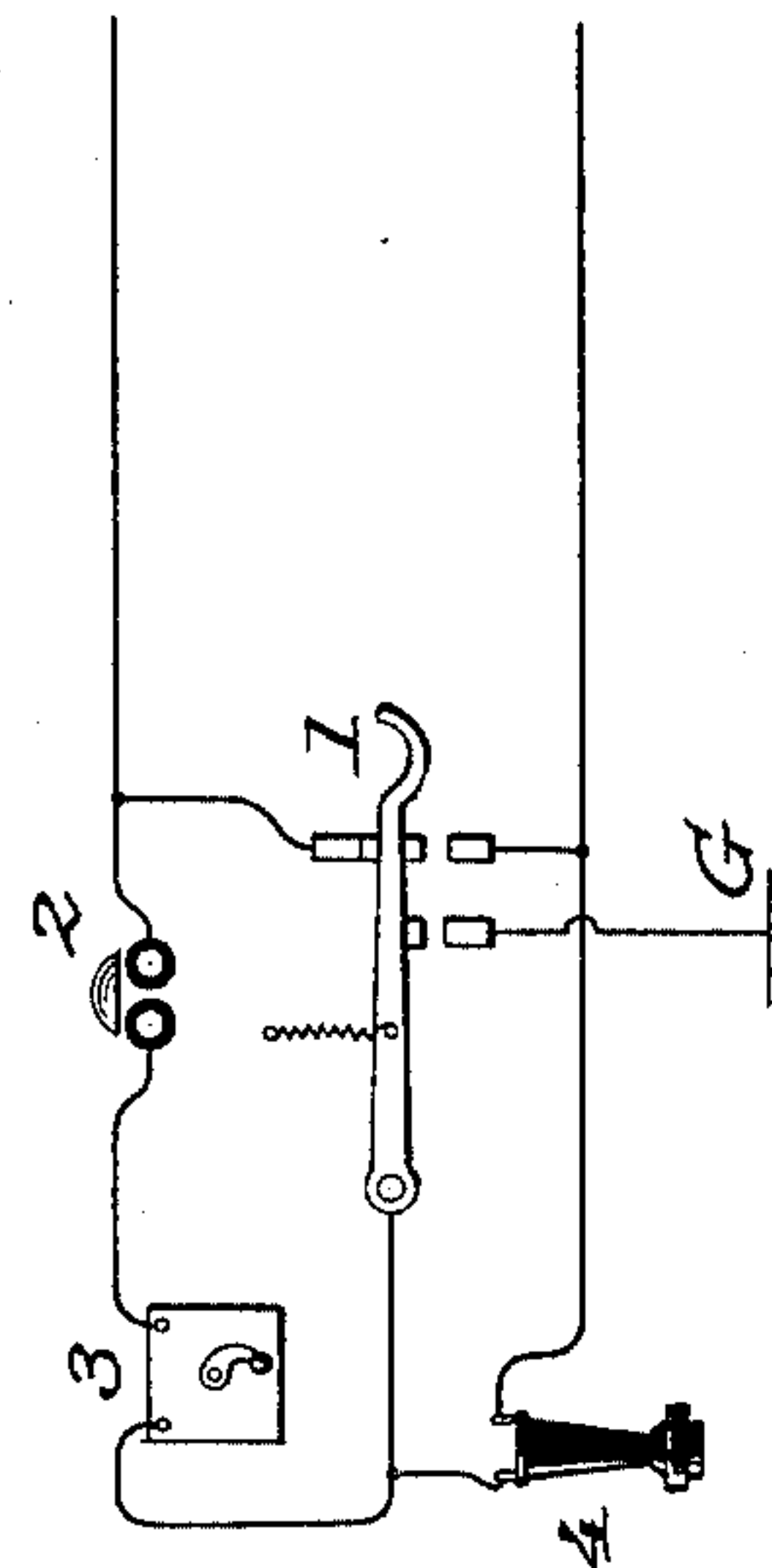
