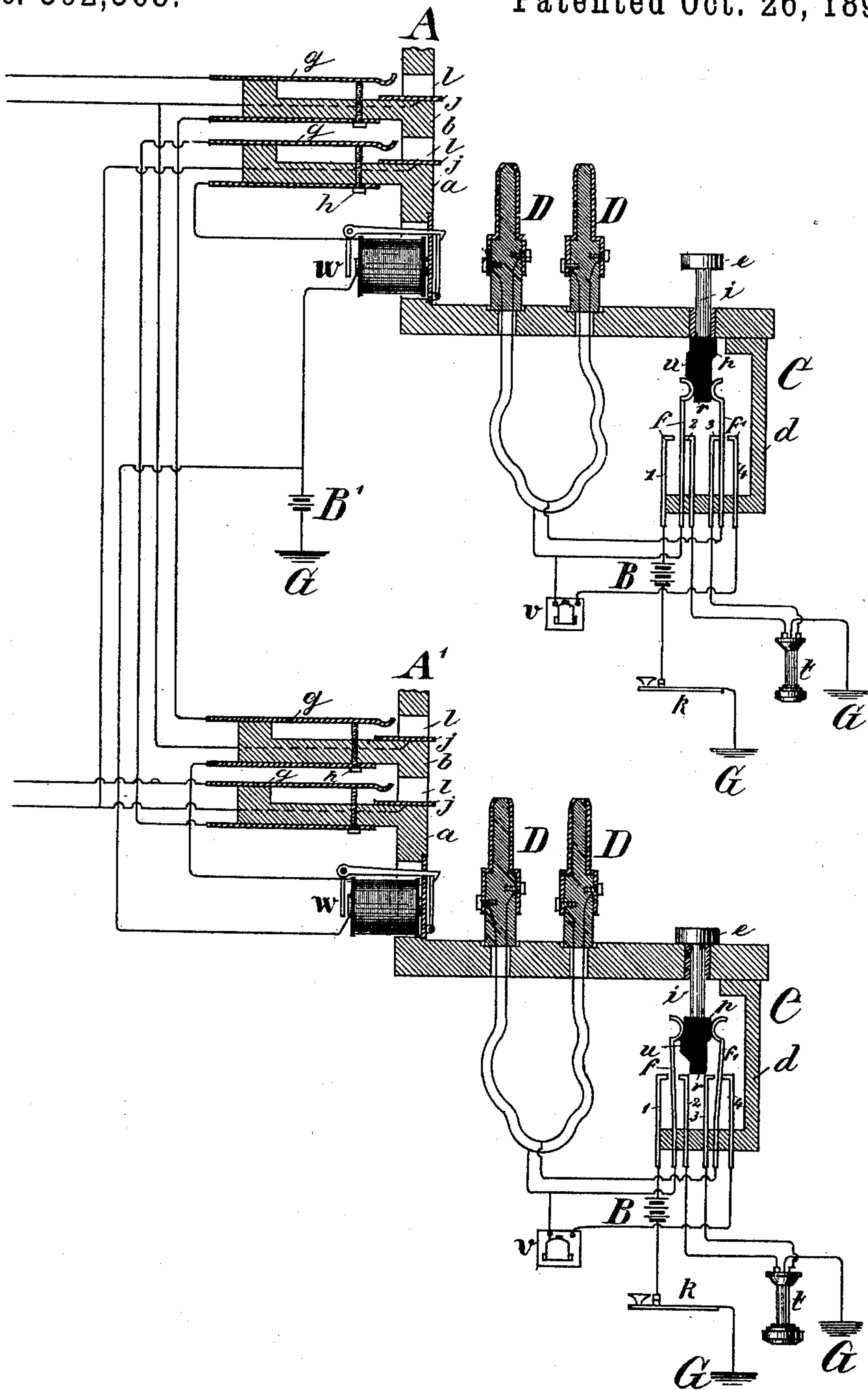


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,368.

Patented Oct. 26, 1897.



Witnesses:  
Gustav Cross.  
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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. 592,368, dated October 26, 1897.

Application filed July 26, 1890. Serial No. 360,077. (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, temporarily residing at Stuttgart, in the Empire of Germany, 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 drawing, forming a part of this specification.

