

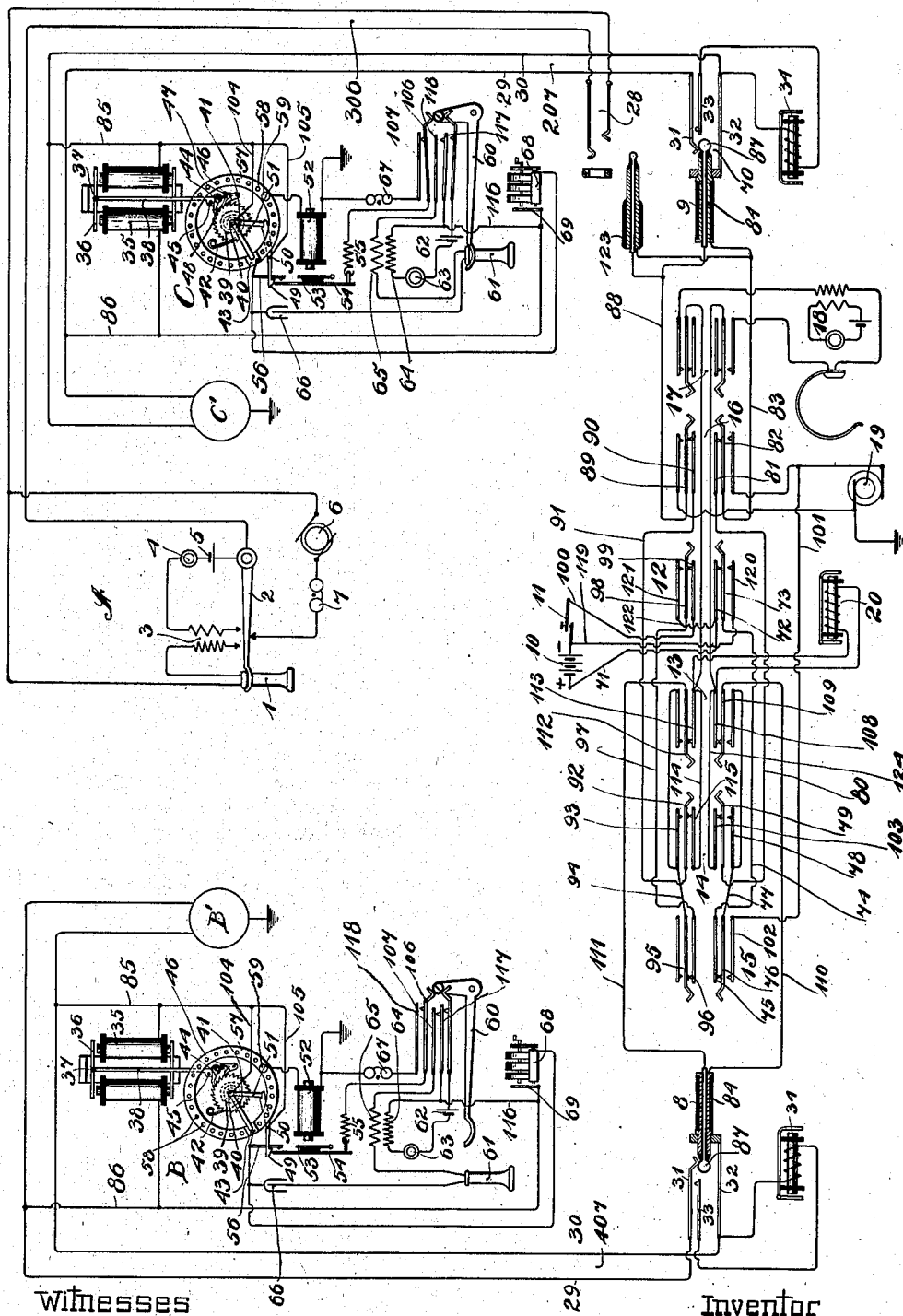
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G. BABCOCK.

SELECTIVE SIGNALING SYSTEM.

APPLICATION FILED JULY 17, 1903.



Witnesses

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SELECTIVE SIGNALING SYSTEM.

No. 893,125.

Specification of Letters Patent.

Patented July 14, 1908.

