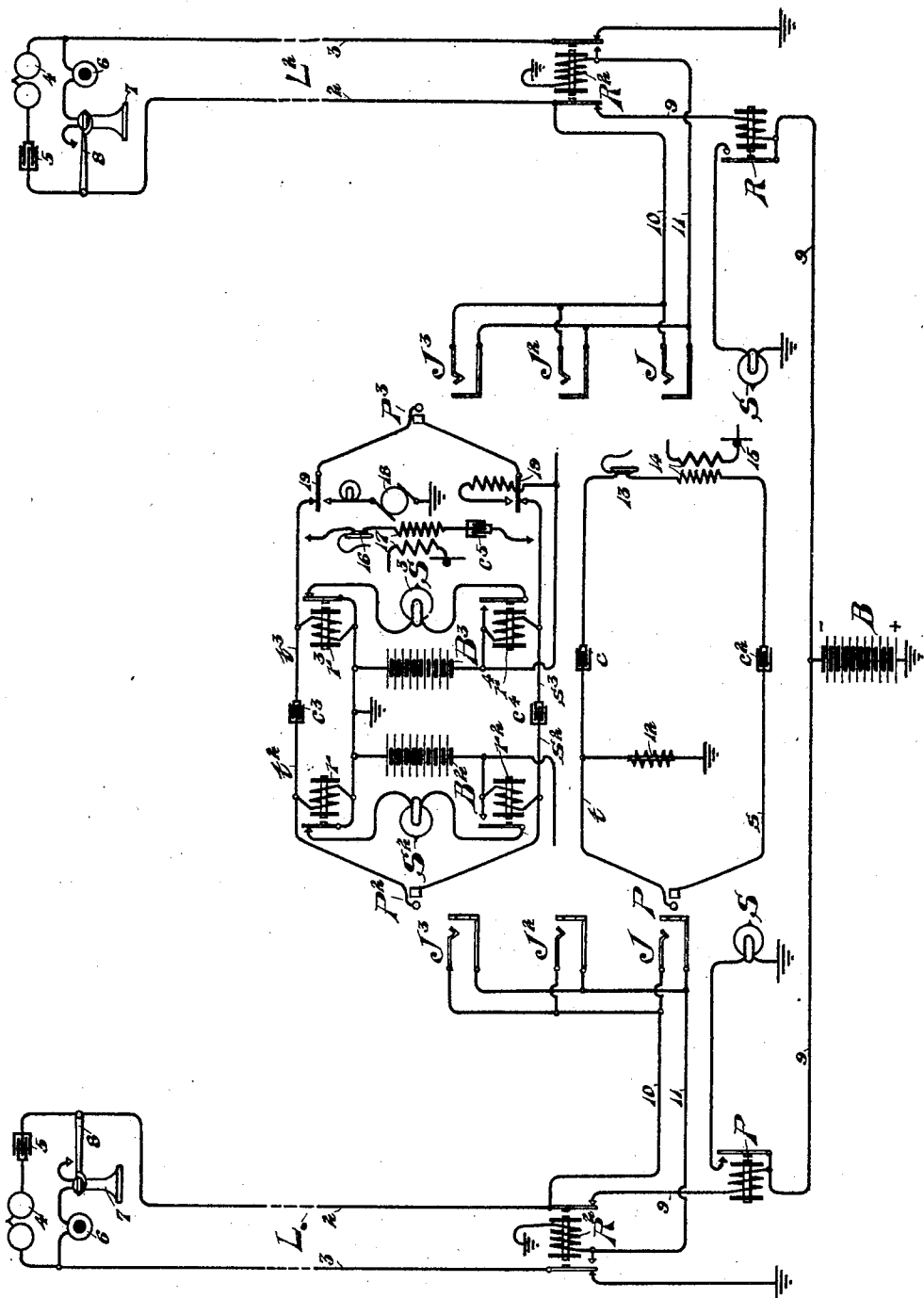


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W. W. DEAN.
TELEPHONE SYSTEM.
APPLICATION FILED JUNE 15, 1903.



Witnesses.
R. H. Bumpford
Kempster B. Miller

Inventor:
William W. Dean,
by Robert Lewis Ames,
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE SYSTEM.

No. 814,118.

Specification of Letters Patent.

Patented March 6, 1906.

Application filed June 15, 1903. Serial No. 161,533.

