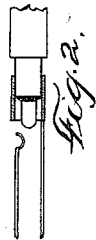


APPLICATION FILED OCT. 12, 1908. RENEWED APR. 29, 1911.

Patented July 30, 1912.



H. E. Stroh
H. E. Stroh

By G. L. Cragg Att'y.

UNITED STATES PATENT OFFICE.

ELMER R. CORWIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO CORWIN TELEPHONE MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE-EXCHANGE SYSTEM.

1,033,877.

Specification of Letters Patent.

Patented July 30, 1912.

Application filed October 12, 1908, Serial No. 457,195. Renewed April 29, 1911. Serial No. 624,143.

To all whom it may concern:

Be it known that I, ELMER R. CORWIN, 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 Telephone-Exchange 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 its objects and advantages will fully appear by a description of one embodiment thereof shown in the accompanying drawing, in which—

Figure 1 illustrates a multiple switch-board telephone exchange system to which the invention is adapted, though the invention is not to be limited in its application to multiple switch-board systems. Fig. 2 is a detail of plug and jack.

I have shown at A, B two telephone sub-stations each including a receiver *a*, a transmitter *b*, a switch-hook *c*, a call bell *e*, and a condenser *f*, the elements *a b c* being included in bridge of the telephone line, which bridge is open when the receiver is upon the switch-hook *c* and which bridge is closed by the switch-hook when relieved of the weight of the receiver. The elements *e f* are in another bridge permanently closed to alternating signaling currents but open to direct currents. The type of sub-station outfit shown is one that I have selected for the purpose of illustrating the invention, but it is to be understood that I do not limit myself to the form of sub-station apparatus shown, for it will be obvious as the description of the invention is proceeded with, that the operation of the system does not depend upon the peculiar sub-station outfit shown. The stations A B are connected to the exchange, in the form of the invention shown, by means of metallic circuits whose limbs *g* and *h* are connected, respectively, with line springs *g*¹ and thimbles *h*¹, constituting spring-jacks. A plurality of spring-jacks is shown in multiple relation with each line, the lowermost spring-jacks constituting the answering-jacks while the remaining jacks constitute line-jacks. The limbs *g* and *h* of each telephone line also terminate in contacts of an armature switch, which switch is governed in its position by a cut-off relay *i*,

the limbs of each telephone line being normally connected by way of said armature switch and the contacts normally engaged thereby, with a line lamp or signal *k* and a battery *k*¹ adapted to excite said lamp, when the circuit including the battery *k*¹, the line signal *k*, the armature switch of the associate cut-off relay *i* and the line limbs *g* and *h* is closed by the removal of the telephone receiver at a calling station from its supporting switch-hook. The cut-off relays *i* are included in grounded limbs extending from contact portions of the answering-jacks, preferably the line thimbles. As will more fully hereinafter appear, the cut-off relays are initially included in local circuits by the plugs, while, ultimately, the circuits for said cut-off relays depend upon the line conductors that are conductively connected by the switch-hooks at the sub-stations. In order that the spring-jacks need not be provided with more than two contact elements *g*¹ *h*¹, and in order to dispense with line relays and contacts between the lines and the jacks, I employ the non-inductive resistances *l* that connect a limb (*h*) of each line with the contact *h*¹ of such line that has connection with the cut-off relay *i*, these non-conductive resistances being permanently connected and in parallel with the cut-off relays and permitting the passage of voice currents to their associate spring-jack parts, while at the same time properly controlling the distribution of battery current to effect the proper operation of the cut-off relays *i*, all in a manner which will be understood, after I have described the form of cord circuit outfit illustrated. For the cord circuit, I have shown an answering plug *m*, and a connecting plug *n* having tips and sleeves united respectively by the tip strand *o* and the sleeve strand *p*, with which strands the cord circuit apparatus of the form illustrated is connected. As I prefer to employ double supervision, the cord strands *o p* are separated, so far as the passage of straight current is concerned, by condensers *q* and *r*, which, however, permit the passage of telephonic current. Upon the left of the condensers *q* and *r*, I have shown the calling subscriber's supervisory relay *s* controlling an armature switch whose normal contact constitutes a terminal of a display signaling device, such as a lamp *s*¹, the other terminal of said lamp being grounded through a bat-

tery s^2 . The cord strand p is normally broken at the alternate terminal of the armature switch of the supervisory relay s , but is closed when said supervisory relay s is attracted, as will be explained. The supervisory signal apparatus associated with the answering end of the cord circuit finds a counterpart in the supervisory signal apparatus associated with the called subscriber's end of the cord circuit, and I will, therefore, simply rely upon the illustration of the called subscriber's signaling apparatus to indicate its nature. There is also employed any suitable form of operator's telephone outfit t and calling or ringing outfit u whose circuit relation with the cord circuit is well illustrated but need not be described.

