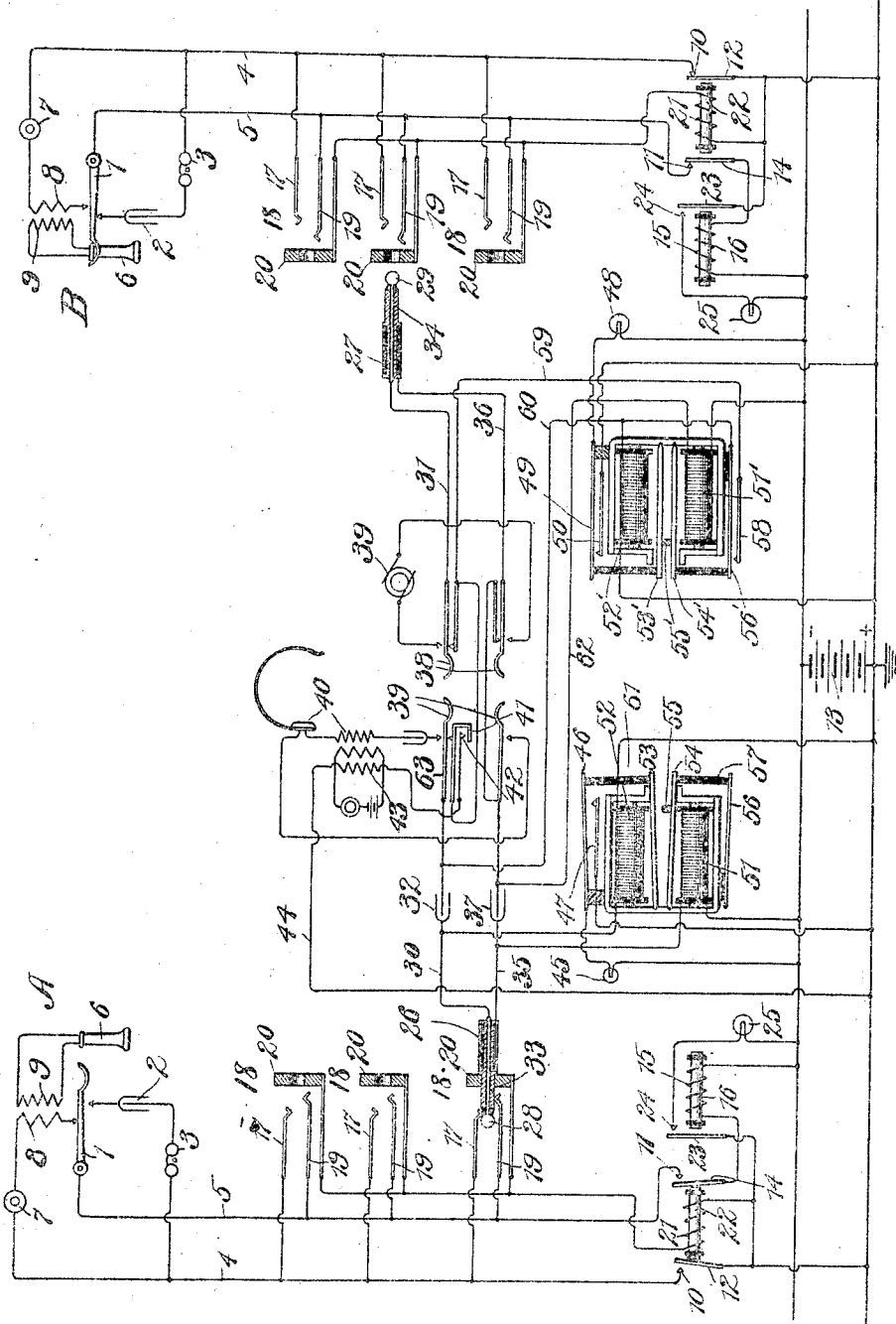


M. S. CONNER.
SUPERVISORY SYSTEM.
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SUPERVISORY SYSTEM.

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To all whom it may concern:

Be it known that I, MERRITT S. CONNER, 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 Supervisory 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 telephone exchange systems; and particularly to an improved supervisory signal for use in conjunction therewith.