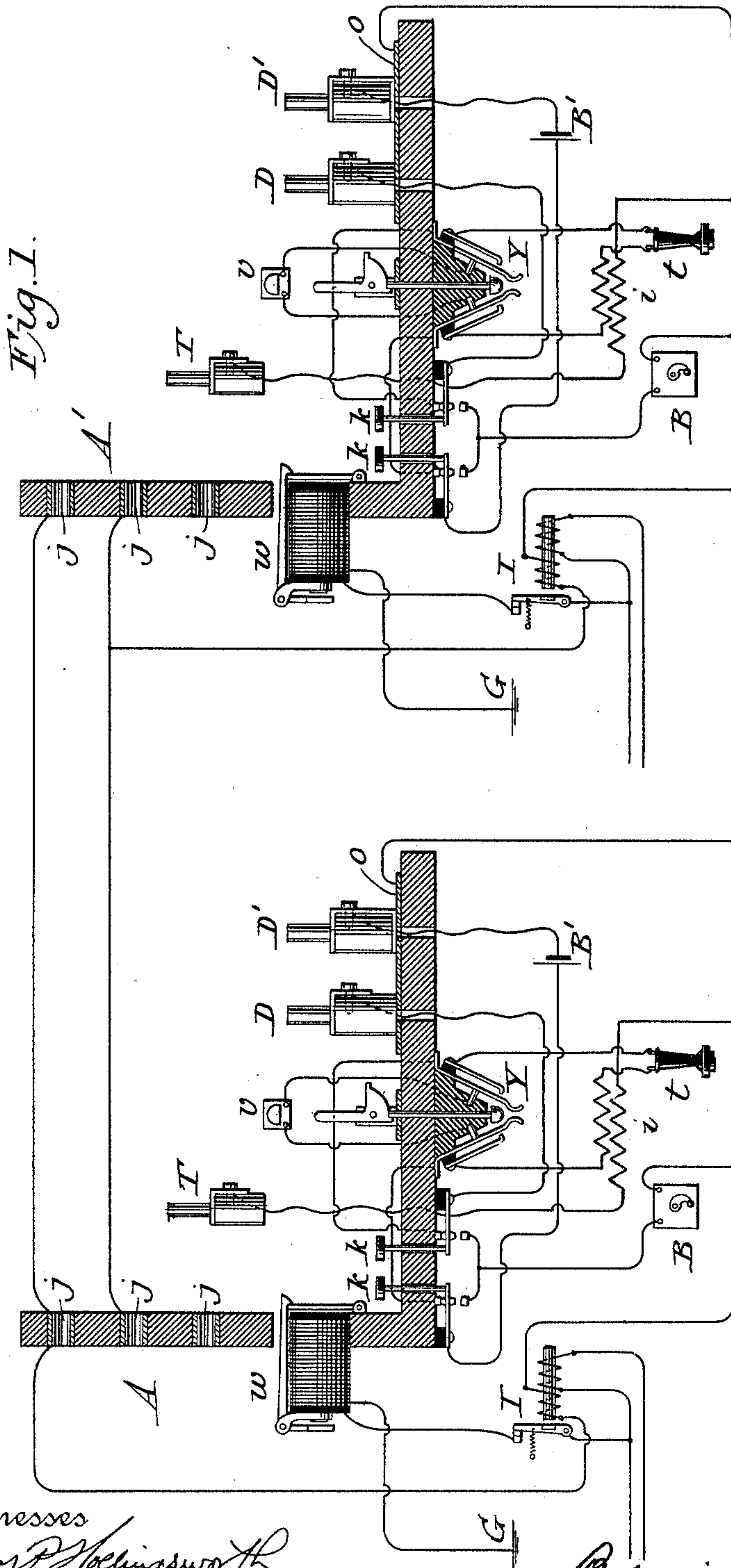


