C. L. HOWK.

TELEPHONE SYSTEM.

APPLICATION FILED NOV. 21, 1913.

1,127,005.

Patented Feb. 2, 1915.

2 SHEETS—SHEET 1.

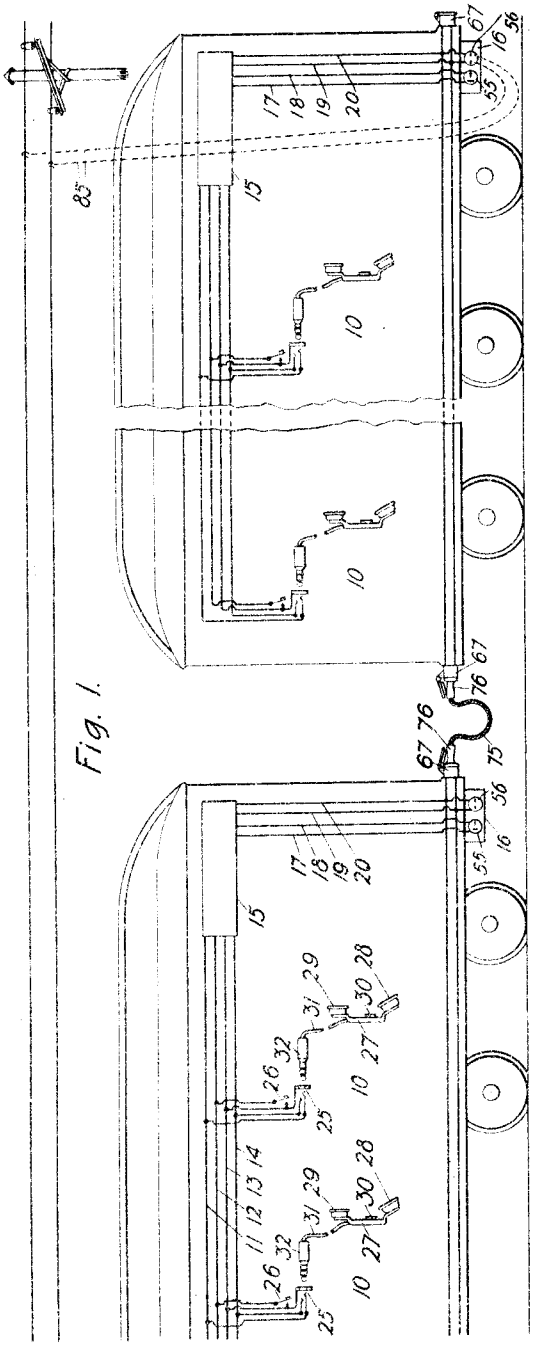


Fig. 1.

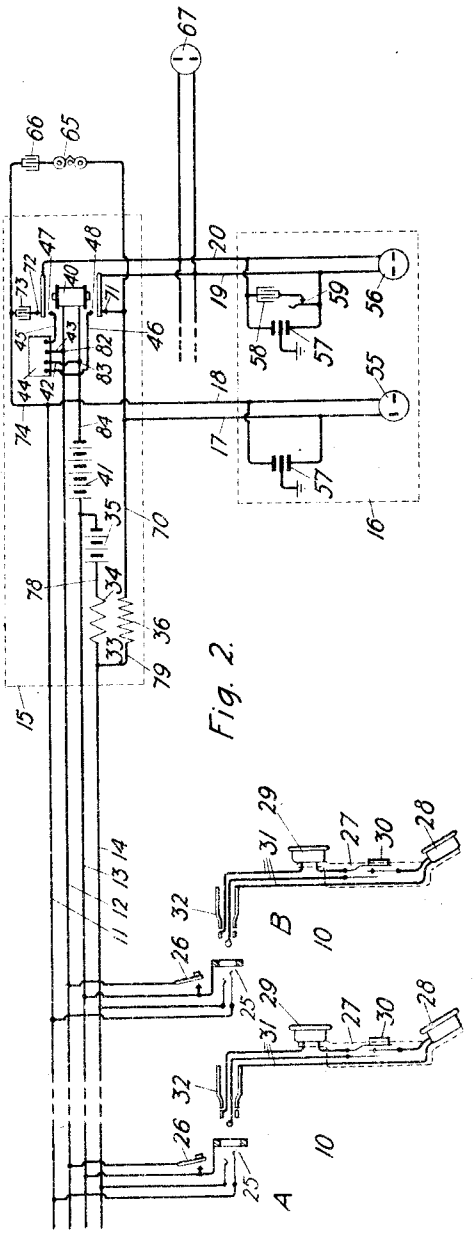


Fig. 2.

