W. W. DEAN.

TELEPHONE SYSTEM.

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963,875.

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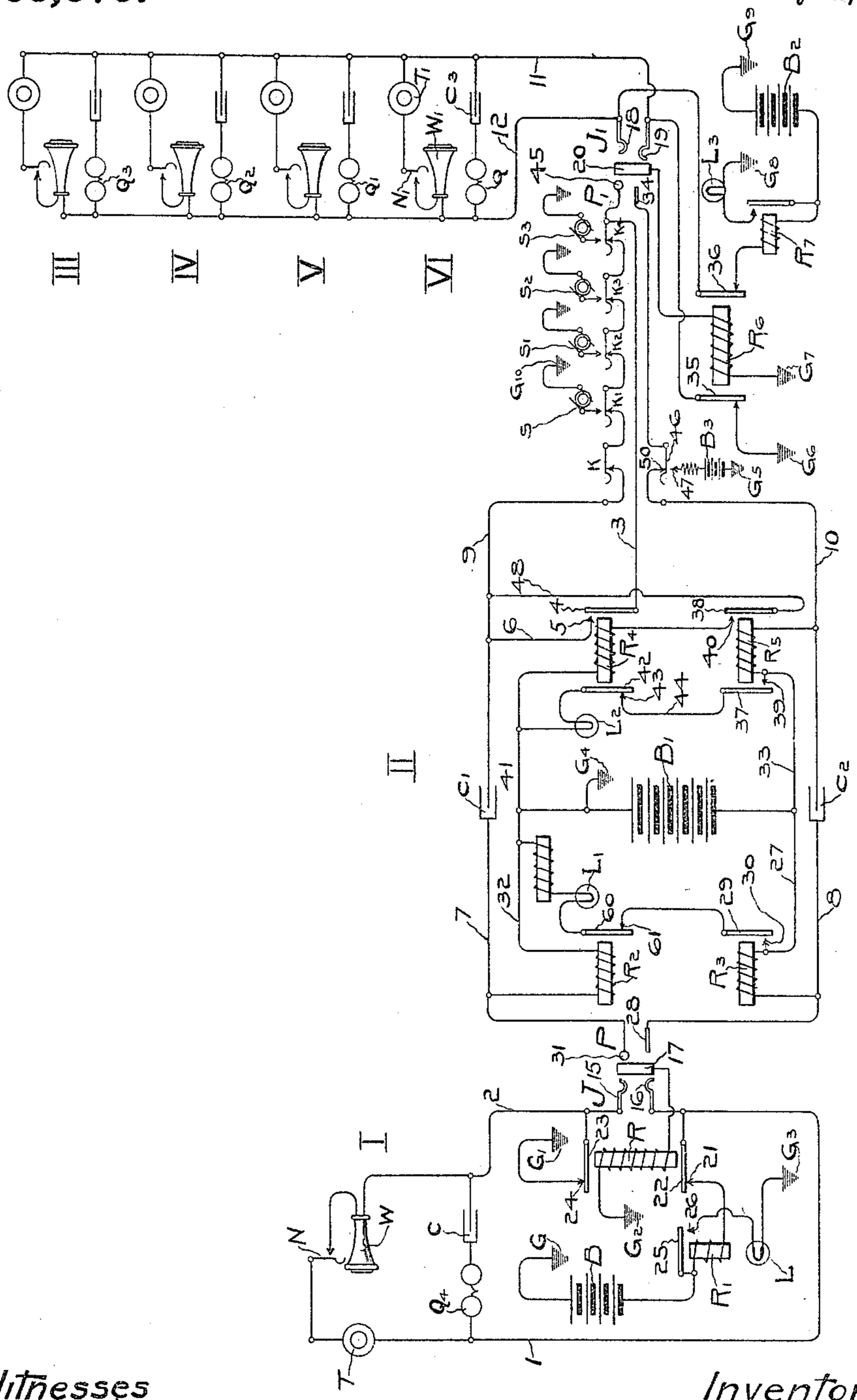

Witnesses

E. F. Kennedy

Mary Malloy

Inventor

William W. Dean.

By F. O. Richey

His Attorney

UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF ELYRIA, OHIO, ASSIGNOR TO THE DEAN ELECTRIC COMPANY, OF ELYRIA, OHIO, A CORPORATION OF OHIO.

TELEPHONE SYSTEM.

963,875. Specification of Letters Patent. **Patented July 12, 1910.**

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To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing in Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates more particularly to the apparatus to be employed in connection with the application of signaling current to conductors afterward to be included in the talking circuit.

