

No. 620,002.

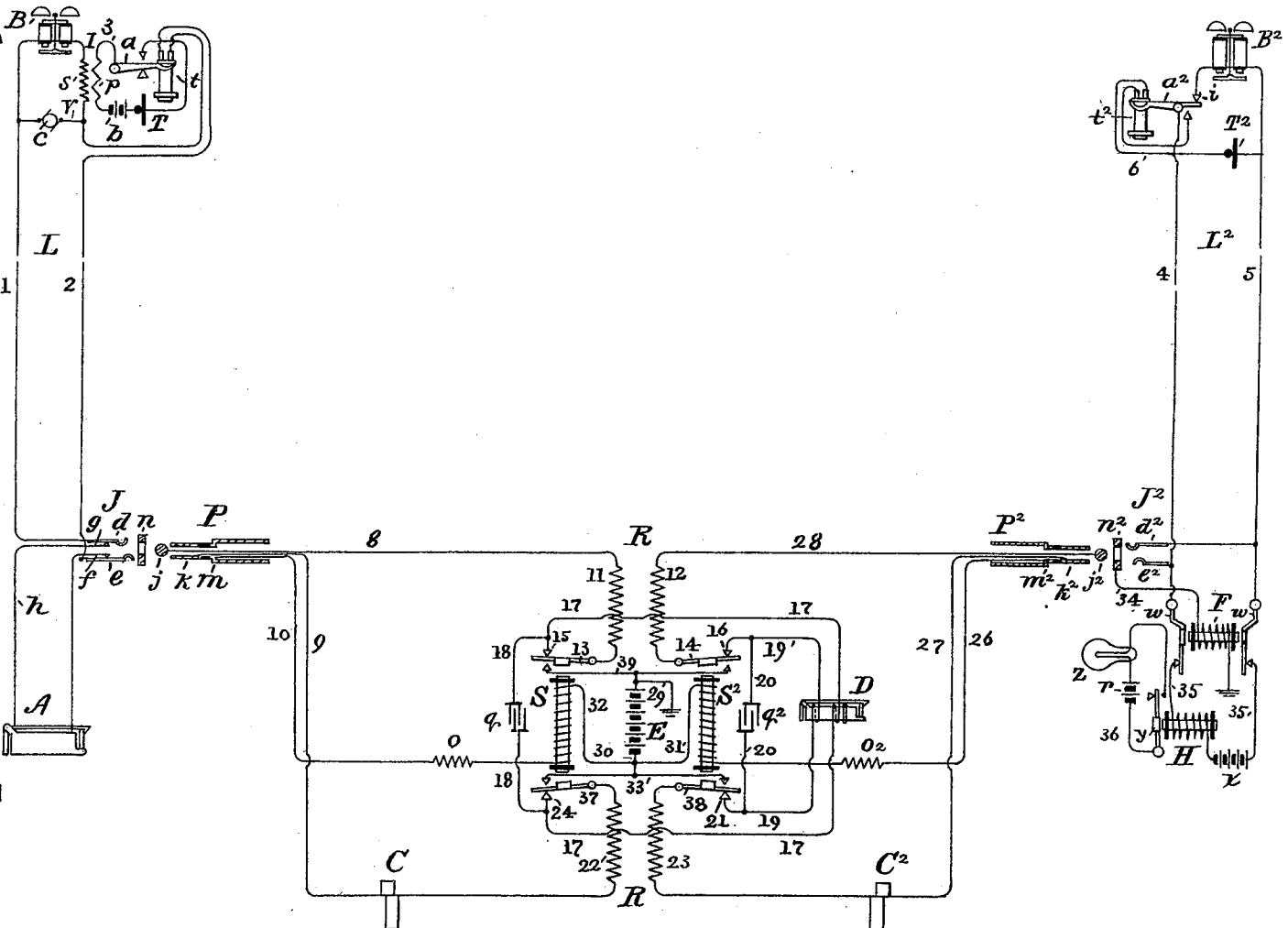
G. K. THOMPSON.