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Fig. 3.

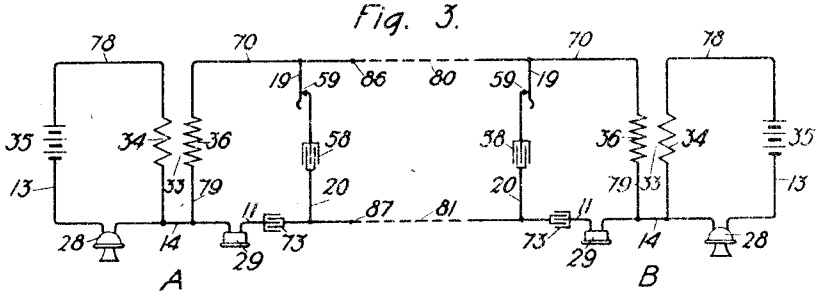


Fig. 4.

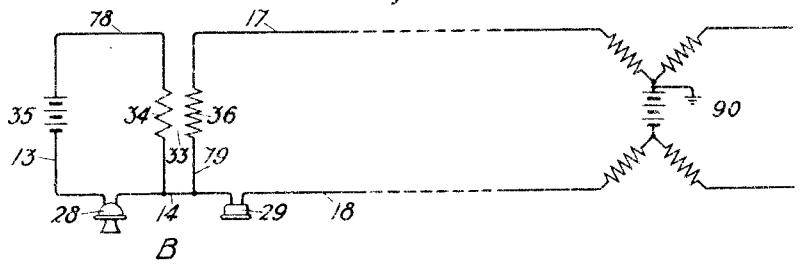
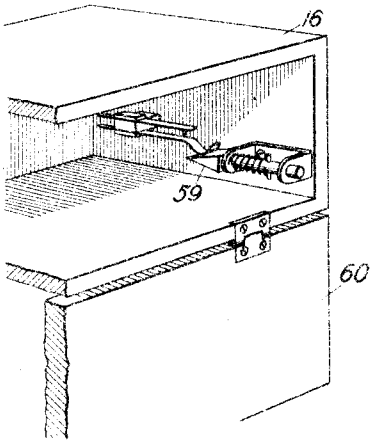


Fig. 5.



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

1,127,005. Specification of Letters Patent. Patented Feb. 2, 1915.

Application filed November 21, 1913. Serial No. 802,269.

To all whom it may concern:

Be it known that I, CLARENCE L. HOWK, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone systems, and more particularly to telephone systems for trains, the cars of which are equipped for intercommunication between stations located therein and which are adapted to be connected with outside lines.

In railway cars which are equipped with telephone apparatus for intercommunication between different stations thereof, frequently it is desired to be able to establish communication with the telephone lines along the railroad right of way or to establish connection with the telephone exchange when the car is lying in the railroad yards in the city. It furthermore frequently occurs that two railway cars, similarly equipped for telephone communication between different stations of the same car, are attached to the same train, in which case it is desirable to be able to hold telephone communication from stations in one car to those in another. Since railway cars are usually manned with help having very limited knowledge of telephone equipment, it is desirable that the establishing of connections from car to car, and from car to outside lines, be simplified as much as possible.

It is the object of this invention therefore to provide apparatus so arranged as to meet the requirements enumerated above.

