

No. 819,073.

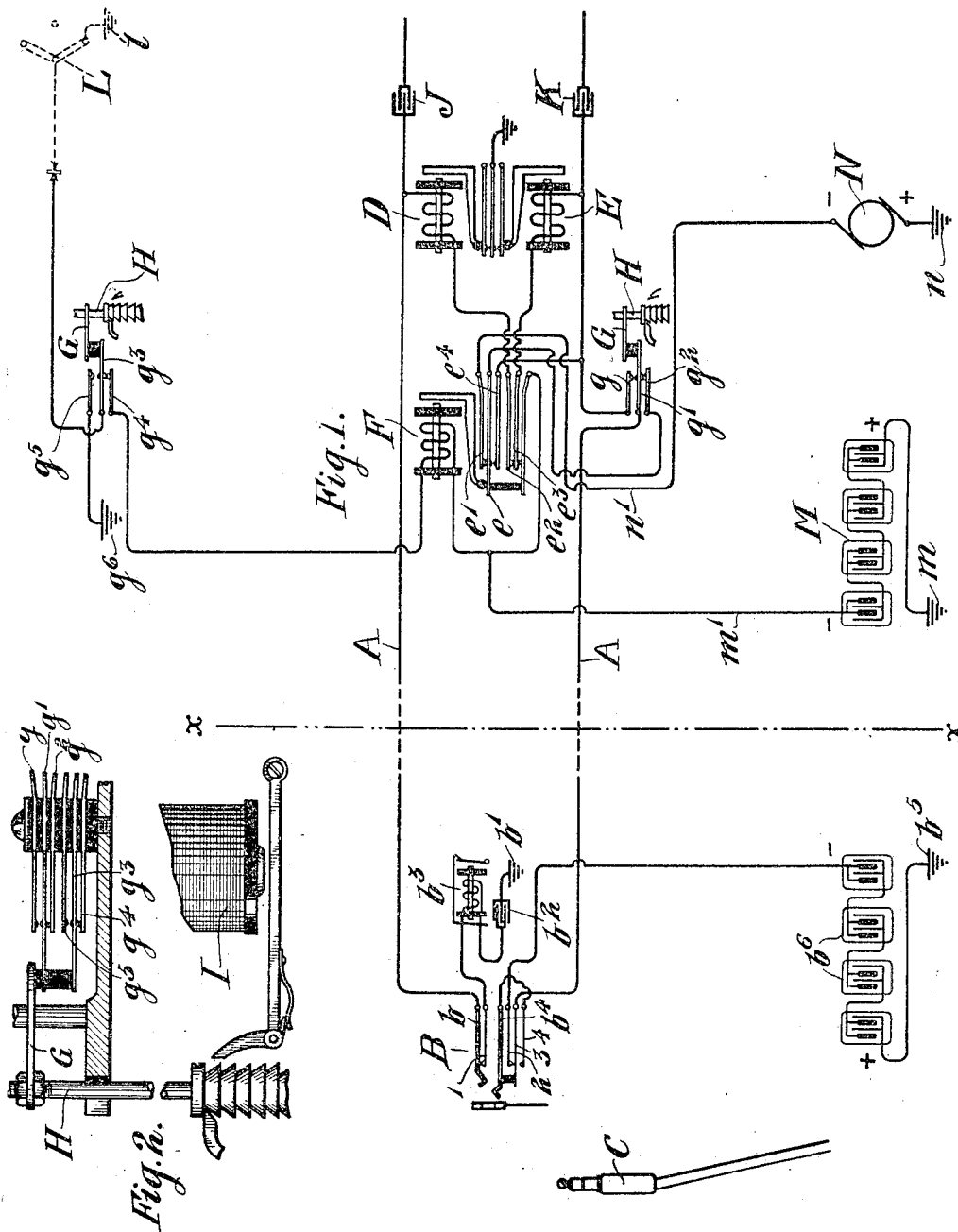
PATENTED MAY 1, 1906.

T. G. MARTIN.

MEANS FOR CHARGING STORAGE BATTERIES OF TELEPHONE SYSTEMS.

APPLICATION FILED DEC. 12, 1904.

4 SHEETS—SHEET 1.



Witnesses.