Application filed July 17, 1903. Serial No: 166,028.

To all whom it may concern:

Be it known that I, GARRISON BABCOCK, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Selective Signaling Systems, 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 selective signaling systems, and has for its object improved central exchange apparatus and connections, whereby the central operator may more readily establish circuit conditions necessary for such systems.

My invention is particularly adaptable to a system as described in my Patent No. 763,351 issued June 28, 1904, in which it is necessary for the central operator to successively send setting-up current, locking current, signaling current and restoring current into the line, to properly adjust or readjust subscribers' substation apparatus whereby to selectively signal and connect subscribers together for conversation and to restore the system to its normal condition after conclusion of the conversation.

The features of my invention are embodied in an improved operator's cord circuit. In the cord circuit employed in the system described in the patent above referred to, the necessary currents could be sent from only one of the cord plugs, and when a subscriber was answered with this plug and desired connection with a party line subscriber, it was necessary for the central operator to withdraw the answering plug and insert it in the springjack connected with the line leading to the desired subscriber's substation. If this was not done, it was necessary for her to employ the calling plug connected to another cord circuit. Also, when subscribers of different party lines were connected together for conversation, it was necessary for the operator, in order to restore both party lines to their normal condition, to restore first the line connected with the calling plug and then to withdraw this plug for connection with the other party line to restore this line. This interchange of plugs and cord circuits caused great waste of time besides being very apt to confuse connections. By my improved cord circuit and apparatus I am enabled, when two party line subscribers are connected to-

gether, to send the necessary currents into the lines from either plug or simultaneously through both plugs of the cord circuit employed, thus saving a great deal of time.

It is sometimes desirable to associate a party line system of one manufacture with a metallic telephone system of another manufacture. Heretofore, where systems of different manufacture have been operated together, circuit and apparatus changes were necessary in the systems to accommodate the circuits of one system to those of another and to adapt the apparatus of one system to receive and fit the apparatus of the other. I employ means whereby such changes may be avoided and I provide a plug which fits the spring-jacks connected with the telephone system with which it is desired to associate the party line system. This plug may be connected in bridge of the calling plug of my improved cord circuit. Thus, when the calling subscriber of a party line desires connection with another party line subscriber, the calling plug adapted for the party line system is employed. Should the calling subscriber, however, call for connection with a subscriber connected with a single subscriber metallic line, for instance, the substitute plug adapted for that line is employed. The same plug is employed as an answering plug when the call is initiated from a metallic single subscriber line. It is to be borne in mind, however, that in many cases the jacks used for both single substation lines and polystation lines are of the same manufacture and adapted to cooperate with interchangeable plugs, in which cases the auxiliary plug 123 is unnecessary and only the plugs 8 and 9 are connected to the cord circuit.

I shall describe my invention more clearly and fully by reference to the accompanying drawing, in which I have shown two party line subscribers B and C connected together through the cord circuit, these subscribers being connected with the central exchange through limbs 29 and 30 of the metallic telephone lines 407 and 207, respectively. I have also shown a metallic line 306 leading from the central exchange to the substation A. This line 306 terminates in a springjack 28, which can only be engaged by a plug of like manufacture. The limbs 29 and 30 of the party line terminate in jack springs 31 and 32, respectively, and a third jack spring

33 is normally in connection with the jack spring 31 to connect the line indicator 34 with the limbs of the line.

The apparatus at substation A includes a receiver 1, normally suspended from a switch hook 2, an induction coil 3, transmitter 4, battery 5, generator 6, and signal bells 7. The cord circuit includes an answering plug 8, a calling plug 9, a battery 10, a make and break switch 11, a restoring key 12, circuit changing keys 13 and 14, a ground ringing key 15, a metallic ringing key 16, an operator's listening key 17, an operator's talking set 18, a ringing generator 19, and a clearing-out drop 20.

