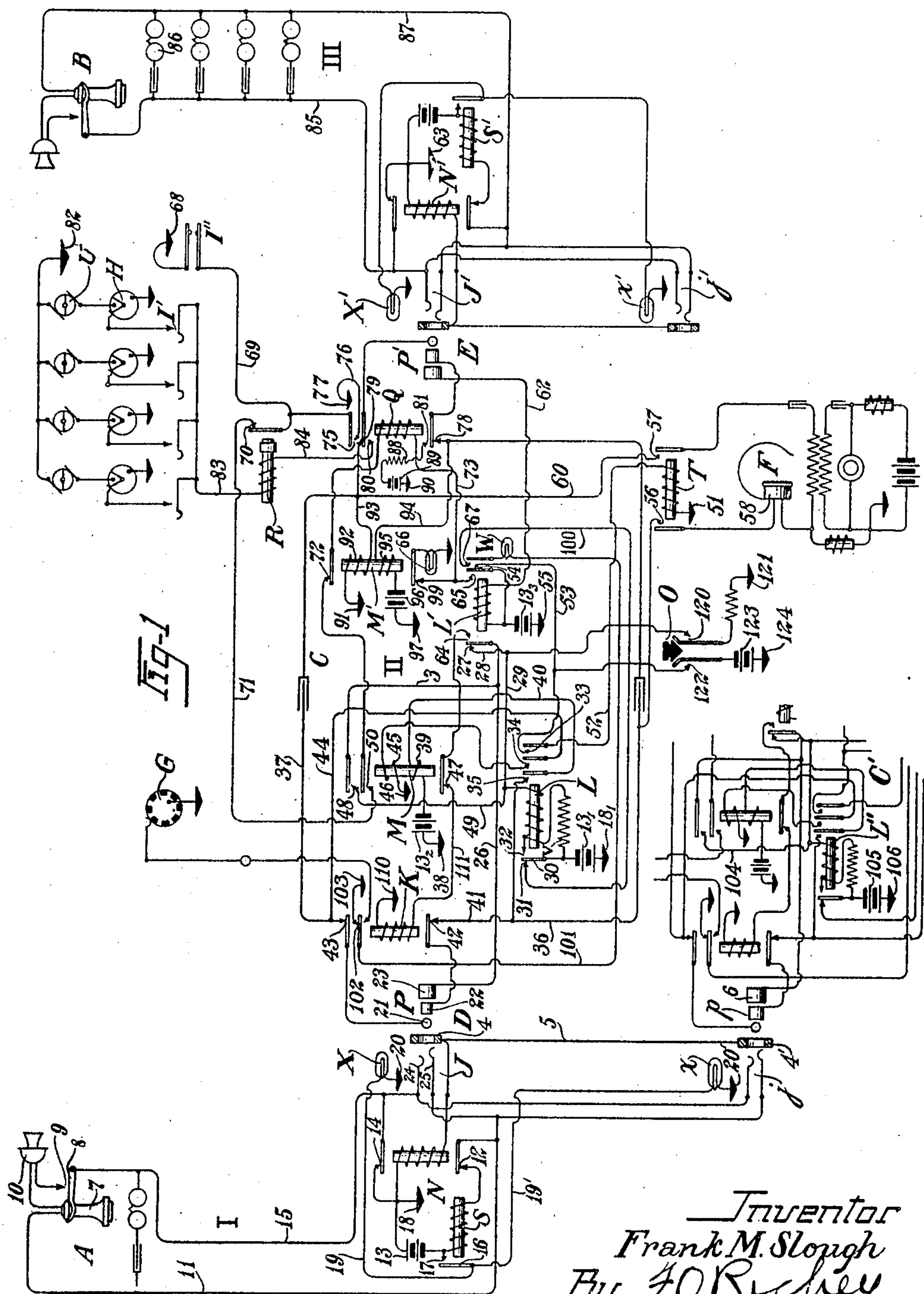


F. M. SLOUGH.
TELEPHONE SYSTEM.
APPLICATION FILED JULY 15, 1915.

1,298,414.

Patented Mar. 25, 1919.
2 SHEETS—SHEET 1.



Inventor
Frank M. Slough
By J. O. Richey
His Atty.