In accordance with my invention any desired supervisory signal may be employed, such, for instance, as a small incandescent lamp. The circuit of this lamp is controlled by a unitary electromagnetic switching device, which is controlled by a central station operator and the subscriber's line circuit with which the supervisory signal may be associated.

My invention will be readily understood by reference to the accompanying drawing, which diagrammatically represents a central energy exchange system with two subscribers' lines terminating therein and in which I have shown at each of the substations A and B a well known form of substation apparatus for use with central energy systems.

Each of the substations is provided with a switch hook 1, which, when in its normal depressed position connects a condenser 2 and call bell 3 between the line limbs 4 and 5 leading to the central station. When the receiver 6 is removed from the switch hook 1 circuit for continuous current is closed between the line limbs and through the transmitter 7 and primary 8 of the induction coil, whose secondary 9 is connected with the receiver 6. The line limbs 4 and 5 terminate respectively at the central station in back contacts 10 and 11 of a cut-off relay, whose armature 12 is connected with the positive grounded pole of the battery 13 and whose armature 14 is connected through the winding 15 of a line relay 16 to the negative pole of the battery.

The tip contacts 17 of the multiple line jacks 18, 18 are connected directly with the line limb 4, while the line limb 5 is connected with the associated sleeve springs 19, 19. The test thimbles 20, 20 of these line jacks are connected together and thence through

the winding 21 of the cut-off relay 22 with the positive pole of the battery. The line relay 16 controls by means of its armature 23 and contact 24 a local circuit through the line signaling lamp 25. The line circuit which I have thus described is well adapted for use with my invention, as are the majority of common battery line circuits which have heretofore been proposed. The operator's cord circuit comprises an answering plug 26 and a calling plug 27, the tip contacts 28 and 29 of which are connected by means of a tip strand comprising the sections 30 and 31, these sections being conductively interrupted by the serial inclusion of a condenser 32.

The sleeve contacts 33 and 34 are connected by means of the sections 35 and 36 of a sleeve strand between which a condenser 37 is connected. The usual ringing and listening key is provided, the spreading of the springs 38 serving to connect the generator 39 in bridge of the strands leading to the calling plug. The spreading of the springs 39 serves to connect the operator's telephone set 40 in bridge of the strands. An additional spring 41 is provided for the listening key, this spring operating in conjunction with a contact 42. The spring 41 normally makes contact with the spring 39 connected with the tip strand, and is adapted to remain in contact therewith until it engages spring 42 when the key is actuated. The contact 42 is connected through a test winding 43 of the induction coil of the operator's set with the positive pole of the battery by means of a conductor 44.

My present invention provides a positive double supervisory system in accordance with which two supervisory lamp signals are provided, one controlled from each side of the circuit. The supervisory lamp 45 is connected in a local circuit with the battery and the contact springs 46 and 47. In the same way the supervisory lamp 48 is included in a circuit with the contact springs 49 and 50. The closure of the springs closes the circuit through the associated supervisory lamp causing the same to be illuminated to give a signal. Each of the supervisory lamps is controlled by a compound relay, which may be described as follows: The relay winding 51 is connected between the negative pole of the battery and the section 35 of the sleeve strand of the cord cir-

cuit. The relay winding 52 is connected between the positive pole of the battery and the section 30 of the tip strand of the cord circuit. The armature is provided with the armature tongues 53 and 54. The stud 55 is carried by the armature tongue 54 and serves to prevent the armature tongue 53 from dropping upon the tongue 54. The spring 56 exerts a slight upward pressure upon the tongue 54 through the intervention of the column 57, which, if desired, may be of insulating material, as shown. The compound relay controlling the illumination of the supervisory lamp 48 is similar to that already described and the various parts are designated by similar characters of reference, except that each is primed. The compound relay associated with the calling plug may, if desired, be provided with an extra contact 58, this contact 58 being connected by means of the conductor 59 with the contact spring 41 of the listening key. The spring 56' of the relay associated with the calling plug is connected by means of the conductor 60 with the tip strand of the cord circuit which is to the right of the condenser 32.

