

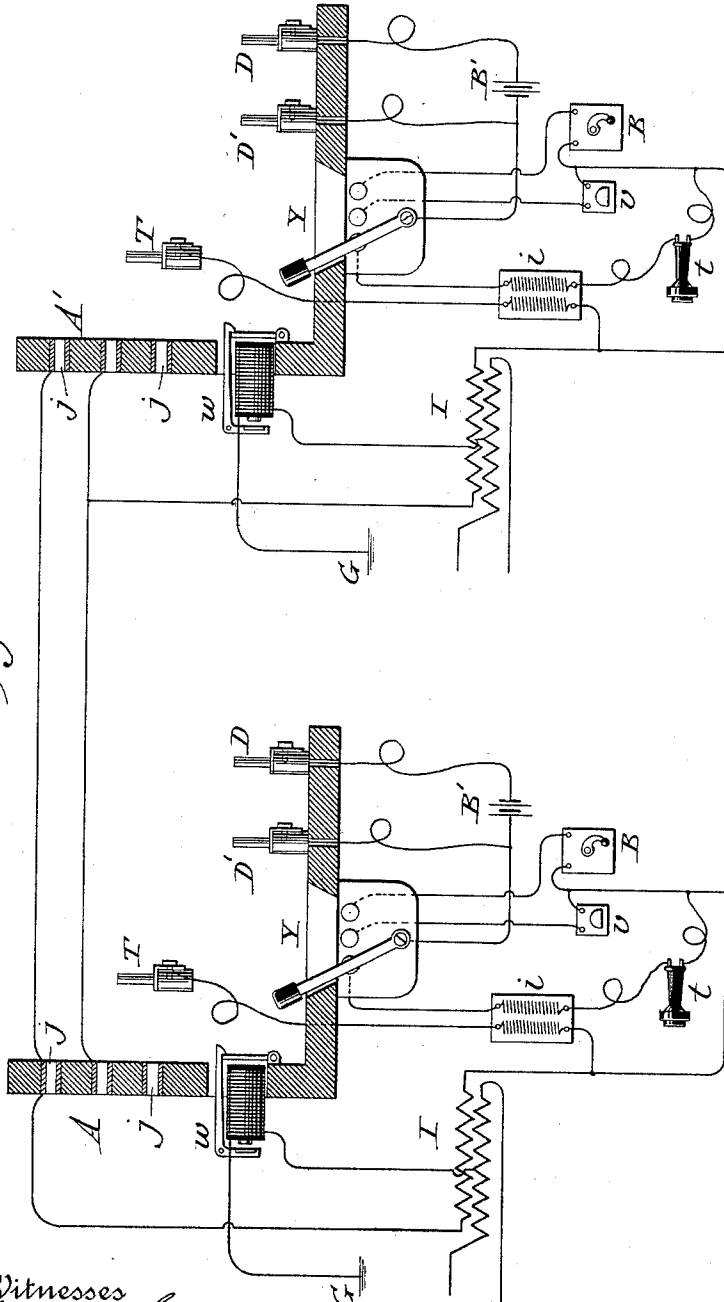
(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,409.

Patented Oct. 26, 1897.

Fig. 1.

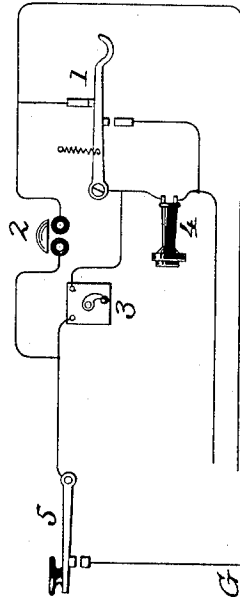


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Fig. 2.



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. 592,409, dated October 26, 1897.

Application filed August 31, 1891. Renewed December 30, 1893. Serial No. 495,261. (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

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.

My invention relates especially to a 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 from one circuit or line to another circuit or line.

It consists in a system of answering-calls, clearing-out signals, and calling from the central office which I shall describe and claim in detail.

In the drawings and in the description of the system I indicate the lines as metallic-circuit lines. The invention is, however, applicable to other kinds of lines, as ground-circuit lines.