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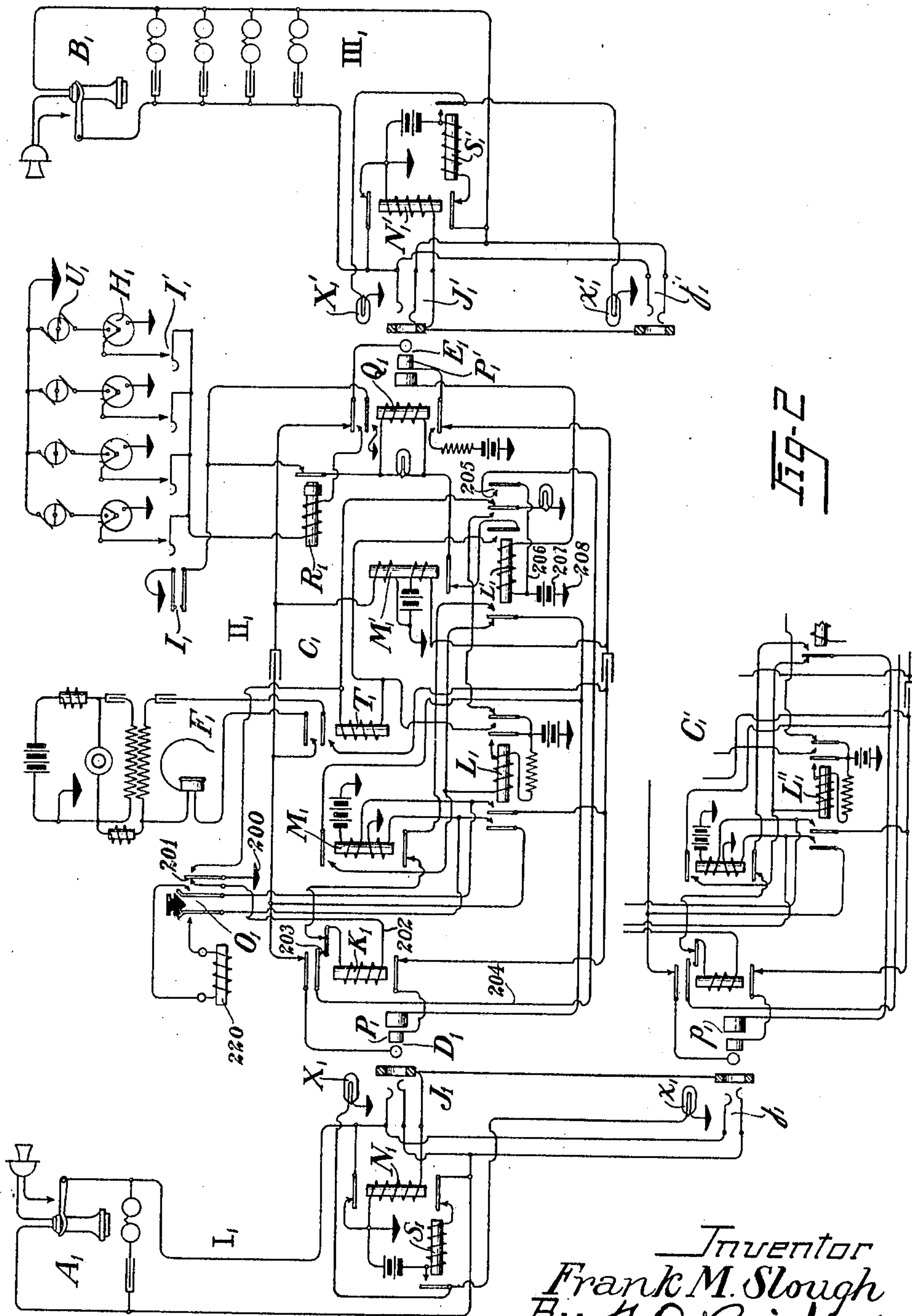


FIG. 2

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UNITED STATES PATENT OFFICE.

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STROMBERG-CARLSON TELEPHONE MFG. CO., OF ROCHESTER, NEW YORK, A
CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

1,298,414.

Specification of Letters Patent.

Patented Mar. 25, 1919.