The operation of this system to which my invention may be applied is as follows: A subscriber at substation A, desiring connection, removes his receiver from the switch hook, thereupon closing the line circuit through the line relay 16. The armature of the line relay is thereby brought into connection with its front contact 24, thus closing the local circuit through the line lamp 25 and causing the illumination thereof. The operator responds to this signal by inserting the answering plug 26 in the answering jack of the line to substation A, whereupon the following circuit is closed: from the negative pole of the battery through the winding 51' of the compound relay, thence to section 35 of the sleeve strand, through sleeve contact 33, thimble 20 and winding 21 of the cut-off relay to the positive pole of the battery. The passage of current through this circuit causes the energization of the cut-off relay 22, whereupon the armatures 12 and 14 are withdrawn from their back contacts respectively, thereby interrupting the continuity of the otherwise closed circuit through the line relay and permitting a de-energization thereof. The energization of the cut-off relay at the same time breaks the direct connection between the line limbs and the battery. The energization of the relay due to the passage of current through its winding 51 causes a downward attraction of the armature tongue 54, the movement of the tongue being opposed by the spring 56. As the stud 55 is withdrawn from the under side of the tongue 53, this tongue 53 would naturally drop with the tongue 54, thereby permitting the contact spring 46 to be brought into connection with the contact

47, the movement of the spring 46 being controlled by the tongue 53 through the intervention of the column 61. This closure of the circuit through the contacts 46 and 47 would cause the supervisory lamp 45 to glow except for the fact that at the same time circuit is closed through the winding 51, a circuit is also closed through the relay winding 52, this circuit being traced as follows: from the positive pole of the battery, through the winding 52, the section 30 of the tip strand, to the tip contact 28 of the answering plug, tip spring 17, line limb 4, transmitter 7, primary coil 8, switch hook 1, line limb 5, sleeve spring 19, and thence through the sleeve strand 35 and winding 51 to the negative pole of the battery. The current flowing through this winding 52 causes an upward attraction of the tongue 53, whereupon the circuit through the springs 46 and 47 is prevented from closing. It will be noted that the circuit through the winding 51 is controlled by the operator by means of the connection between the sleeve contact of the plug and the thimble of the line jack, whereas the circuit through the winding 52 is controlled by means of the switch at the substation. In establishing a connection; therefore, with a calling line, no illumination of the supervisory lamp 45 will be caused. The operator, after inserting her plug, manipulates her listening key to connect her telephone set in bridge of the cord strand and thereupon learns the number of the line with which connection is desired.

Upon learning that the line of substation B is desired, the operator first applies the tip contact 29 of the calling plug to a test thimble 20 of one of the multiple line jacks associated with the line of substation B. In doing so the listening key is left in the open position connecting the operator's set in bridge of the cord strands. If the telephone line is not busy, the potential of the test thimbles will be that of the positive grounded pole of the battery by reason of the connection therewith. As the test winding 43 is also connected through the conductor 44 with the same pole of the battery, there will be no click in the operator's telephone receiver. She thereupon inserts the calling plug in the multiple jack and manipulates her ringing key to call the subscriber.

Upon inserting the calling plug 27 in a multiple jack, the following circuit is closed: from the negative pole of the common battery through the winding 51' of the compound relay, through conductor 62, to the section 36 of the sleeve strand, sleeve contact 34, thimble 20 of the multiple jack, and through the winding 21 of the cut-off relay 22 of line of substation B, to the positive pole of the battery 13. The current flowing through this circuit energizes the cut-off re-

