No. 824,291. PATENTED JUNE 26, 1906.

E. A. FALLER & O. A. DANIELSON.

AUTOMATIC TELEPHONE KEY.

APPLICATION FILED OCT. 6, 1904.

2 SHEETS—SHEET 1.

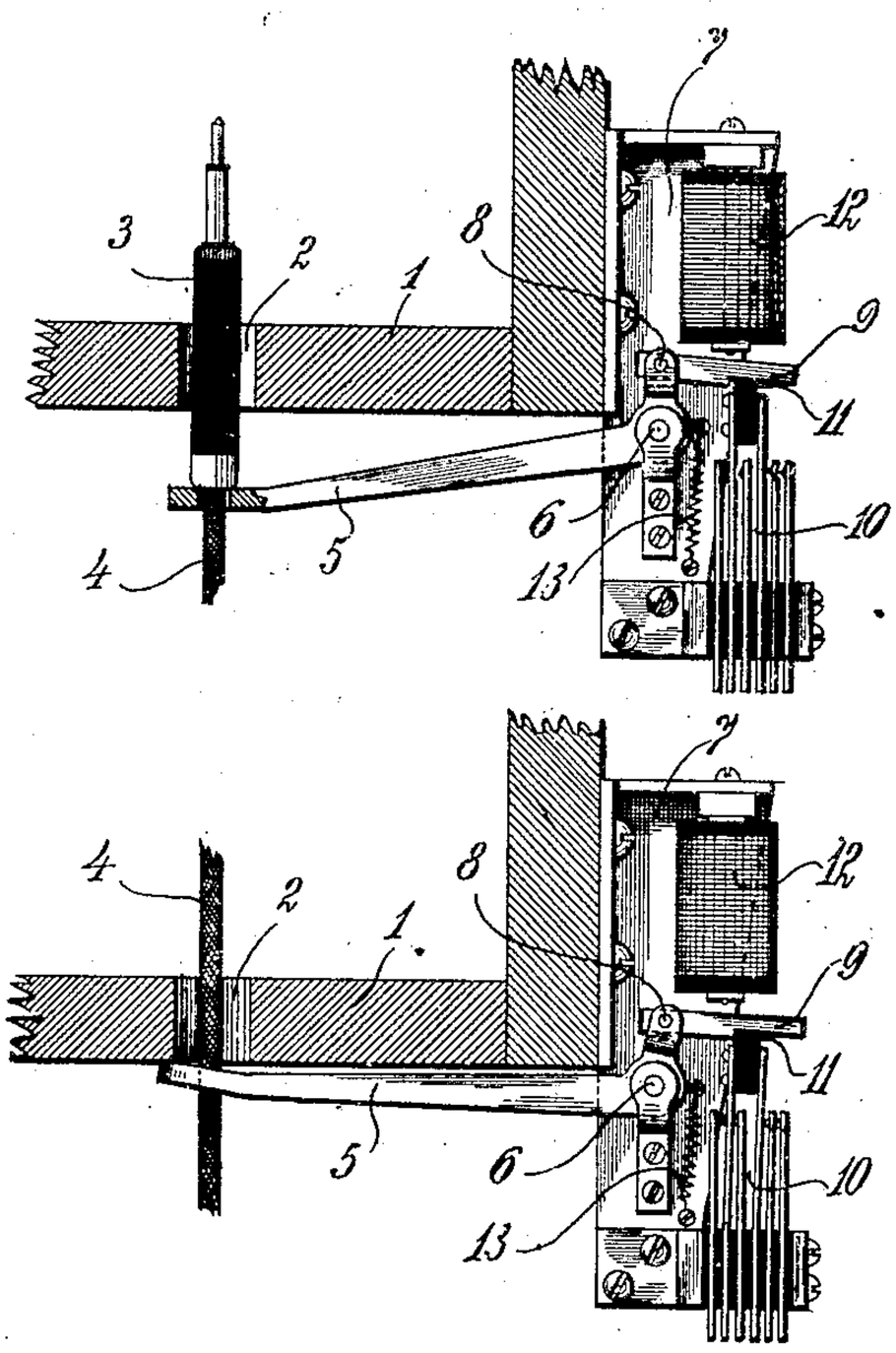


Fig. 1.

