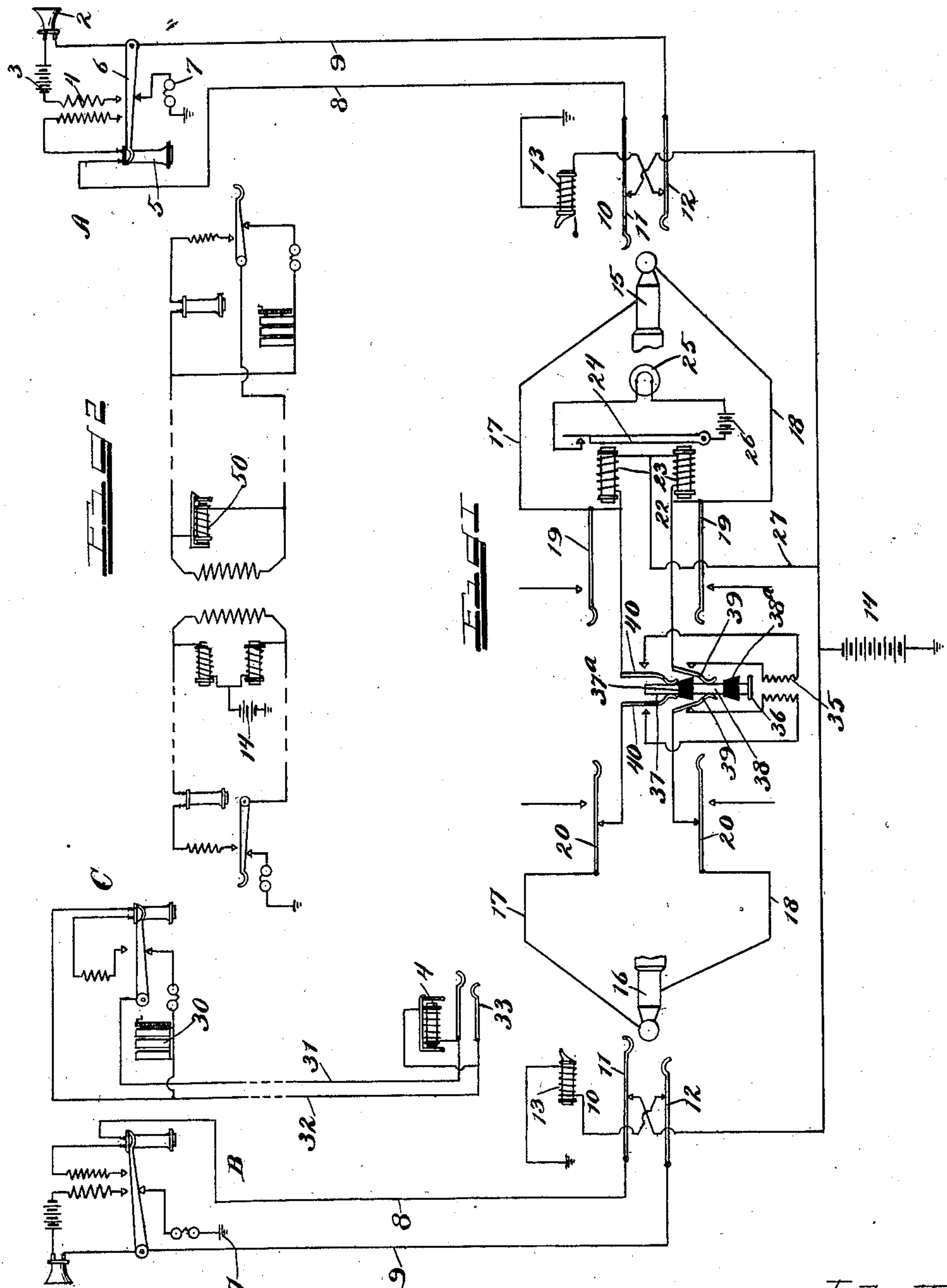


No. 861,808.

PATENTED JULY 30, 1907.

H. P. CLAUSEN.
TELEPHONE SYSTEM.

APPLICATION FILED NOV. 20, 1901.



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TELEPHONE SYSTEM.

No. 861,808.

Specification of Letters Patent.

Patented July 30, 1907.

Original application filed April 26, 1901, Serial No. 57,531. Divided and this application filed November 20, 1901.
Serial No. 82,968.

To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a specification.

