

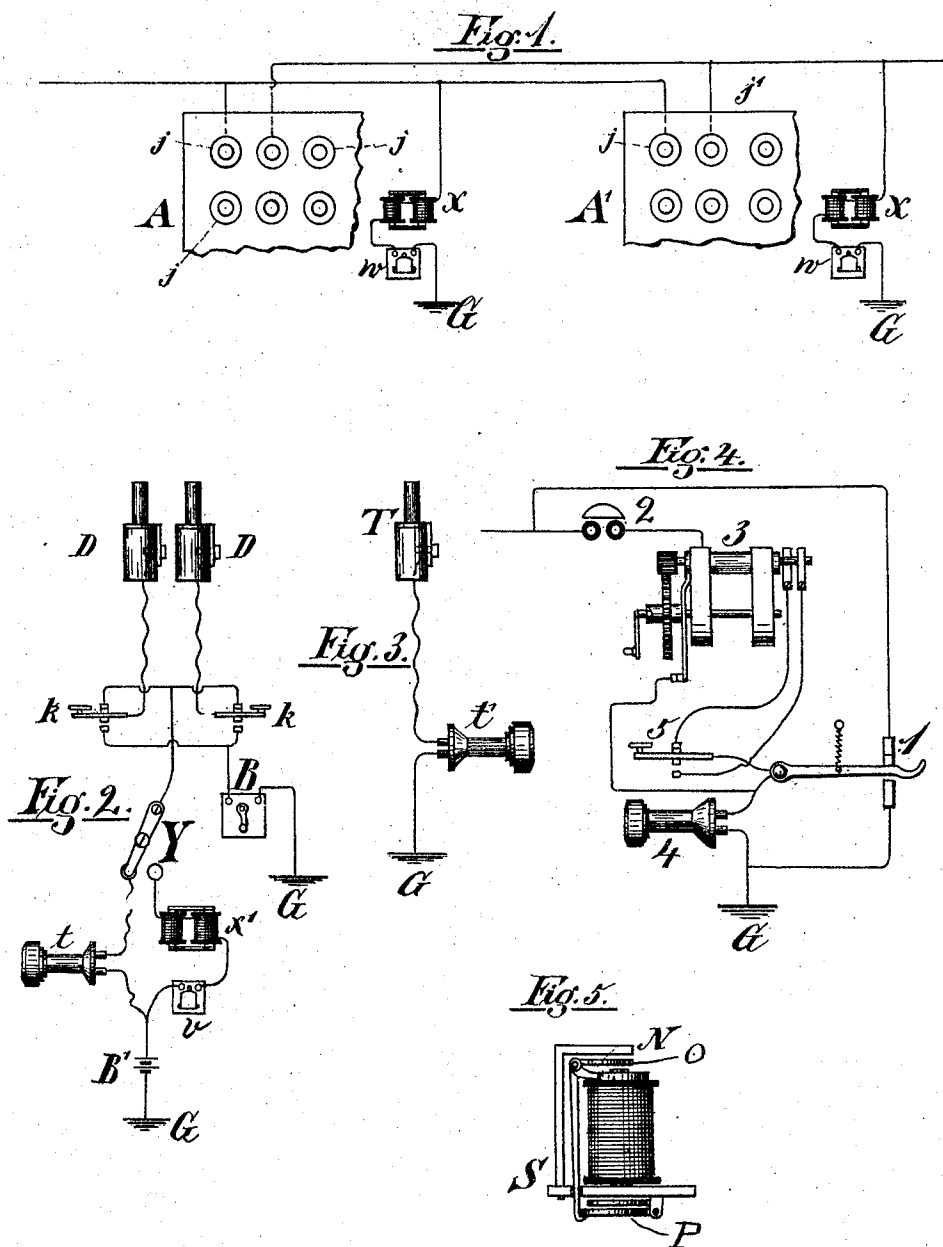
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MULTIPLE SWITCHBOARD FOR TELEPHONE EXCHANGES

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MULTIPLE SWITCHBOARD FOR TELEPHONE-EXCHANGES.

No. 800,160.

Specification of Letters Patent.

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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 Geneva, in the Republic of Switzerland, 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 to a telephone-exchange system in which the lines are each connected to a metallic switch-terminal at each board adapted to receive and make contact with a switch-plug which may be inserted; and it consists of a system of calling, switching, testing, and clearing-out connections, which I shall describe and claim in detail.