To apply signaling current, the talking strands are interrupted while the signaling source is connected to the call line. This places a switch contact in the talking strand and in the so-called harmonic party line systems where several sources of current are employed, each source requires a separate switch in the conductor. A master switch is also employed, which increases the number of contacts in the strand. Since, owing to various reasons, such as the resistance of these contact joints, the possibility of particles of dust and rust coming between them, the efficiency of the strand for talking purposes is lowered, it is very desirable to remove these from the path of the voice currents. To accomplish this, I place a shunt around these contacts which is open during the application of the signaling current, thus preventing the flow of such current to the calling line. This shunt is adapted to be closed during the conversation, thus effectively removing the master and signaling switches from the talking circuit. In the preferred form of my invention, as shown in the drawing, this shunt is governed by means which permit it to remain open during the signaling, but which automatically closes the shunt when the called subscriber responds, holding said shunt closed during the conversation.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustration, showing one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

The figure shows a diagram of a telephone system employing my invention.

On the left hand side of the figure I show a telephone line with but one station I thereon. At this station I show a transmitter T, a hook switch N and a receiver W in open bridge of the line; a second bridge includes a ringer Q^4 and a condenser C. The line extends by conductors 1 and 2 to a jack J which is arranged upon a switchboard at the central station. This jack consists of a tip spring 15, a sleeve spring 16, and a ring 17. The line lamp is shown at L, the line relay at R^1 and the cut-off relay at R. The function and mode of operation of these parts will be understood from the description of the operation. At the right hand side of the figure, I show a second telephone line to which four sub-stations III, IV, V and VI are connected. At one of these stations I reference the parts. There I show a normally open bridge including transmitter T^1, hook switch N and receiver W^1 in a normally open bridge, a ringer Q and condenser C^3 in a second bridge. These parts are duplicated at the other stations, the ringer Q being referenced. Other ringers are shown at Q^1, Q^2, Q^3 at stations V, IV and III respectively. This line extends by conductors 11 and 12 to the jack J^1, which is also arranged upon a switchboard at a central station. This jack consists of the tip spring 18, the sleeve spring 19 and the ring 20. At L^3 I show the line lamp, at R^7 the line relay, at R^6 the cut-off relay.

At II in the center of the figure, I show a diagram of a link shown here as a cord circuit, which is arranged at a central station and which terminates in an answering plug P and a calling plug P^1, which are adapted to be inserted into the jacks for the purpose of connecting the two lines together. The two ends of this link are separated by condensers C^1 and C^2. A source of current B^1 is connected to the link. At L^1 and L^2, I show the supervisory lamps, at R^2 and R^3 the answering supervisory re-

lays and at R^4 and R^5 the calling supervisory relays. The functions and modes of operation of these parts will be better understood from the description of the operation. One of the strands of the link conductor includes the switches K^1, K^2, K^3, K^4 and a switch of the master key K. Associated with the switches K^1, K^2, K^3 and K^4, I show sources of signaling current S, S^1, S^2, and S^3 respectively. When it is desired to call a subscriber, the source of current having a frequency to which the signal at the desired subscriber's station responds, is connected by the operation of the key corresponding to that source. At the same time, the master key K is operated. Around these switches I show a shunt 3—6 having a switch 4—5 therein. This switch is controlled by supervisory relay R^4 and is closed when the called subscriber responds, remaining closed during the conversation. At B^3 I show a source of current which is connected to the sleeve strand of the link when the station is being signaled. This is for the purpose which will be apparent from the description of the operation.