At the party line substations B and C I have diagrammatically illustrated the apparatus employed. The windings of an electromagnet 35 are permanently connected in bridge of the limbs 29 and 30. This electromagnet is provided with a polarized armature 36 pivotally mounted at 37 and provided with a lever 38. A ratchet wheel 39 is mounted upon a shaft 40 which carries at its upper end a switch arm 41. A suitable spring 42 tends to cause a clock-wise rotation of the shaft 40 and the parts mounted thereon; the clock-wise rotation of the switch arm 41 being limited, however, by the insulated normal contact 43. The lever 38 is provided at its extremity with a pivoted dog 44, a stop 45 being provided to limit the backward swing of this dog. A relatively stationary pawl 46 is mounted upon the frame of the selective instrument, this pawl being provided with a projecting pin 47 adapted to be engaged by a depending arm 48 forming a part of the dog 44. The passage of a current through the coils of the electromagnet 35 in one direction causes a movement of the lower extremity of the lever toward the shaft 40, whereby the dog 44 is made to engage a tooth of the ratchet wheel to cause a one step forward advancement thereof, the pawl 46 dropping into the next successive tooth to check and prevent the backward rotation of the ratchet wheel upon the deenergization of the electromagnet 35, suitable spring mechanism, not shown, being provided to cause the armature 36 and the lever 38 to return to their normal intermediate position.

An energization of the electromagnet 35, due to the passage of a current therethrough in a reverse direction causes a movement of the extremity of the lever 38 away from the shaft 40 whereby the depending arm 48 of the dog 44 engages the pin 47 carried by the pawl 46, whereby the ratchet wheel 39 is disengaged from both the dog 44 and the pawl 46 to permit the clock-wise rotation of the shaft 40 and the parts carried thereby, due to the tension of the spring 42. A trip lever 49 is pivotally mounted at 50 and a trip arm 51 is carried by the shaft 40 in such a position as

to engage the end of the trip lever 49 when the switch arm 41 is in its normal position, as shown. A second electromagnet 52 serves, when energized by the passage of an electric current therethrough, to cause an attraction of its armature 53 to which is attached the switch arm 54, this switch arm being normally held in its retracted position by means of a spring 55. The front contact 56 for the switch arm 54 is connected with the normal contact 43. When the trip lever 49 is not engaged by the trip arm 51 the trip lever 49 serves to engage the end of the switch arm 54 to retain the latter in its forward attracted position after having been brought into this position, due to the energization of the electromagnet 52.

Concentrically mounted with respect to the shaft 40 is a metal ring 57, this ring being provided with a series of equally spaced holes 58, the pitch of which is equal to that of the teeth of the ratchet wheel 39. A contact pin 59 is inserted in one of the holes 58. At each of the substations connected with any one line a similar pin is inserted in one of the holes of the ring 57, the pin at each substation, however, being inserted in a different hole from that in which a pin at any other substation is inserted, thus: The first substation connected with a given line may have this contact pin 59 inserted in the first hole, the second substation may have this pin inserted in the second hole, the third substation may have this pin inserted in the third hole, and so on. The pin at substation C only is inserted in the seventh hole of the ring 57. The contact 43 is insulated from the metal ring 57, and the ring 57 as well as the contact 43 is insulated from the frame of the instrument with which the switch arm 41 is in electrical connection.

A switch hook 60 serves when in its normal depressed position, due to the weight of the telephone receiver 61, to open a local circuit through the battery 62, the transmitter 63, and the primary 64 of an induction coil whose secondary 65 is adapted for inclusion in circuit with the receiver 61. A condenser 66 is serially connected with the receiver 61. The call bell 67 is connected with the ground when the switch hook is in its normal depressed position with the switch arm. A pulsating direct current generator 68 provided with an automatic switch 69 for opening the armature circuit when the generator is not being operated is connected with the line limb 29 and the normal contact 43.

I have shown the receiver at substation B removed from the hook, the subscriber having signaled the central exchange operator and called for connection with subscriber C, subscriber C having not yet been signaled by the central operator. The operation and the various circuits may now be readily traced as follows: After having inserted the calling