(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,413.

Patented Oct. 26, 1897.



Witnesses
Sidney P. Spellingworth
B. Washington Miller

by

Inventor
Milo G. Kellogg
Baldwin, Davidson & Wright.
Attorneys

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. 592,413, dated October 26, 1897.

Application filed September 8, 1891. Serial No. 405,095. (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 especially to a metallic-circuit telephone-exchange system in which induction-coil translators or converters, one for each line at the central office, are employed to translate the telephone-currents
15 from one circuit or line to another circuit or line.

It consists of a system for calling, switching, testing, and clearing-out signals for such an exchange which I shall describe and state
20 in detail.

In the accompanying drawings, illustrating my invention, Figure 1 represents sectional views of two switchboards with the central-office switches and apparatus for two lines of
25 the exchange and the connecting and answering apparatus at each board for answering calls, testing the lines, connecting the translators of the two lines, testing to see whether the lines are in use, and receiving clearing-out signals for a connection which may be
30 made. Fig. 2 shows in diagram a subscriber's station apparatus to be used in the exchange system.

In Fig. 1, A A' are two switchboards. Other
35 boards may be added and used as required for the size of the exchange. Each board has a metal socket or switch contact-piece for each line. These sockets or contact-pieces are marked *j j*, and are each adapted to receive the switch-plugs at their board and
40 thereby form contact with the contact-piece of the plug and also to have the plug contact-pieces applied to them for testing, as will hereinafter be described. I I are two induction-coil translators or converters, one for
45 each line, with relay armatures and attachments, such as will be described. *w w* are two annunciators, one for each line.

At each board there is a pair of plugs,
50 (marked D D'), a test-battery for the pair of plugs, (marked B'), a clearing-out annunciator

for the pair of plugs, (marked *v*), two calling-keys for the pair of plugs, (marked *k k*), an operator's telephone, (marked *t*), a looping-in switch for the pair of plugs, (marked Y,) and a
55 calling-generator, (marked B.) The switch Y has two levers and two pairs of contact-bolts on which the levers may alternately be placed. The plugs are adapted to be inserted into the switch-holes of the terminals *j j* at their board
60 and form connection with the terminals. The keys *k k* have each a lever normally in contact with a point and another point against which the lever comes into contact when it is passed away from the first-mentioned point.
65 One of the plugs is connected by a flexible conductor to one of the key-levers and the other plug is similarly connected to the other key-lever. The two points against which the levers normally press are connected to the
70 two levers of the switch Y of the pair of plugs. The bolts of one pair of the contact-bolts with which the levers of the switch Y may be placed in contact are connected together through the operator's telephone and the other pair
75 are connected together through the clearing-out annunciator of the pair of plugs. The test-battery of the pair of plugs is connected in circuit with one of the cords. The contact-piece of the plug D' extends, as shown,
80 to the bottom of the handle and rests normally on the metal strip *o*. The induction-coil translators I I have each an armature placed so as to be attracted and moved by the core of the translator when a battery-current
85 of suitable character passes through one of its coils and a pair of contact-points which are separated by the armature when it is thus attracted. Each metallic-circuit line passes through one of the coils of the trans-
90 lator and is also connected to ground through the pair of contacts of the translator described above and its annunciator. One side of the other coil of the translator of the line is connected to all the metal sockets *j j* of the
95 line and the other side of said coil is connected by a wire or metallic-circuit connection with the same side of all the other coils of the exchange which are connected to metal sockets *j j*. As the circuits of these coils are
100 local to the exchange they may be called the "local" coils of the translators. One side of

the generator is connected to each of the lower of the normally open contacts of the calling-keys k k and the other side of the generator is connected by metallic connection with said metallic-circuit connection mentioned above. The metal plates o , with which the contact-pieces of the plugs D' D' normally connect, are also metalically connected with said metallic-circuit connection.

In the subscriber's-station apparatus shown in Fig. 2, 1 is the telephone-switch; 2, the signal-receiving bell; 3, the calling-generator, and 4 the subscriber's telephone. The circuit and connections are substantially as shown, but may be in other ways so as to operate substantially as hereinafter described. When the subscriber's telephone is on the switch, the signal-receiving bell is in the circuit of the line and the line is grounded at his station. When the telephone is off the switch, the telephone is in the circuit of the line and the ground connection at the subscriber's station is open. When the generator is operated, it is in the metallic circuit of the line.