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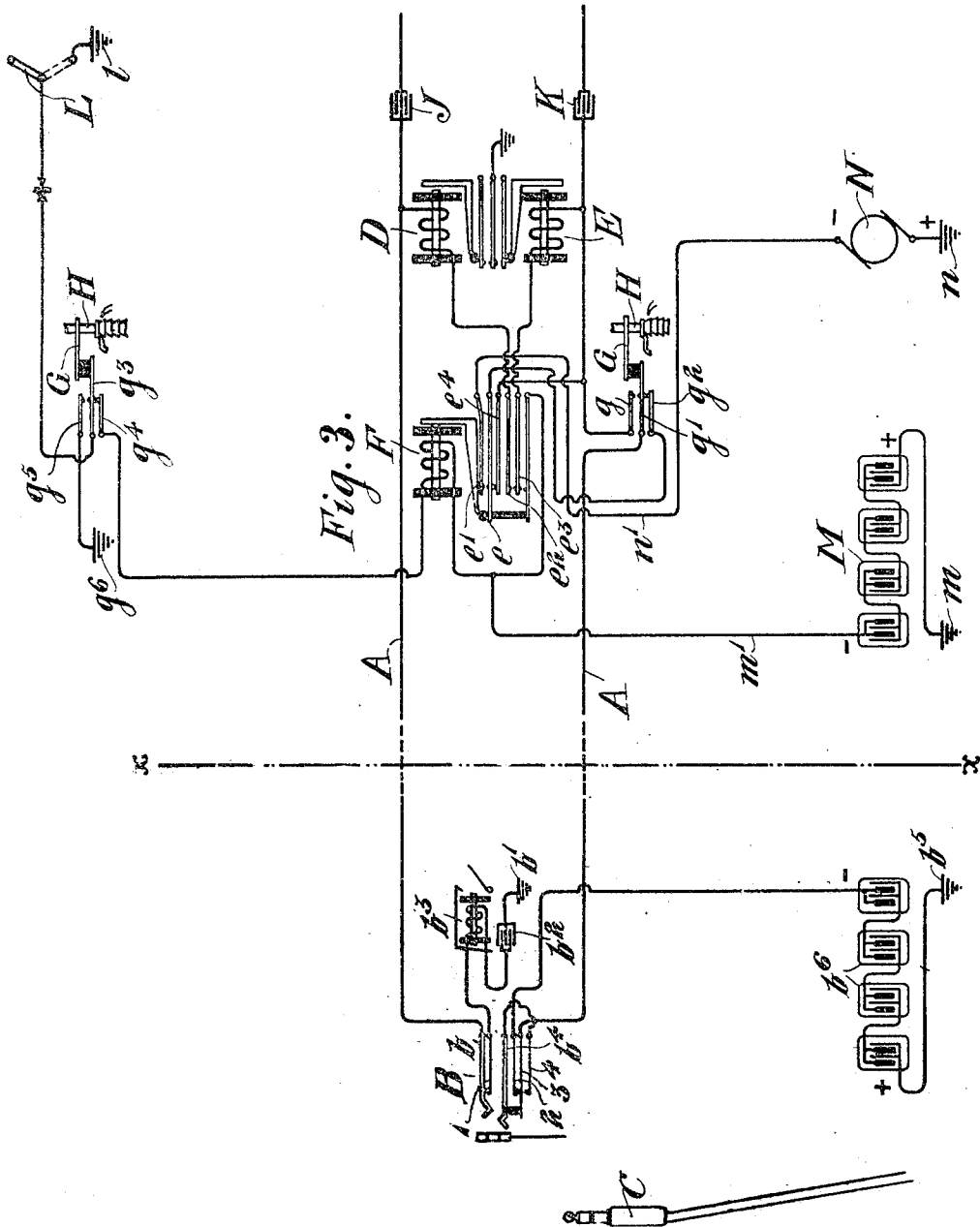
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Witnesses.