Application filed July 15, 1915. Serial No. 39,941.

To all whom it may concern:

Be it known that I, FRANK M. SLOUGH, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to telephone systems and to improvements therein for the purposes of performing certain useful functions and attaining useful objects which will be apparent from a description of embodiments of the invention, and some of which will be mentioned in the following description of the two embodiments shown in the drawings.

Figure 1 shows diagrammatically a telephone system embodying my invention.

Fig. 2 is a modification of the embodiment shown in Fig. 1.

Referring first to Fig. 1 of the drawing at I and III are shown telephone lines, the line I leading from a substation shown at A to a main station shown at II, and the line III leading from a plurality of substations, one of which is illustrated at B to the main station II. Means are provided at the main station II. Means are provided at the main station for connecting telephone lines together, here shown as a cord circuit C. I also illustrate at C' a portion of a second cord circuit, since a portion is sufficient to explain this embodiment of my invention. Switching means are provided for connecting the link conductors at C to the telephone lines, which are here shown as plugs and jacks. The line I, which hereinafter may be called the calling line, terminates at the main station II in a plurality of jacks, two of which are here illustrated at J and j, and the line III, likewise terminates in a plurality of jacks, two of which are shown at J' and j'. The link conductors at C terminate in the plugs P and P', which are provided with contacts adapted to register with the contacts of the jacks when the plugs are inserted into the jacks to complete the connection. The cord circuit C' is provided with plugs, one of which is shown at p.

Means are provided for apprising the op-

erator at the main station that the subscribers upon the lines desire attention. The calling line is provided with a line relay S and a plurality of line lamps, one associated with each jack, the lamp X being associated with the jack J and the lamp x being associated with the jack j. The line III, which may hereinafter be spoken of as the called line is likewise provided with a plurality of line lamps, the lamp X' being associated with the jack J' and the lamp x' being associated with the jack j'. The main station operator is provided with an operator's set F which is adapted to be connected to the link conductors to furnish the operator with the means of communicating with the subscribers. When the operator observes the operation of one of the line lamps, the switching means D is operated—in the form shown, by inserting the plug P, which will hereinafter be spoken of as the answering plug, into one of the line jacks, in case the cord C is used, say the jack J. The operation of the switch D will cause the actuation of both the relays N and L and when a subscriber is upon the calling line, the relay M will also be actuated. The actuation of the relay L will cause the actuation of the relay T and the operator's set F will be automatically connected to the cord, so that the operator can communicate with the subscriber and learn his desire. The actuation of the relay N cuts off the relay S and the line lamps from the line. The operation of the relay M opens the circuit of the relay K and completes a substitute circuit for the relays N and L through the conductor 3.

Assuming that it is the subscriber at B that is desired, and that the called line is idle, the operator actuates the switching means E by inserting the plug P', hereinafter spoken of as the calling plug, into the jack J', connecting the calling and called line together through the cord circuit. The actuation of the switching means E causes the operation of the relays N' and L'. The operator now places ringing current upon the called line by actuating one of the ringing keys, shown in the upper right-hand corner of Fig. 1, say the key I', which causes the actuation of the master key I''. This completes a circuit through the ringing relay Q, which connects the ringing generator

U through the commutator H and the relay R to the called line. The subscriber will be automatically rung, and when response is made the relay R will be actuated, interrupting the circuit of the relay Q, whereupon the ringing is discontinued and the talking strands of the cord completed. The relay M' will also be actuated when the subscriber responds.

Upon the termination of the conversation, the circuits of the relays M and M' will be broken, restoring their contacts to the position shown in the drawing. This will interrupt the circuits of the relays N and L, so that the line relay S and the line lamps will be placed in condition to be actuated by the subscriber at A, should a recall be desired. Assuming that the subscriber at A does desire a recall and again operates the line lamps, such call may be answered by any operator in the exchange, whose position is equipped with a line lamp of the line I. Assuming the operator controlling the cord circuit C' answers the call by inserting the plug *p* into the jack *j*, current will be placed upon the contacts 4, 4' and the conductor 5, as soon as the contact 6 of the plug *p* engages the contact 4'. This will cause the energization of the relays N and K, the relay N again disconnecting the line relay S and the line lamps of the line I and the relay K operatively disconnecting the line and cord by interrupting the talking strands of the cord circuit C without disturbing the switch D. The lamp W will also be flashed through the operation of the device G, indicating to the operator controlling the cord C that another operator has answered the recall of the subscriber A. Should the operator controlling the cord C desire to answer the call herself, she operates the key O, which will cause the actuation of the relays N and T, placing herself in position to answer the call herself. When the plugs are withdrawn from the jacks, of course, the system is restored to normal.

