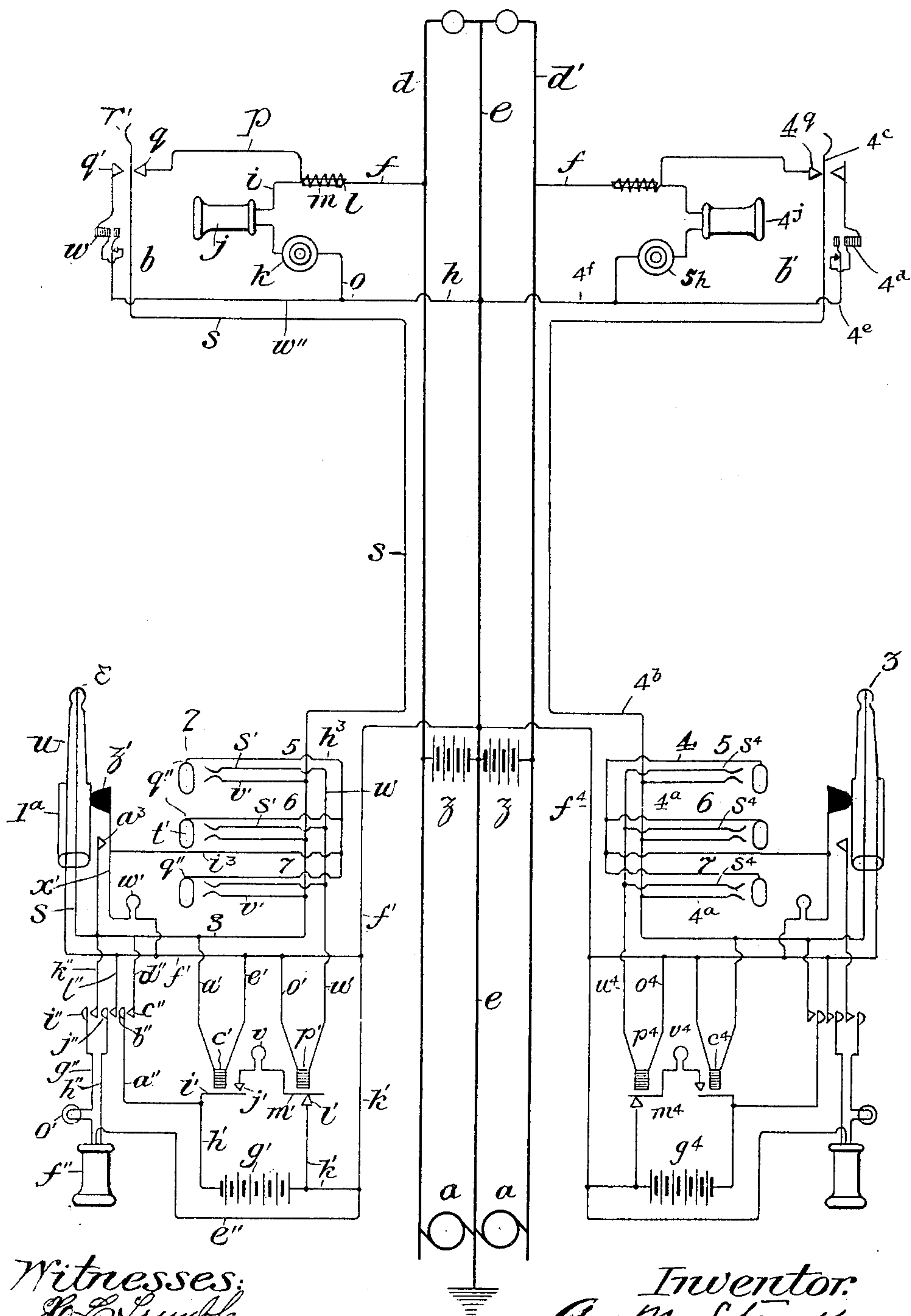


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A. M. STARK.
COMMUNICATING ELECTRIC SYSTEM.

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COMMUNICATING ELECTRIC SYSTEM.

No. 819,095.

Specification of Letters Patent.

Patented May 1, 1906.

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To all whom it may concern:

Be it known that I, ALEXANDER McMARTIN STARK, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented a Communicating Electric System; and I hereby declare that the following is a full, clear, and exact description of the same.

In carrying out this invention I use a power-current transmitted over a main power-circuit and distributed at each substation to the substation main circuit to continuously furnish it with current for the instruments, and I maintain this power-current at constant tension by a storage battery bridged across the main power-circuit between the generator and substations.