The operation of the system is as follows: When a subscriber desires a connection, he operates his generator while his telephone is on the switch. A signal-current then passes from his ground connection through the branch of the line in which is the generator to ground at the central office through the contact-points of the translator and the line-annunciator and operates the annunciator. When the operator to whom the annunciator is assigned observes the indication, she places one of her plugs D in the metal socket j of the line, and the levers of the switch Y being in position, so that her telephone is in circuit with the plug, her telephone is in a closed circuit with the local coil of the translator of the line and the battery B' , which belongs to the plug. This circuit is, say, from the metal socket j , through the local coil of the translator to said metallic-circuit connection of the exchange to the mate D' of the plug, through its contact with plate o , and thence through the operator's telephone and the test-battery B' to the plug D , which is inserted in the metal socket. The operator then by conversation finds out what line is wanted and she tests the line, as will hereinafter be indicated, and if she finds it to test "free" or not in use she places the plug D' of the pair of plugs in the metal socket of that line. The local coils of the translators of the two lines are thereby included in a closed metallic circuit which is local to the central office and contains the test-battery B' . The operator then presses on the key k which is connected to the plug D' , and the calling-generator is included in a local circuit with the local coil of the translator of the line wanted, and induced current will be generated in that line and will ring its signal-receiving bell at the subscriber's station. The

operator then moves the levers of the switch Y , so that the clearing-out annunciator v is in circuit with the pair of plugs. The test-batteries B' B' should be of such strength that when one of them is included, as above described, in a closed circuit with a local translator-coil it will cause the armature of the translator to be attracted so as to open its contact-points. The ground connection of the line at the central office is thereby opened as soon as connection is made with one of its metal sockets j j . The batteries and clearing-out annunciators should be so related as that the annunciators will not be operated by the batteries when connected as described. For this purpose they may be made less sensitive than the relay part of the line-translator. To send a clearing-out signal, either subscriber operates his generator and a current passes over his metallic circuit and an induced current is thereby generated in the circuit which contains his local coil and operates the clearing-out annunciator, which is in circuit with the local coil. The test-battery, which is also in circuit, will reinforce the clearing-out current generated by the subscriber. As the ground connection of the line through the annunciator is open when the clearing-out signal is sent, the subscriber may send the signal after replacing his telephone on its switch without operating his line-annunciator. The operation of sending a clearing-out signal is therefore the same as that of sending a calling-signal.

The test system is as follows: Each operator has a test-plug T and an induction-coil i . One coil of the induction-coil is in circuit with her telephone. The test-plug is connected to a flexible conductor, by which it may be carried into contact with any metal socket j at its board, and is connected through the other coil of the induction-coil with the heretofore-mentioned metallic-circuit connection of the exchange. When the operator tests a line, she places her test-plug on its metal socket. If the line is not in use, no complete circuit is established, which contains a battery and one coil of her induction-coil, and her telephone will not respond. If, however, any metal socket of the line has a switch-plug in it, as above described, a complete circuit is established, which includes the coil and a battery, and the telephone will respond, indicating that the line is in use. This circuit may be traced thus: from the test-plug to the metal socket, in which is a switch-plug, thence to the mate of the plug through the battery B' , thence to the metallic-circuit connection of the exchange, and thence through the coil of the induction-coil to the test-plug. It will be observed that the connections of the local coils of the translator's and of the operator's apparatus to the same are all metallic and without ground circuit or connection, so that when any two coils are connected together for purposes of conversation the circuit is entirely

metallic and without ground connection, and also that the lines themselves are at the times for conversation entirely disconnected from the ground. The system is, therefore, when conversation is going on entirely a metallic-circuit system without ground connections, and conversation is not subject to interference from earth currents or connections. In other systems for multiple-switchboard operation with translator-coils the main-line circuits and the local or central-office circuits of a connection have ground-line connections while conversation is going on. In my system this is entirely eliminated.