Assuming that the calling subscriber A has removed his receiver a from its switch-hook, circuit is established through the line lamp k by way of the contacts of the armature switch of the associate cut-off relay i . The operator, in response to the signal conveyed by the lamp k , will place herself in communication with the calling subscriber, after having inserted the answering plug m into the jack of the calling subscriber (the answering jack, inasmuch as a multiple switch-board system has been selected for illustrating the invention). The sleeve or body of the answering plug m first engages a contact part of the answering jack, namely, the part h^1 , whereupon the cut-off relay i of the calling subscriber's line is included in a circuit that may be traced from the grounded terminal of said cut-off relay, through the winding of said cut-off relay, the terminal h^1 , the sleeve or body of the engaged answering plug m , a part of the cord strand p , the armature switch of the supervisory relay s , the normal contact of said armature switch, the supervisory signal device s^1 , the battery s^2 , back to said cut-off relay i . The cut-off relay i being energized, the line signal lamp k is placed in open circuit, so that the signal presented by said lamp is effaced. Upon the further movement of the answering plug m within the engaged jack, the tip of said answering plug is brought into engagement with the line spring g^1 , whereupon circuit is established through the supervisory relay s that may be traced from the grounded battery s^2 , through the winding of said supervisory relay, the portion of the tip strand o , the tip of the answering plug m , the line spring g^1 , the line limb g (of the calling subscriber), the switch-hook c , receiver a , transmitter b , line limb h (of the calling subscriber), to the grounded cut-off relay i corresponding to the calling subscriber's line, by way of non-inductive resistance l . When the relay s is energized, the supervisory signal displayed by the lamp s^1 is effaced, so that the local circuit for the cut-off relay i

is broken at the armature switch of said supervisory relay, but the circuit of the cut-off relay of the calling subscriber's line is still maintained, owing to the establishment of the circuit last traced through the resistance l . This resistance l , therefore, is an important feature of my present invention, for by its employment the telephonic connection between the contacts h^1 and the limb h of each line is preserved, while at the same time the limbs of each line enter into the formation of an alternative circuit for the associate cut-off relay i when the local circuit for said cut-off relay has been ruptured by the movement of the armature switch of the supervisory relay s from its normal contact.

When the operator establishes connection with the called subscriber, the local circuit through the called subscriber's cut-off relay i is established, as had been the local circuit, through the calling subscriber's cut-off relay, but the alternative circuit through the called subscriber's line is, of course, not established until the called subscriber removes his telephone from the switch-hook.

It goes without saying that the supervisory lamps s^1 are caused to glow when the associate supervisory relays are in open circuit, which is the case when the corresponding receivers are upon their switch-hooks, and that such supervisory lamps are included in open circuit when said supervisory relays are energized, which occurs when the associate receivers are removed from their switch-hooks.

Another feature of my invention which has been generally described will now be specifically pointed out. It consists in using for the cut-off relay circuits and the circuits for the supervisory signal devices s^1 , a portion of the cord strand p as well as a part of an associate line conductor intervening between the associate contact h^1 and the resistance l . Said line conductor portion and cord circuit portion are included in local circuit in order to operate the signal device shown and the associate cut-off relay i , the cord strand then being incomplete for talking purposes, owing to the break in the talking strand p at the armature switch of the supervisory relay s . When the alternative circuit by way of the line for the cut-off relay i , has been established, and the supervisory signaling device s^1 has been excluded from circuit, then the function of the conductor p as a signal circuit conductor has been discharged and its function as a part of the talking circuit is then brought about. It will be understood from the description that has been given that were it not for the interposition of each resistance l between the associate line limb h and the conductor uniting the associate thimbles h^1 associated with said associate cut-off relay i ,

current from the battery s^2 would be shunted by said cut-off relay to the ground that must be provided in practice in connection with a battery k , and with which ground a terminal of the cut-off relay is connected.

