

(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,399.

Patented Oct. 26, 1897.

Fig. 1.

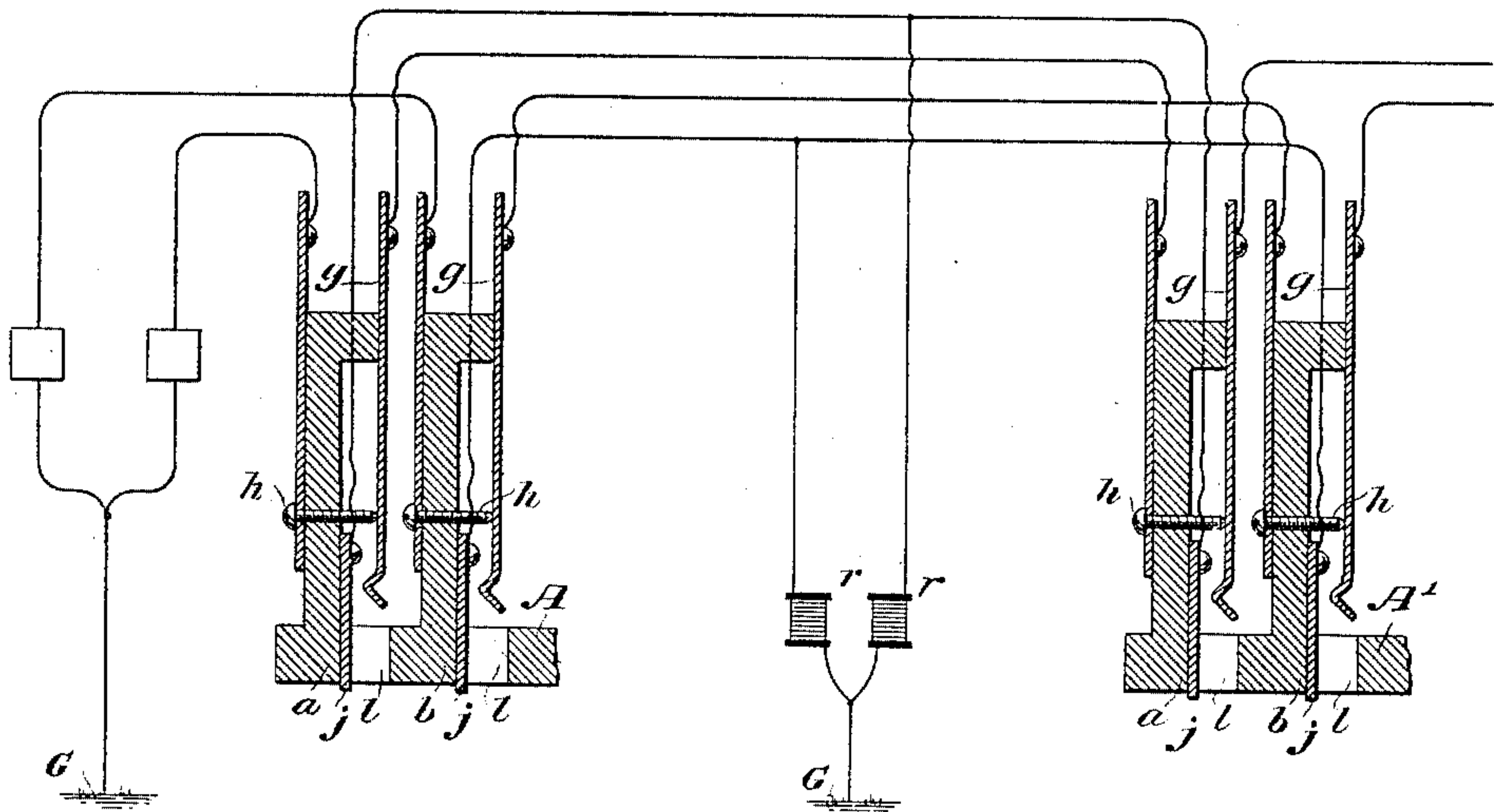
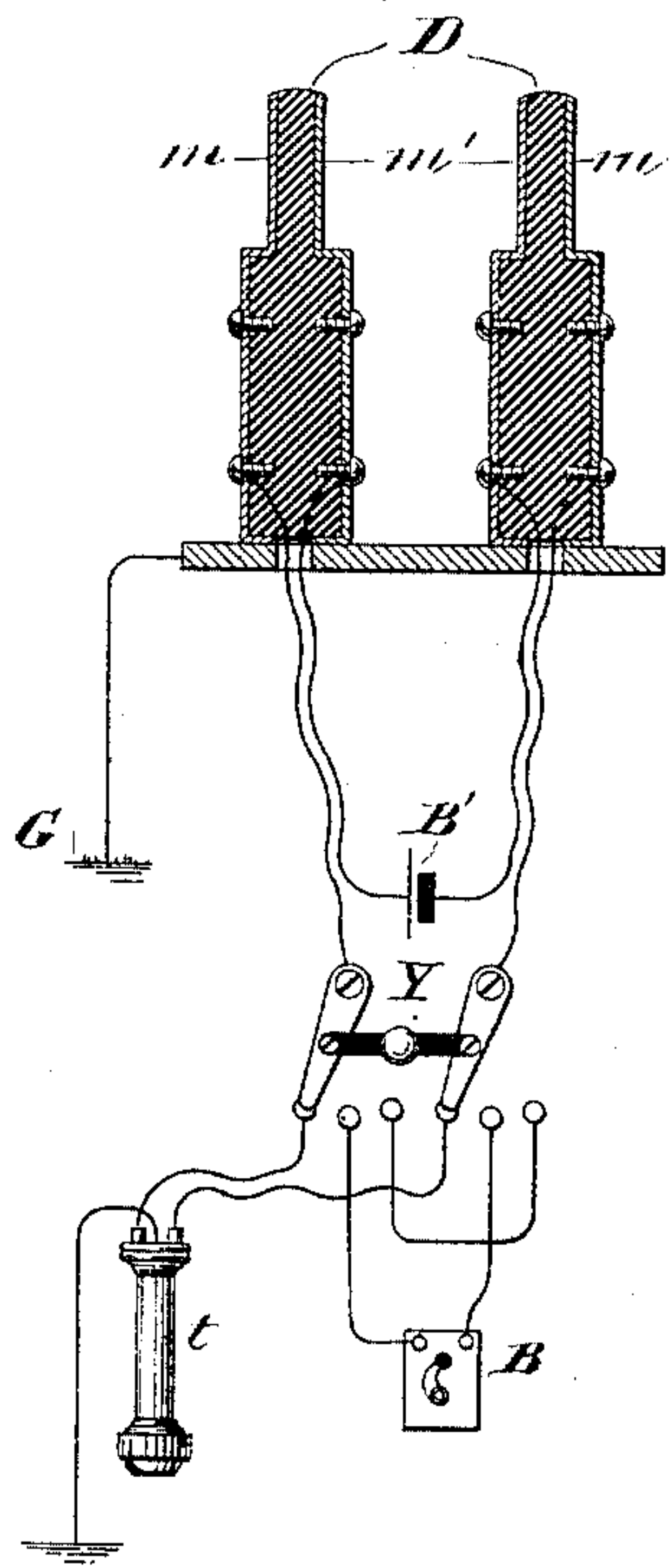


