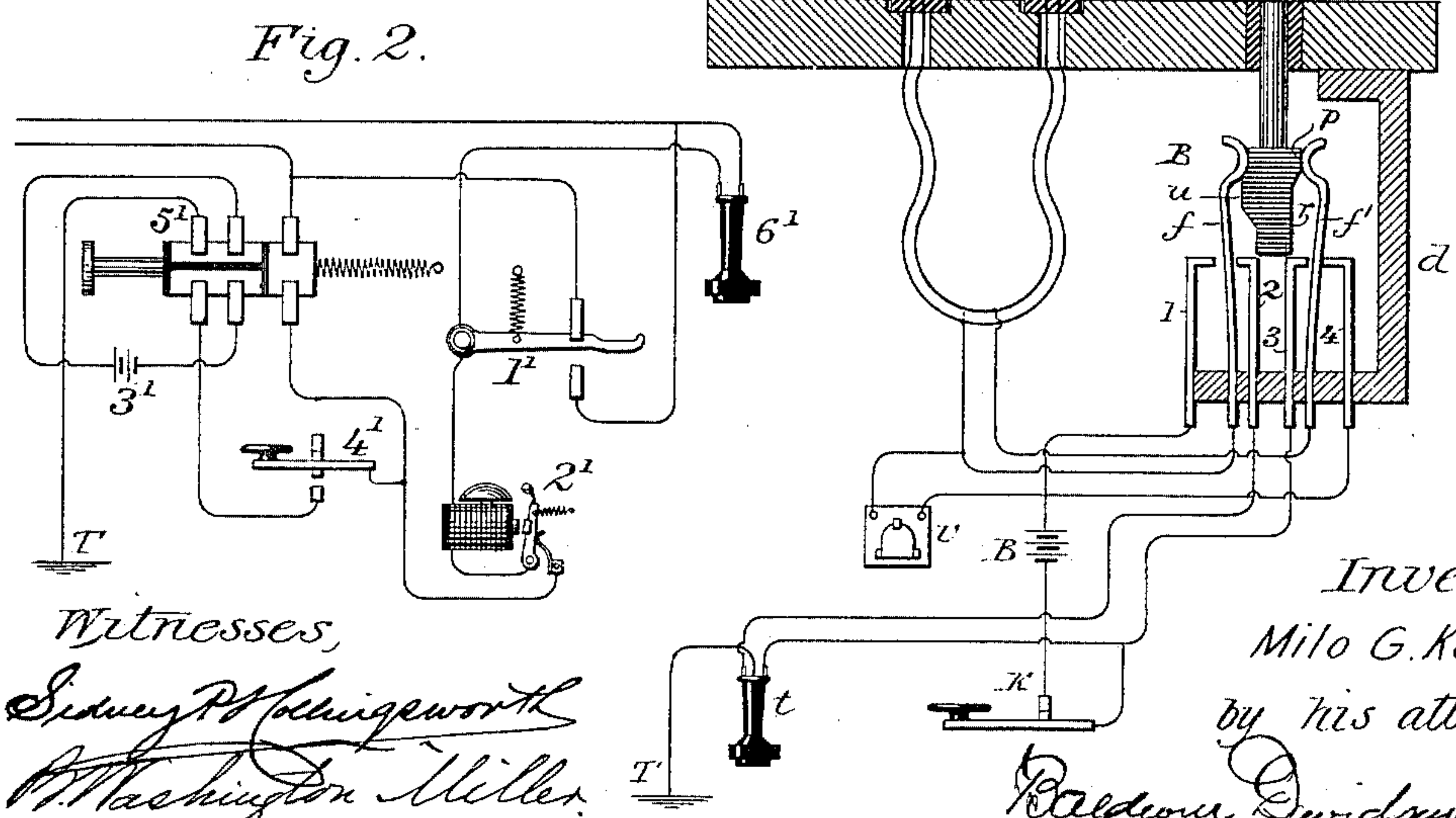