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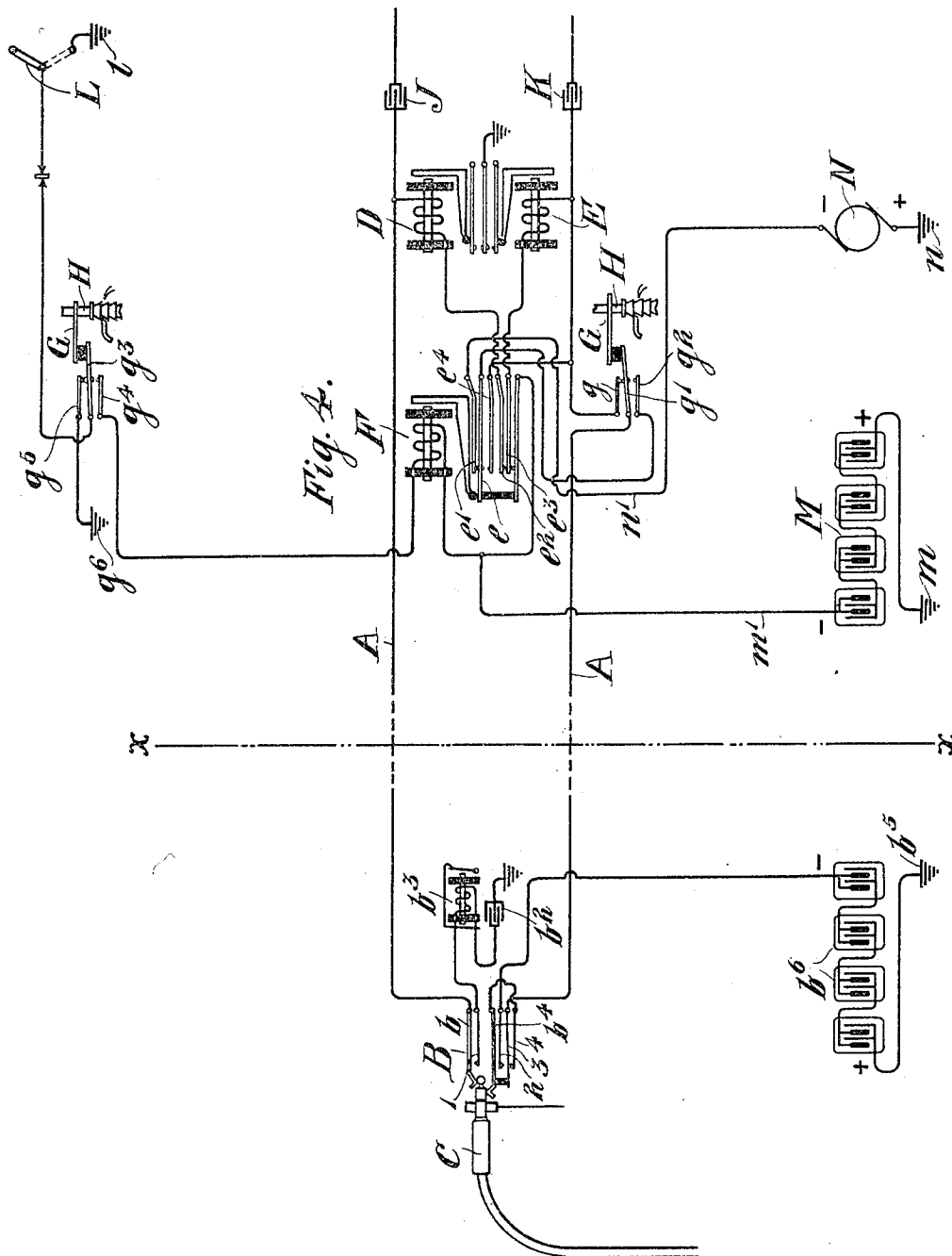
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4 SHEETS—SHEET 3.



Witnesses.