Fig. 2.

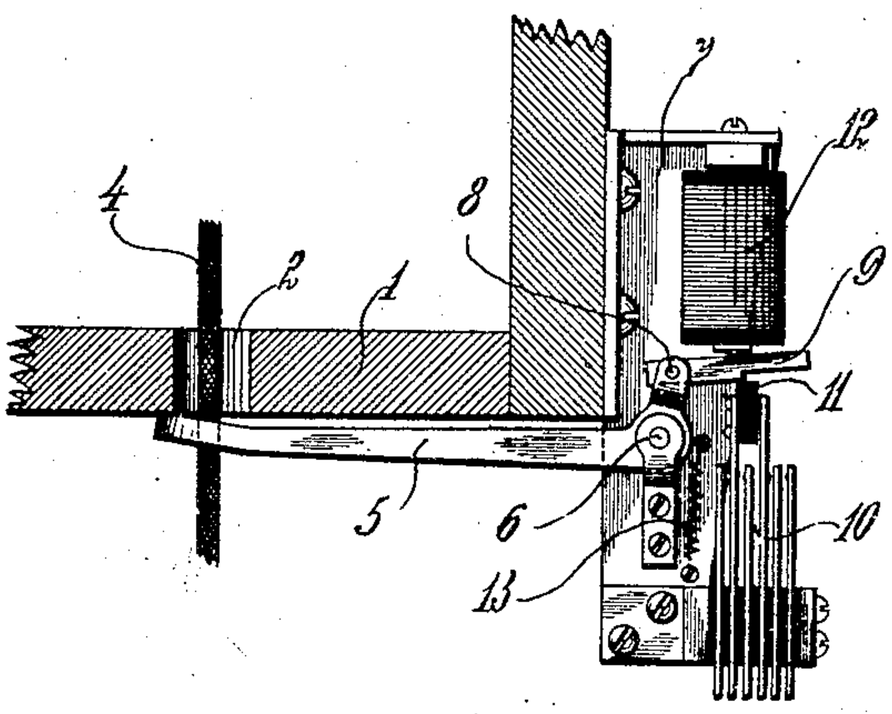


Fig. 3.

WITNESSES:

K. O. Charlson

Max Sidon

INVENTORS:

Ernest A. Faller,

Oscar Alvin Danielson

BY

Ralph Julian Sachers

ATTORNEY

No. 824,291.

PATENTED JUNE 26, 1906.

E. A. FALLER & O. A. DANIELSON.

AUTOMATIC TELEPHONE KEY.

APPLICATION FILED OCT. 6, 1904.

2 SHEETS—SHEET 2.

Fig. 4.