My invention relates to a metallic-circuit telephone-exchange system in which the lines are connected together for conversation by means of pairs of loop-switch plugs, the two contact-pieces of one plug of a pair being connected to the two contact-pieces of the other plug by means of double flexible conductors. Such a system is called a "double-cord" system.

My invention includes a system of testing and apparatus, circuits, and connections whereby the operator may quickly and with few motions connect her telephone to the circuit of the calling-line, may ascertain by a test whether the line wanted is already in use, may connect the two lines together, may send a signaling-current over the circuit of the line wanted, may connect her telephone to the circuit to determine whether the subscribers are through conversation, and may disconnect the lines and place the apparatus in readiness for receiving new calls.

In the accompanying drawing, illustrating my invention, A A' are sectional views of sections of two switchboards to which the same lines connect. Each switchboard has a spring-jack or similar switch for each line. Each switch has a contact-spring which is normally in contact with a contact-point, but is separated from the point when a switch-plug is inserted into the switch, and has a contact-piece which is insulated from the other parts (except by the circuit connections) and which is connected with a contact-piece of the switch-plug when the plug is inserted. This contact-piece is adapted to have a test plug or device applied to it for testing.

The contact-springs are shown at *g g*, while *h h* are the contact-points on which the springs

normally bear, and *j j* are the contact-pieces of the switches.

*l l* are the switch-holes through the fronts of the rubber strips *a b*, on which the metal parts of the switches are mounted.

The switch-plugs (marked D D) are loop-plugs adapted to be inserted into the switches, and when a plug is inserted into a switch it separates the points normally in contact and one of its contact-pieces forms connection with the spring *g*, while the other forms connection with the contact-piece *j* of the switch.

B' is the test-battery, and W W are line-annunciators.

G in each case in the drawing is a ground connection.

Two lines and their switches on the boards and their annunciators are shown in the drawing. The circuits of the lines are as follows, and, as shown, one side or branch of the line passes successively through the pairs of contact-points *g h* of its switches on the boards, passing in each case to the spring first and from the last contact-point *h* through the line-annunciator to the common ground-wire of the lines in which is the test-battery B' and through the battery to ground. The other side or branch of the line is connected to contact-pieces *j j* of the switches of the line.

The line should be grounded at the subscriber's station while the subscriber's telephone is not switched for use and this ground connection open while the telephone is thus switched. This can be accomplished in the usual way for such a connection by means of contact-points on the telephone-switch. The signal-receiving bell should be placed in this ground-connection circuit.

For each pair of plugs there is an operator's switching device. These devices are marked C C. There are one pair of plugs and one switching device shown at each board. Other pairs may be added as required and connected to the operator's special apparatus, substantially as will be described.

*d d* are the rubber supports of the switching devices.

*f f'* are a pair of contact-springs of a device.

1, 2, 3, and 4 are contact-points.

*i* is a movable piece to one end of which is



attached the irregular rubber piece *p u r* and to the other end of which is attached the knob *e*. The piece *i* with the rubber piece *p u r* and the knob *e* move as one piece and may be called the "commutator-piece." The springs and points are so constructed, mounted, adjusted, and related to each other that when the commutator-piece is in its upper position, as shown at board A, the two springs *f f'* are in contact with 2 and 3, respectively, when the piece is moved to its central position, so that the springs rest on *u*, *f* is in contact with 1 and *f'* is in contact with 3, and when the piece is moved to its inner position, as shown at A', *f* is in contact with neither of the points and *f'* is in contact with 4.

*v v* are clearing-out annunciators, of which there is one for each pair of cords.

*B B* are calling generators or batteries.

*k k* are two point-keys, and *t t* are operators' telephones, of which there may be one of each kind of apparatus for each operator.

The connections of a pair of plugs to its operator's switching device and to the operator's special apparatus are as shown and as follows: The two contact-pieces of one of the plugs are connected to the two contact-pieces of the other plug, respectively, by two flexible-cord circuits. One of these cord-circuits is connected to spring *f* and the other to spring *f'* of the device of the pair. Contacts 2 and 3 are connected together through the operator's telephone. Contact 1 is connected to the ground through the calling generator or battery and the points of the key *k*. Contact 4 is connected through the clearing-out annunciator to the cord-circuit which is connected to *f*. The wire which connects the two coils of the telephone is connected with the ground.