To all whom it may concern:

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

My invention relates to improvements in telephonic apparatus and systems, including means for testing the line-circuits to determine whether or not they are in suitable working condition. These improvements in my invention comprise the extension of the side of the line to which the line-relay is connected directly through to the corresponding contacts of the jacks and providing a plug and cord circuit of special type whereby upon inserting the plug in one of the jacks of the said line a local path for current is completed through the line signaling device of the telephone-line, which causes the same to operate if it is in working order, thus indicating to the attendant that the said line signaling device is in proper working condition.

My invention is illustrated in the accompanying drawing, in which the same reference characters are used throughout to indicate like parts, and in which the figure is a diagram of a system embodying my improvements.

L and L² indicate subscribers' lines extending in two limbs 2 and 3 from the respective substations to the central office. At the substation any suitable common battery outfit may be employed, that shown including a bell 4 and condenser 5 in a permanent bridge of the line conductors, together with a transmitter 6 and a receiver 7 in a bridge of said conductors that is normally open at the switch-hook 8. At the central office the line is fitted with an answering-jack J and a suitable number of multiple jacks J² and J³ and with a line-signal S, whose local circuit is controlled by means of the line-relay R, which is included in the normal extension of the line conductor 2 over a conductor 9 to the live pole of the central and common battery B. The other line conductor 3 is normally grounded. The switchboard-section of the jacks includes the tip and sleeve conductors 10 and 11, conductor 10 being permanently connected with the line conductor 2, while conductor 11 is joined to the forward contact

of the sleeve-spring of the cut-off relay R², which has its winding grounded from said sleeve-conductor 11.

In order to test the condition of the line relays and signals of the telephone-lines, I provide a plug P, having tip and sleeve contacts adapted to register with the corresponding contacts of the jacks. A tip-strand *t* is connected with the tip-contact of the plug P, while a sleeve-strand *s* is similarly connected with the sleeve-contact of said plug. A retardation-coil 12 is legged to ground from the tip-strand *t* of the testing-cord. A receiver 13 and induction-coil 14 may be connected with the strands *t* and *s* by means of the condensers *c* and *c*². A suitable transmitter 15 may be provided to cooperate with the receiver 13 and is charged from any suitable source of current.

The test is carried out in the following manner: The insertion of the plug P in the answering-jack J or in any of the other jacks of the line, but preferably in the answering-jack, for the reason that the testing is supposed to be done at the section on which the line-signal is mounted, a path for current is completed from the live pole of the battery B over conductor 9, through line-relay R, the normal contacts of the cut-off relay R² and thence by way of conductor 10 to the tip-spring of the jack, the tip-contact of the testing-plug P, strand *t* of the testing-cord, and through the retardation-coil 12 to ground. If the line-relay R is in working order, it is now energized and closes the local circuit of the line-lamp S. If the lamp is in proper working condition, it is lighted and indicates the fact to the attendant that the said parts are all right. In case they are out of order, the fact will be indicated to the attendant by the failure of the lamp to light, and the proper steps may be taken to remove the trouble. It will be noticed that this testing operation is carried out without operating the cut-off relay of the line or otherwise affecting the normal arrangement of the line devices. The receiver 13 and transmitter 15 are for the purpose of enabling the attendant to talk with the chief operator or any one else with whom it may become necessary or desirable and without being required to use a separate cord. This test is preferably carried out in the early morning before the telephone-lines

are being used to any extent and is sometimes termed the "morning" test.

The ordinary cord-circuit used for talking purposes is shown above the testing-cord and includes an answering-plug P^2 and a calling-plug P^3 , having tip and sleeve contacts adapted to cooperate with the corresponding contacts of the jacks, the tip-contacts being connected together by means of the tip-strands t^2 and t^3 and the condenser c^3 , while the sleeve-contacts are joined by strands s^2 and s^3 and the condenser c^4 . Suitable supervisory relays r and r^2 are bridged across the answering end of the cord-circuit, together with a suitable battery B^2 , while the similar relays r^3 and r^4 are connected across the calling end of the cord-circuit, together with a battery B^3 . These batteries are common to the cord-circuits of the exchange, and each is preferably common to a large number of lines. While a third battery B is shown at the bottom of the exchange, it will be understood that one of the batteries B^2 or B^3 will be used in place thereof for the telephone-lines. The operator's receiver 16, her induction-coil 17, together with a condenser c^5 , are connected across the cord-circuit in the usual manner by means of any suitable listening-key, while the generator 18 is adapted to be connected with the tip-strand of the cord-circuit by means of the ringing-key 19.