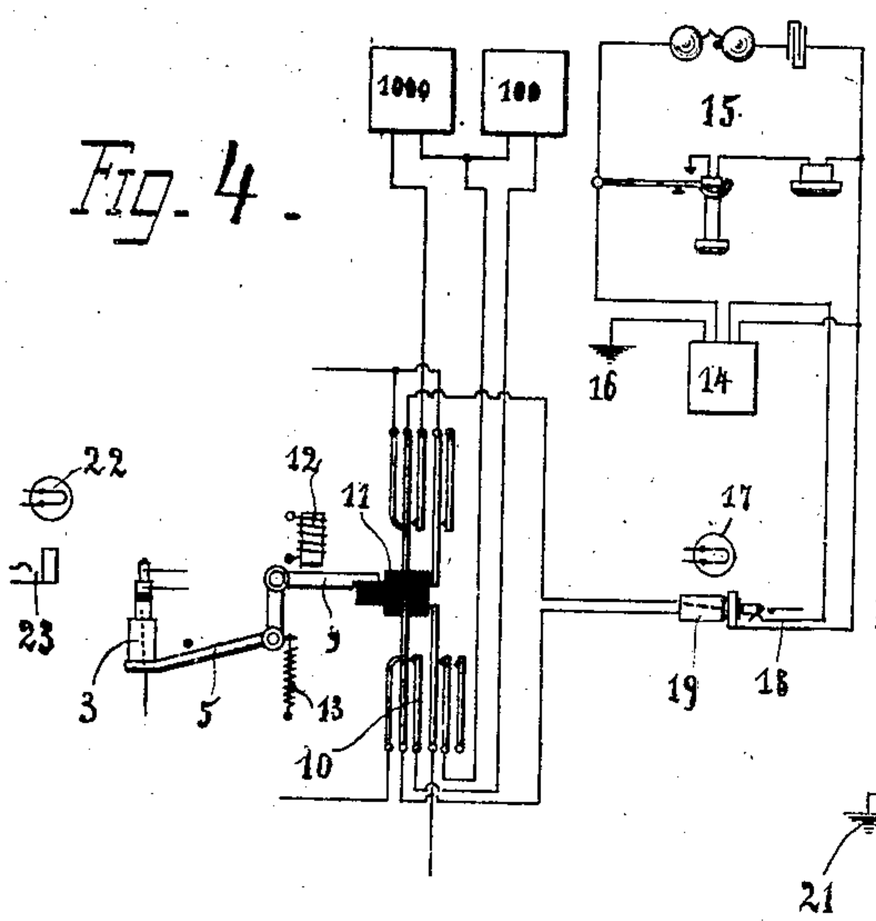


Fig. 5.