In the drawings illustrating my invention, Figure 1 represents front views of sections of two switchboards with metallic sockets or switch-terminals for several lines and two lines connected to the two boards with their line-annunciators, retardation-coils, and central-office connections. Fig. 2 shows an operator's cord system adapted to be used at each board; Fig. 3, an operator's test system adapted to be used at each board, and Fig. 4 a diagram of the subscriber's-station apparatus for each line. Fig. 5 indicates a polarized calling-annunciator for the lines.

In Fig. 1, A A' are the two switchboards. *j j* are metallic sockets or switch-terminals, one for each line on each board. Each socket or switch-terminal is adapted to receive and form connection with each switch-plug at its board. (Shown in Fig. 2 and marked D D.) *ww* are the line-annunciators, and *xx* retardation-coils; one annunciator and one retardation-coil for each line. Each line is connected to its metallic socket or switch-terminals on the boards and is grounded through its annunciator and retardation-coil, as shown. It is preferable, as will hereinafter appear, that the annunciators be polarized annunciators and be connected in the circuits, as will hereinafter be indicated. The retardation-coils are not necessary, but are desirable to retard the passage to ground at the central office of telephone-currents which may be passing over the circuit of two lines connected together for conversation. The annunciators may be so

constructed as to offer the retardation effect required.

The polarized line-annunciator is shown in Fig. 5, N S indicating the poles thereof, O the armature, and P the shutter or drop.

In Fig. 2, D D are a pair of switch-plugs, each adapted to be inserted into the switch-terminals and form the connections, as heretofore described. *k k* are two calling-keys, one for each plug. Each key has a lever connected by a flexible conductor with its plug and a contact-point normally in contact with the lever and another contact-point normally out of contact with the lever. When the lever is depressed, it passes out of contact with the first contact and into contact with the second-mentioned contact. The first-mentioned contact is connected with the similar contact of the other key. Y is a switch, *v* a clearing-out annunciator, and X' a retardation-coil for the pair of plugs. *t* is the operator's telephone. B is a calling-generator, and B' a test-battery, of which there may be one of each for the exchange. The lever of the switch Y is connected with the two contacts of the key which are normally in contact with the key-levers. The other contacts of the keys are connected to ground through the calling-generator. One of the switch-bolts on which the lever may be placed by the operator is connected through the clearing-out annunciator and retardation-coil of the pair of plugs and the test-battery to the ground. Other pairs of plugs with their special apparatus may be connected to the operator's cord system substantially as shown and as will be evident to those skilled in the art.

In the operator's test system shown in Fig. 3, T is the test-plug, which is adapted to be brought into connection for testing with any metallic socket or switch-terminal *j* at its board. *t'* is the test-receiving instrument. The plug is connected through a flexible conductor to the test-receiving instrument and through the instrument to the ground.

Each operator has one cord system and one test system located at the board where she operates.

In the diagram of the subscriber's-station apparatus shown in Fig. 4, 1 is the telephone-switch. 2 is the signal-receiving bell. 3 is the calling-generator. 4 is the operator's telephone, and 5 is a calling-key. The gen-

erator is constructed with the usual automatic device whereby it is shunted or switched from the line-circuit while not operated. The insulated contact-piece on the shaft of the armature, to which is connected one end of the armature-wire and which conducts the generated current to the line through the stationary spring-contact (or contacts) provided for it, is a half-circle, the remaining part of the circle being an insulation, as shown. I provide two stationary spring contact-pieces, as shown, each bearing on the diametrically opposite part of the circle of the shaft of which said insulated contact-piece is a part. The key 5 is provided with two pairs of contact-points, as shown, one pair being normally closed and the other pair normally open, and when the key is depressed the normally open pair of contacts is closed and the normally closed pair is opened. The connection of the key to the contact-springs of the generator and to the line-circuit is as follows and as shown: The spring-lever, which forms one of the contacts of each pair of contact-points, is connected with one side of the main-line circuit. The two other contact-pieces of the pairs of contact-points are connected to the two contact-springs, respectively. As stated above, one end of the armature-wire is connected with the half-circle contact-piece on the generator-shaft, on which the springs alternately bear when the generator is being turned. The other end of the armature-wire is connected with the other side of the main-line circuit.