With this object in view, generally speaking, there are provided for each railway car jacks whereby, upon the insertion therein of the plugs associated with a cord, one into a jack of one car and the other into a jack of another, connection is established therebetween, permitting communication to be had between stations in the two cars so connected. Each car is also provided with a receptacle containing jacks, whereby, upon the opening of said receptacle and inserting a plug associated with one end of a cord into the proper jack, the other end of the cord being associated with the proper line, communication may be had with either a common battery or local battery line or a line over which direct current is used for signaling, such for example as a train despatching line. Normally, the telephone system of each car is arranged for communication between stations in the same car, and mere opening of the receptacle automatically changes circuit conditions, adapting each car equipment for communication with outside lines.

This invention will be more fully understood by reference to the accompanying drawings, wherein—

Figure 1 is a view of two railway cars similarly equipped with telephone systems; Fig. 2 is a diagram of the circuit in each car; Fig. 3 is a diagram of the talking circuit between two stations in different cars; Fig. 4 is a diagram of the talking circuit between a station in one car and a common battery exchange; and Fig. 5 is a view in perspective of the receptacle provided on each car, showing a switch which automatically changes circuit conditions upon operating the receptacle.

As shown in the drawings, the telephone system or exchange equipment for each railway car comprises a plurality of stations 10, 10, connected by means of conductors 11, 12, 13 and 14, with one another and with the telephonic apparatus common to all stations located in an apparatus box 15, mounted in the car. Located under the car is a receptacle 16 containing jacks connected with the apparatus located in the apparatus box 15 by means of conductors 17, 18, 19 and 20.

At each station, taps from the conductors 11, 12, 13 and 14 terminate in a jack 25 and a switch 26. The station apparatus may consist of a hand set 27 comprising a transmitter 28, a receiver 29 and a switch 30 attached to one end of a cord 31, the other end of which terminates in a plug 32, adapted for connection with the jack 25.

Located in the apparatus box 15 is an induction coil 33, the primary 34 of which, in series with a transmitter battery 35, is bridged across the conductors 13 and 14. The secondary winding 36 of the induction coil 33 is located in the receiver circuit. In order to provide means for signaling from the car to a local battery exchange or to a station on a train despatching line, relay 40 is mounted in the apparatus box 15. The winding of relay 40 is in series with a battery 41 and the conductors 12 and 13, the circuit being normally open at the

switches 26. In multiple with the winding of relay 40 is the battery circuit 42, 43 of an interrupter 44, having a ringing circuit 45, 46 terminating in normally open contacts 47, 48 of the relay 40. This interrupter being of well known construction, is a device for producing, from a direct current source, currents for operating the usual telephone line signals.

Located in the receptacle 16, are jacks 55 and 56, the former being adapted for making connections to common battery lines and the latter for making connections to local battery lines or lines over which direct current is used for signaling. The conductors 17 and 18, and 19 and 20, having bridged thereacross a protector 57, the middle point of which is grounded to the truck frame of the car, terminate in the jacks 55 and 56 respectively. Bridged across conductors 19 and 20 and in series with a condenser 58, of small capacity, is a switch 59 which is normally closed when the receptacle 16 is closed, and open when said receptacle is open. The switch 59, which may be of any suitable construction, is so mounted in the receptacle 16 that when a door 60 thereof (see Fig. 5) is closed, said switch is closed, and open when said door is open. The door 60 of the receptacle 16 is only opened when connection is to be made to an outside line and remains open during the time such connection is established. The condenser 58 of the exchange equipment in each car normally completes the talking circuit therein. When, however, connection is established between the exchange equipments of two similarly equipped cars, the condensers 58 are bridged across the line and prevent the said line from being short circuited. These condensers being of small capacity do not interfere with the transmission between stations.

In order that the car may be signaled from an outside line when connection therewith has been established, there is mounted in the car a ringer 65, which is in series with a condenser 66 and is normally bridged across the conductors 17 and 18 and across the conductors 19 and 20. In order that connection may be established between two cars similarly equipped with telephone systems, there is mounted in each end of the car (or at any other suitable place) a jack 67 which is bridged across the conductors 19 and 20.