It will be seen that one of the principal objects of my invention is to release the telephone line immediately the conversation is terminated, so that the subscriber thereon can immediately secure a recall, thereby taking advantage of the interval of time which always exists between the termination of one conversation and the taking down of the connections. This interval is sometimes very long when the operator is busy and does not have time to take down such connections as soon as the conversation is terminated.

In the embodiment shown in Fig. 2, the relay K₁ locks up when operated, so that a recall once having been answered by a second operator, the apparatus will not be returned to the conditions existing after the

termination of the first conversation, as is the case in the embodiment shown in Fig. 1.

Perhaps the invention will be better understood from a detailed description of the operation of the embodiment shown in Fig. 1. Assuming that the subscriber at A desires to converse with the subscriber at B, the operation would be as follows: The subscriber at A removes the receiver 7 from the switch-hook 8, which being spring pressed upward, will close the switch 9, completing a circuit through the magnet of the relay S, as follows: 9—the transmitter 10—7—conductor 11—the switch 12—the magnet of S—the battery 13—the switch 14—the conductor 15—back to the switch-hook 8. Current from the battery 13 through this circuit will cause the energization of the magnet of the relay S, which will attract its armature 16 and close the switch 17, completing a circuit through the line lamps, as follows: from ground 18—through 13—17—the conductors 19 and 19' in parallel—through the lamps X and x in parallel and to the grounds 20 and 20', respectively. The lamps are at different positions upon the switchboard, and so located that their illumination is observed by the operators at these various positions. One of the operators will respond to the call. Assuming that it is the operator who controls the cord C, and that cord is to be used, the switching device D is operated by inserting the plug P into the jack J, the tip contact 21 and sleeve contact 22 and the ring contact 23 of the plug P registering respectively with the tip spring 24, the sleeve spring 25 and the ring 4 of the jack J, and making electrical connection therewith. A circuit will be completed through the relays N and L, as follows: ground 18—magnet of N—4—23—conductor 26—switch 27—conductor 28—conductor 29—the magnet of the relay L—the resistance device V—the battery 13₁—to ground 18₁. The magnets of both N and L will be operated. The magnet N opens the switches 12 and 14, interrupting the circuit of the magnet S, which releases the switch 17, thereby disconnecting the line lamps X and x from the current source and extinguishing the same, so that no other operator will respond to the call, and the line I will be separated from the line relay and the line lamps. Thence forward during the call, the subscriber will be unable to re-operate any of the line lamps. The magnet L attracts the armature 30, opening a switch 31, for a purpose to be described and closing a switch 32, completing a circuit for the magnet L, as previously described, except that the resistance device V is shunted, the current now having an easier path through the armature 30 and the switch 32. This apparatus is for the purpose of "cap-

turing the call," but constitutes no part of my present invention.

The relay L also closes the switches 33, 34 and 35. The closing of the switches 34 and 35 completed the circuit of the magnet M and connected the battery 13₂ to the strands 36 and 37 of the cord circuit. The relay M will now be actuated over the following circuit: ground at 38—13₂—winding 39 of M—conductor 40—35—conductor 41—switch 42—switch 34—winding 45 of M—to ground at 46. The magnet of M opens the switch 47 for a purpose to be described and closes the switch 48, completing a new circuit for the relays L and N, as follows: 18—magnet of N—4—23—26—3—48—49—magnet of L—32—30—13₁—to ground at 18₁. The purpose of making this new circuit will be understood from the description which follows.

The magnet of the relay M also closes a switch 50 in the circuit of the relay Q, whose functions will be understood from the description which follows.