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 the exchange and the connecting and answering apparatus at each board for answering calls, 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 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 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 *jj* and are each adapted to receive the switch-plugs at the boards and thereby form contact with the contact-piece of the plug and also to have the test-plug contact-pieces applied to them for testing, as will hereinafter be described. I I are two induction-coil translators or converters, one for each line. *ww* are two annunciators, one for

(marked D D'), a test-battery for the pair of plugs, (marked B'), a clearing-out annunciator for the pair of plugs, (marked *v*), an operator's telephone, (marked *t*), a switch for the pair of plugs, (marked Y,) and a calling-generator, (marked B.) The switch Y has a lever and three contact-bolts on which the lever may alternately be placed. The plugs of a pair are connected together by flexible conductors, and in the circuit between them is their test-battery B'. Each plug is adapted to be placed in connection with each metal socket *j* at its board.

The lever of the switch is connected to the circuit which connects the two plugs preferably so that the battery B' is in circuit between the lever and the plug D. One side of the telephone, one side of the calling-generator, and one side of the clearing-out annunciator are connected with the three contact-bolts, respectively, of the switch Y. The other sides of the telephone, calling-generator, and clearing-out annunciator are connected together by metal conductors, and are connected by metal conductors with the same side of the various other instruments of the same kind in the exchange. One side of one of the coils of each translator is connected by a metal conductor with the same sides of these instruments.

i i are induction-coils, and T T are test-plugs, one of each for each operator. One coil of each of these induction-coils is in circuit with the telephone of the operator. The test-plug T is connected to a flexible conductor adapted to be brought for testing into connection with each contact-piece *j* at its board and is connected through the other coil of the induction-coil with the metal conductor mentioned above.

Only one pair of plugs with their special apparatus is shown at each board. One telephone answers for each operator, and one calling-generator may be used for the whole exchange. Other pairs of plugs, with their special apparatus, may be added for each operator as she may need, and their connection to the other apparatus is substantially the same as has been described and is shown and as will be apparent to those skilled in the art. The other side of each translator-

coil mentioned above is connected to the metal sockets $j j$ of the line to which the translator belongs. The other coil of each translator is connected into circuit with its line. From the center of the last-mentioned coil of each line a branch wire passes to ground through the annunciator of the line. The connections of the first-mentioned coil are local to the central office and it may be called the "local" coil.

In the subscriber's station apparatus shown in Fig. 2, 1 is the telephone-switch; 2, the signal-receiving bell; 3, the calling-generator; 4, the subscriber's telephone, and 5 a calling-key. The circuits and contacts are substantially as shown and may be in other ways which will carry out substantially the operations which will hereinafter be described. When the key 5 is pressed, the line-circuit is grounded at the central office. Otherwise the line-circuit is not grounded there. When the generator is operated, it is in the metallic circuit of the line. When the telephone is on the switch, the signal-bell is in the direct circuit of the line, and when the telephone is off the switch it is itself in the direct circuit of the line.

The operation of the system is as follows: When a subscriber wishes to make a call, he presses on his key 5 and while doing so operates his calling-generator. A calling-current then passes in a circuit from the ground at his station through that side or branch of the line in which the generator is to ground at the central office through the line-annunciator and operates the annunciator. Part of the current generated will pass through the complete metallic circuit of the line, but enough will pass through the ground-circuit traced above to operate the annunciator. When the operator to whom the annunciator is assigned observes the call, she places one of her switch-plugs D into the metal socket of the line at her board and moves the lever of the switch Y belonging to the plug so that her telephone is in connection with it. A complete metallic circuit is thus established, in which is included the operator's telephone and one coil of the translator of the line. The subscriber having taken his telephone from its switch, the telephone is included in a direct metallic circuit with the line and the other coil of the translator. The subscriber and operator may then converse and the subscriber give his call. The operator then tests the line wanted, as will be described, and if it is not in use places the mate to the plug (marked D') into the metal socket of the other line wanted. The local coil of the translator of the line wanted is thereby connected in a metallic circuit with the local coil of the calling-line, and this circuit has the test-battery B' of the pair of plugs in it and is bridged or cross-connected by the operator's telephone. The operator then moves the lever of the switch Y so that it is in connection with the calling-generator and the generator is in a bridge-circuit of the me-

tallic circuit containing the two coils, and the generator being operated a current goes through both coils and an induced current is generated in the metallic circuit of both lines. The bell of the subscriber wanted will therefore be rung. The operator then moves the lever of the switch Y so that it is in connection with the clearing-out annunciator, and the annunciator is thereby connected in a bridge or cross connection of the metallic circuit which contains the two translator-coils. The subscribers can then converse, the telephone-currents being translated from one metallic-circuit line to the metallic circuit which contains the two local coils and from said circuit to the other metallic-circuit lines.