The automatic shunt device mentioned before may shunt that part of the circuit containing the armature-wire and the key when the generator is not being operated upon.

It is well known that when magneto-generators are turned and operated a current of one polarity is generated during one half of the revolution of the armature and a current of the other polarity is generated during the other half of the revolution of the armature.

It will be apparent from the description of the subscriber's-station apparatus which has been given and from the circuits that when the generator is being operated and the key remains in its normal position the armature-wire is in circuit through one of the contact-springs, and that only, and a current of one polarity will be sent to the line, and that when the generator is being operated and the key is depressed the armature-wire is in circuit through the other contact-spring, and that only, and a current of the other polarity will be sent to the line. The subscriber can therefore at will send currents of either polarity to line as he does not or does press on the calling-key.

The line-annunciators should preferably be connected into their respective circuits in such a direction as to be operated by the current from the subscriber's generator when it

is operated while the calling-key is not depressed.

The clearing-out annunciators may be non-polarized annunciators.

The test-battery should preferably be connected in such a direction that when it is connected to the circuit of any line by means of a switch-plug being inserted into the terminal of the line its current will be of the same polarity or direction in the line as is the current from the line-generator when it is operated and the subscriber's key is depressed.

The operation of the system is as follows: When a subscriber desires to make a call, he operates his generator without pressing his key 5. A calling-current is thereby sent to the line which operates the line-annunciator. The operator then places one of the switch-plugs into the switch-terminal of the line and places the switch Y, so that her telephone is in circuit with the line and finds out by conversation what line is wanted. She then tests the line wanted, as will be described, and if she finds that it is "free" or unswitched she places the other plug of the pair in its switch-terminal at her board. The two lines are then connected in a circuit, and the circuit is grounded at the central office through the annunciator and retardation-coil of each line. The operator then presses the key whose lever is connected with the plug which is connected with the calling-line and by so doing disconnects the line from the other and grounds it through the calling-generator, and a calling-current goes to the line, which rings the subscriber's bell. The operator then moves the lever of the switch Y, so that the circuit is grounded through the annunciator and retardation-coil of the pair of plugs used. The lines are thus connected together for conversation, and the circuit is grounded through the annunciator and retardation-coils of both lines and of the pair of plugs. The retardation effect of the annunciators and retardation-coils will, however, be such as not to interfere with the telephone-currents which may pass over the circuit.

The operator's calling-generator B should preferably be such as to give but one polarity of current and should be so connected as not in calling to send the polarity of current to the lines which will operate their annunciators, and the subscriber's signal-receiving bell should be such as to respond to currents of that character. Any usual forms of apparatus which produce these results may be used.

The test system is as follows: When a line is switched for conversation, its circuit is grounded through the test-battery B'. If when it is in that condition a test-plug is applied to its switch-terminal at any board, a complete test-circuit is established which contains the battery and the operator's test-receiving instrument, and the instrument will sound, in-

dicating that the line is already switched for use. This complete circuit is from the ground through the test-battery to the switch-terminal where the line is used, thence to the switch-terminal where the line is tested, and thence through the test-plug and test-receiving instrument to the ground. When a line is tested which is not switched for use, no circuit is established which contains the operator's test-receiving instrument and a battery, and the instrument will not sound, and the operator thereby knows that the line is not switched. When the calling-generator B is connected to a line-circuit and the line is tested, there will be a current from the generator through the test-receiving instrument which will give an indication that the line is busy. When either the operator's telephone or a clearing-out annunciator is connected to the line, the test indication comes from the battery B'. In any case, therefore, the line will test "busy" when a switch-plug is in one of its metal sockets or terminals.

The battery B' should not be strong enough to operate any clearing-out annunciator when connected to the circuit of two lines, as described. It will, however, reinforce the clearing-out current sent from either station and may be of such strength as to do this in a material way. With certain forms of apparatus this may be necessary or desirable, as only part of the current generated when a clearing-out signal is given goes through the clearing-out annunciators, the remainder going to ground through the line-annunciators of the two lines and the subscriber's ground of the line in which the clearing-out signal did not originate.