lay, whereupon its armatures are attracted, and also causes the desired attraction of the armature tongue 54' of the compound relay. The withdrawal of the stud 55' from the under side of the armature tongue 53' permits this latter tongue to drop, thereby causing a connection between the contact spring 49 and the contact 50. Upon the closure of this connection circuit is established through the supervisory lamp 48, thereby causing its illumination as a signal. After having inserted the calling plug the operator manipulates her ringing key to call the subscriber at substation B to his telephone. Upon answering the call he removes his receiver from the switch hook, thereby closing the following circuit: from the positive pole of the battery through the winding 52' of the compound relay, thence through conductor 60 to the section 31 of the tip strand, tip contact 29, tip spring 17 of the multiple jack, line limb 4, transmitter 7, primary winding 8 and switch hook 1 at substation B, line limb 5, sleeve spring 19 of the multiple jack, sleeve contact 34, section 36 of the sleeve strand, conductor 62, and winding 51' to the negative pole of the battery. Current flowing through this circuit energizes the compound relay in such a way as to cause the upward movement of the tongue 53', whereupon the circuit established through the supervisory lamp 48 and the contacts 49 and 50 is broken, the supervisory lamp being extinguished thereby. The removal of the receiver from the switch hook at substation B does not cause the illumination of its line lamp signal 25, for the reason that the circuit through the line relay 16 has previously opened due to the energization of the cut-off relay 22. Either subscriber, upon replacing his telephone upon the switch hook, opens the circuit through the compound relay winding controlled by the subscriber's switch, whereupon the upper armature tongue is permitted to drop upon the insulating stud 55 or 55', as the case may be, whereupon the associated local supervisory circuit is closed through the supervisory lamp to indicate to the operator that the subscriber has finished this conversation. The removal of the cord plugs from the jacks causes the deenergization of the associated relay winding controlled from the substation, whereupon the lower armature tongue is forced into its normal position by the spring 56 or 56', as the case may be, whereupon the local supervisory circuit is again opened and the supervisory lamp extinguished.

The drawing illustrating my invention shows its use in conjunction with a certain feature of the busy test circuit, which I shall now describe. In the first place, it will be noted that the insertion of a plug within a line jack causes a change in the potential of

the thimbles of these jacks, due to the circuit which is established through the cut-off relay winding, the sleeve strand of the cord circuit, and one of the windings of the compound relay. Normally the potential of the test thimbles is that of the positive grounded pole of the battery, but upon the closure of this circuit the potential is changed and this change of potential is used in making the busy test. The operator, after manipulating her listening key to ascertain the number of the line wanted, applies the tip contact 29 of the calling plug to the multiple jack thimble.

If a connecting plug at some other position of the multiple switchboard has already been inserted in one of the associated multiple jacks, a circuit may be traced as follows: from the negative pole of the battery through one winding of the compound relay of the other cord circuit, to the sleeve contact of the other plug, and thence from the test thimble of the jack already in use to the test thimble with whose jack it is desired to make connection, thence to the tip contact 29 of the calling plug, through the tip strand 31, contact spring 41, and, due to the open condition of the listening key, to contact 42, and thence through the test winding 43 and conductor 44 to the positive pole of the battery. The passage of current through this circuit will cause a click in the operator's telephone to notify her of the busy condition of the line. It will be noted that the manipulation of the listening key in making this busy test closes the test circuit and opens circuit through the tip strand of the cord circuit, this circuit being open on account of the break between the contact spring 41 and the upper spring 63 of the listening key. It is desirable that after the insertion of the calling plug within the jack of a line which is not busy the operator be provided with means by which she may listen in upon the line. In order therefore to maintain the continuity of the tip strand of the cord circuit after the insertion of a calling plug, the contact 58 is provided upon the compound relay associated with the calling plug. Upon the insertion of this plug the consequent energization of the compound relay due to current passing through the winding 51' causes a downward movement of the spring 56', whereby the following circuit is established: from the right hand side of the condenser 32, through conductor 60, spring 56', to the contact 58 and conductor 59, to the section 31 of the tip strand of the cord circuit. The closure of this circuit prevents the break which would otherwise be introduced upon the manipulation of the listening key, thereby enabling the operator to listen in without interfering with the continuity of the talking circuit connection.

While I have herein shown and described

a preferred embodiment of my invention, it will be readily understood that its application to other telephone circuits and systems is quite within the skill of those familiar with the art. I do not, therefore, wish to limit myself to the precise disclosure herein set forth, but

Having described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a telephone exchange system, the combination with a telephone line extending from a substation to a central station, of cord connecting apparatus at the central station for connecting said line with another, a supervisory signal, an armature absolutely controlling a circuit through said signal, an electromagnet for controlling said armature, a second armature controlled by a second electromagnet, a mechanical connection between said armatures whereby said first armature is mechanically controlled by said second armature, an electric circuit including part of the talking circuit closed through said second electromagnet upon the connection of said cord connecting apparatus with said line, and an electric circuit through said first electromagnet controlled by a switch at the substation.