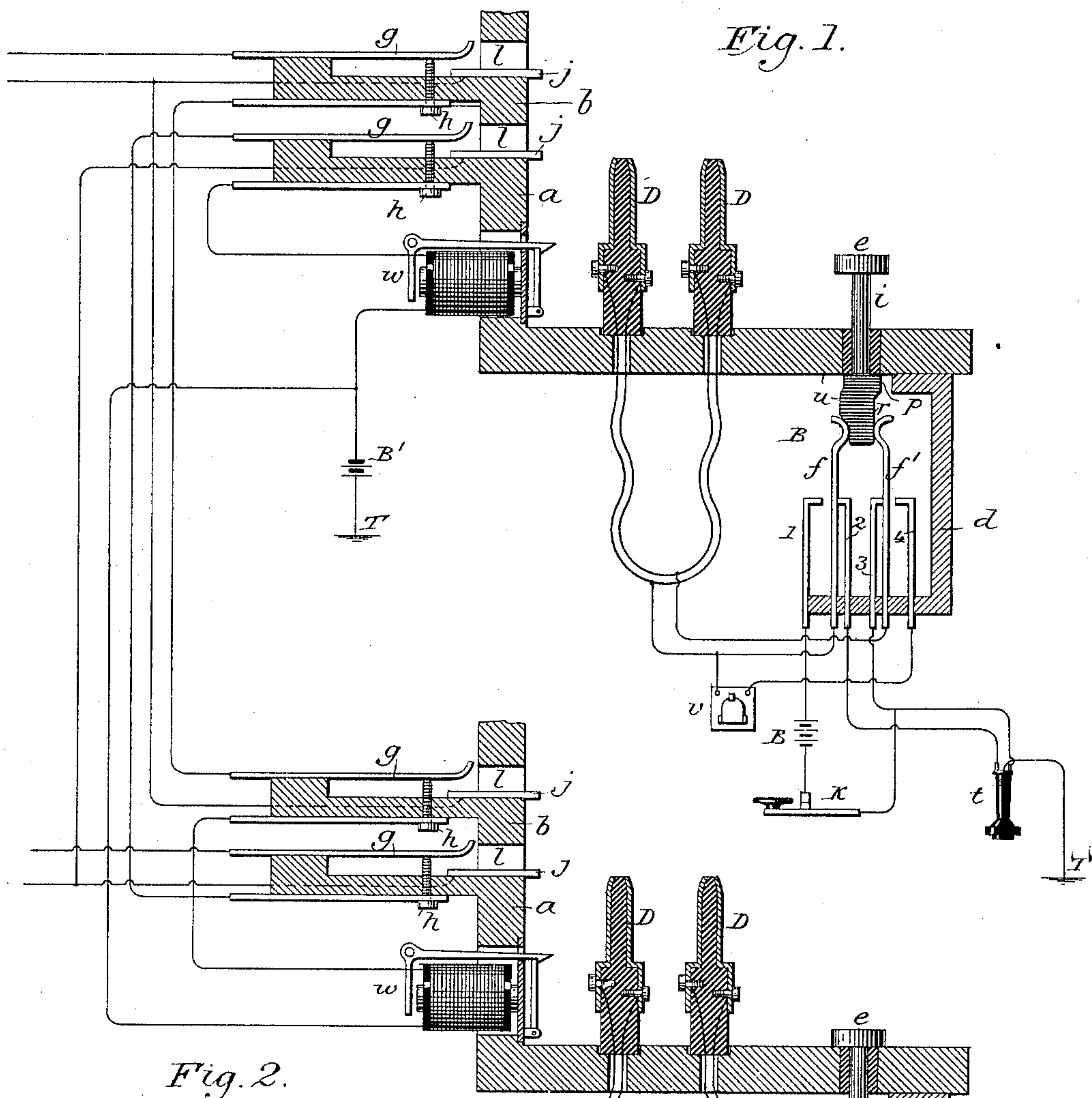