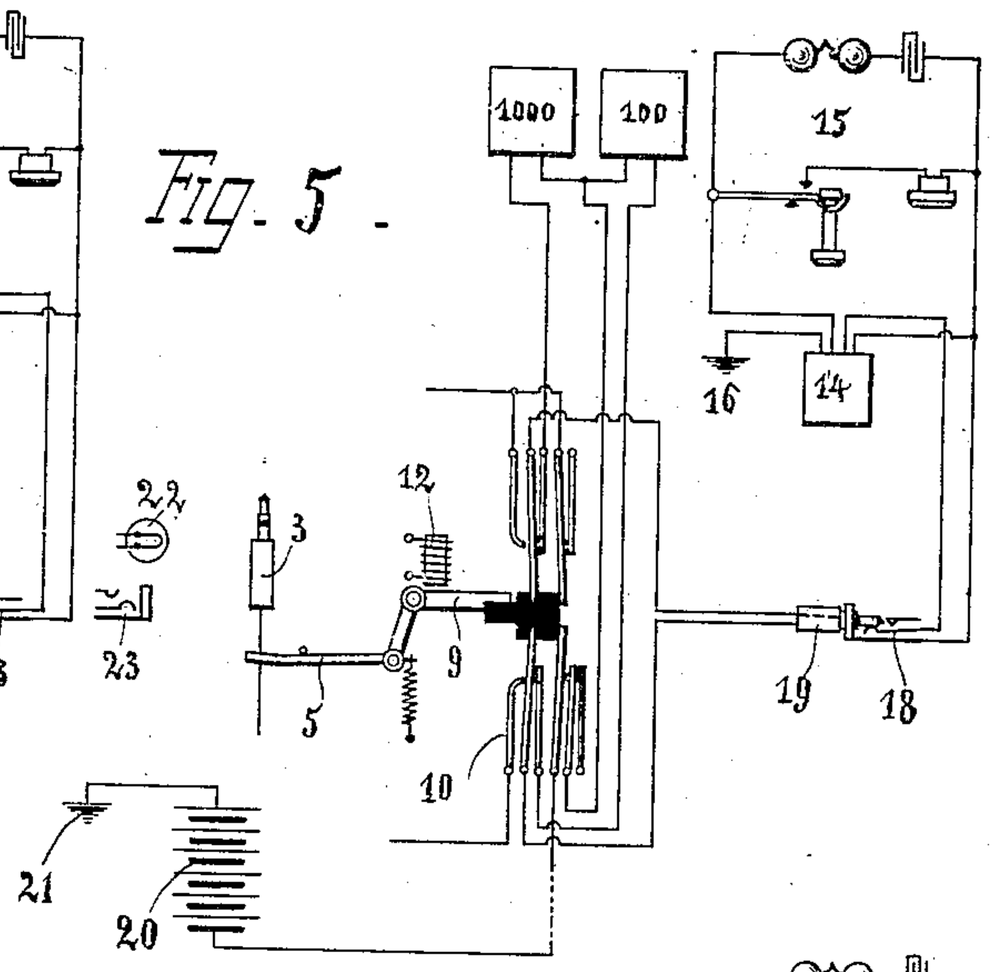
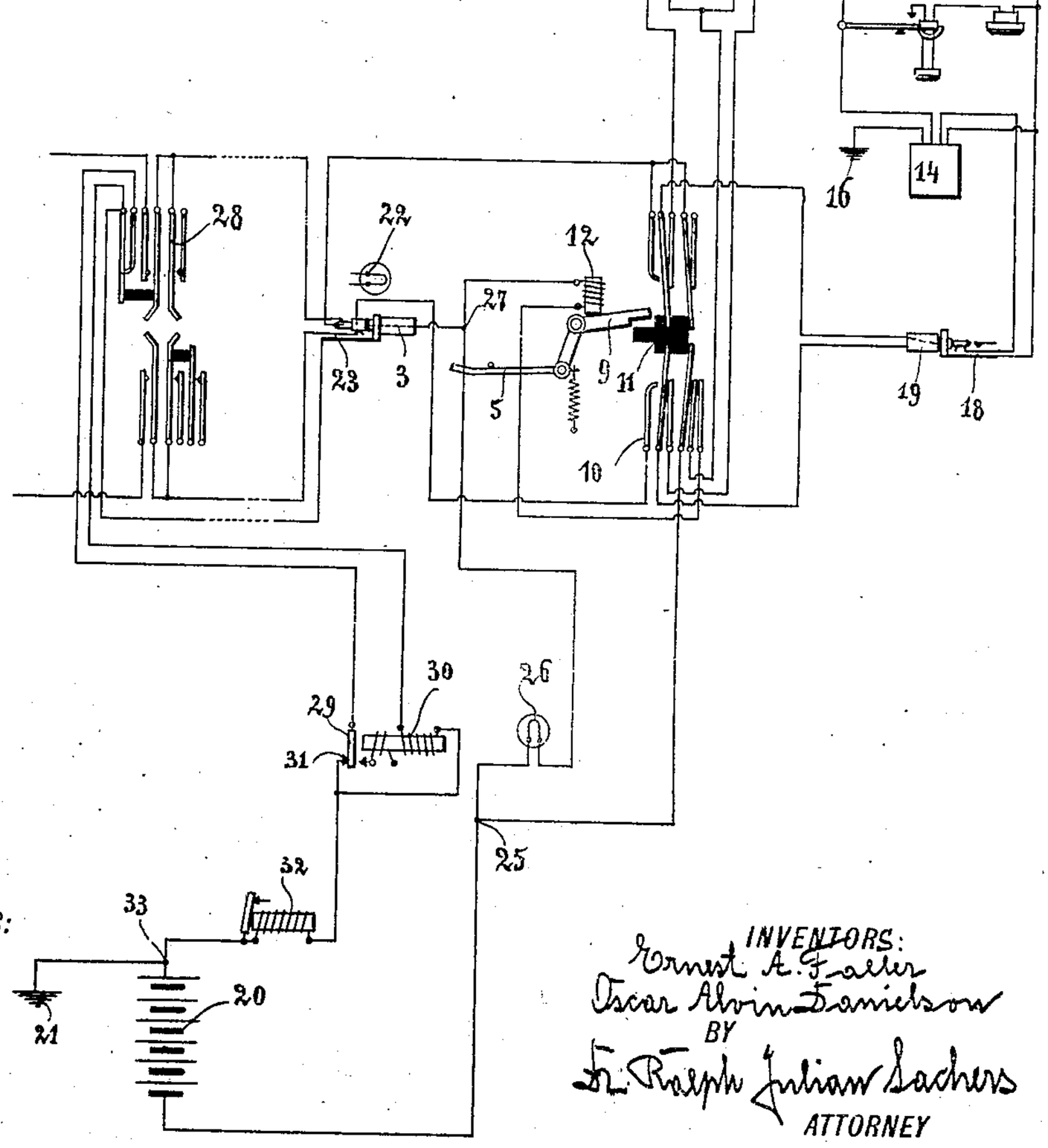


Fig. 6.