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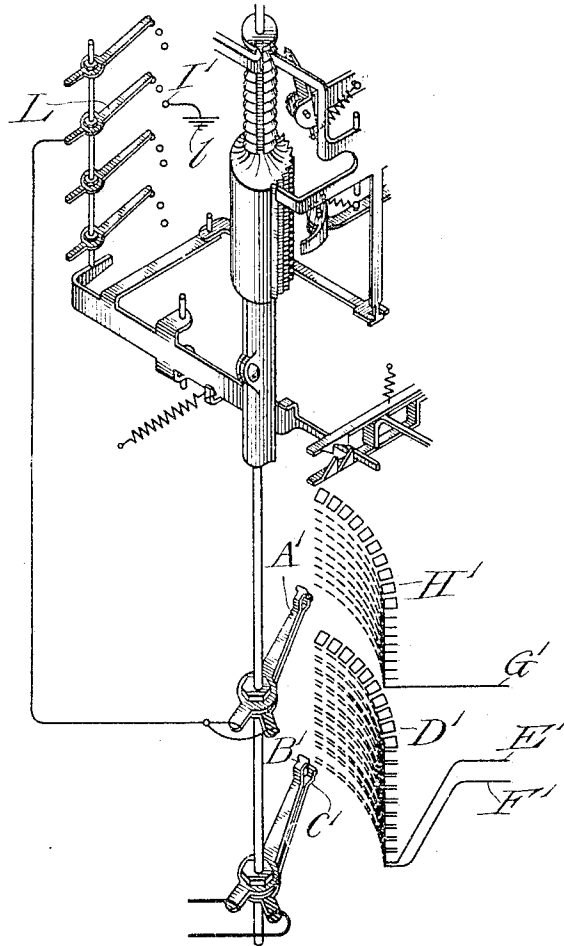
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4 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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MEANS FOR CHARGING STORAGE BATTERIES OF TELEPHONE SYSTEMS.

No. 819,073.

Specification of Letters Patent.

Patented May 1, 1906.

Application filed December 12, 1904. Serial No. 236,640.

To all whom it may concern:

Be it known that I, TALBOT G. MARTIN, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented a certain new and useful improvement in Means for Charging Storage Batteries of Telephone Systems, of which the following is a specification.

My invention relates to the charging of a storage battery employed at a manual telephone-exchange having suitable trunk-line connection with an automatic telephone-exchange. The said battery, as will be readily understood, may be employed at the manual exchange for furnishing current to the subscribers' lines for either signaling or talking purposes, or for both; and my invention contemplates an improved arrangement for charging the said storage battery, and thereby maintaining it in condition to at all times properly supply the subscribers' lines or other circuits with current for the desired purpose; but, as will hereinafter more fully appear, my invention also contemplates, broadly, the automatic connecting and disconnecting of the generator or other source of current from which the said storage battery is charged through the medium of some portion of the switching apparatus of an automatic telephone-exchange and in such manner that the charging-circuit is only closed when some portion thereof is not in use for other purposes.

Generally stated, the object of my invention is therefore the provision of an improved, simplified, and highly efficient arrangement for charging the storage battery of a telephone system.

A special object is to provide an improved construction and arrangement whereby a telephone trunk-line may when not in use for talking or other purposes be employed for supplying charging-current to the storage battery.

Another object is to provide a simple and efficient arrangement whereby the charging of a storage battery may be automatically controlled through the medium of some suitable portion of the apparatus of an automatic telephone-exchange.

A further object is to provide a construction and arrangement whereby a so-called "selector-switch" and so-called "connector-switches" of the automatic telephone-ex-

change system may be employed for automatically connecting and disconnecting the generator or other source of current from which the storage battery is charged and whereby some portion of a line-circuit may when not in use for talking or other purposes be automatically included and employed as a portion of the charging-circuit and then automatically eliminated from such charging-circuit as soon as the said line-circuit is required for service between subscribers.

It is also an object, of course, to provide certain details and features of improvement tending to increase the general efficiency and serviceability of a storage-battery-charging arrangement of this particular character.

To the foregoing and other useful ends my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a diagram illustrating a trunk-line connection between a manual exchange and an automatic exchange and showing a storage battery at the manual exchange and a charging-generator at the automatic exchange, together with the circuits and switching devices for controlling the charging-circuit, the apparatus as a whole being shown in its normal or at-rest condition and being of such character as to embody the principles of my invention. Fig. 2 is a fragmentary or detail view of that portion of the selector-switch mechanism which automatically opens the charging-circuit when the operator at the manual exchange establishes connection with the trunk-line and then proceeds to call a subscriber of the automatic exchange. Fig. 3 is a diagrammatic view similar to Fig. 1, but showing the manner in which the charging-circuit is opened and the charging-generator thereby disconnected when the subscriber at the automatic exchange establishes connection with the said trunk-line and then calls the operator at the manual exchange. Fig. 4 is also a diagrammatic view similar to Fig. 1, but showing the manner in which the charging-circuit is opened and the charging-generator thereby disconnected when the operator at the manual exchange makes connection with the trunk-line and calls a subscriber of the automatic exchange. Fig. 5 is a perspective view of certain portions of the well-known connector-switch, showing the side switch and a section of the

switch-shaft with the private wiper A' and line-wipers B' and C' secured thereon.