The commutator-piece of each switching device remains normally in its outer position, as shown at board A.

The operation of the system is as follows:  
 45 When the operator at any board observes the annunciator of a line to indicate a call, she places one of the plugs of a pair of her plugs in the switch of the line. By so doing the line is disconnected from its normal ground connection through the test-battery and is included in circuit with the operator's telephone. The connection is from the two contact-pieces of the plug to the springs *f f'* of the switching device and thence to the two sides of the telephone through contacts 2 and 3, respectively. The operator then finds out by conversation what line is wanted. She then tests the line by placing a contact-piece of the other plug of the pair on the piece *j* of the switch of the line wanted, and if she hears a click in her telephone she knows that the line is not in use and places the plug in the switch. By so doing the line is disconnected from its connection to ground through its test-battery and the circuit of the two lines is established, with the circuit bridged or cross-connected by the operator's telephone. The operator

then presses the commutator-piece to its central position and the telephone is disconnected from the circuit and the circuit is grounded through the calling-generator. This connection is made by the contact between *f* and 1. A calling-current will therefore go to the circuit of the line wanted and to ground through its normal ground connection through its signal-receiving bell and the bell will ring. The operator then presses the commutator-piece to its lower position, as shown at A', and *f* is in contact with 4 and the other points of the device are open. The generator is thereby disconnected from the circuit and the circuit is bridged or cross-connected through the clearing-out annunciator, and any clearing-out signal sent over the circuit of either line will be indicated on the annunciator.

Should the operator desire to listen to the circuit to determine whether the subscribers are through conversation, she opens the contact-points of the key and while the key is in that position moves the commutator-piece to its outer position, when the circuit is bridged or cross-connected through the telephone. The operation of the key prevents any calling-current from going to the lines to give a false signal that they are wanted.

The operations of answering a call and making a connection are, first, to place a switch-plug in the switch of the calling-line; second, to test the line wanted with the other plug; third, to place the plug in the switch, and, fourth, to press the commutator-piece from its upper to its lower position. The lines are thereby connected together and signaling-current sent to the line wanted and they are left with their circuit bridged by a clearing-out annunciator.

To disconnect a connection, the operator merely takes the plugs from the switches and moves the commutator-piece of the switching device to its upper position.

When two subscribers' lines are connected together into a closed circuit for conversation, as described, and the operator, by means of her commutator-piece, sends a calling-current from ground to one side of the closed telephone-circuit, the current passes over a circuit to ground at the station of the called subscriber, ringing his bells, and if the calling subscriber has hung up his telephone while waiting for his connection his bell is also rung by a portion of the calling-current passing through his grounded bell-circuit, so that whenever two subscribers' telephones are upon their respective hooks their lines are connected to ground through their switches and bells and the bells will be rung by a current connected at central between the line-circuit and ground. It is evident that by connecting one contact of a pair of contacts to the closed telephone-circuit and the other contact through a call-generator to ground this result is secured.

I use the terms "bridge" and "cross-connect" in connection with a complete metallic



circuit to describe a connection between one side or branch of the circuit and its other side or branch, and an instrument in a bridge or cross-connecting circuit is not in the direct circuit, but is in a circuit connection across the two sides or branches of the circuit.

I claim as my invention and desire to secure by Letters Patent—

10 1. In a telephone-exchange system, two metallic-circuit lines temporarily connected together into a closed metallic circuit for conversation, and an operator's telephone temporarily in a bridge across the two sides of said  
15 circuit, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally open one of which  
20 contacts is connected to the other side of the generator and the other of which contacts is connected to said closed metallic circuit, and a commutator-piece adapted to be in three positions, in the first position said normally closed contacts being closed, in the second  
25 position, said normally closed contacts being open and the other pair closed and in the third position all of said pairs of contacts being open, substantially as set forth.