(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,418.

Patented Oct. 26, 1897.



Witnesses,
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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. 592,418, dated October 26, 1897.

Application filed September 14, 1893. Serial No. 485,489. (No model.) Patented in France March 25, 1890, No. 204,567.

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, a citizen of the United States, residing at 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 specification.

My invention (for which I have received a Patent in France, No. 204,567, of March 25, 1890) is a multiple-switchboard system for large telephone-exchanges, in which each operator has pairs of cords and plugs attached to them for making connections between the different line-switches, and an operator's switching device for each pair of plugs, by means of which the necessary switching and connecting operations may be performed between the operator's special apparatus and the several pairs of cords and plugs. This multiple-switchboard system is called the "two-cord" system, to distinguish it from the single 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 at another switchboard, may connect the two lines together, may send signaling-currents over the lines, may receive a signal for disconnection, may connect her telephone into the circuit to determine whether the two subscribers have finished talking, and may disconnect the lines and place the line apparatus in readiness for receiving a new call.

In the accompanying drawings, illustrating my invention, Figure 1 represents sections of two multiple switchboards at the central office of the exchange, and Fig. 2 represents a subscriber's instrument.

On each switchboard is 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 and insulated from the point when a plug is inserted into it, and a contact-piece which is normally insulated from the spring and which is connected with one contact-piece of the plug when the plug is inserted into the switch.

The contact-piece of the switch is adapted to have a test-plug applied to it for testing.

The contact-springs are shown at *g g*, while *h h* are the contact-points, *j j* the insulated contact-pieces, *l l* the plug-holes, and *a b* are ebonite strips, of the shape substantially as shown, on which the metal parts of the switch are mounted.

Double switch-plugs are used adapted to be inserted into the switch-holes. When a plug is inserted into a switch, its two contact-pieces form connection with the spring and contact-piece *j*, respectively, of the switch. Each pair of plugs has an operator's switching device, the construction, operation, and manipulation of which will be hereinafter explained in detail.

Two lines and their switches on the boards, two pairs of plugs and cords, and their operators' switches and the line-annunciators are shown in Fig. 1. The drawings show one pair of plugs and cords, with their operator's switch, and one line-annunciator as located at one board, and the other corresponding parts as located at the other board.

The operator's switching devices are marked B B.

d is a frame which supports and insulates the parts.

f f' are contact-springs, and 1, 2, 3, and 4 are contact-points, while *i* is a movable rod terminating at one end in the knob *e* and at the other end in the irregularly-shaped ebonite piece *p u r*. The rod *i*, with the knob *e* and the ebonite piece *p u r*, move together as one piece and may be called the "movable commutator-piece" of the switch. The knob *e* and the piece *p* furnish stops which limit the inner and outer motions of the commutator-piece.

The parts of the switching device are constructed, shaped, and mounted substantially as shown and so as to obtain the following switching connections: When the commutator-piece is in its outer position, springs *f* and *f'* are in contact with points 2 and 3, respectively. When it is moved to its central position, spring *f* is forced into contact with point 1. When it is moved to its inner position, the spring *f* is not in contact with any switch-point, and *f'* is in contact with 4.

D D and D D are the two pairs of double plugs.

K K are two-point keys each having a lever normally in contact with a contact-point, but separated from the point when pressed by the operator.

t t are the operator's telephones, B B the calling generators or batteries, and B' is a test-battery.

v v are disconnecting or clearing-out annunciators, one for each pair of plugs and cords.

T in all the drawings is an earth connection, and w w are line-annunciators, one for each line.

The cords connecting the plugs are flexible and are shown permanently continuous—i. e., in the operation of the system, the continuity of the connection between the plugs is not at any time broken or interrupted by the operation of the calling-key, switches, or otherwise.

The connections of the lines and of the central-office apparatus are substantially as shown and as follows: One side or branch of the line passes normally in succession through the spring and contact-point *gh* of its switches on the several boards, passing in each case first to the spring. It then passes through the line-annunciator to a common wire for the lines containing the test-battery B', and thence to earth. The other side or branch of the line is connected to all the contact-pieces *jj* of the switches of the line on the several boards.

Two of the contact-pieces of the two plugs of each pair are connected by means of two conductors of their double cords, and this cord-circuit is connected to one of the contact-springs—say *f'*—of the switching device of the pair of plugs and cords. The other contact-pieces of the pair of plugs are connected by the other conductors of the cords, and this cord-circuit is connected to the other contact-spring *f* of the switching device. The contact-points 2 and 3 of the switching device are connected through the operator's telephone. The contact-points 1 and 3 are connected through the calling generator or battery and the normally closed points of the operator's key. Contact-point 4 of the switching device is connected through the disconnecting-annunciator to the cord-circuit which is connected to contact-spring *f* of the switching device. The junction-wire between the two coils of the operator's telephone is connected to earth through the test-battery.