This application is filed as a division of my application, Serial Number 57531, filed by me in the United States Patent Office on April 26, 1901, for improvement in telephone systems.

In said former application I have claimed certain features of improvement relating more particularly to supervisory signal apparatus, while in the present application I have elected to claim certain features of improvement relating more particularly to apparatus at the central station for establishing connection between substations of different character.

My invention relates to improvements in telephone systems, and has special reference to those systems employing a common calling generator at the central station and a grounded bell at the subscriber's stations, with provision also for connecting the lines of such a system with other lines employing a magneto calling set, and a series or bridging bell at the subscribers' stations, as in the ordinary toll line.

My invention has for its objects the provision of a common generator signaling system of telephoning, having grounded signaling bells at the subscribers' stations, and without repeating coils at the central station or other complicated apparatus; of means for utilizing the same cord-circuits, for connecting such lines with other lines having different methods of signaling, or grounded lines, such as toll lines, by conveniently introducing repeating coils into the cord circuits, and of a simple and efficient arrangement of apparatus and circuits whereby a better and more economical service is obtained.

To these ends, and such others as may hereinafter appear, the invention comprises a central office from which subscribers' lines radiate, the usual arrangement of the subscriber's apparatus being employed except that one line conductor of the metallic circuit is grounded through the subscriber's hook, resting contact, and signaling bell. At central the cord circuits have their strands each connected with the tip and sleeve contacts of the plugs, with a double coil relay connected thereacross and having its center point connected with the central source of currents, the said coils being adapted to operate supervisory signals for the convenience of the operator. A switch is also provided to cut in a repeating coil in the cord circuit for use in connection with toll or other lines differing from the main system.

The invention further consists in the arrangements, connections, and combinations hereinafter described, and particularly pointed out in the claims, reference being had to the accompanying drawings forming a part hereof, in which the same reference characters designate like parts throughout the several views and in which

Figure 1 is a diagrammatic view of one embodiment of my invention; Fig. 2 is a simple diagrammatic view showing lines of different type connected together.

In these figures, A and B denote the subscribers' stations, which are each provided with the usual apparatus, including transmitters 2, local battery 3, induction coil 4, receiver 5, hook switch 6 connected with one of the line wires, and the signal bell 7, grounded from the normal or resting contact of the hook switch. The lines comprise the conductors 8 and 9, which terminate in the central office in the line spring jacks 10, having the line springs 11 and 12 which are normally connected through their resting contacts with the branch conductors leading to the line annunciator 13, and common battery 14, the type of annunciator used being preferably of the self-restoring type indicated conventionally, and the generator 14 being preferably a storage battery, though other sources of current could be substituted.

The operator's connective means comprise the cord circuits having the plugs 15 and 16 to which the cord-strands 17 and 18 are connected, each strand extending between the tip of one plug and the sleeve ring of the other. The usual listening and ringing key is provided, by virtue of which the operator's telephone may be connected with the cord-circuit by springs 19, and the ringing generator by springs 20, these devices not being shown for the sake of clearness but only indicated by the adjacent contact.

Any suitable supervisory signal apparatus can be employed—that is to say, it will be understood relays supervisory signals and the circuit arrangement for the same can be of any suitable fashion or approved form. For example, and as a simple and effective arrangement particularly adapted for use in connection with my improved telephone system, the cord-circuit may include the supervisory signal arrangement shown in Fig. 1. In this figure, across the cord-circuit between the strands 17 and 18 the double coil 22 is bridged or connected, having the coils 23 and common armature 24, which controls the operation of the local circuit containing the supervisory lamp 25 and the battery 26, which may be the same as battery 14.

In operation of so much of the system as described, the subscriber at A lifts his receiver to call central and operates his individual annunciator 13 from the com-

mon battery 14 over his metallic line. The operator seeing the line signal exposed, inserts the plug 15 in the jack 10, thereby restoring line signal 13, and connects her telephone therewith by means of the key-springs 19. Upon ascertaining the number of the wanted party the plug 16 is inserted in that party's jack and the ringing key-springs 20 operated to throw ringing current upon the line. This generator being grounded at central, the ringing current passes from ground thereat over one line conductor to ground at the subscriber's station through his grounded bell. When the plug 15 alone is in the jack the supervisory lamp is not lighted, for the telephone at the subscriber's station A is off the hook and the ground branch is cut off. But when the plug 16 is inserted in the jack of the called subscriber the lamp is lighted by the action of relay 22 over a circuit from ground at central, through the battery 14, conductor 27, coil 23 of the relay, strand 17 of the cord circuit, line wire 9 and through the ground branch containing the bell. But when the subscriber responds the ground is cut off and the lamp extinguished. When the conversation is terminated and either party hangs up his receiver, the lamp again lights to indicate the fact to the operator. Either coil 23 is capable of closing the armature whereby either subscriber is capable of actuating it over the grounded line conductor and the proper cord strand.