For a full understanding of the invention reference is to be had to the following description and to the accompanying drawing, which represents a diagrammatic view of a complete system of distribution.

Like characters of reference refer to like parts throughout the specification and drawing.

a represents the generator-station, and b and b' two substations connected with the generator-station a by a three-wire circuit consisting of two main conductor-wires d and d' and a main return-wire e . Tapping the main conductor-wire d and leading to the substation b is the substation conductor-wire f in circuit with the substation return-wire h , leading to the main return-wire e . Tapping the substation conductor-wire f is the telephone conductor-wire i , in circuit through the telephone-receiver j , transmitter k , and telephone return-wire o with the substation return-wire h , and interposed in the circuit between the tap l and receiver j is an inductive resistance m . The telephone-hook r' is connected to the line-wire s , leading to the tip t of the plug u . The substation signaling device w , having a contact-point q' , is tapped on the substation return-wire h by the wire w'' , and when the receiver is on the hook r' the hook engages the contact-point q' and a circuit for the current is established over the line-wire s from the central station, through the hook r' , contact-point q' , substation signaling device w , and wire w'' , to the substation return-wire h and main return-wire e .

In shunt to the telephone-wire i is a contact-point q to be engaged by the telephone-hook r' , and when the receiver has been removed from the telephone-hook r' the telephone-hook engages the contact-point q , and the current then flows, by means of the main conductor-wire d , substation conductor-wire f , resistance m , telephone-wire p , contact-point q , telephone-hook r' , and line-wire s , to the tip t of the plug u , this current being also in the receiver j and transmitter k by means of the telephone-wires i and o and substation return-wire h and main return-wire e , so that telephone-messages may be received and transmitted over the substation-circuit when the telephone-hook is in this position. A similar system of circuits is installed in the substation b' .

Bridged on the main power-circuit is a storage battery z to aid in maintaining constant pressure of the current as it circuits from the generator to the substations and to remove the effects of the imperfect commutation of the generator and destroy the individual vibrations of the current by a neutralization of the same. Connected with the jacket of the plug u and with the main return-wire e is the line return-wire f' to complete the circuit through the substation and central station from the conductor d to the main return-wire e . In the central station is a signal-relay c' , connected with the line-wire s by the signal conductor-wire a' and with the line return-wire f' by the signal return-wire e' . When the substation desires to call the central station, the receiver is removed from the hook r' , which then engages the contact-point q and completes the circuit for the current from the tap l , through the resistance m , contact-point q , telephone-hook r' , line-wire s , to the tip t of the plug u and through the relay c' , which it energizes, by means of the relay conductor-wire a' and return-wire e' .

In the central station is a battery g' , the circuit of which is normally open and the conductor-wire h' of which is connected to an armature i' , adapted to be attracted by the relay c' when such relay is energized by the circuit of the current over the line-wire s and line return-wire f' , as previously described. Opposed to the armature i' is the contact-

point j' of the signal v , having an armature m' normally engaging the contact-point l' of the battery return-wire k' , connected with the line return-wire f' and main return-wire e . When the current circuits from the line-wire s and relay conductor-wire a' through the relay c' to the relay return-wire e' , line return-wire f' , and main return-wire e , the armature i' is attracted to the contact-point j' of the signal v , and the armature m' of the signal v being normally in engagement with the contact-point l' of the battery return-wire k' the battery-current is short-circuited through the signal v actuating it to notify the operator at the central station that the substation is calling. Tapped on the line return-wire f' is the return-wire o' of the second relay p' , opposed to the armature m' and connected with the springs s' of the jacks t' by the conductor-wire u' , so that when the tip of the plug for the substation b' is inserted in any one of the jacks t' for the substation b it will engage the spring s' and enable the current to establish a circuit from the jacket of such plug over the spring s' , conductor u' , to the relay, which it energizes to attract the armature m' from the contact-point l' and then flows over the relay return-wire o' to the line return-wire f' and main return-wire e to prevent the short-circuiting of the battery-current through the signal-lamp v when the receiver at substation b is removed from the telephone-hook to establish a circuit for the current from the tap l over the line-wire s and line return-wire f' when responding to the call from the substation b' . When the tip t of the plug u for the substation b is inserted in the jack 4 of the substation b' , it engages the line-spring 4^a of that jack in circuit with the line-wire 4^b and establishes a circuit to the signaling device 4^d , which it operates until the receiver is removed from the telephone-hook 4^c , when the circuit through the signaling device is broken and established over the contact-point 4^a and its circuit-wire 4^b to the telephone instruments 4^j and 5^h , telephone-return 4^f , and main return-wire e .