It will be observed that the resistances l are in parallel with the associate cut-off relays i , in order that the function of said resistance may be accomplished.

It is obvious that changes may readily be made in the preferred embodiment of the invention herein shown and particularly described, without departing from the spirit of the invention, and I do not, therefore, wish to be limited to the precise features illustrated, but,

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

1. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said metallic telephone lines for opening and closing circuit through said signal devices, cut-off relays at the exchange for excluding the aforesaid line signal devices from circuit, thereby effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal.
2. A telephone exchange system including telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug,

a source of current, and a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal.

3. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, and a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal.

4. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, cut-off relays at the exchange for effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

5. A telephone exchange system including telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

6. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

7. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, cut-off relays at the exchange for effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient cur-

rent is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

8. A telephone exchange system including telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

9. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

10. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, cut-off relays at the exchange for effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having

a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay and included in circuit with the cut-off relay that is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay.

11. A telephone exchange system including telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit and included in circuit with the cut-off relay that is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay.

12. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, a resistance interposed between a side of each telephone line and a line terminal contact of a jack

associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay and included in circuit with the cut-off relay that is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay.

13. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said metallic telephone lines for opening and closing circuit through said signal devices, cut-off relays at the exchange for excluding the aforesaid line signal devices from circuit, thereby effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

14. A telephone exchange system including telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the ex-

change by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

15. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, and switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit.

16. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said metallic telephone lines for opening and closing circuit through said signal devices, cut off relays at the ex-

change for excluding the aforesaid line signal devices from circuit, thereby effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

17. A telephone exchange system including telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

18. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, line

signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay.

19. A telephone exchange system including metallic telephone lines extending to jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said metallic telephone lines for opening and closing circuit through said signal devices, cut-off relays at the exchange for excluding the aforesaid line signal devices from circuit, thereby effacing the signals occasioned by said line signal devices, each cut-off relay and associate telephone line having a common ground, a local circuit for each cut-off relay including a line contact of an associate jack switch and a plug contact for engagement with said jack switch terminal and a grounded source of current, a resistance interposed between each cut-off relay and the associate line limb which is in connection with said jack terminal that is connected with said cut-off relay, whereby in establishing connection between a jack switch and a plug, all of the current flowing from said grounded source of current is not permitted to pass to the grounded connection of the associate telephone line, but sufficient current is forced to pass through the associate cut-off relay to cause its energization, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate

circuit, and a supervisory signal governed in its action by said cord circuit relay and included in circuit with the cut-off relay that is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay.

20. A telephone exchange system including telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit and included in circuit with the cut-off relay that is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay.

21. A telephone exchange system including metallic telephone lines connected with jack switches at an exchange, line signal devices at the exchange, switching means at the stations that are connected with the exchange by said telephone lines for opening and closing circuit through said signal devices, a resistance interposed between a side of each telephone line and a line terminal contact of a jack associated with said line, a cut-off relay in association with each telephone line and in parallel with the associate resistance for excluding the aforesaid line signal devices from circuit, thereby to efface the line signals occasioned by said line signal devices, a cord circuit including a plug, a source of current, a circuit established by said plug when engaged with a jack and including said source of current and cut-off relay, said resistance forcing the

passage of sufficient current from said source through the cut-off relay brought into association with said plug to cause the energization of said cut-off relay, and
5 thereby the effacement of the line signal, a cord circuit relay under the control of a telephone station, an alternate circuit for a cut-off relay, switching mechanism controlled by said cord circuit relay serving to
10 govern the effectiveness of said alternate circuit, and a supervisory signal governed in its action by said cord circuit relay and included in circuit with the cut-off relay that

is brought into association with a cord circuit plug and excluded from said circuit by said cord circuit relay upon the establishment of the alternative circuit for the cut-off relay. 15

In witness whereof, I hereunto subscribe my name this tenth day of October A. D., 20 1908.

ELMER R. CORWIN.

Witnesses:

G. L. CROGG,
L. G. STROH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."