2. In a telephone exchange system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal, an armature absolutely controlling the circuit through said supervisory signal, an electromagnet for said armature, a second armature having normally mechanical engagement with said first armature, an electromagnet for said second armature, a circuit including part of the talking circuit closed through said second electromagnet upon connection of said cord connecting apparatus with the line, whereby said second armature is actuated and the mechanical connection between the armatures removed, and a circuit through said first electromagnet closed upon actuation of substation apparatus.

3. In a telephone exchange system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal, a unitary electromagnetic device for controlling the circuit through said signal, two electromagnet coils for said device, an armature associated with one coil, switching mechanism included in the supervisory signal circuit and absolutely controlled by said armature, an armature for the second coil having normally mechanical connection with said first armature, switching mechanism for said second coil adapted through said mechanical connection to nor-

mally cause the supervisory circuit to be opened at the switching mechanism of the first coil, a circuit including part of the talking circuit closed through said second coil upon connection of the cord connecting apparatus with the line whereby the corresponding armature is withdrawn from said mechanical connection with the first armature and the supervisory circuit allowed to be closed, and a circuit closed through said first coil upon actuation of substation apparatus, whereby said first armature is actuated to cause its switching mechanism to again open the supervisory circuit.

4. In a telephone exchange system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal at the central exchange, an electromagnetic device comprising two electromagnets for jointly controlling said supervisory signal, an armature for one of said electromagnets, switching mechanism absolutely controlled by said armature and included in the supervisory signal circuit, an armature for the second electromagnet, switching mechanism associated with said second armature, a mechanical connection normally between said armatures and serving in conjunction with said switching mechanisms to maintain the armatures in a neutral position away from the poles of the electromagnets, in which position the switching mechanism of the first armature is caused to open the supervisory circuit, a circuit including part of the talking circuit closed through the second electromagnet upon connection of the cord connecting apparatus with the line, whereby said electromagnet is energized to attract its armature and to break the mechanical connection between the armatures whereby the supervisory circuit is closed through the switching mechanism of the first armature, and a circuit closed through the first electromagnet upon closing of the line at the substation, whereby said first electromagnet is energized to again open the supervisory circuit.

5. In a telephone exchange system, the combination with a line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal, an electromagnetic device comprising two electromagnets for jointly controlling said supervisory signal, an armature for one of said electromagnets, switching mechanism included in the supervisory circuit and absolutely controlled by said armature, said switching mechanism tending to close the supervisory circuit, an armature for the second electromagnet, switching mechanism for said second armature tending nor-

mally to engage the first armature to prevent the switching mechanism of the first electromagnet from closing the supervisory circuit, a circuit including part of the talking circuit closed through said second electromagnet upon connection of the cord connecting apparatus with the line, whereby the second armature is withdrawn from engagement with the first armature to allow the switching mechanism of the first electromagnet to close the supervisory circuit, and a circuit closed through the first electromagnet upon closure of the line at a substation, whereby said first relay is energized to cause the switching mechanism to be again open.

6. In a telephone exchange system, the combination with a line extending from a substation to a central station, of multiple spring jacks at the central station associated with said line, said jacks being provided with test contacts, cord connecting apparatus at the central station for connecting said line with another, an operator's telephone set, a listening key adapted to connect said telephone set with the cord circuit, a switch associated with said listening key, said switch being adapted to open the tip strand of the cord circuit upon manipulation of the listening key, a test circuit terminating in the tip of the calling plug, an electrically operated supervisory signal, and a unitary electromagnetic device having an armature tongue absolutely controlling the circuit through said signal, and having also a second armature tongue absolutely controlled by an electric circuit closed upon the connection of said cord connecting apparatus with the line, said first armature tongue being jointly controlled by said second armature tongue and an electric circuit closed by a switch at the substation of a connected line and having also a switch absolutely controlled by the second armature tongue, said switch serving during the abnormal position of said second armature tongue to close a circuit in shunt of the switch adapted to control the continuity of the tip strand of the cord circuit.