Fig. 2.



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UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,399, dated October 26, 1897.

Application filed May 16, 1891. Serial No. 392,969. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

10 My invention relates to a telephone-exchange system; and it consists in a system of testing to determine whether lines are in use.

In the accompanying drawings, illustrating my invention, Figure 1 represents sectional
15 views of sections of two multiple switchboards and the main-line central-office apparatus and connections of two lines connected to the same, and Fig. 2 represents a diagram of an operator's cord system and apparatus, neces-
20 sary to illustrate my invention.

G in each case in the drawings represents a ground connection.

In Fig. 1, A A' represent sectional views of sections of two multiple switchboards to
25 which the same lines are connected. Each board has a spring-jack or similar switch for each line. Each switch has a contact-spring which normally bears on an insulated contact-point, but which is separated from the
30 point while a plug is inserted into the switch, and has an insulated contact-piece adapted to have a plug applied to it for testing and to form connection with a contact-piece of a switch-plug when the plug is inserted into the
35 switch. *g g* represent the contact-springs; *h h*, the contact-points on which the springs normally bear; *j j*, said insulated contact-pieces; *l l*, the switch-holes, and *a b* rubber strips on which the metal parts are mounted.
40 *r r* are resistance-coils, of which there may be one for each line. The connections are as follows: The line passes normally successively through the pairs of contacts *g h* of its switches on the several boards and from the last contact
45 *h* to the ground. The contact-pieces *j j* of the switches of a line are connected together and to the ground through the resistance-coil of the line.

In the operator's cord system shown in Fig.
50 2, D D are a pair of double plugs each having two contact-pieces *m m'*. When the plug

is inserted into a switch, it separates the contacts *g h* of the switch, and piece *m* of the plug forms connection with spring *g* of the switch, while piece *m'* of the plug forms con- 55
nection with piece *j* of the switch. The contact-pieces *m m'* of the pair of plugs are connected together by means of flexible conductors through the test-battery B'. Y is a loop-
ing-in switch for the pair of plugs. *t* is the 60
operator's telephone, and B is her calling-generator. The two contacts *m m* of the pair of plugs are connected to the two levers, respectively, of the switch by means of flexible
conductors shown. A pair of the contact- 65
bolts of the looping-in switch are connected together through the telephone. Another pair are connected together through the generator, and the third pair are connected together through a simple loop. 70

As many pairs of plugs, with their corresponding apparatus, may be provided for each operator as she may need. For each pair of
plugs are the double cords and the switch. There may be a test-battery for each pair of 75
plugs or a single battery common to a number of pairs. The connections of each pair to its special apparatus and to the operator's telephone and generator are as described above.

The circuit-wire which connects the two 80
coils of the telephone is grounded.

The operation of the system is as follows: When the operator receives a call from a line she places one plug of a pair of her switch-
plugs in the switch of the line, inserting the 85
plugs so that contact-piece *m* forms connection with the spring of the switch and *m'* with the piece *j* of the switch. When the operator finds out by conversation what line is wanted, she tests the line wanted, and if she 90
finds it to be free or unswitched she places the other plug of the pair in the switch of the line wanted, inserting the plug in the same direction as described above. She then, by
moving the switch Y, directs a calling-current 95
to the circuit which will ring the bell of the subscriber wanted.

The operation of the test system is as follows: When two lines are connected together
as above described, the contact-pieces *j j* of 100
the two sets of switches are connected together through a test-battery. When the op-

erator tests a line thus switched by placing one of the contact-pieces m of a pair of her plugs on the contact-piece j of its switch, (the switch Y being in position so that the telephone is in connection with m ,) a closed circuit is established from the ground through one coil of the telephone to the piece j to which the test is applied, and thence through the test-battery to the piece j of the other line, and thence to ground through the resistance-coil. The operator will then, on applying the test, hear a click or sound in her telephone. If the line is not thus switched, she will hear nothing on making the test. She can therefore tell, on testing, whether or not the line is switched with another line.

The use of the resistance-coils in the connections, as described, is to prevent the telephone being short-circuited to ground when the test is made.

I have shown the test system applied to single-circuit lines. It is equally applicable to other than such lines.

I claim as my invention—

1. In a telephone-exchange system, telephone-lines and test wires or connections, one for each line, open to the line and grounded, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, and a test-battery in series circuit between said two test wires or connections, substantially as set forth.

2. In a telephone-exchange system, telephone-lines, test wires or connections, one for each line, open to the line and grounded, and a resistance-coil in each test wire or connection, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, and a test-battery in series circuit between said two test wires or connections, substantially as set forth.