plug 9 into the spring jack 70 connected with the line 207 leading to substation C, the operator sends a series of impulses over the line by actuation of circuit closing key 11. This circuit may be traced as follows: from the positive side of battery 10, to conductor 71, to inner spring 72 of the restoring key 12, to middle spring 73, conductor 74, inner spring 75 of the ground ringing key 15, middle spring 76, conductor 77, outer spring 78 of circuit changing key 14 which is depressed, middle spring 79, conductor 80, inner spring 81 of metallic ringing key 16, middle spring 82, conductor 83, sleeve 84, of plug 9, jack spring 32, limb 30, conductor 85, through the windings of electromagnet 35, to conductor 86, limb 29, jack spring 31, plug tip 87, conductor 88, middle spring 89, inner spring 90, conductor 91, inner spring 92 of key 14, outer spring 93, conductor 94, middle spring 95 of key 15, inner spring 96, conductor 97, middle spring 98 of key 12, inner spring 99, conductor 100, and through key 11 back to the negative side of the battery 10. The passage of current through the electromagnet 35 in the direction caused by the closure of this circuit causes an attraction of the armature 36 to produce a one step forward advancement of the ratchet wheel 39 and the switch arm 41 operatively associated therewith. A sufficient number of impulses, in this case seven, must be given to bring the switch arm 41 into contact with the pin 59. Circuit connections are now established at the substation, whereby the operator, by depression of keys 14 and 15, may actuate the signal bell 67. This signaling circuit may be traced as follows: From the generator 19, to conductor 101, to outer spring 102 of key 15, to middle spring 76, conductor 77, outer spring 78 of key 14, middle spring 79, conductor 80, inner spring 81, middle spring 82, conductor 83, plug sleeve 84, jack spring 32, limb 30, conductor 85, conductor 104, to the shaft 40, switch arm 41, pin 59, through electromagnet 52 to ground, and back through the ground conductor at the central exchange to the generator 19. Immediately upon the passage of current through this circuit, electromagnet 52 will become energized to attract its armature 53, and switch arm 54 is engaged and retained by the trip lever 49, and the current from conductor 85 divides, part thereof passing, as above described, through electromagnet 52 to ground, the other part passing through conductor 105, trip lever 49, switch arm 54, spring 55, to switch spring 106, switch spring 107, through signal bell 67, to ground, the subscriber being thus signaled. The call bells at no other substation connected with line 207 will be actuated for the reason that none of the other switch arms 54 have been attracted by the energization of the associated electromagnet 52, substation C being the

only one on the line having a pin 59 adapted for contact with switch arm 41 at the seventh impulse. The subscriber C, upon receiving the signal and removing his receiver from the hook, establishes the following talking circuit through the cord apparatus with subscriber B: from receiver 61 at substation C, through condenser 66, contact 56, switch arm 54, trip lever 50, through conductor 105, conductor 85, limb 30, jack spring 32, plug sleeve 84, conductor 83, middle spring 82, inner spring 81, conductor 80, middle spring 79, inner spring 103, conductor 124, inner spring 108 of key 13, middle spring 109, conductor 110, through the sleeve of plug 8, through substation B following the same circuits traced through substation C back to the tip of the plug 8, through conductor 111, middle spring 112, inner spring 113, conductor 114, inner spring 115, middle spring 92, conductor 91, inner spring 90 of key 16, middle spring 89, conductor 88, plug tip 87, jack spring 31, limb 29, conductor 86, conductor 116, switch spring 117, switch spring 118, secondary winding 65, and back to the receiver at substation C.

Upon the subscribers concluding their conversation they actuate their substation generator 68, whereby the current is sent over the line to actuate the clearing-out drop 20. Before the operator, upon receiving this signal, can withdraw the plugs from the lines it is necessary that she restore the system to its normal condition. A subscriber will be unable to signal the operator when the plugs are out of the jacks unless switch arm 41 is in contact with the contact 43, central, therefore, actuates restoring key 12 whereby a current from battery 10 is sent through the windings of the electromagnet 35 in a reverse direction to cause actuation of either arm 38 in a direction away from the ratchet wheel 39 to allow spring 42 to return the switch arm to its normal position in contact with contact piece 43.