The disconnect-signal w' is in circuit with the line return-wire f' and is fitted with a spring x' , having an insulated tip z' , normally resting against the plug u when the plug is in its seat. When the plug is pulled from its seat and inserted in one of the jacks for the substation b' , the spring x' moves against the contact-point a^3 in circuit with the line-wire s , and the circuit of the current is then established by means of the line-wire s , contact-point a^3 , spring x' , disconnect-signal w' , and the line return-wire f' to the main return-wire e , the current continuing to flow over this circuit while the instruments in the calling-substation b are in use and until the receiver j has been again placed upon the telephone-hook r' to bring it into engagement with the contact-point q' and break the cir-

cuit of the current from the main conductor-wire d to the line-wire s , the breaking of which circuit effaces the signal w' .

In circuit with the conductor-wire h' of the battery g' is a battery conductor-wire a'' , fitted with a contact-point b'' , adapted when actuated to engage the contact-point c'' of the branch wire d'' , tapped on the line-wire s , and in circuit with the return-wire k' of the battery g' is a battery return-wire e'' , connected with the receiver f'' of the operator's instrument. The operator's instrument is furnished with two wires g'' and h'' , respectively, in circuit with the battery return-wire e'' and fitted with contact-points i'' and j'' , respectively. The contact-point i'' is opposed to the contact-point of a branch wire k'' , tapped on the line-wire s , while the contact-point j'' is opposed to the contact-point of the branch wire l'' , tapped on the line return-wire f' . The contact-points i'' , j'' , and b'' are shown in their normal position in the drawing, and are brought into engagement with the contact-points of the wires k'' and l'' and d'' by the ordinary operating-lever used in telephone-exchanges. The current from the generator a is transmitted over the conductor-wires d and d' to the substations b and b' , and at the taps l sufficient current is taken off the substation-circuits to operate the communicating systems.

Assuming that substation b desires to communicate with substation b' , the operator at substation b removes the receiver from the telephone-hook r' , so that the telephone-hook r' will move into engagement with the contact-point q and establish a circuit for the current from the main conductor-wire d over the substation conductor-wire f , resistance m to the contact-point q and telephone-hook r' , from which it flows to the line-wire s , relay conductor-wire a' , relay c' , relay return-wire e' to the line return-wire f' and main return-wire e , energizing the relay to attract the armature i' and close the circuit of the battery g' through the signal-lamp v . The operator at the central station by bringing the contact-points i'' and j'' into engagement with the contact-points of the branch wires k'' and l'' , respectively, forms a circuit from the line-wire s through the operator's instrument at the central station to the line return-wire f' and main return-wire e , which puts the operator's instrument in communication with the instrument at substation b , the current from the main conductor-wire d furnishing the current for the operation for both sets of instruments. The current from the conductor d is by means of the line-wire s in the tip of the plug u and in its jacket by means of the line return-wire f' and main return-wire e , and when the operator inserts the plug u of the substation b into the jack 4 of the substation b' the circuit of the current is then from the generator a to the plug u of the substation b and jack 4

of the substation b' over the line-spring 4^a to the line-wire 4^b , telephone-hook 4^c , signaling device 4^d , signal return-wire 4^e , telephone return-wire 4^f , and main return-wire e . The resistance of the relay c' exceeds the resistance of the instruments and wires for the substation b' , so that when the plug for the substation b is in the jack of the substation b' the current will flow from the plug to that jack and cut out the circuit through the relay c' , so that the armature i' will move away from the contact-point of the signal v and open the circuit from the battery g' to extinguish it. When the plug u of the substation b is inserted in the jack 4 of the substation b' , a portion of that current circuits by means of the spring s^4 , relay-conductor u^4 to the relay p^4 , relay return-wire o^4 to the return line-wire f^4 and main return-wire e , energizing the relay p^4 to attract the armature m^4 , so as to open the circuit of the current from the battery g^4 through the signal v^4 to avoid any possibility of the signal v^4 being lighted by the circuit of the current from the substation b' when the receiver is removed from the telephone-hook at that substation.

When the receiver is removed from the telephone-hook 4^c at substation b' , the circuit through the signaling device 4^d is broken and is established over the contact-point 4^a to the telephone instrument 4^j and then over the telephone return-wire 4^f to the main return-wire e . Substation b is now in communication with substation b' , the generator a continuing to furnish the current for the operation of the instruments.