WITNESSES:

K. O. Christolm

Max Sidon

INVENTORS:

Ernest A. Faller

Oscar Alvin Danielson

BY

E. Ralph Julian Sachers

ATTORNEY

UNITED STATES PATENT OFFICE.

ERNEST A. FALLER AND OSCAR ALVIN DANIELSON, OF NEW YORK, N. Y.

AUTOMATIC TELEPHONE-KEY.

No. 824,291. Specification of Letters Patent. Patented June 26, 1906.

Application filed October 6, 1904. Serial No. 227,437.

To all whom it may concern:

Be it known that we, ERNEST A. FALLER, a citizen of the German Empire, and OSCAR ALVIN DANIELSON, a citizen of the United States, residing in the borough of Manhattan, in the city of New York, in the county of New York and State of New York, have jointly invented certain new and useful Improvements in Automatic Telephone-Keys, of which the following is a specification.

The present invention relates to telephone apparatus, and more particularly to certain circuit-closing devices or keys used in telephone systems now known in the art as "semi-automatic," such as described in the United States Letters Patent to Ernest A. Faller, Nos. 757,030 and 757,031, dated April 12, 1904.

Heretofore in telephone systems of the character stated a variable electrical signal sent by a calling subscriber to the telephone-exchange and at this exchange identifying the called subscriber was received by the operator by operating one of the keys on the shelf of the switchboard after she had plugged the answering-jack indicated by the burning line-lamp of the calling-subscriber. This operation of the key resulted in closing a path to the signal-selectors at the exchange-section, which selectors after having received the group signal identifying the exchange-section with which the called subscriber is connected caused the lighting of a trunk-indicating lamp, as fully described in the aforementioned patents.

The present invention has for its object to eliminate the key necessary for opening a path for the admission of the selective impulses and to substitute therefor an automatic key arranged at the plug-socket of the connecting-plug, which key is operated when the connecting-plug is removed or lifted from its socket and establishes the circuits over which group signals are received at the exchange-section.

In order to restore the contact-springs of the automatic key before the plug is returned to its socket, an electromagnet is provided, which in attracting its armature releases the contact-springs held by this armature and again opens the path over which the signals had been received.

The accompanying drawings illustrate the new automatic key.

Figure 1 is a side view of the key in its normal position. Fig. 2 is a similar view of the key when the plug is removed from its socket. Fig. 3 is a similar view of the key when the plug is still removed from its socket, but the electromagnet has already operated; and Figs. 4, 5, and 6 are diagrammatic views of the electric circuits corresponding to the different positions of the key illustrated in Figs. 1 to 3.

The automatic key consists of a bell-crank lever 5, pivotally connected at 6 to the bracket 7. To the shorter vertical arm 8 of this lever is connected a detent 9, adapted to engage an insulating-piece 11, secured to one of a number of contact-springs 10. The detent 9 is capable of being attracted by the electromagnet 12.

The key is arranged on the shelf 1 of the switchboard, which shelf is provided with the socket 2 for the connecting-plug 3, whose cord 4 passes through an opening in the end of the bell-crank lever 5 and holds the same down by its weight. A coiled spring 13 causes the lever 5 to rise when the weight of the connecting-plug 3 is taken off the end of the lever.