As thus illustrated, it will be seen that all devices at the left of the line X X in Figs. 1, 3, and 4 are included in the apparatus of the manual exchange at one station, while all the devices shown at the right of said line are included in the apparatus of the automatic exchange at another station, the two stations being connected by a trunk-line A. In the diagrams it will be understood that the telephone instruments of the two exchanges may be of any suitable known or approved character, and it will also be understood that only such portions of the switching devices have been shown as are necessary to a clear and full understanding of my invention. The devices shown and indicated are sufficient to enable those skilled in the art to readily identify the different switches and the character of apparatus in connection with which I have elected to show and describe my invention. In Fig. 1, for example, the trunk-line A terminates at the manual exchange in what is commonly known as a "trunk-jack" B—that is to say, a spring-jack in which the usual operator's cord-plug C is inserted when a subscriber of the manual exchange desires to converse with a subscriber of the automatic exchange. The tip-spring b of the said spring-jack is normally grounded at b' , the ground connection preferably including a condenser b^2 and a drop or other calling signal b^3 . It will also be seen that the lower spring b^4 of the said spring-jack is normally disconnected from the lower side of the trunk-line, so as to permit the lower side of the trunk-line to be normally connected to ground at b^5 , and it will be seen that a storage battery b^6 is preferably included in this second ground connection at the manual exchange. The said battery b^6 is, it will be understood, employed in furnishing current to the circuits and apparatus of the manual exchange for either talking or signaling purposes, or for both. By the provision of the contacts 1, 2, 3, and 4 the insertion in the jack of the plug C serves to disconnect the drop b^3 from one side of the trunk-line and the storage battery b^6 from the other side of the trunk-line and to connect the jack-spring b^4 with the lower side of said line. In this way the said drop and battery are normally connected with the trunk-line, but are cut off or disconnected therefrom as soon as the manual-board operator establishes connection between her cord-circuit and the said trunk-line. As stated, the said trunk-line connects the manual telephone-exchange with the automatic telephone-exchange, and at the said automatic exchange the so-called "selector-switch" which is individual to the trunk-line A and which is employed by the manual-board operator at the other end of the line for automatically establishing connec-

tion either directly or indirectly with the line of any subscriber of the automatic exchange is represented by the so-called "vertical" relay D and the "rotary" relay E and by the so-called "bridge" cut-off relay F. Another familiar feature of a selector-switch of this character consists of the normal post-arm G (shown at two places in each diagram) and which, it will be remembered, is usually secured to the upper end portion of the rotary and endwise or vertically movable switch-shaft H. This normal post-arm is shown in Fig. 2, and in this figure the vertical magnet I is also indicated—that is to say, the magnet for producing the vertical step-by-step movement of the switch-shaft H. If desired, condensers J and K can be interposed in opposite sides of the line-circuit. The "private" wiper of the side switch of the so-called "connector-switch" by which a subscriber of the automatic exchange establishes connection with the trunk-line leading to the manual exchange is indicated at L. Current for operating the relays D, E, and F is obtained from the battery M.