7. In a telephone exchange system, the combination with a line extending from a substation to a central station, of multiple spring jacks at the central station each provided with a test contact and associated with said line, cord connecting apparatus at the central station for connecting said line with another, a listening key and a switch adapted to open a strand of the cord circuit upon manipulation of the listening key, a test circuit terminating in a contact of a connecting plug, a supervisory signal, an electromagnetic device having an armature tongue absolutely controlling the operation of said supervisory signal, a second armature tongue absolutely controlled by an electric circuit closed upon the connection of said cord con-

necting apparatus with said line, an electric circuit controlled by a switch at the substation serving secondarily to control said first mentioned armature tongue, a mechanical connection between said first and second armature tongues, whereby the former is jointly controlled by said second armature tongue and the circuit controlled by the substation switch, and a switch absolutely controlled by said second armature tongue, said switch serving when actuated to close a circuit in shunt of the switch controlling the continuity of the cord strand.

8. In a telephone system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal at the central exchange, an electromagnetic device comprising two electromagnets for controlling said supervisory signal, an armature for one electromagnet, switching mechanism absolutely controlled by said armature and included in the supervisory circuit for said supervisory signal, said switching mechanism having a tendency to normally close the supervisory circuit, mechanical means associated with said armature for normally preventing closure of the supervisory circuit, said mechanical means being controlled by the second electromagnet upon connection of the cord connecting apparatus with the line to release the armature to allow closure of the supervisory circuit, and a circuit including part of the talking circuit closed through the first electromagnet upon connection of the cord connecting apparatus with the line and closure of the line at the substation, whereby said first electromagnet becomes energized to again open the supervisory circuit.

9. In a telephone exchange system, the combination with a telephone line extending from a substation to an exchange, of cord connecting apparatus at the exchange for connecting said line with another, a supervisory signal at the exchange, an electromagnetic device comprising two electromagnets for jointly controlling said supervisory signal, an armature for one electromagnet, switching mechanism absolutely controlled by said armature and included in a circuit containing said supervisory signal, said switching mechanism tending to remove said armature away from the electromagnet pole and to close the circuit through said signal, an armature for the second electromagnet, a spring connected with said armature tending to move said armature away from the pole of its electromagnet, a mechanical connection between said armatures, whereby said spring also serves to retain the first armature and to prevent the switching mechanism controlled thereby from closing the supervisory circuit, a circuit including part

of the talking circuit closed through said second electromagnet upon connection of the cord connecting apparatus with the line whereby said electromagnet is energized to withdraw its armature from mechanical engagement with the first armature, whereby the switching mechanism controlled by the first armature may close the supervisory circuit, and a circuit closed through the first electromagnet upon closure of the line at the substation, whereby the armature of said first electromagnet is actuated to open the switching mechanism controlled thereby and the supervisory circuit.

10. In a telephone exchange system, the combination with a telephone line extending from a substation to an exchange, of cord connecting apparatus at the exchange for connecting said line with another, a supervisory signal at the exchange, an electromagnetic device comprising two electromagnets for jointly controlling said supervisory signal, an armature for one of said electromagnets, switching mechanism controlling the supervisory circuit and controlled by said armature, a member of said switching mechanism tending normally to close the switching mechanism and to move the armature away from the electromagnet pole, and an armature for the second electromagnet, said armature normally having mechanical connection with the first armature tending to maintain the first armature in position to prevent closure of the supervisory circuit at said switching mechanism, said second electromagnet being controlled upon connection of the cord connecting apparatus with the line to destroy the mechanical connection and to allow closure of the supervisory circuit, said first electromagnet being controlled by substation apparatus, closure of the line at the substation through the apparatus causing actuation of the armature to again open the supervisory circuit the circuits for said electromagnets each including part of the talking circuit.

11. In a telephone exchange system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal at the central exchange, an electromagnet at the central exchange, an armature for said electromagnet, switching mechanism included in the supervisory circuit and absolutely controlled by said armature, mechanical means for normally preventing actuation of the armature to close the switching mechanism and the supervisory circuit, electromagnetic means controlled upon connection of the cord connecting apparatus with the line for releasing said armature from said mechanical connection whereby the supervisory circuit may be closed, said electromagnet upon actuation of

substation apparatus being included serially in a circuit with said electromagnetic means to actuate said armature to again open the supervisory circuit.