Patented Feb. 21, 1899.

SWITCHBOARD CONNECTING CORD CIRCUIT.

(Application filed July 19, 1898.)

(No Model.)



Attest.

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SWITCHBOARD-CONNECTING CORD-CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 620,002, dated February 21, 1899.

Application filed July 16, 1898. Serial No. 686,093. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. THOMPSON, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Switchboard-Connecting Cord-Circuits, of which the following is a specification.

In the extension or the reconstruction of the switchboard at a telephone central station it is often desirable to gradually add new sections thereto which constitute the terminals and switching apparatus of substation-circuits of a different and more improved type than those of the original switchboard. During such a period of growth or of reconstruction means have to be provided at each operator's table whereby the different types of substation-circuits can be switched to each other; and this invention relates to new and improved means for effecting this result.

In the common and usual type of substation-circuits and switching apparatus the call-bell and generator at the substation are respectively adapted to be switched in or out of the main circuit, and the transmitting-telephone is in a normally open local circuit which is in inductive relation with the said main circuit, and at the central station the circuit is provided with an electromagnetic line-signal adapted to be cut off when a plug of the cord-circuit is connected with a line-jack. This invention provides a new arrangement of the cord-circuits, by means of which such so-called "magneto-circuits" can be connected with each other and also with the type of substation-circuits known as "relay-circuits" and whereby such relay-circuits can also be connected with each other.

Substation relay-circuits are well known in the art, but have not as yet been extensively adopted. They are constituted with a centralized battery at the central station, with means whereby when a call is to be made from a substation by the removal of the telephone from its hook-switch, the line-signal is automatically displayed, also with means for exciting a relay which disconnects the normal terminal and line-signal when a switch-plug is inserted in the line-switch socket to answer a call, and other appliances which provide that when two such circuits are switched to-

gether the current for the substation-transmitters is furnished from the same centralized source, the said circuits being adapted to repeat into each other by means of an interposed repeating-coil in the linking cord-circuit.

The cord-circuit is so constructed that each plug-section thereof is independent of, as well as complementary to, the other, and when either plug is inserted into a magneto substation-circuit each plug and plug-section is conductively independent of but inductively connected with the other and includes a clearing-out signal between its divided coils in shunt with a condenser, and when either plug is inserted in a relay substation-circuit that side or end of the cord-circuit becomes automatically switched to include a separate clearing-out signal, and the talking-battery, while remaining in inductive relation with the other, all of which will now be described in detail.

Referring to the drawing, which is a diagram illustrating the invention, L represents a magneto substation-circuit having a bell B and a magneto-generator *c* in parallel between the conductors 1 and 2.

I is an induction-coil whose secondary *s* is in the conductor 2 of the main circuit and whose primary *p* is in the local circuit 3, which includes the hook-switch *a*, battery *b*, and transmitter T.

J is a spring-jack whose springs *d* and *e* are in connection with their respective contacts *g* and *f*, which are the terminals of the circuit *h* and which includes the line-signal A.

L² represents a relay substation-circuit whose conductors 4 and 5 connect the hook-switch *a*² and its upper contact *i* with the armatures *w w* of the cut-off relay F.

B² is a high-resistance bell in conductor 5, and the telephones *t*² and T² are in a parallel circuit 6, which is open when the telephone *t*² is upon the hook-switch *a*².

J² is a spring-jack, and *n*² the test-ring connected by wire 34 to the relay F and ground. Wire 35 connects the relay H and battery *x* with the back contacts of the armatures *w w*, and wire 36 connects the battery *r* and line lamp-signal *z* with the armature *y* and its front contact.