3. In a telephone-exchange system, telephone-lines and test wires or connections, one for each line, open to the line and grounded, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said two test wires or connections, and a test receiving instrument grounded on one side, and connected on its other side to a plug or device adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

4. In a telephone-exchange system, telephone-lines, test wires or connections, one for each line, open to the line and grounded, and a resistance-coil in each test wire or connection, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said two test

wires or connections, and a test receiving instrument grounded on one side, and connected on its other side to a plug or device adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

5. In a telephone-exchange system, telephone-lines, a test receiving instrument and test wires or connections, one for each line, open to the line and connected to one side of said test receiving instrument, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said test wires or connections, and a plug or device connected to the other side of said test receiving instrument and adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

6. In a telephone-exchange system, telephone-lines, a test receiving instrument, test wires or connections, one for each line, open to the line and connected to one side of said test receiving instrument, and a resistance-coil in each test wire or connection, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said test wires or connections, and a plug or device connected to the other side of said test receiving instrument and adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

7. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same and test wires or connections, one for each line, open to the line and grounded, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, and a test-battery in series circuit between said two test wires or connections, substantially as set forth.

8. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, test wires or connections, one for each line, open to the line and grounded, and a resistance-coil in each test wire or connection, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, and a test-battery in series circuit between said two test wires or connections, substantially as set forth.

9. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, and test wires or connections, one for each line, open to the line and grounded, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said two test wires or

connections, and a test receiving instrument at each board grounded on one side, and connected on its other side to a plug or device adapted to be brought into connection with each of said test wires, or connections, substantially as set forth.

10. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, test wires or connections, one for each line, open to the line and grounded, and a resistance-coil in each test wire or connection, in combination with switch apparatus connecting any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said two test wires or connections, and a test receiving instrument at each board grounded on one side, and connected on its other side to a plug or device adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

11. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, a test receiving instrument at each board, and test wires or connections, one for each line, open to the line and connected to one side of said test receiving instrument, in combination with switch apparatus connecting together any two of said test wires or connections while their lines are switched together for conversation, a test-battery in series circuit between said test wires or connections, and a plug or device for each test receiving instrument connected to the other side of said test receiving instrument and adapted to be brought into connection with each of said test wires or connections, substantially as set forth.

12. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, switch apparatus by which any two of said lines may be connected together for conversation, and test wires or circuits, one for each line, open to the line, extending to all the boards and grounded, in combination with apparatus and connections by which any two of said test-circuits are connected together, and a test-battery in series circuit between them, when their lines are switched together for conversation, and test receiving instruments, one at each board, each instrument grounded on one side and connected on its other side to a plug or device adapted to be brought into connection with any of said test-circuits, substantially as set forth.

13. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, switch apparatus by which any two of said lines may be connected together

for conversation, test wires or circuits, one for each line, each open to its line, extending to all the boards and grounded, and an individual resistance-coil in each test wire or circuit, in combination with apparatus and connections by which any two of said test-circuits are connected together, and a test-battery in series circuit between them, when their lines are connected together for conversation, and test receiving instruments, one at each board, each instrument grounded on one side and connected on its other side to a plug or device adapted to be brought into connection with any of said test-circuits, substantially as set forth.

14. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, switch apparatus by which any two of said lines may be connected together for conversation and test receiving instruments, one at each board, in combination with test wires or circuits, one for each line, each open to the line, extending to all the boards and connected to one side of each of said test receiving instruments, apparatus and connections by which any two of said test-circuits are connected together, and a test-battery in series circuit between them, when their lines are switched together for conversation, and plugs or devices, one for each test receiving instrument, connected to the other side of the instrument and adapted to be brought into connection with any of said test-circuits, substantially as set forth.

15. In a telephone-exchange system, multiple switchboards, telephone-lines connected to the same, switch apparatus by which any two of said lines may be connected together for conversation, and test receiving instruments, one at each board, in combination with test wires or circuits, one for each line, each open to the line, extending to all the boards and connected through an individual resistance-coil to one side of each of said test receiving instruments, apparatus and connections by which any two of said test-circuits are connected together, and a test-battery in series circuit between them, when their lines are connected together for conversation, and plugs or devices, one for each test receiving instrument, each connected to the other side of its instrument and adapted to be brought into connection with any of said test-circuits, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

FRANK S. OBER,
EDWARD C. DAVIDSON.