12. In a telephone exchange system, the combination with a telephone line, of cord connecting apparatus at the central exchange for connecting said line with another, a supervisory signal at the central exchange, a unitary electromagnetic device for controlling said signal and comprising two electromagnets, an armature for one electromagnet, switching mechanism connected with said armature and included in the supervisory circuit, an armature for the second electromagnet, switching mechanism connected with said second armature, spring means associated with said switching mechanism, a mechanical connection existing normally between the armatures and serving with said spring means to balance the armatures to normally prevent closure of the supervisory circuit, connection of said cord connecting apparatus with the line causing current flow through the second electromagnet to destroy said balance whereby the supervisory circuit is closed, and actuation of substation apparatus after connection of said cord connecting apparatus with the line causing the first electromagnet to be included in a circuit with said second electromagnet whereby said first electromagnet is energized and said supervisory circuit is again opened.

13. In a telephone exchange system, the combination with a telephone line, of a cord circuit at the central exchange for connecting said line with another, a listening key in said cord circuit, normal contacts for said listening key normally included in the talking circuit, actuation of said listening key tending to disrupt the cord circuit, a supervisory signal, unitary electromagnetic mechanism comprising two electromagnets for jointly controlling said supervisory signal, an armature for one electromagnet, switching mechanism connected with said armature and controlling the supervisory circuit, an armature for said second electromagnet, switching mechanism connected with said second armature and included in a circuit in bridge of listening key contacts, spring means associated with said switching mechanisms, a mechanical connection existing normally between the armatures and acting with said switching means to maintain the armatures in a balanced position to normally prevent closure of the circuits controlled by the switching mechanisms, connection of the cord connecting apparatus with the line causing current flow through the second electromagnet whereby the circuit in bridge of listening key contacts is closed whereby said listening key may be actuated thereafter without opening the cord circuit, actuation

ation of said second electromagnet causing said armatures to be unbalanced, whereby the supervisory circuit is also closed, and actuation of substation apparatus after connection of the cord connecting apparatus with the line causing current flow through the first electromagnet whereby its armature is actuated to again open the supervisory circuit.

10 14. In a telephone exchange system, the combination with a telephone line extending from a substation to a central exchange, of cord connecting apparatus at the central exchange for connecting said line with another, a listening key in said cord circuit, contacts for said listening key disengaged upon actuation of said key whereby the cord circuit is opened, a supervisory signal, an electromagnet, an armature for said electromagnet, switching mechanism controlled by said armature and included in the supervisory circuit, means tending normally to close said switching mechanism and the supervisory circuit, mechanical means associated with said armature to normally maintain said armature in balance to prevent closing of the switching mechanism, an additional electromagnet, an armature for said additional electromagnet, switching mechanism controlled by said armature, a circuit including said switching mechanism for bridging said listening key contacts, connection of said cord connecting apparatus with the line causing a local circuit to be closed through said second electromagnet to destroy the balance of the first electromagnet and to energize the second electromagnet whereby the switching mechanism of the first electromagnet is caused to close the supervisory circuit and the switching mechanism of the second electromagnet caused to close the bridging circuit about the listening key contacts, and a circuit closed through the first electromagnet upon closure of the line at the substation whereby the switching mechanism of said first electromagnet is actuated to again open the supervisory circuit.

15. In a telephone exchange system, the combination with a telephone line leading from a substation to an exchange, of a cord circuit at the exchange, a supervisory signal at the exchange, a supervisory relay electrically controlling the circuit through said supervisory signal, an auxiliary supervisory relay mechanically associated with said first relay to normally prevent control thereby of the supervisory circuit to allow actuation of the supervisory signal, connection of the cord circuit with the telephone line causing closure of a circuit through the auxiliary relay whereby said relay is actuated to destroy its mechanical control of the first relay to allow the first relay to control the supervisory circuit to cause actuation of the supervisory signal, and means upon actuation of apparatus at the substation connected with the telephone line for causing said first relay to be included in a circuit with the auxiliary relay whereby the first relay is also electrically actuated to control the supervisory circuit to render the supervisory signal inert.

In witness whereof, I hereunto subscribe my name this 24th day of February A. D., 1904.

MERRITT S. CONNER.

Witnesses:

LYNN A. WILLIAMS,
JOHN STAHR.