The main object in connecting the tip and sleeve contacts of the plugs with each strand of the cord circuit is so that both coils of the relay 22 may be used to operate the armature 24, in which case the grounded conductors of the subscriber's lines should be connected in the same unvarying relation with the jack springs. But this arrangement is not absolutely necessary for the line conductors can be grounded if desired or as it happens, and the cord strands also connected in any way, so far as some features of my invention are concerned. The supervisory signal 25 will operate in the same way under these conditions but one coil of the relay may be used more than the other.

In such a system as described it is often found desirable or essential to connect lines of another type therewith, as, for example, lines using the ordinary magneto generator and accompanying apparatus for signaling, or grounded lines. Such occasion might also arise in the case of toll lines, or where all the lines of the local exchange did not conform to the general system above outlined. Such a different line is indicated at the left in Fig. 1, and has the station C provided with subscribers' station apparatus as usual, including the magneto generator 30. Line wires 31 and 32 extend to the central office and there connect with the jack 33 and line signal 4.

In order to connect with other lines of the main system with this or other type of line without providing an entirely different cord circuit from that heretofore used and described, I provide a repeating coil 35 normally disconnected from the cord strands, but adapted to be inserted therein by the switch 36, indicated conventionally, and having the conducting portions 37 and 38 adapted to normally complete the cord strands 17 and 18, but having also the insulating portions 37^a and 38^a adapted to break them and connect the windings of the repeating coil 35 thereacross

by means of the springs 39 and 40. A clearing-out drop 50 is bridged across the calling side of said repeating coil, while the other clearing out signal 25 would remain connected with the other end of the cord circuit, as indicated by the bridged relay magnets in Fig. 2. This switching-in of the repeating coil renders the cord-circuit conductively discontinuous and changes it over into inductively continuous sections, as indicated simply in Fig. 2 where the repeating coil is shown inductively connecting the different types of lines. By this arrangement a system is provided having all the advantages of automatic common battery signaling and supervision, with the further advantage of a complete through talking circuit devoid of obstructions such as relays or repeating coils therein, and a further ready means for instantly rendering the circuit conductively discontinuous to connect together lines of different types. The repeating coil of course may be used with any operator's connective means and is not limited so far as its general features are concerned to one with that shown.

The invention is held to include all such changes, alterations, and modifications as fairly fall within the scope and principle. It is defined in the following claims:

1. In a telephone system the combination with subscribers' lines, of a central office at which said lines terminate, a common source of current supply thereat connected with the lines, operator's connective means to connect said lines together for conversational purposes, other lines terminating at the central office and not connected with the common current supply, and repeating coils to be introduced in the said connective means when lines of the one set are to be connected with lines of the other set said repeating coils being normally disconnected from the said operator's connective means the arrangement as a whole including means whereby the repeating coil, when not in use, is totally disconnected from the talking circuit.
2. In a telephone system the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, said means being conductively continuous for use in connection with lines of one type, and means for making them inductively continuous but conductively discontinuous when used to connect the lines of one set with those of the other said last mentioned means being normally and totally disconnected from the said operator's connective means.
3. In a telephone system the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, the said means forming a through talking circuit when used with one type of lines, and means for dividing the connective means into inductively related sections for use in connecting lines of both types together said last mentioned means comprising an inductive connection normally disconnected from the operator's connective means, and a switch for introducing the said inductive connection into the said operator's connective means the arrangement as a whole including means whereby the repeating coil, when not in use, is totally disconnected from the talking circuit.
4. In a telephone system the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, said means forming a through talking circuit when used with the lines of one set, and a repeating coil to be introduced into said means when it is desired to connect lines of one type

with those of the other said coil being normally and wholly disconnected from said operator's connective means.

5. In a telephone system the combination with subscribers' metallic lines, of a central office at which said lines terminate, cord-circuits thereat to connect said metallic lines together in pairs to form through conversational circuits, other telephone lines terminating at said central office, repeating coils, and keys to insert said coils in said cord-circuits when it is desired to connect the metallic lines with the other lines said repeating coils being normally disconnected from said cord-circuits the arrangement as a whole including means whereby the repeating coil, when not in use, is totally disconnected from the talking circuit.