The operation of the system for conversational purposes is thought to be obvious; but it may be well to mention that the subscriber in taking up his receiver completes a path for current from the battery B over the metallic line in the usual manner and operates the line-signal S . The operator upon observing this signal inserts the plug P^2 of the cord-circuit into the answering-jack J of the calling-line, thereby connecting the battery B^2 over the sleeve-strand and through the wire 11 and cut-off relay R^2 to ground, which relay is operated to disconnect or render inoperative the line-signal device and to connect the sleeve-conductor of the line with the sleeve-conductor 11 of the switchboard-section. The tip conductor 10 is already connected with the line conductor 2. Supervisory relays r and r^2 and the supervisory signal S^2 operate in the usual manner, and upon learning the order the operator inserts the calling-plug P^3 into the jack of the telephone-line and depresses the ringing-key. After the subscriber has been called, but before his response, the supervisory signal S^3 is lighted; but as soon as the subscriber answers the said signal is extinguished. During conversation the batteries B^2 and B^3 send current out over the telephone-line for talking and for the operation of the various relays associated therewith. At the termination of the conversation the return of the receivers to the hooks deenergizes the relays r and r^3 and lights the supervisory signals S^2 and S^3 . Upon ob-

serving these signals the operator takes down the connection and restores all parts to normal condition.

Having thus described my invention, what I claim as new is—

1. In a telephone system, the combination with a telephone-line, of a line-signal-controlling magnet therefor having its actuating-winding included in one of the line conductors, a connection-terminal having a line-contact connected permanently with the said line conductor, a plug adapted to be inserted in the connection-terminal and having a contact cooperating with the contact of said terminal that is connected with said line conductor, and a source of current included between said line conductor and said plug-contact whereby upon the insertion of the plug a path for current is completed through the line signaling-magnet and its working condition thereby determined, substantially as described.

2. In a telephone system, the combination with a telephone-line, of a line-signal-controlling magnet included in one of the line conductors, a connection-terminal having one contact normally connected with said line conductor, a connecting-plug having a contact adapted to engage the corresponding contact of the connection-terminal, a common source of current having one pole connected to said line conductor, and a third conductor connected between the other pole of said source and the said plug-contact, whereby upon the insertion of the said plug a local path for current is completed through the said line signaling-magnet whereby its condition may be determined, substantially as described.

3. In a telephone system, the combination with a telephone-line, of a line signaling device included in one line conductor, a connection-terminal having one of its contacts permanently connected with the said conductor and its other contact disconnected from the other line conductor, a common source of current connected with said line at the central office and adapted to furnish current over the telephone-line for the operation of said signaling device when the subscriber is calling the central office an operator's connecting-plug, and means for closing a local circuit from said source through said device, when said plug is connected with said first-mentioned contact, substantially as described.

4. In a telephone system, the combination with a telephone-line, of a line signaling device in the normal connection of one line conductor, a connection-terminal permanently connected with said line conductor, an operator's connecting plug and cord, said plug having a contact adapted to engage the contact of said line that is connected with the said line conductor when inserted therein, and means associated with said cord for including a source of current in the local circuit of said

signaling device whereby the condition of the latter may be determined, substantially as described.

5 In a telephone system, the combination
with a telephone-line, of a line-signal-controlling magnet and a source of current connected
to one of the line conductors, the opposite
pole of said source of current being connected
to a suitable common return, a connection-
10 terminal for the line having a contact corresponding to each line conductor, a connecting-plug of the usual type adapted to be inserted
in said connection-terminal, said plug having
a contact adapted to engage the contact of
15 the connection-terminal that is connected with the same line conductor as the said magnet, and a flexible connection from said plug-contact to the said common return of the battery, whereby upon the insertion of said
20 plug a local path for current is completed

through the said line-signal-controlling magnet to determine its working condition, substantially as described.

6. In a telephone system, the combination
with a telephone-line, of a line signaling device therefor, a testing-plug, suitable connections from said plug and a suitable source of
25 current to test the condition of the line signaling device when desired, and an operator's outfit connected with said plug whereby the
30 said plug may be used for conversational purposes when desired, substantially as described.

Signed by me at Chicago, county of Cook,
State of Illinois, this 12th day of June, 1903. 35

WILLIAM W. DEAN.

Witnesses:

EVA A. GARLOCK,
ROBERT LEWIS AMES.