15 I claim as my invention—

1. In a telephone-exchange system, two metallic-circuit lines, each having normally a ground connection at the central office, and translators for said lines, one translator for each line, one coil of which is in the circuit of the line, the two other or local coils of the translators being temporarily connected in a circuit for conversation and a battery in said circuit while or as long as said local coils are thus connected together, in combination with an armature for each translator and a pair of contact-points controlled by the armature and through which said ground connection of the line passes, said contact-points being normally closed but opened by the armature when the local coil is connected in circuit with the battery.

2. In a telephone-exchange system, two metallic-circuit lines, each having normally a ground connection at the central office, and translators for said lines, one translator for each line, one coil of which is in the circuit of the line, the two other or local coils being temporarily connected into a circuit for conversation and battery in circuit with each local coil while and as long as it is thus connected, in combination with an armature for each translator and a pair of contacts controlled by the armature and through which said ground connection of the line of the translator passes, said contacts being normally closed but opened by the armature on its being attracted when the local coil is connected in circuit with the battery.

3. In a telephone-exchange system, metallic-circuit lines, each having normally a ground connection in the central office, an annunciator for each line in its ground connection, and translators, one for each line, one coil of which is in the circuit of the line, in combination with switching apparatus to connect together any two of the other coils of the translators, battery in circuit with any coil as long as said coil is thus connected with another coil, an armature for each translator and a pair of contacts for each armature controlled by it through which said ground connection of the line of the translator passes, each pair of contacts being normally closed but opened by their armature when the coil

of its translator is thus connected in circuit with the battery.

4. In a telephone-exchange system, a metallic-circuit line passing to the central office and through one coil of its translator, in combination with an armature for the translator operated on by the core of the translator to open a pair of contacts when the other coil of the translator is on closed circuit with a battery, a ground connection for the line through said pair of contacts, and a battery in circuit with said other coil of the translator as long as said coil is closed with another translator-coil.

5. In a telephone-exchange system, a metallic-circuit line passing to the central office and through one coil of its translator, in combination with an armature operated by the core of the translator to open a pair of contacts when the other coil of the translator is on closed circuit with a battery, a ground connection for the line through said pair of contacts, an annunciator in said ground connection, and a battery in circuit with said other coil of the translator as long as said coil is connected in closed circuit for conversation.

6. In a telephone-exchange system, subscribers' telephone-lines, annunciators, one for each line, each normally in a circuit with its line, switches on a switchboard, one for each subscriber's talking-circuit and having each a contact-piece, electromagnetic devices, one for each line, each actuated when a current is established through it to open the normal circuit of the line with the annunciator, pairs of switch-plugs, each plug having a contact-piece adapted to form connection with said contact-piece of the switch of a subscriber's talking-circuit when the plug is placed in said switch to switch said talking-circuit for conversation, said contact-pieces of the pair of plugs being connected together by a flexible switch-conductor, said contact-piece of a line being connected to one side of its electromagnetic device, and the other sides of the electromagnetic devices being connected together, and a battery in the circuit between said contact-pieces of each pair of plugs while and as long as the two plugs connect the talking-circuits of two lines for conversation.

7. In a telephone-exchange system, multiple switchboards, subscribers' telephone-lines, annunciators one for each line, each normally in a circuit with its line, switches, one on each board for the talking-circuit of each subscriber and having each a contact-piece, electromagnetic devices, one for each line, each actuated when a current is established through it to open the normal circuit of the line with the annunciator, pairs of switch-plugs at each board, each plug having a contact-piece adapted to form connection at its board with said contact-pieces of the

switches of the subscribers' talking-circuits when the plug is placed in either of said switches to switch a talking-circuit for conversation, said contact-pieces of each pair of
5 plugs being connected together by a flexible switch-conductor, said contact-pieces of a line being connected to one side of its electromagnetic device, and the other sides of the electromagnetic devices being connected to-
10 gether, and a battery in the circuit between

said contact-pieces of each pair of plugs while and as long as the two plugs connect the talking-circuits of two lines for conversation.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

CALVIN DE WOLF,
R. B. BELL.