When the plug u is lifted from its seat to be inserted in the jack 4, the calling-substation spring x' moves against the contact-point a^3 and establishes a circuit from the generator a over the line-wire s through the disconnect-signal w' to the line return-wire f' , the spring x' and contact-point a^3 forming part of the plug-switch. When the generator-circuit from substation b is broken by the receiver being hung on the telephone-hook r' at substation b , the circuit through the disconnect-signal w' is broken. In the case of substation b' desiring to speak to substation b the same *modus operandi* is put into force, the plug 3 being inserted by the operator into the jack 2. The current from the generator a is used for calling the wanted substation when making connections between the calling and called substations; yet when the operator desires to call a substation the contact-point b'' is brought into engagement with the contact-point c'' and the current from the battery g' circuits, by means of the battery-wire a'' , branch wire d'' , line-wire s , hook r' , signaling device w , and wire w'' , to the telephone return-wire o and main return-wire e , operating the signaling device w until the substation responds by removing the receiver from the telephone-hook r' , when the circuit of the

generator-current is established, by means of the hook r' , line-wires s , relay c' , and line return-wire f' to the main return-wire e , energizing the relay c' to attract the armature i' to the contact-point j' , causing the battery to short-circuit through the signal v .

When the circuit is established through the signal v , the operator knows that the substation has responded and brings the contact-points i'' and j'' into engagement with the contact-points of the branch wires k'' and l'' , establishing the circuit between the operators and substation instruments over the line-wire s and line return-wire f'' , respectively. When the contact-points i'' and j'' have been brought into engagement with the contact-points of the branch wires k'' and l'' , the current circuits from the generator a over the line-wire s , the wires k'' g'' , instrument f'' , wires h'' l'' to the line return-wire f'' and main return-wire e . When the instruments are no longer in use, the circuit is broken by the contact-points i'' and j'' being disconnected from the contact-points of the wires k'' and l'' . The operation of the lever which brings the contact-points i'' and j'' into engagement with the contact-points of the branch wires k'' and l'' separates the contact-points b'' and c'' and interrupts the normal circuit from the battery g' to the line-wire s .

As shown in the drawing, there are three sets of jacks for each of the substations b b' , respectively, these jacks being numbered 5, 6, and 7, respectively, and it will be noticed that the line-spring v' of each of the jacks is connected with the line-wire s and that the sockets q'' of the jacks are coupled by means of the wires h^3 .

The spring x' is connected with the wire h^3 by means of the wire i^3 , and when the plug u is removed from its socket the spring x' engages the contact-point a^3 and the current circuits from the line-wire s , by means of the spring x' , wires i^3 and h^3 , to the sockets q'' of the jacks of the substation b on the various switch boards and terminates in the sockets of the jacks, so that the sockets of all the jacks of the instruments in use will be furnished with battery-current.

When the contact-points i'' and j'' of the telephone-operator's instrument are brought into engagement with the branch wires k'' and l'' of a substation-circuit, the circuit of the current is established between the telephone-operator's receiver and the socket of the substation-jack, and by placing the tip of the plug against the socket q'' of the jack the operator can ascertain whether the line is in use or not. If the current above described is in the socket of the jacks, it will produce a metallic click in the telephone-operator's receiver each time the tip of the plug touches the socket of the jack.

The contact-springs s^4 of the jacks of the

substation b' are all in circuit with the conductor-wire u^4 in order that the insertion of the tip t of the plug u in any one of the jacks will establish a circuit to energize the relay p^4 , and so are the contact-springs of the jacks of the substation b in circuit with the conductor-wire a' for the relay p' to allow of the insertion of a plug of the substation b' in any one of the jacks establishing a circuit to energize the relay p' .

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An electric system comprising a main circuit, a substation-circuit in shunt thereto, an auxiliary circuit, a line-signal in the auxiliary circuit, a relay responsive to the substation-circuit adapted when energized to close the auxiliary circuit through the line-signal, a second substation-circuit and a second relay responsive to the second substation-circuit when connected with the first-mentioned substation-circuit and adapted when energized to open the battery-circuit through the line-signal.

2. An electric system comprising an auxiliary circuit, a line-signal in the auxiliary circuit, a substation-circuit, a relay responsive to the substation-circuit adapted when energized to close the central-station auxiliary circuit through the line-signal, a second substation-circuit, and a second relay responsive to the second substation-circuit when connected with the first-mentioned substation-circuit and adapted when energized to open the central-station auxiliary circuit through the line-signal.