The operation of the automatic key in receiving a call and establishing a connection in a telephone-exchange is as follows: The calling subscriber in setting the signal-sender 14 of his telephone set 15 to the call-number of the called subscriber has placed ground 16 on his line, which results in energizing his line-relay at the exchange-section with which he is connected and in the lighting of his line-lamp. This lighted line-lamp notifies the operator at the exchange-section that a subscriber desires connection with another subscriber, and she thereupon plugs the answering-jack 18 with the answering-plug 19, whereby the line-lamp 17 is extinguished, as well known in the art, and the line of the calling subscriber is extended to the automatic key forming the particular subject-matter of the present invention. For the purpose of admitting the group signal of the call-number of the called subscriber to the "1000" and "100" selectors of the exchange-section with which the calling subscriber is connected, the operator lifts the trunk-plug 3 from its socket 2 on the shelf 1 of the switchboard, whereby the lever 5, upon which the plug 3 was resting and was pressed down by its weight, is allowed to rise under the tension of the spring 13. This causes the detent 9 to push

the insulating-piece 11, secured to the second contact-spring of the key 10, to the right, whereby the second spring from the left-hand side of the key 10, by means of the insulating-piece 11, presses against the fourth spring of the key, thereby breaking contact between the first and second spring and making contact between the second and third spring and, further, between the fourth, fifth, and sixth springs. By this operation of the key electrical circuits for the selective impulses are established as follows: from the ground 16 at the subscriber's station to the signal-sender 14, over the subscriber's line to the exchange-section with which he is connected, the middle spring of the answering-jack 18, the tip of the answering-plug 19, the second spring of the upper group of contact-springs of the key 10, the third spring of the same, the "1000" selector of the exchange-section with which the calling subscriber is connected, the fifth spring of the lower groups of springs of the automatic key 10, the fourth spring of the same now in contact therewith to battery 20, and the ground 21. The second circuit which is established simultaneously with the first circuit is as follows: from ground 16 at the subscriber's station to the signal-sender 14 over the second leg of the subscriber's line to the exchange-section with which he is connected, the sleeve of the answering-jack 18, the sleeve of the answering-plug 19, the second spring of the lower group of contact-springs of the automatic key 10, the third spring now in contact therewith, the "100" selector of the exchange-section with which the calling subscriber is connected, the fifth spring of the lower group of contact-springs of the automatic key 10, the fourth contact-spring now in contact therewith, to the battery 20, and the ground 21.

The effect of the operation of the selectors, as now well known in the art of semi-automatic telephony, is the lighting of a trunk-indicating lamp 22, indicating the exchange-section with which the called subscriber is connected. The operator of the exchange-section with which the calling subscriber is connected, seeing the trunk-indicating lamp lighted, selects one of the idle trunks terminating at the exchange-section with which the called subscriber is connected and plugs the trunk-jack 23 with the trunk-plug 3. By doing so a circuit is established as follows: from the lower end of the battery 20 to the wire joint 25, the disconnect-lamp 26, the wire joint 27, the sleeve of the trunk-plug 3, the test-sleeve of the trunk-jack 23, the first contact-spring on the left-hand side of the upper group of contact-springs of the selector-key 28, the second spring of this group normally in contact therewith, the armature 29 of the compound relay 30, the front contact 31 of this relay and normally in contact with the armature 29, the winding of the trunk-relay 32, the wire joint 33, to the upper end of the battery 20. A branch circuit of this circuit is joined thereto at the wire joint 27 and contains the release-magnet 12 of the automatic key, the last or sixth spring of the lower group of contact-springs 10 of the automatic key, the fifth and fourth springs, all still in contact with the sixth spring, to the wire joint 25 of the first-mentioned circuit.

The effect of current passing over the circuits just described is to light the disconnect-lamp 26 and to energize the magnet 12. The energization of the magnet 12 results in the attraction of the detent 9, which in becoming removed from the insulating-piece 11 of the contact-springs 10 allows all the contact-springs to return to their normal position, whereby the circuits for sending the number-signal of the called subscriber to the selectors of the exchange-section with which the same is connected are broken. After the conversation between the two connected subscribers is finished and the established connections taken down the trunk-plug 3 is restored to its socket 2 on the shelf 1 and the detent 9 is brought again in its normal position on the insulating-piece 11 of the contact-springs.