Both sides or sections of the cord-circuit are similar, and a description of one will thus suffice for the other also. The plug P has three contacts j , k , and m . The first, j , is connected by wire 8 with one upper helix 11 of the repeating-coil R and with armature 13. The second, k , is connected by wire 9 and clearing-out signal C with the lower helix 22 of the said coil R and to armature 37, and the third contact, m , is connected by wire 10, resistance o , relay S, and wire 32 to one pole of battery E, which is located in the bridge 30, which connects the wire 33, having the front contacts of the armatures 37 and 38 at its ends, with the wire 39, whose ends terminate in the respective front contacts of armatures 13 and 14, and wire 29 connects the upper side of battery E with ground. The wire 17 connects the back contacts 15 and 24 of the armatures 13 and 37, including in circuit a helix of the disconnecting-signal D, and wire 18 includes the condenser q in a circuit parallel with the wire 17. On the right-hand side of the cord-circuit the wire 19 connects the back contacts 16 and 21 of the armatures 14 and 38 and has in circuit a winding of the disconnecting-relay D, and the wire 20 and the condenser q^2 are in parallel thereto.

In the operation of the invention consider first a call coming in from the magneto-circuit L. The subscriber by rotating the generator c causes the line-signal A to be displayed in a well-known manner, and in response thereto the operator inserts the answering-plug P in the jack J. The diagram shows the cord-circuit in its normal condition, and when either plug is inserted in a jack there is no change in its condition. Consequently when the answering-plug is inserted in the jack it raises the springs d and e , cutting off the line-signal A, and spring d connects the conductor 1 to tip j and spring e the conductor 2 to sleeve k , and the circuit is then by wire 8, helix 11, armature 13, contact 15, wire 18, and condenser q , contact 24, armature 37, helix 22, and wire 9 to the sleeve k . A circuit is also formed through the wire 17 from the armature-contacts 15 and 24; but as the condenser q offers less impedance to the telephone-currents than the winding of the disconnecting-signal D in the wire 17 they are shunted around said winding. Now if the plug P² be inserted into a magneto-circuit it will be readily seen that the corresponding and opposite helices 11 and 12 and 22 and 23 will repeat into each other the electrical vibrations produced by the transmitters T in the local circuits 3, and when the generator c is operated to ring off the relatively low frequency currents produced thereby find so great an opposition to their passage through the condenser q that the signal D is operated without difficulty, and as the test-ring of the jack J has no earth connection current from battery E will not flow through the wire 10 and the relay S will not be operated. When a call comes over the relay-circuit L² and is in-

dicated by the glowing of the line-signal z in a manner well understood, the operator inserts the answering-plug P in the jack J² and the plug-contact j makes contact with the spring e^2 and conductor 4. The contact k makes contact with spring d^2 and conductor 5, while contact m connects with test-ring n^2 , and a circuit is formed from ground via relay F, wire 34, test-ring n^2 , plug-contact m , wire 10, relay S, wire 32, battery E, and wire 29 to ground. Current from battery E flows in the circuit thus completed and energizes the relay S, causing its armatures 13 and 37 to be attracted to their front contacts, so that the talking-circuit is now from conductor 4, through spring e^2 , tip j , wire 8, helix 11, armature 13, wire 39, battery E, wire 33, armature 37, helix 22, wire 9, sleeve k , spring d^2 to conductor 5. It will be understood that the current which energizes the relay S also energizes relay F and operates to extinguish the lamp-signal z . When conversation is concluded at the substation of a relay-circuit, the replacement of the telephone upon the hook-switch opens the circuit and operates the disconnecting-signal C, which is of a type to show a signal when its electromagnet is demagnetized, as illustrated by the Patent No. 536,104, granted to Theodore Spencer March 19, 1895.

The battery E serves three purposes in the operation of the relay-circuit. It energizes the relays S, causing their armatures to be attracted to their front contacts. Current therefrom also circulates in the substation-circuit to energize the transmitters, and, lastly, current from the battery, graduated by the resistances o , so that it will not cause an undue noise in the operator's head-telephone, flows to the test-ring and test-circuit.

As both plug-circuits are entirely independent of each other, it will be readily seen from the foregoing description that either two magneto or two relay substation-circuits can be connected together or that one of each kind can be connected with one another by means of the improved cord-circuit described.