30 2. In a telephone-exchange system, two metallic-circuit lines temporarily connected together into metallic circuit for conversation, and an operator's telephone temporarily in a bridge across the two sides of said circuit, in  
35 combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally open one of which is connected to the other side of the generator and  
40 the other to said metallic circuit, a key in circuit with said generator, having a pair of contacts normally closed but opened at the will of the operator, and a commutator-piece adapted to be in three positions, in the first  
45 position said normally closed contacts being closed, in the second position said normally closed contacts being open and the other pair closed and in the third position all of said  
50 pairs of contacts being open, substantially as set forth.

3. In a telephone-exchange system, two metallic-circuit lines temporarily connected together into a closed metallic circuit for conversation and an annunciator temporarily in  
55 a bridge across the two sides of said circuit, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the annunciator, a pair of contacts normally open, one of which  
60 contacts is connected to the other side of the generator, and the other of which contacts is connected to said metallic circuit, and a commutator-piece adapted to be in two positions, in the first position said closed contacts being closed, in the second position said closed

contacts being open, and the other pair closed, substantially as set forth.

4. In a telephone-exchange system, two metallic-circuit lines temporarily connected together into metallic circuit for conversation, and an annunciator temporarily in a bridge across the two sides of said circuit, in combination with a calling-generator grounded on  
70 one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the annunciator, a pair of contacts normally open, one of which is connected to the other side of the generator and the  
75 other to said metallic circuit, a key in circuit with said generator and having a pair of contacts normally closed but opened at the will of the operator, and a commutator-piece adapted to be in two positions, in the first  
80 position said closed contacts being closed, in the second position said closed contacts being open and the other pair closed, substantially as set forth.

5. In a telephone-exchange system, a pair of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other, by two flexible switch-conductors, and an operator's telephone temporarily in a bridge across the  
90 two flexible conductors, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally  
95 open, one of which contacts is connected to the other side of the generator, and the other of which contacts is connected to one of said conductors, and a commutator-piece adapted to be in three positions, in the first position  
100 said normally closed contacts being closed, in the second position said normally closed contacts being open and the other pair closed, and in the third position all of said pairs of contacts being open, substantially as set forth.

6. In a telephone-exchange system, a pair of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by two flexible switch-conductors, and an operator's  
105 telephone temporarily in a bridge across the two flexible conductors, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally  
110 open, one of which is connected to the other side of the generator and the other to one of said conductors, a key in circuit with said generator and having a pair of contacts normally closed but opened at the will of the operator, and a commutator-piece adapted to be in three positions, in the first position said  
115 normally closed contacts being closed, in the second position, said normally closed contacts being open and the other pair closed, and in the third position, all of said pairs of contacts being open, substantially as set forth.

7. In a telephone-exchange system, a pair



of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by two flexible switch-conductors, and an operator's telephone temporarily in a bridge across the two flexible conductors, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally open, one of which contacts is connected to the other side of the generator, and the other of which contacts is connected to one of said conductors, and a commutator-piece adapted to be in two positions, in the first position said closed contacts being closed, in the second position said closed contacts being open, and the other pair closed, substantially as set forth.

8. In a telephone-exchange system, a pair of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by two flexible switch-conductors and an operator's telephone temporarily in a bridge across the two flexible conductors, in combination with a calling-generator grounded on one side, a switching device, two normally closed pairs of contacts in said bridge, one on each side of the telephone, a pair of contacts normally open, one of which is connected to the other side of the generator and the other to one of said conductors, a key in circuit with said generator and having a pair of contacts normally closed but opened at the will of the operator, and a commutator-piece adapted to be in two positions, in the first position said closed contacts being closed, in the second position said closed contacts being open and the other pair closed, substantially as set forth.

9. In a telephone-exchange system, two metallic-circuit lines temporarily connected together in metallic circuit for conversation, and a bridge circuit or connection across the two sides of said metallic circuit, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing pairs of contacts to connect at will either said telephone or said annunciator into said bridge-circuit, and a pair of normally open contacts adapted to be closed at the will of the operator, one of which contacts is connected with said metallic circuit and the other of which contacts is connected with the other side of the generator, substantially as set forth.