To enable connection to be established between two cars similarly equipped, each car is provided with a cord 75 having attached thereto, at each end, a plug 76 adapted for insertion into the jacks 67 in the ends of the cars. Furthermore, to enable connection to be established between the car equipped with a telephone system embodying this invention and a line upon which there is used direct current for signaling, such as a composited telegraph circuit, a train despatching line or some similar line, each car is provided with a line pole and cord 85 having one end terminating in hooks or other suitable devices for connecting with the line wires, and the other end in a plug for insertion in the jack 56, shown diagrammatically by dotted lines in Fig. 1. In order to prevent the signaling currents over the line to which the telephone system of the car is connected from interfering with the proper working of the telephone system, a condenser 73 is included in series with the conductor 20.

When connection is to be established between the car and a telephone exchange, the car will be located near a jack in which terminates a pair of line wires from the exchange, and there will be located at the jack a cord having a plug attached to each end thereof, so that it is unnecessary to equip the car with a cord for this purpose. Connection to a common battery exchange is established by connecting a plug and cord to the jack 55, and to a local battery exchange through the jack 56. The jacks 55 and 56 are of different characters so as to receive only a plug of particular construction and, to enable the proper connection to be established readily, all plugs associated with a jack from common battery exchanges will be of a construction suitable to enter the jacks 55, while those associated with a jack from local battery exchanges will be of a construction suitable to enter the jacks 56.

The signaling from station to station in the same car or from a station in one car to a station in another car is accomplished by means of a buzzer circuit or circuits which may be of any well known construction.

With the circuit as shown in Fig. 2 and assuming that communication is desired from station A to station B in the same car, the plugs 32 having been inserted into the jacks 25 and station B having been signaled from station A over the buzzer circuit, switches 30 of the hand sets 27 are closed, placing the transmitters 28 across the conductors 13 and 14 and the receivers across the conductors 11 and 14. Talking into the transmitter of station A will set up a current in a circuit which may be traced as follows: From one side of battery 35, through conductor 78, induction coil primary 34, conductor 14, transmitter 28 of station A, conductor 13, to other side of battery 35. Current in this circuit will induce a current in a circuit including the receiver of station B, which may be traced as follows: From induction coil secondary 36, through conductor 70, normally closed contact 71 of relay 40, conductor 19, normally

closed switch 59, condenser 58, conductor 20, normally closed contact 72 of relay 40, condenser 73, conductors 74 and 11, receiver 29 of station B, conductors 14 and 79, and back to induction coil secondary 36.

Suppose now that railway cars similarly equipped with telephone systems are adjacent in the same train, and that it is desired to be able to communicate from a station in one to a station in another, the plugs 76 of the cord 75 are inserted in the jacks 67 in the adjacent ends of the two cars, thereby establishing connection between the two telephone systems. The number of conductors terminating in the jacks and the number in the cords may be increased to accommodate the buzzer circuit conductors required for signaling purposes. The talking circuit established by the insertion of the plugs 76 into the jacks 67 of two similarly equipped cars and by the closing of switches 26 at stations in different cars is represented in Fig. 3.

Considering now the station in one car as station A and the one in the other car as station B, speaking into the transmitter of station A will cause current flow in a circuit which may be traced as follows: From battery 35, through conductor 78, induction coil primary 34, conductor 14, transmitter 28 of station A, conductor 13 to the other side of battery 35. Current flowing in this circuit will induce a current in the induction coil secondary 36 and through a circuit which may be traced as follows: From induction coil secondary 36, through conductor 70 at station A; conductor 80; induction coil secondary 36, conductors 79 and 14, receiver 29, conductor 11 and condenser 73 at station B; conductor 81; condenser 73, conductor 11, receiver 29, conductors 14 and 79 and back to induction coil secondary at station A. The condensers 58 bridged across the line at each station are of such a small capacity as to have a negligible effect upon the transmission.

Assuming that a car equipped with a telephone system embodying this invention is temporarily stationed at a point where line conductors from a common battery telephone system terminate in a suitable plug and cord, and that it is desired to establish connection between the car and the telephone exchange, the door 60 of the receptacle 15 is then opened, thereby opening the switch 59 and removing the condenser bridge from across conductors 19 and 20. The plug of the cord is now inserted into jack 55, establishing a talking circuit such as is represented in Fig. 4. If it is desired to signal the exchange represented as 90 in Fig. 4 from station B, the switch 30 of the hand set 27 is operated, thereby closing the battery circuit and actuating the usual exchange signal. If it is desired to signal a station in the car from the exchange, the usual generator current is sent over the line wires operating the ringer 65 in the car. With the usual operator's telephone set bridged across the line conductors at the exchange, the operation of the talking circuit shown in Fig. 4 will be evident.