As shown in the drawings and described herein, a retardation-coil or its equivalent is preferably used in circuit with the clearing-out annunciator. This circuit is therefore of comparatively high resistance, and a correspondingly small amount of the clearing-out current sent by the subscriber will pass through it. The use of the battery B' to reinforce the current and secure the operation of the annunciator is therefore desirable.

Instead of the annunciator *w* and retardation-coil *x* for each line an annunciator may be employed which has high resistance and high retardation to telephone-currents.

I claim as my invention—

1. In a telephone-exchange system, a pair of switch-plugs and two calling-keys, one for each plug, each having a lever connected with the plug by a flexible switch-conductor, a contact-point normally in contact with the lever and in electrical connection with the corresponding point of the other key and a contact-point normally out of contact with the lever, each lever being adapted to be pressed away from the point with which it is normally in contact and into contact with the other point of the key, in combination with a

calling-generator grounded on one side and connected on the other side to each of said contact-points normally out of contact with its lever, a battery grounded on one side, a clearing-out annunciator connected on one side to the other side of said battery and a switch with contacts to connect said annunciator on its other side to the circuit connecting said first-mentioned contact-points, substantially as set forth.

2. In a telephone-exchange system, a pair of switch-plugs and two calling-keys, one for each plug, each having a lever connected with the plug by a flexible switch-conductor, a contact-point normally in contact with the lever and in electrical connection with the corresponding point of the other key and a contact-point normally out of contact with the lever, each lever being adapted to be pressed away from the point with which it is normally in contact and into contact with the other point of the key, in combination with a calling-generator grounded on one side and connected on the other side to each of said contact-points normally out of contact with its lever, a battery grounded on one side, a clearing-out annunciator and retardation-coil in a circuit connection connected on one side to the other side of said battery, and a switch with contacts to connect said circuit connection on its other side to the circuit connecting said first-mentioned contact-points, substantially as set forth.

3. In a telephone-exchange system, a pair of switch-plugs and two calling-keys, one for each plug, each having a lever connected with the plug by a flexible switch-conductor, a contact-point normally in contact with the lever and in electrical connection with the corresponding point of the other key, and a contact-point normally out of contact with the lever, each lever being adapted to be pressed away from the point with which it is normally in contact and into contact with the other point of the key, in combination with a calling-generator grounded on one side and connected on the other side to each of said contact-points normally out of contact with its lever, a battery grounded on one side, a clearing-out annunciator and an operator's telephone each connected on one side to the other side of said battery, and a switch with contacts to connect either said annunciator or said telephone on its other side to the circuit connecting said first-mentioned contact-points, substantially as set forth.

4. In a telephone-exchange system, a pair of switch-plugs and two calling-keys, one for each plug, each having a lever connected with the plug by a flexible switch-conductor, a contact-point normally in contact with the lever and in electrical connection with the corresponding point of the other key and a contact-point normally out of contact with the lever, each lever being adapted to be pressed away

from the point with which it is normally in contact and into contact with the other point of the key, in combination with a calling-generator grounded on one side and connected on the other side to each of said contact-points normally out of contact with its lever, a battery grounded on one side, an operator's telephone, a clearing-out annunciator and a retardation-coil in a circuit connection, said telephone and said circuit connection being each connected on one side to the other side of said battery, and a switch with contacts to connect at will said telephone and said circuit connection on their other sides to the circuit connecting said first-mentioned contact-points, substantially as set forth.

5. In a telephone-exchange system, two lines connected together for conversation and their circuit grounded through the polarized annunciator of each line, in combination with a clearing-out annunciator and a battery on a circuit connection from the circuit of said lines to the ground, said battery being so connected as not to cause the magnets of said polarized annunciators to attract their armatures in the direction to operate the annunciators and being so related to said clearing-out annunciator as to

cause the magnet to attract its armature but not sufficiently to operate the annunciator and means whereby either subscriber may send over the line a current of a polarity that will not operate the line-annunciators but will operate the clearing-out annunciator, substantially as set forth.

6. In a telephone-exchange system, two lines grounded at their outer ends and connected together for conversation, in combination with a clearing-out annunciator and a battery in a circuit connection from the circuit of said lines to the ground, said battery being so related to said clearing-out annunciator as to cause the magnet to attract the armature but not sufficiently to operate the annunciator, and means whereby either subscriber may send over the line a current which reinforces the battery-circuit to operate the annunciator substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

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