Each multiple switchboard is provided with as many pairs of the double plugs and cords, with their switching devices, as may be needed for the connections to be made at that board, and they are connected, substantially as described, to the operator's special apparatus. The parts are conveniently arranged and mounted for manipulation. The cords should be long enough to reach any switch at their

switchboard. There is one disconnecting (or clearing-out) annunciator for each pair of plugs and cords. One key suffices for each operator. The commutator-pieces of the operator's switching devices normally rest in their outer position, as shown in the drawings.

In the subscriber's instrument shown in Fig. 2, 1' is the telephone-switch. 2' is the bell or signal-receiver. 3' is a calling battery or generator of any suitable well-known type commonly used in telephone-exchange systems. 4' is a calling-key. 5' is a disconnection-switch, and 6' is the subscriber's telephone. The calling-key has two points normally out of contact, but brought into contact by the subscriber when he wishes to call the central office. The disconnection-switch may be of any well-known form which will switch an instrument from one circuit into another. The circuits, contacts, and connections are substantially as shown. The battery may also be connected and used as a transmitter-battery in a way apparent to those skilled in the art.

The operation of the system is as follows: When a subscriber desires to call, he depresses his calling-key, which establishes a closed circuit from his earth connection through one branch of his line and his annunciator at the central office, thereby operating his annunciator. The operator sees the signal and places the first plug of any pair of the double switch-plugs in the switch of the line, thus disconnecting the line from its normal earth connection through its annunciator, and bridging or cross-connecting its two sides or branches through the circuit which contains the operator's telephone. The circuit is completed through the two conductors of the cord and the contacts of springs *f f'* with points 2 and 3, respectively, of the switching device. On learning which line is wanted the operator tests that line, as will be described hereinafter, and on finding it free or unswitched places the second plug of the pair in the switch of that line, thus disconnecting it from its earth connection through the annunciator and connecting the two lines of the calling and called subscribers into a metallic circuit, which is bridged or cross-connected at the central office by a circuit which includes the operator's telephone. The operator then presses the commutator-piece of the switching device to its inner position. While this is passing from one position to another and while spring *f'* rests on part *u* of the ebonite piece the spring is in contact with point 1, and the calling generator or battery is connected in a bridge or cross-connection to the circuit of the two lines. A split current therefore passes to both lines, ringing the bell of the subscriber wanted as well as that of the calling subscriber if he has replaced his telephone on its switch.

When the commutator-piece is in its inner position, neither the telephone nor the call-

ing generator or battery is connected to the circuit of the two lines.

When the lines are connected as described, their circuit is bridged or cross-connected by a circuit containing the disconnecting-annunciator of the pair of plugs. This is effected by the connections described and by the closing of the contact between spring f' and point 4. This annunciator will therefore indicate any disconnection-signal from either subscriber. The disconnecting or clearing-out annunciator is an electromagnetic annunciator, is preferably of high resistance, and constructed so as to offer considerable retardation to telephonic currents.

If the operator desires to determine whether the subscribers have finished talking, she depresses key K and while its contacts are open moves the commutator-piece to its outer position. This connects to the lines in a bridge-circuit the telephone of the operator, who can hear whether the conversation is finished or not. The opening of the key contact-points prevents any false signal being sent from the calling generator or battery in case the subscribers have already replaced their telephones on their switches.

When the subscribers have finished talking, either or both may depress his disconnecting-switch and thus transfer his calling-battery into his metallic circuit and operate the special or clearing-out annunciator, which bridges the circuit at the central office. The operator, noticing the indication on the clearing-out annunciator, promptly disconnects the lines, as will hereinafter be described. The annunciator on which this clearing-out signal is received being a special clearing-out annunciator (and not the line-annunciator of one of the two lines) great promptness in clearing out is obtained and great efficiency in the telephone-exchange service is thereby obtained. The operator knows at once on observing the signal and without further investigation that a clearing-out signal (and not a primary calling-signal) is intended by such indication and gives such signal the preference over any primary calling-signals which may at the same time be indicated at her board, and thus makes the two connected lines at once free to be connected to at her own or at any other board. Moreover, the operator knows at once what to do and does not hesitate in her work in finding out whether the call indicated is a primary or a clearing-out signal and thus lose valuable time, as would be the case were the clearing-out indication made on one of the line-annunciators.