What we claim is—

1. The combination with a telephone-connecting plug, of a plug-socket switch adapted to operate on removing the plug from its socket, and an electromagnet for releasing the switch when operated.

2. In an automatic switch, the combination with a spring-controlled switch-lever, of a detent pivoted thereto, a plurality of contact-springs adapted to be operated by said detent, and an electromagnet to disengage said detent from said contact-springs.

3. An apparatus for telephone-switch-boards, comprising a connecting-plug, a seat wherein the plug is adapted to rest when not in use, a switch-contact, means coöperating with said seat and operative upon the removal of said plug from said seat to vary the electrical condition of said contact but non-operative by the return of the plug to its seat to alter the electrical condition of said contact.

4. An apparatus for telephone-switch-boards, comprising a connecting-plug, a seat wherein the plug is adapted to rest when not in use, a switch-contact, means coöperating with said seat and operative upon the removal of said plug from said seat to vary the electrical condition of said contact, and electromagnetic means to release said contact-operating means.

5. An apparatus for telephone-switch-boards, comprising a connecting-plug, a seat wherein the plug is adapted to rest when not in use, switch-contacts, means coöperating with said seat and operative upon the removal of said plug from said seat to vary the

electrical condition of said contacts but non-operative by the return of the plug to its seat to alter the electrical condition of said contact, and electromagnetic means to release said contact-operating means.

6. A plurality of switch-contacts, spring-operated means not forming a part of said contacts to shift certain of said contacts, electromagnetic means to release said spring-operated means, and gravity-operated means to restore the spring-operated means to its normal position.

7. A plurality of switch spring-contacts, spring-operated means not forming a part of said contacts to shift certain of said contacts, electromagnetic means to release said spring-operated means, and gravity-operated means to restore the spring-operated means to its normal position.

8. A pivoted lever, yielding means exerting a force tending to rotate said lever on its pivot, a detent pivoted to said lever, a switch-contact arranged for movement by said detent when said lever is moved in one direction only, an electromagnet to release said detent, and means to restore said detent to its initial position.

9. A pivoted bell-crank lever, yielding means exerting a force tending to rotate said lever on its pivot, a detent pivoted to one of the arms of said lever, a switch-contact arranged for operation by said detent when the arms of said lever are moved in one direction only, and an electromagnet to release said detent.

10. A pivoted bell-crank lever, yielding means exerting a force tending to rotate said lever on its pivot, a detent pivoted to one of the arms of said lever, a switch-contact arranged for operation by said detent when the arms of said lever are moved in one direction only, an electromagnet to release said detent, and means operating by gravity to return said detent to its initial position without altering the electrical condition of said contact.

11. An apparatus for telephone-switchboards, comprising a connecting-plug, a bell-crank lever one arm of which forms a seat wherein said plug is adapted to rest when not in use, a detent pivoted to the other lever-arm, a yielding device exerting a force normally tending to raise the seat-arm and operative to move in one direction both lever-arms upon the removal of said plug from its seat, a plurality of switch-contacts adapted to be operated automatically by said detent when said plug is removed from said seat and non-operative by said detent when said plug is returned to said seat, and an electromagnet to release said detent.

12. An apparatus for telephone-switchboards, comprising a connecting-plug, a bell-crank lever one arm of which forms a seat wherein said plug is adapted to rest when not in use, a detent pivoted to the other lever-arm, a spring exerting a force tending normally to raise the seat-arm and operative to move in one direction both lever-arms upon the removal of said plug from said seat, a plurality of switch spring-contacts, a body carried thereby and adapted to be engaged by said detent to move said contacts in one direction when said plug is removed from said seat and non-operative to move said contacts by the return of said plug to its seat, and an electromagnet to release said detent.

In witness whereof we have hereunto set our hands, in the presence of two subscribing witnesses, at New York, in the county of New York and State of New York, this 4th day of October, 1904.

ERNEST A. FALLER.
OSCAR ALVIN DANIELSON.

In presence of—
RALPH JULIAN SACHERS,
MAX SIDON.