Should connection be desired between the car and a line over which direct current is used for signaling purposes, the connecting devices of the pole and cord 85 are caused to engage the wires of said line, the door 60 of the receptacle 16 is opened and the plug associated with the said pole and cord 85 is inserted into the jack 56. Should the connection be established with a local battery exchange, the operations would be similar, using the cord associated with the jack in which terminate the line wires from the local battery exchange instead of the plug and cord 85. In fact, it may be that in some cases the line over which direct current is used for signaling may terminate in a plug similar to that associated with a local battery exchange. The signaling from the local battery exchange or from a station on the line over which direct current is used for signaling to the car is accomplished in the same manner as from the common battery exchange hereinbefore described. In signaling from the car to a local battery exchange or to a station on the line over which direct current is used for signaling, the same operations are necessary. In signaling from the station A in the car to a line connected with the car through the jack 56, the switch 26 (see Fig. 2) is operated, thereby closing a circuit which may be traced as follows: From one side of battery 41, through conductor 13, switch 26 at station B, conductor 12 to a point 82 therein where it divides, one part going through the winding of relay 40 and the other through the battery circuit 43, 42 of the interrupter 44, meeting at a point 83 in a conductor 84, conductor 84 and back to the other side of battery 41. Current through the winding of relay 40 causes the energization of said relay, which thereupon attracts its armatures, closing the normally open contacts 47 and 48. Current is flowing at the same time in the battery circuit 43, 42 of the interrupter 44 and causes an alternating current to flow from the interrupter through conductor 45, contact 47, conductor 20, one line wire to the signal at the station being signaled, the signal at said station, other line wire, conductor 19, contact 48, conductor 46 and back to the interrupter 44. The talking circuit established by the insertion of a plug into the jack 56 may be represented in Fig. 3, the switch 59 at station A being open and considering that one conductor of the connecting cord is connected at a point 87 and the other at a point 86, thereby substitut-

ing the connected line for station B. The operation of such a circuit is considered so well known as to require no explanation.

What I claim is:

1. In a telephone system for trains, an exchange equipment carried by each car adapted for both interconnection and connection to outside lines, means normally in circuit with said equipment for changing circuit conditions when interconnection is established, outside telephone lines of different characters, means for connecting said exchange equipment and any of said outside lines, and means operated in establishing connection between said equipment and any of said outside lines for conditioning the talking circuit therebetween for operation.

2. In a telephone system for trains, an exchange equipment carried by each car adapted for both interconnection and connection to outside lines, means normally in circuit with said equipment for preventing the short circuiting of the line when interconnection is established, and means operated in establishing connection between said equipment and an outside line for disconnecting said short circuiting preventative means.

3. In a telephone system for trains, an exchange equipment carried by each car adapted for both interconnection and connection to outside lines, a condenser normally in circuit with said equipment, which, when interconnection is established, prevents the short circuiting of the line, and a switch normally in circuit with said equipment, which, during the establishing of connection to an outside line, is operated to remove said condenser from the circuit.

4. In a telephone system for trains, an exchange equipment carried by each car adapted for connection from station to station within the same car and for connection between stations in different cars, and means normally in circuit with said equipment to complete the talking circuit from station to station within the same car, said means upon connection being established between stations in different cars permitting the completion of the talking circuit therebetween.

5. In a telephone system for trains, an exchange equipment carried by each car adapted for connection from station to station within the same car, for connection between stations in different cars and for connection to outside lines, means normally in circuit with said equipment to complete the talking circuit from station to station in the same car, means for connecting together a plurality of said equipments and for changing the relation of said first mentioned means to said equipments, and means operated in establishing connection between said equipment in one car and an outside line for removing said first mentioned means from the circuit.

In witness whereof, I hereunto subscribe my name this 18th day of November, A. D., 1913.

CLARENCE L. HOWK.

Witnesses:
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ALICE HAZLEY.