3. An electric system comprising a substation-circuit, a line-signal closing circuit in shunt to the substation-circuit, an auxiliary circuit, a line-signal in the auxiliary circuit, the auxiliary circuit being closed through the line-signal by the circuit of the current through the line-signal closing circuit, a second substation-circuit, and a line-signal opening circuit formed by connecting the second substation-circuit with the first-mentioned substation-circuit.

4. An electric system comprising a substation-circuit, a line-signal closing circuit tapped on the substation-circuit, an auxiliary circuit, a line-signal through which the auxiliary circuit is closed by the circuit of the current through the line-signal closing circuit, and a line-signal opening circuit formed by the closing of two substation-circuits.

5. An electric system comprising a substation-circuit, a connecting-plug and a series of jacks in the substation-circuit, and a disconnect-signal in shunt to the substation-circuit comprising a contact-point tapped on one of the conductors of the substation-circuit, a signal device tapped on the other conductor and a contact-spring for the signal device to engage the contact-point and close the cir-

cuit through the signal device when the plug is lifted from its seat and an insulator for the switch to engage the connecting-plug when in its seat and open the circuit through the signal device.

6. An electric system comprising a substation-circuit, a connecting-plug and a series of jacks in the substation-circuit and a disconnect-signal in shunt to the substation-circuit comprising a contact-point tapped on one of the conductors of the substation-circuit, a signal device tapped on the other conductor and a contact-spring for the signal device to engage the contact-point and close the circuit through the signal device when the plug is lifted from its seat, an insulator for the switch to engage the connecting-plug when in its seat and open the circuit through the signal device, and a conductor from the switch to the substation-jacks.

7. An electric system comprising a substation-circuit, a connecting-plug in the substation-circuit, a disconnect-signal tapped on one of the conductors of the substation-circuit, a contact-point tapped on the other conductor of the substation-circuit, a switch for the disconnect-signal displaced from the contact-point by the connecting-plug when in its seat, a spring-jack in the substation-circuit and an electric conductor from the disconnect-signal switch to the line-spring of the jack.

8. An electric system comprising a main circuit having a storage battery therein, a substation-circuit connected with the main circuit, a line-signal closing relay in the substation-circuit, an auxiliary circuit having an armature controlled by the relay, a line-signal through which the auxiliary circuit is closed when the armature has responded to the relay, a second substation-circuit, a line-signal opening relay energized by the second substation-circuit when connected with the first-mentioned substation-circuit, and an armature for the line-signal responsive to the second-mentioned relay to open the battery-circuit through the line-signal.

9. An electric system comprising a main circuit having a storage battery therein, a substation-circuit connected with the main circuit, a line-signal opening relay, a series of jacks in the substation-circuit, the line-springs of which are connected with the line-wire of the substation-circuit and the sockets of which are coupled together and the contact-springs of which are in circuit with the return-wire of the substation-circuit through the line-signal opening relay, a line-signal having an armature adapted to be attracted by the line-signal opening relay as the current flows through it, a line-signal closing relay connected with the substation-circuit, an auxiliary circuit having an armature responsive to the line-signal closing relay to close the auxiliary circuit through the line-signal,

a connecting-plug in the substation-circuit, a disconnect-signal on one of the conductors of the substation - circuit having a conductor-spring displaced by the plug when in its seat, 5 a contact-point opposed to the conductor-spring and connected with the other conductor of the substation-circuit to be engaged by the conductor - spring when the plug is removed from its seat.

10 10. An electric system comprising a main circuit having a storage battery therein, a substation-circuit connected with the main circuit, a line - signal opening relay, a series of jacks in the substation - circuit, the line- 15 springs of which are connected with the line-wire of the substation-circuit and the sockets of which are coupled together and the contact-springs of which are in circuit with the return-wire of the substation-circuit through 20 the line - signal opening relay, a line - signal having an armature adapted to be attracted by the line-signal opening relay as the cur-

rent flows through it, a line-signal closing relay connected with the substation-circuit, an auxiliary circuit having an armature responsive to the line-signal closing relay to close 25 the auxiliary circuit through the line-signal, a connecting-plug in the substation-circuit, a disconnect-signal on one of the conductors of the substation - circuit having a conductor- 30 spring displaced by the plug when in its seat, a contact-point opposed to the conductor-spring and connected with the other conductor of the substation-circuit to be engaged by the conductor-spring when the plug is re- 35 moved from its seat, and a conductor connected to the conductor-spring and the sockets for the jacks.

Toronto, May 23, A. D. 1902.

ALEX. M. STARK.

In presence of—

C. H. RICHES,
L. F. BROCK.