Having thus explained my invention, I claim—

1. A cord-circuit for linking together substation-circuits of different types, divided into two inductive plug-circuits, each plug having tip, sleeve, and test contact surfaces which constitute the terminals of two separate circuit-sections, including separate disconnecting-signals for each type of substation-circuit, and means whereby when either plug is inserted into the switch-socket of either a magneto or a relay substation-circuit, the said circuit is adapted to repeat into the opposite plug-circuit and the substation-circuit connected thereto, and whereby the distinctive disconnecting-signal appropriate to each type of circuit is adapted to be operated as set forth.

2. A cord-circuit, divided by a repeating-coil into two independent plug-circuits, nor-

5 mally organized to connect with magneto sub-
station-circuits, each plug having three con-
tact-surfaces, the tip and sleeve contacts be-
ing in circuit with each other, and normally
10 including in series two helices of the said re-
peating-coil, a condenser and a disconnect-
ing-signal, and having in shunt therewith one
coil of a second disconnecting-signal; and the
test-contact being in circuit with a relay and
15 battery; each plug-circuit being adapted
when connected with a relay substation-cir-
cuit to automatically switch out from the said
tip and sleeve circuit the said condenser and
second disconnecting-signal and to switch in
20 thereto the said battery, as set forth.

3. A cord-circuit divided by a repeating-coil
into two independent plug-circuits normally
organized to connect with substation-circuits
of one type, each plug having three contact-
20 surfaces, the tip and sleeve contacts being in
circuit with each other and normally includ-
ing in series two helices of the said repeating-
coil, a condenser and a disconnecting-signal,
and having in shunt therewith a second dis-
25 connecting-signal; and the test-contact be-
ing in circuit with a relay and battery; each
plug-circuit being adapted when connected
with substation-circuits of a different type to
automatically switch out from the said tip
30 and sleeve circuit the said condenser and sec-
ond disconnecting-signal and to switch there-
in the said battery, as set forth.

4. A cord-circuit for linking together sub-
station-circuits of two different types, divided
35 into two similar inductive plug-circuits, each
plug having tip, sleeve and test contact sur-
faces, the latter surface forming the terminal
of a grounded test-circuit including a relay
and battery, the former surfaces constituting
40 the terminals of an inductive circuit, includ-
ing switches, normally organized to repeat
into the opposite plug-circuit current undu-
lations from a battery at a connected magneto-

substation; and when a plug is inserted into
a relay substation-circuit the relay in that 45
plug-circuit operates said switches to reor-
ganize said inductive circuit and include
therein and in the test-circuit of said relay-
circuit, the said first-mentioned battery, as
set forth.

5. A cord-circuit for linking together sub-
station-circuits of diverse character divided 50
by a repeating-coil into two independent plug-
circuits, each plug having three contact-sur-
faces, the tip and sleeve being in circuit with 55
each other and normally including in series
two helices of said coil, a condenser, and a
disconnecting-signal, and the test-contact
surface being in circuit with a relay and bat-
tery; whereby when the plugs are inserted 60
into substation-circuits of the same or of dis-
similar type, each plug-circuit is adapted to
repeat into the other, as set forth.

6. A cord-circuit for linking together sub-
station-circuits of diverse character divided 65
by a repeating-coil into two independent plug-
circuits, each plug having three contact-sur-
faces, the tip and sleeve being in circuit with
each other and normally including in series
two helices of said coil, a condenser and a 70
disconnecting-signal, and having in shunt
therewith one coil of a second disconnecting-
signal; and the test-contact surface being in
circuit with a relay and battery; whereby
when the plugs are inserted into magneto or 75
into relay substation-circuits, each circuit is
adapted to repeat into the other, and the dis-
connecting-signals be operated, as set forth.

In testimony whereof I have signed my
name to this specification, in the presence of 80
two subscribing witnesses, this 12th day of
July, 1898.

GEORGE K. THOMPSON.

Witnesses:

GEO. WILLIS PIERCE,
JOSEPH A. GATELY.