The operation of my system is as follows: Assuming that a subscriber at station I desires to converse with the subscriber at station VI, the receiver W is removed from the hook which rises, closing a bridge across the conductors 1 and 2, which permits the flow of direct current therethrough, the bridge through the condenser C normally barring the passage of such current. Current then flows over the following circuit: from ground at G—battery B—R^1—21—22—1—T—N—W—2—23—24 to ground at G^1. The relay R^1 is energized over this circuit attracting its armature 25, and closing the switch 25—26, current then flows from G—B through 25—26, line lamp L to ground G^3. The line lamp L is illuminated and being placed before the central station operator, she observes the illumination and inserts the plug P into the jack J. A circuit is then completed from ground G^4—B^1—27—R^3—8—28—17—R to ground G^2. The relays R and R^3 are energized. The relay R pulls up its armatures 22 and 23, cutting the line lamp and line relay off from the line. The relay R^3 pulls up its armature 29, closing the switch 29—30, which would complete a circuit through the supervisory lamp L^1 were not the relay R^2 energized at the same time. This relay is energized over a circuit which begins with the negative pole of battery B^1 through 27—R^3—8—28—16—1—the substation bridge at I—2—15—31—7—R^2—32— to positive pole of B^1. The central operator now connects her own telephone set (not shown) in bridge of the link and ascertains the number of the subscriber desired. Learning that the subscriber at station VI is desired, she inserts the plug P^1 into the jack J^1. A circuit through the relays R^5 and R^6 is at once made as follows: G^4—B^1—33—R^5—10—34—20—R^6 to G^7. The relay R^6 pulls up the armatures 35 and 36, cutting off the line lamp and relay from the line. Relay R^5 pulls up the armatures 37 and 38, closing the switch 37—39. This completes a circuit through the lamp L^2 from positive side of B^1—41—L^2—42—43—44—37—39—33. This lamp lights. The attraction of the armature 38 closes a switch 38—40, which connects the relay R^4 to the tip side of the calling end of the cord. We will assume that the source S supplies current of a frequency to which the bell Q responds. The operator accordingly, throws the switch K, signaling current then flows from ground G^{10} through S, the switch K^1, the tip side, tip 45—18—12—Q—C^3—11—19—34—46—47—B^3 to ground G^5. This operates ringer Q and when the subscriber responds, removing the receiver from the hook N, which closes the bridge through the sub-station set, current flows over the following circuit: positive pole B^1—41—R^4—40—38—48—9 through the ringing switches—45—18—12— sub-station at VI—11—19—34—46—50—10—R^5 to the other pole of battery B^1. This energizes the relay R^4, which pulls up the armatures 4 and 42. The attraction of the armature 42 breaks the circuit of the lamp L^2 by opening the switch 42—43. The attraction of the armature 4 closes a switch 4—5 and completes a shunt 3—6 around the ringing switches. The talking circuit is now completed from the station I as follows: from T to 1—16—28—8—C^2—10—50—46—34—19—11—T^1—N^1—W^1—12—18—45—3—4—5—6—C^1—7—31—15—2—W—N— back to T. Current for this source is supplied by the battery B^1, which is bridged across either end of the cord circuit through the supervisory relays. At the close of the conversation each subscriber hangs up his receiver. When the receiver W is hung up, the sub-station bridge is broken at the hook switch N. The circuit of the relay R^2 is interrupted permitting the armature 60 to fall back against the contact 61, completing the circuit of the lamp L^1. Upon observing this, the operator withdraws the plug P from jack J, whereupon the cut-off relay R is deënergized, restoring conditions at the answering end to normal. At the other end, the restoration of the receiver interrupts the circuit of relay R^4 in a similar way. The shunt is broken and the circuit of the lamp L^2 retored. Upon observing the illumination of this lamp, the

operator extracts the plug P^1, whereupon the conditions at the calling end of the cord are reestored to normal, the whole system being now at normal.

While I have shown my invention in this particular form, it will be obvious to those skilled in the art that numerous and extensive departures from the form and the details of the apparatus here shown, may be made without departing from the spirit of this invention, the same being herein shown solely for the purpose of clearly illustrating one specific embodiment thereof.

I claim—

1. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a normally open shunt of said switch and means for closing said shunt about said switch during conversation.

2. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a shunt path about said switch and means under control of the called subscriber for closing said shunt during conversation.

3. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a shunt path about said switch and means acting automatically to close said shunt when the called subscriber responds.

4. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a relay associated with said link conductor and a shunt about said switch controlled by said relay.

5. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a supervisory relay associated with said link conductor and a shunt about said switch controlled by said supervisory relay.

6. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, a shunt about said switch and a relay controlling said shunt, said relay being controlled by the called subscriber to close said shunt during conversation.

7. In a telephone system, the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a cord at the exchange for connecting said lines together, sources of signaling current at said exchange, signaling switches in said cord for connecting said sources to a called line, a shunt about said switches and an electromagnet controlling said shunt, said magnet acting to close the shunt during conversation.

8. In a telephone system, the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a cord at the exchange for connecting said lines together, sources of signaling current at said exchange, signaling switches in said cord for connecting said sources to a called line, a normally open shunt about said switches and means for maintaining said shunt during conversation, said means acting automatically to close said shunt when two subscribers are connected in conversational relation.

9. In a telephone system the combination of a plurality of subscribers' lines extending from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line and means to close a circuit for conversation independent of said switch, said means under control of the called subscriber.

10. In a telephone system the combination of a plurality of subscribers' lines extending

from sub-stations to an exchange, a link conductor at the exchange for connecting said lines together in conversational relation, a source of signaling current at said exchange, a switch associated with said link conductor controlling the connection of said source with a called line, and a relay to close a circuit for conversation independent of said switch, said relay under control of the called subscriber.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:
A. D. T. LIBBY,
F. O. RICHEY.