6. In a telephone system, the combination of subscriber's lines, an operator's cord circuit for connecting any two of said lines, a repeating coil associated with said cord circuit, and a switch for severing the cord circuit and introducing the said repeating coil, so as to provide an inductive connection between the two parts of the cord circuit the arrangement as a whole including means whereby the repeating coil, when not in use, is totally disconnected from the talking circuit.

7. In a telephone system, the combination of subscriber's lines, two way jacks connected with said lines, an answering plug provided with a pair of contacts, a calling plug provided with a pair of contacts, a two way cord circuit consisting of a pair of strands, each strand connecting the tip of one plug with the sleeve of the other plug, a repeating coil associated with the cord circuit, and a switch for severing the cord circuit and introducing the repeating coil, so as to provide an inductive connection between the two parts of the cord circuit.

8. In a telephone system, the combination of subscriber's lines, an operator's cord circuit for connecting any two of the said lines, a repeating coil associated with the cord circuit, and a switch for severing the cord circuit and introducing the said repeating coil, so as to provide an inductive connection between the two parts of the cord circuit, said switch comprising the contact portions 37 and 38, which are normally in circuit, and involving also the insulating portions 37^a and 38^a, substantially as and for the purpose set forth.

9. In a telephone system, the combination with subscribers' lines, of a central office at which said lines terminate, a common source of current supply thereat connected with the lines, operator's connective means to connect said lines together for conversational purposes, said connective means including plugs each having contacts normally connected with unlike contacts of another plug, other lines terminating at the central office and not connected with the common current supply, and repeating coils to be introduced in the said connective means when lines of the one set are to be connected with lines of the other set, said repeating coils being normally disconnected from the said operator's connective means.

10. In a telephone system, the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, said connective means including plugs each having contacts normally connected with unlike contacts of another plug, said means being conductively continuous for use in connection with lines of one type, and means for making them inductively continuous but conductively discontinuous when used to connect the lines of one set with those of

the other, said last-mentioned means being normally and totally disconnected from the said operator's connective means.

11. In a telephone system, the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, said connective means including plugs each having contacts normally connected with unlike contacts of another plug, the said means forming a through talking circuit when used with one type of lines, and means for dividing the connective means into inductively related sections for use in connecting lines of both types together, said last-mentioned means comprising an inductive connection normally disconnected from the operator's connective means, and a switch for introducing the said inductive connection into the said operator's connective means.

12. In a telephone system, the combination with a central office, subscribers' lines of one type terminating thereat, other lines of a different type also terminating at the said office, operator's connective means to variously connect said lines together for conversational purposes, said connective means including plugs each having contacts connected with unlike contacts of another plug, said means forming a through talking circuit when used with the lines of one set, and a repeating coil to be introduced into said means when it is desired to connect lines of one type with those of the other, said coil being normally and wholly disconnected from said operator's connective means.

13. In a telephone system, the combination with subscribers' metallic lines, of a central office at which said lines terminate, cord-circuits thereat to connect said metallic lines together in pairs to form through conversational circuits, said connective means including plugs each having contacts connected with unlike contacts of another plug, other telephone lines terminating at said central office, repeating coils, and keys to insert said coils in said cord-circuits when it is desired to connect the metallic lines with the other lines, said repeating coils being normally disconnected from said cord-circuits.

14. In a telephone system, the combination of subscribers' lines, an operator's cord-circuit for connecting any two of said lines, a repeating coil associated with said cord-circuit, both terminals of each winding of said coil being normally disconnected from the cord-circuit, and a switch for severing the cord-circuit and introducing the said repeating coil, so as to provide an inductive connection between the two parts of the cord-circuit.

15. A telephone system, comprising subscribers' lines, operator's connective means for connecting the limbs of one line with unlike limbs of another line, a repeating coil normally in inoperative relation to said connective means, and a switch adapted to sever said connective means and bridge the two windings across the talking circuit in parallel with each other when lines of different character are to be connected for conversational purposes.

16. A telephone system comprising a repeating coil and a pair of cord plugs normally and totally disconnected from the repeating coil.

Signed by me at Chicago, Cook county, Illinois, this 16th day of November, 1901.

HENRY P. CLAUSEN.

Witnesses:

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