10. In a telephone-exchange system, two metallic-circuit lines temporarily connected together in metallic circuit for conversation, and a bridge circuit or connection across the two sides of said metallic circuit, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing pairs of contacts to connect at will either said telephone or said annunciator into said bridge-circuit, a pair of normally open contacts

adapted to be closed at the will of the operator, one of which is connected with said metallic circuit and the other with the other side of the generator, and a key in circuit with said generator, and having a pair of contacts normally closed but opened at the will of the operator, substantially as set forth.

11. In a telephone-exchange system, a pair of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by flexible switch-conductors, and a bridge circuit or connection across the two conductors, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing pairs of contacts to connect at will either said telephone or said annunciator into said bridge-circuit, and a pair of normally open contacts adapted to be closed at the will of the operator, one of which contacts is connected with one of said switch-conductors, and the other of which contacts is connected with the other side of the generator, substantially as set forth.

12. In a telephone-exchange system a pair of loop-switch plugs, the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by flexible switch-conductors, and a bridge circuit or connection across the two conductors, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing pairs of contacts to connect at will either said telephone or said annunciator into said bridge-circuit, a pair of normally open contacts adapted to be closed at the will of the operator, one of which is connected with one of said conductors, and the other with the other side of the generator, and a key in circuit with said generator and having a pair of contacts normally closed but opened at the will of the operator, substantially as set forth.

13. In a telephone-exchange system, two metallic-circuit lines temporarily connected together in metallic circuit for conversation, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing two contacts connected respectively to the two sides of said metallic circuit, two contacts connected to the two sides respectively of said telephone, two contacts connected to the two sides respectively of said annunciator, two contacts one of which is connected with said metallic circuit and the other of which is connected with the other side of said generator, and a commutator-piece adapted to be placed at will in three positions, in the first position said two first-mentioned contacts being closed to said two second-mentioned contacts, in the second position said two fourth-mentioned contacts being closed to each other and in the third position said two first-mentioned contacts being closed to said two third-mentioned contacts, substantially as set forth.



14. In a telephone-exchange system, two metallic-circuit lines temporarily connected together in metallic circuit for conversation, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing two contacts connected respectively to the two sides of said metallic circuit, two contacts connected to the two sides respectively of said telephone, two contacts connected to the two sides respectively of said annunciator, two contacts one of which is connected with said metallic circuit, and the other of which is connected with the other side of said generator, a commutator-piece adapted to be placed at will in three positions, in the first position said two first-mentioned contacts being closed to said two second-mentioned contacts, in the second position said two fourth-mentioned contacts being closed to each other, and in the third position said two first-mentioned contacts being closed to said two third-mentioned contacts, and a key in circuit with said generator, having a pair of contacts normally closed but opened at the will of the operator substantially as set forth.

15. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by flexible switch-conductors, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing two contacts connected respectively to the two flexible switch-conductors, two contacts connected to the two sides respectively of said telephone, two contacts connected to the two sides respectively of said annunciator, two contacts, one of which is connected with one of said conductors, and the other of which is connected with the other side of said generator, and a com-

mutator-piece adapted to be placed at will in three positions, in the first position said two first-mentioned contacts being closed to said two second-mentioned contacts, in the second position said two fourth-mentioned contacts being closed to each other and in the third position said two first-mentioned contacts being closed to said two third-mentioned contacts, substantially as set forth.

16. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces of each of which are respectively connected with the two contact-pieces of the other by flexible switch-conductors, in combination with an operator's telephone, an annunciator, a calling-generator grounded on one side, a switching device containing two contacts connected respectively to the two flexible switch-conductors, two contacts connected to the two sides respectively of said telephone, two contacts connected to the two sides respectively of said annunciator, two contacts one of which is connected with one of said conductors and the other of which is connected with the other side of said generator, a commutator-piece adapted to be placed at will in three positions, in the first position said two first-mentioned contacts being closed to said two second-mentioned contacts, in the second position, said two fourth-mentioned contacts being closed to each other, and in the third position said two first-mentioned contacts being closed to said two third-mentioned contacts, and a key in circuit with said generator, having a pair of contacts normally closed but opened at the will of the operator, substantially as set forth.

In witness whereof I hereunto subscribe my name this 23d day of June, 1890.

MILO G. KELLOGG.

Witnesses:

EMIL ABENHEIM,  
C. STRICH-CHAPELL.