The switch arms 41 at all the substations on a party line move simultaneously with impulses sent over the line by closure of key 11 at the central exchange, and upon restoring current being sent over the line all the switch arms are returned to their normal position. By actuation of restoring key 12 and either one or both of the circuit changing keys 13 and 14, the central operator may send restoring current through either line 407 or line 207 or simultaneously through both, being thus able to restore both lines without reversing the plugs of the cord circuit or without utilizing the calling plug from another cord circuit. The restoring circuit through substation C, for instance, may be traced as follows: From the negative side of battery 10, to conductor 119, outer spring 120 of restoring key 12, middle spring 73, conductor 74, inner spring 75 of key 15, 130

middle spring 76, conductor 77, outer spring 78, middle spring 79, conductor 80, inner spring 81 of key 16, middle spring 82, conductor 83, plug sleeve 84, jack spring 32, limb 30, through electromagnet 35, to conductor 86, limb 29, jack spring 31, plug tip 87, conductor 88, middle spring 89 of key 16, inner spring 90, conductor 91, middle spring 92 of key 14, outer spring 93, conductor 94, middle spring 95 of key 15, inner spring 96, conductor 97, middle spring 98 of key 12, outer spring 121, to conductor 122, and to conductor 71 back to the positive side of battery 10. To restore the apparatus at substation B the operator actuates both the restoring key 12 and the circuit changing key 13, the restoring current passing through substation B through the same circuits as in substation C. The plugs may now be withdrawn and the lines are again in normal condition to give or receive calls.

When a party line system is installed to be operated in connection with a telephone system of different manufacture, I employ a substitute plug 123, which may be connected in bridge of the calling plug 9 connected with the party line cord circuit. This plug 123 is made to fit the springjack 28 associated with the system of different manufacture. Had subscriber B, upon connection with the central operator, called for connection with subscriber A the operator would have inserted the substitute plug 123 into springjack 28, to connect subscriber B with subscriber A. If the line 306 leading to subscriber A be a metallic line the operator will signal subscriber A by actuation of metallic ringing key 16 to connect the generator 19 across the sides of line 306 in a manner well known to those skilled in the art. Again, should subscriber A, for instance, signal the central operator, she would insert plug 123 in springjack 28 and if subscriber A desired connection with subscriber B she would insert plug 8 into the jack connected with the line 407, whereupon the connections at substation B could be adjusted as hereinbefore described.

The system of my invention may thus be associated with any telephone system of different manufacture without changing any of the circuits or apparatus of either system, the mere use of an additional plug of a pattern corresponding to the different system being necessary.

I do not wish to be limited to the exact arrangement of apparatus and circuits as herein described, as changes may readily be made without changing the scope of the invention.

I claim as new, however, and desire to secure by Letters Patent:

1. In a telephone system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with one or more of said

telephone lines, cord plugs at the central exchange, a cord circuit connecting said plugs, a source of current associated with said cord circuit, circuit changing keys in said cord circuit whereby said source of current may be connected with either one of said plugs, a reversing key in said circuit, whereby the direction of current flow from said source may be reversed, a generator at the central exchange, one side of said generator being grounded, a ringing key acting in conjunction with said circuit changing keys whereby the ungrounded side of said generator may be connected to one side of either of said plugs, and an additional ringing key whereby said generator may be connected to both sides of only one of said plugs, substantially as described.

2. In a telephone system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with one or more of said telephone lines, cord plugs at the central exchange for connection with said telephone lines, a cord circuit connecting said plugs, a source of current associated with said cord circuit, circuit changing keys in said cord circuit whereby said source of current may be connected with either one of said plugs, a reversing key in said circuit whereby the direction of current flow from said source may be reversed, a generator associated with said cord circuit, one side of said generator being grounded, a ringing key acting in conjunction with said circuit changing key, whereby the ungrounded side of said generator may be connected with one side of either of said plugs, an additional ringing key in said cord circuit, whereby said generator may be connected to two sides of one of said plugs, an operator's talking set, and an operator's key for connecting said operator's set with said cord circuit, substantially as described.

3. In a telephone exchange system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with each of said telephone lines, a selective device at each substation and a polarized electromagnet for controlling said selective device, a relay and a signal bell at each substation, cord plugs at the central exchange, a cord circuit connecting said plugs, a source of current associated with said cord circuit, circuit changing keys in the cord circuit whereby said source of current may be connected simultaneously with both plugs to send signaling current through the polarized electromagnets at the substations to cause actuation of substation apparatus, a reversing key in said circuit for reversing the current flow from said source to send current through the polarized electromagnets at the substation in a reverse direction to cause restoration of

the substation apparatus, a generator at the central exchange having a grounded terminal, and a ringing key acting in conjunction with said circuit changing keys whereby the grounded side of said generator may be connected to one side of both plugs whereby current will be sent to the relays at the substation to connect the signal bells thereat in circuit, said generator current causing also actuation of the signal bell when connected in circuit.