The operation of the test system is as follows: The operator places one of the contact-pieces of the second plug of the pair used on the contact-piece j of the switch of the line wanted. If the line tested is free, a closed circuit will be established from earth through one telephone-coil to the line tested and

through the line to its normal earth, through the test-battery at the central office, and the operator will hear a sound or click in the telephone. If the line tested is already switched at any board, this test-circuit will be open and the operator hears nothing. The test therefore shows whether the line is in use at any board.

The operations of making a connection are, first, to place one plug of a pair in the switch of the calling-line; second, to test the line wanted with the other plug of the pair; third, to place the second plug in the switch of the line wanted; fourth, to depress the commutator-piece to its inner position.

To disconnect the lines, the operator merely takes the plugs from the switches and restores them to their normal positions and withdraws the commutator-piece of the switching device to its outer position.

I claim as my invention—

1. In a telephone-exchange system, metallic-circuit lines and annunciators for said lines at the central office, one annunciator for each line, each annunciator normally, or when the line is not switched for use at the central office, connected from one side or branch of the line to the ground, but each disconnected from said side or branch of its line while and as long as the line is switched for use, in combination with switching apparatus at the central office connecting together any two of said lines at the will of the operator into a combined metallic circuit for conversation and the annunciators of the two lines while and as long as the lines are thus switched disconnected from said connection with their respective lines, electromagnetic clearing-out annunciators at the central office, one in a bridge connection across the two sides of the combined metallic circuit of any two lines connected together, and current-generating apparatus at each subscriber's station in the closed circuit of his line and sending current for the clearing-out signal over said metallic circuit.

2. In a telephone-exchange system, multiple switchboards, metallic-circuit lines and annunciators for said lines at the central office, distributed among said boards, one annunciator for each line, each annunciator normally, or when the line is not switched for use at the central office, connected from one side or branch of the line to the ground, but each disconnected from said side or branch of its line while and as long as the line is switched for use, in combination with switching apparatus at the central office connecting together any two of said lines at the will of the operator into a combined metallic circuit for conversation and the annunciator of the two lines while and as long as the lines are thus switched disconnected from said connection with their respective lines, electromagnetic clearing-out annunciators at the central office, one in a bridge connection across the

two sides of the combined metallic circuit of any two lines connected together, and current-generating apparatus at each subscriber's station in the closed circuit of his line and sending current for the clearing-out signal over said metallic circuit.

3. In a telephone-exchange system, metallic-circuit lines and annunciators for said lines at the central office, one annunciator for each line, each annunciator normally, or when the line is not switched for use at the central office, connected from one side or branch of the line, but each disconnected from said side or branch of its line while and as long as the line is switched for use, in combination with switching apparatus at the central office connecting together any two of said lines at the will of the operator into a combined metallic circuit for conversation and the annunciators of the two lines while and as long as the lines are thus switched disconnected from said connection with their respective lines, electromagnetic clearing-out annunciators at the central office, one in a bridge connection across the two sides of the combined metallic circuit of any two lines connected together, and current-generating apparatus at each subscriber's station in the closed circuit of his line and sending current for the clearing-out signal over said metallic circuit.

4. In a telephone-exchange system, multi-

ple switchboards, metallic-circuit lines and annunciators for said lines at the central office, distributed among said boards, one annunciator for each line, each annunciator normally, or when the line is not switched for use at the central office, connected from one side or branch of the line, but each disconnected from said side or branch of its line while and as long as the line is switched for use, in combination with switching apparatus at the central office connecting together any two of said lines at the will of the operator into a combined metallic circuit for conversation and the annunciator of the two lines while and as long as the lines are thus switched disconnected from said connection with their respective lines, electromagnetic clearing-out annunciators at the central office, one in a bridge connection across the two sides of the combined metallic circuit of any two lines connected together, and current-generating apparatus at each subscriber's station in the closed circuit of his line and sending current for the clearing-out signal over said metallic circuit.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

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FRANK S. OBER.