With the arrangement shown it is preferable to charge the storage battery b^6 from the generator N; the latter being located at the automatic exchange. Inasmuch as this is accomplished by including one side of the trunk-line in the charging-circuit, it is desirable, of course, that the charging of the battery b^6 be accomplished without interfering in any way with the use of the trunk-line for connecting subscribers of the two different exchanges. For this reason the arrangement is preferably such that the said generator N or other suitable source of current is automatically disconnected from the trunk-line as soon as the operator at the manual exchange after inserting the plug C in the jack D has operated the selector-switch at the automatic exchange. This, it will be seen, may be accomplished by providing the three switch-springs g , g' , and g^2 and arranging them in such position that springs g' and g^2 are separated and springs g' and g brought together, as soon as the shaft H is stepped up sufficiently to remove the pressure of the normal post-arm G upon the end of the spring g' . Normally current from the generator N passes from ground n to ground b^5 , thence through the battery b^6 to the contact-point 2, thence through the spring-contact 3, through the lower side of the trunk-line to the spring-contact g' , thence through contact g^2 , through the normally closed contacts e and e' , through the conductor n' , to the other pole of the said generator. Obviously, therefore, the charging-circuit thus maintained during the time that the trunk-line is not in use is opened as soon as the operator at the manual exchange operates the selector-switch for the purpose of establishing connection directly or indirectly with a sub-

scriber of the automatic exchange. It will be seen, however, that it is fully as important to disconnect the generator from the line-circuit when a subscriber of the automatic exchange finds it necessary to make connection with the trunk-line in order to converse with some subscriber of the manual exchange. Consequently the arrangement is preferably such that the so-called "connector-switch" or automatic switch by which the subscriber of the automatic exchange establishes connection with the trunk-line will not only close a circuit including the bridge cut-off relay F, so as to cut off or restore the continuity of the bridge in which the relays D and E are included, but will also effect a disconnection of the generator N from the line-circuit. The said connector-switch comprises, as usual, a set of side-switch wipers, among which is found the so-called "private" side-switch wiper L, that is connected directly with the private wiper A'. It is well known that the line-wipers B' and C' are adapted to engage the line-terminals of lines that terminate in the line-bank D'. Assuming that the line A terminates through the conductors E' and F', as indicated, in the tenth terminal of the first level of the line-bank D', then the private normal conductor G', that connects the bridge cut-off relay F with the "connector private bank" H', terminates correspondingly in the tenth contact of the first level of the said private bank. It is well known that when the "connector" establishes connection with a line the side-switch wipers are in third position. Therefore when an automatic subscriber calls the line A while the line-wipers B' and C' are connected with the normal conductors E' and F' that lead to the said line the private wiper A' is connected with the corresponding private normal G'. Then, since the private side-switch wiper L is in third or calling position at the time, it is connected to ground *l* through the contact-point I'. Also since said side-switch wiper is connected with the private wiper A' the private normal G' is grounded, while the line-wipers B' and C' are in connection with the line A. Therefore when the said connector-switch causes its private wiper L of the side switch to establish connection between the ground *l* and the spring-contact *g*³ it is evident that a local circuit is completed. The connection between the private normal relay F and side-switch wiper L is shown diagrammatically in Figs. 1, 3, and 4, so that the said local circuit is plainly shown between ground *l* and *m* and includes the conductor *m'*, the coil of the bridge cut-off relay F, the contacts *g*³ and *g*¹, and the said private wiper L of the side switch included in the mechanism of the connector-switch which the subscriber employs in establishing connection with the trunk-line A. The closing of this circuit causes the

magnet of relay F to attract its armature, and in so doing the said bridge cut-off relay not only separates the contacts *e* and *e'*, so as to open the bridge in which the relays D and E are included, but also separates the contacts *e* and *e'* and closes the normally separated contacts *r* and *r'*. The separation of the contacts *e* and *e'* opens the previously-described charging-circuit through which current from the generator N is supplied to the storage battery B', and thus relieves the trunk-line of charging-current while the latter is in use for other purposes. By bringing the contacts *r* and *r'* together in the manner explained it will be seen that the continuity of the lower side of the line-circuit is preserved, the line-circuit then including the contacts *r*, *e'* and *g*² *g*¹ in series. Thus when a subscriber of the manual exchange desires to call a subscriber of the automatic exchange the charging-circuit is automatically opened by the switch-shaft of the selector-switch allotted to the trunk-line at the automatic exchange. On the other hand, however, when a subscriber at the automatic exchange desires to call a subscriber at the manual exchange then the charging-circuit is automatically opened by the energizing of the bridge cut-off relay. It will also be seen that when the call originates at the manual exchange and is extended to the automatic exchange the continuity of the lower side of the trunk-line circuit is preserved by the closing of the normally open contacts *g* and *g*¹.