4. In a telephone exchange system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with each of said telephone lines, a selective device at each substation, a polarized electromagnet for controlling said selective device, a relay and a signal bell at each substation, a cord circuit terminating in plugs, a source of current associated with said cord circuit, circuit changing keys in said cord circuit whereby said source may be connected with either one or both of said plugs, impulse mechanism for sending impulses from said source through the plugs and circuit changing keys into the line to cause actuations of the polarized electromagnets at the substations to set up the selective devices, a generator, and a ringing key for connecting said generator through the circuit changing keys with either or both of said plugs, actuation of said ringing key causing current flow through the relays at the substation whereby said signal bells at the connected substations are connected in circuit and actuated by current from said generator.

5. In a telephone exchange system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with each of said telephone lines, a selective device at each substation, a polarized electromagnet for controlling said selective device, a relay and a signal bell at each substation, a cord circuit terminating in plugs, a source of current associated with said cord circuit, circuit changing keys in said cord circuit whereby said source may be connected with either one or both of said plugs, impulse mechanism for sending impulses from said source through the plugs and circuit changing keys into the line to cause actuations of the polarized electromagnets at the substations to set up the selective devices, a generator, a ringing key for connecting said generator through the circuit changing keys with either or both of said plugs, actuation of said ringing key causing current to flow through the relays at the substations whereby said signal bells at the connected substations are connected in circuit and actuated by current from said generator, and a reversing key for said cord circuit for reversing the current flow from

said source whereby said electromagnets at the substations are actuated in an opposite direction to restore the substation apparatus to its normal position.

6. In a telephone exchange system, the combination with a central exchange, of telephone lines extending therefrom, a plurality of substations connected with one or more of said telephone lines, a selective device at each party line substation, a polarized electromagnet for controlling said selective device, a relay and a signal bell at each party line substation, a cord circuit terminating in plugs, a source of current associated with said cord circuit, circuit changing keys in said cord circuit whereby said source may be connected with either one or both of said plugs, impulse mechanism for sending impulses from said source through the plugs and circuit changing keys into the line to cause actuation of the polarized electromagnets at the substations to set up the selective devices, a generator, a ringing key for connecting said generator through the circuit changing keys with either or both of said plugs, actuation of said ringing key causing current flow through the relays at the substation whereby said signal bells at the connected substations are connected in circuit and actuated by current from said generator, a reversing key for said cord circuit for reversing the current flow from said source whereby said electromagnets at the substations are actuated in an opposite direction to restore the substation apparatus to its normal position, and an additional ringing key for connecting said generator with only one of said plugs.

7. In a telephone exchange system, the combination with a central exchange, of telephone lines extending therefrom and terminating in substations, a selective device at each substation connected in bridge of the line limbs, a polarized electromagnet for controlling each selective device, a relay at each substation adapted at a certain position of the selective device to be connected between ground and one of said line limbs, a signal bell controlled by said relay, a cord circuit at the central exchange, a source of current, two cord plugs connected by said cord circuit, impulse mechanism for causing impulses from said source to pass to the cord circuit, circuit changing keys in said cord circuit for allowing passage of said impulses to either or both of said plugs, said impulses causing actuation of the selective devices at the substations to connect the relays thereat in circuit, a generator for the cord circuit having one terminal grounded, a key for connecting the other terminal of said generator with one side of the circuit changing keys whereby actuation of said keys will cause current from said generator to flow into the line limb connected with the relays at the connected substa-

tions whereupon said relays will become energized to connect the controlled signal bells in circuit, current from said generator then causing actuation of said signal bells, and a reversing key for reversing the current flow to said circuit changing keys, whereby reverse impulses may be sent to the substations to cause reverse movement of the selec-

tive devices thereat to restore the substation apparatus to the normal condition.

In witness whereof, I hereunto subscribe my name this 13th day of July A. D., 1903.

GARRISON BABCOCK.

Witnesses:

LYNN A. WILLIAMS,
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