When a subscriber wishes to send a clearing-out signal, he operates his calling-generator without pressing on his key 5. A current is thereby generated in his metallic-circuit line and an induced current is generated in the local coil of the line, which will operate the clearing-out annunciator which is in circuit with such coil, (being in a cross-connecting circuit to the circuit of the two local coils of the lines.)

The operation of the test system is as follows: When the operator wishes to test a line wanted to determine whether it is in use, she places her test-plug T on the contact-piece j at her board of the line to be tested. If, then, the line has a switch-plug in one of its contact-pieces j at another board, a complete circuit is established which contains one coil of her induction-coil i and the battery B' , which is in circuit with the switch-plug which is in said contact-piece j . A current will therefore pass through the coil, which will cause an induced current in the other coil and occasion a click in the operator's telephone. If there is no plug in any contact-piece j of the line, no such complete circuit is established which contains the coil of her induction-coil and a battery, and the click will not be made in her telephone. She can therefore determine on testing whether or not the line is in use.

The closed circuit of the telephone and secondary of the induction-coil when a test is made is, say, from plug D in the contact-piece of the calling-line, thence through the translator-coil of the line to the common wire which unites the translator-coils, thence through the telephone and secondary of the induction-coil i to the lever of the switch Y , and thence through the flexible cord to D .

The complete circuit mentioned above as established when a plug is in a contact-piece j of the line is, say, from the metal conductor heretofore mentioned through the coil of the induction-coil to the test-plug T , thence to the contact-piece j , where the test is made, thence to the contact-piece j in which is the switch-plug, and thence through the battery in circuit with the plug and a local coil connected with it to said metal conductor.

The connections of the local coils of the

translator and of the operator's apparatus to the same are all metallic and without ground connection or circuit, and therefore when two coils are connected together for purposes of
 5 conversation the circuit is not subject to interference from earth currents or connections. These advantages would to a certain extent be obtained should the metallic-circuit connection I have described be purposely or ac-
 10 cidentally connected with the ground at a certain point.

The invention is applicable to other arrangements of circuits and apparatus than that described—as, for instance, a single test-
 15 battery may be used for the exchange connected into the metal conductor, so that the test-plugs T T are connected on one side of the battery and the switches Y Y are connected on the other side of the battery.

20 The induction-coils *i i* with their telephones *t t* may be considered as test receiving instruments. Other forms of test receiving instruments may be used.

It will be observed that when the two local
 25 coils of two line-translators are connected together into a complete metallic circuit and are left for conversation between the two subscribers the circuit is bridged or cross-connected between the two coils by the clearing-
 30 out annunciator. It is preferable that the annunciator be of such a construction as to offer considerable retardation to the passage of telephone-currents, and such cross connection will not greatly affect the amount of tele-
 35 phone-current which would otherwise pass through the complete circuit.

I claim as my invention—

1. In a telephone-exchange system, two metallic-circuit lines and translators at the central office for said lines, one coil of each of
 40 which is in the circuit of its line, the two other coils of the translators being temporarily connected for conversation in a complete metallic circuit, in combination with a clearing-out annunciator in a bridge connection
 45 across said metallic circuit between said coils.

2. In a telephone-exchange system, two metallic-circuit lines and translators at the central office for said lines, one translator for each line, one coil of which is in the circuit
 50 of the line, the two other coils of the translators being temporarily connected in metallic circuit for conversation, in combination with a bridge connection across said metallic circuit, an operator's calling-generator and a
 55 switch to at will include said generator in said bridge connection.

3. In a telephone-exchange system, two telephone-lines and translators at the central office for said lines, one translator for each
 60 line, one coil of which is in the circuit of the line, the other two coils of the translators being temporarily connected together for conversation in a complete metallic circuit, in combination with a clearing-out annunciator
 65 in a bridge or cross connection to said metallic circuit between the two coils.

4. In a telephone-exchange system, two metallic-circuit lines and translators at the central office for said lines, one coil of each of
 70 which is in the circuit of its line, the two other coils of the translators being temporarily connected for conversation in a complete metallic circuit, in combination with a retardation apparatus in a bridge connection
 75 across said metallic circuit between said coils.

5. In a telephone-exchange system, two telephone-lines and translators at the central office for said lines, one translator for each
 80 line, one coil of which is in the circuit of the line, the other two coils of the translators being temporarily connected together for conversation in a complete metallic circuit, in combination with a retardation apparatus in
 85 a bridge or cross connection to said metallic circuit between the two coils.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

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 ANNA P. KELLOGG.