The contact *g*² is preferably grounded at *g*¹. The normally open contacts *g*³ and *g*⁵ are closed by the upward movement of the switch-shaft H, while the contacts *g*² and *g*⁴ are open by the same movement. In this way the said switch-shaft of the so-called "selector-switch" allotted to the trunk-line serves when stepped up to open the circuit of the bridge cut-off relay F and also to open the normally closed circuit for charging the battery B'.

It will be seen that while the spring-contacts *g* to *g*⁵, inclusive, are all operated by the so-called "normal post-arm" G only the spring-contacts *g*, *g*¹, and *g*² constitute a novel feature of this part of the apparatus. This is also true of the spring-contacts *r*, *r'*, and *e*, inasmuch as the normally closed spring-contacts *e*² and *e*³ have been used prior to my present invention.

Thus it will be seen that the so-called "selector-switch" allotted to the trunk-line and which is used only by the manual-board operator at the manual exchange is adapted to automatically open the charging-circuit when the trunk-line is to be used for talking purposes regardless of whether the call comes from one exchange or the other.

The connector herein referred to and in connection with which I have elected to illustrate my invention may be of the general

type disclosed in Patent No. 815,176, issued March 13, 1906.

What I claim as my invention is—

1. A telephone system comprising a manual exchange, an automatic exchange, a trunk-line extending between the two exchanges; a storage battery at the manual exchange, a source of current at the automatic exchange for charging the said storage battery, together with a charging-circuit including one side of the said trunk-line.
2. A telephone system comprising a storage battery, a source of current for charging said battery, and a "selector-switch" provided with means for opening the charging-circuit when the switch is operated.
3. A telephone system comprising a storage battery, a source of current for charging said battery, a normally closed charging-circuit including the said battery and source of current, and a "selector-switch" provided with a bridge cut-off relay adapted when energized to open the said charging-circuit.
4. A telephone system comprising a storage battery, a source of current for charging said battery, a normally closed circuit including said battery and source of current, and a "selector-switch" provided with a normal post-arm adapted when actuated to open the said charging-circuit.
5. A telephone system comprising a trunk-line, a storage battery, a source of current for charging said battery, a normally closed charging-circuit including said battery and source of current, and including also one side of said trunk-line, and an automatic step-by-step switch provided with means for opening said charging-circuit when the trunk-line is to be used for talking or signaling purposes.
6. A telephone system comprising a trunk-line, a storage battery normally connected between ground and one side of said line, a source of charging-current normally connected between ground and the same side of the trunk-line, a "selector-switch" allotted to the said trunk-line and normally connected therewith, and a "connector-switch private wiper," said "selector-switch" having a bridge cut-off relay provided with a normally open circuit adapted to be closed by

the said "connector-switch private wiper" when the latter is actuated in the establishment of connection with the trunk-line, and a normally closed charging-circuit including said battery and source of current, and including also one side of the trunk-line, said charging-circuit having normally closed switch-contacts adapted to be opened by the energizing of said bridge cut-off relay.

7. A telephone system comprising a line, a storage battery normally connected with one end of said line, a source of charging-current normally connected with the other end of said line, whereby the battery is supplied with charging-current whenever the line is not in use for other purposes, and an electromagnetic switch associated with the end of the line connected with the source of charging-current, and adapted to be controlled from the other end of the line, said switch being provided with normally closed switch-contacts adapted to disconnect the source of charging-current when the switch is operated from the other end of the line.

8. A telephone system comprising a talking-conductor, a storage battery, a source of charging-current, a normally closed charging-circuit including said battery and source of current, and also including said talking-conductor, and an electromagnetic switching device adapted when operated to disconnect the said source of current from the talking-conductor.

9. In a telephone system, the combination of a line-wire, a storage battery normally connected with one end of said line-wire, a source of charging-current normally connected with the other end of said line-wire, a plug-switch for disconnecting the said battery when it is desired to use the line for other purposes, and an electromagnetic switching device for disconnecting said source of current when it is desired to use the line for other purposes.

Signed by me at Chicago, Cook county, Illinois, this 5th day of December, 1904.

TALBOT G. MARTIN

Witnesses:

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R. C. GIFFORD.