When the magnet of L closed the switch 33, a circuit was completed for the magnet of the relay T as follows: 51—magnet of T—conductor 52—33—conductor 53—switch 54—battery 13₃—to ground 55. The magnet of T will be energized by current over this circuit and will close the switches 56 and 57, connecting the operator's set to the calling line, so that the operator and the subscriber can converse. The circuit is as follows: from the receiver 58—through the switch 56—36—42—22—25—11—7—10—9—8—15—24—21—43—37—conductor 60—57—back to 58, current being supplied from the battery 13₂ as previously explained. Over this circuit the operator learns that the subscriber A desires to talk to the subscriber B. She tests the line III in the well known manner, and assuming that she finds the line idle, operates the switching device E by inserting the plug P' into the jack J', the circuit connections being made in the same manner as described in connection with the operation of the switching device D. As soon as the device E is operated, a circuit is closed for the magnets of the relays L' and N', as follows: ground 55—battery 13₃—relay L'—conductor 62—switching device E—magnet of N'—ground 63. The magnet of N' will be operated, disconnecting the line signals and the line relay from the line III in the same manner that the line relay and line signals are disconnected from the line I. The magnet of L' will be energized, opening a switch 27 and therefore the branch of the circuit of the relays L and N, which pass through this switch. The relay L' also closes a switch 64 for a purpose to be described, and opens a switch 54 in the circuit of the relay T, which is deenergized,

disconnecting the operator's set from the cord. The magnet of this relay closes a switch 65 in the circuit of the supervisory lamp 66 and a switch 67 in the circuit of the disconnect lamp W. The lamp 66 will be operated during this period, but the lamp W will not be operated, because its circuit is open at 31.

The operator then signals the subscriber at B by operating the keys I' and I'', which are preferably mechanically connected together, so that they are operated together. The operation of I'' closes the circuit of the ringing relay Q, as follows: ground 68—I''—conductor 69—switch 70—conductor 71—now closed switch 50—switch 72—relay Q—conductor 73—65—13₃—to ground 55. The magnet of the relay Q is energized, first closing the switch 75 and completing a locking circuit for said relay through the conductor 76 to ground 77, the relay now being energized independently of the contacts of the key at I''. The magnet of Q also opens the switches 78 and 79, thereby interrupting the strands of the cord circuit and closes the switches 80 and 81, completing the ringing circuit, which is as follows: ground 82—ringing machine U—commutator H—contacts of the key I'—the conductor 83—magnet of the relay R—conductor 84—the contacts of the switch 80—through the switch E—over the conductor 85—the signal 86—the conductor 87—back through the switch E—through the switch 81—conductor 88—battery 89—to ground at 90. The commutator H in a well known manner interrupts this ringing, so that the ringing is applied at intervals until the subscriber responds. The response of the subscriber will change the character of current flowing through the relay R in such a manner that the same will be operated, interrupting the circuit of the relay Q, which releases its contacts, restoring them to the condition illustrated in the drawing. The magnet of the relay M' is then operated over the following circuit: ground at 91—winding 92 of the magnet of M'—the conductor 93—through the switch E and over the called line—back through the switch E—through the conductor 94—the winding of the magnet of M'—the battery 96—to ground at 97. This magnet opens the switch 72 in the circuit of the relay Q, so that the ringing current will not be accidentally placed upon this line.

The magnet M' also opens a switch 99 in the circuit of the signal 66, thereby extinguishing the same. Conversation now takes place between the subscribers at A and B over the limbs of the calling line I—the contacts of the switching device D—the strands 36 and 37 of the cord—the contacts of switching device E and the called line III, battery

being supplied from the source 13₂ in the manner already described. At the termination of the conversation, the subscribers restore their substation sets to the condition illustrated in the drawing, which as will be appreciated from the previous description, will interrupt the circuits of the magnets M and M', restoring the circuit of the signal 66, which operates, indicating to the operator that the conversation is completed. The deenergization of the magnet of the relay M closes a switch 47 in the circuit of the magnet K, conditioning that magnet for operation by the subsequent action of an operator, which will later be described. Second, the deenergization of the magnet of M opens permanently the circuit of the relay Q at 50 and the circuit of the magnets of the relays N and L at 48, deenergizing the same. The deenergization of L interrupts the circuits of the magnets T and M and completes the circuit of the disconnect lamp W, as follows: 18₁—13₁—31—conductor 100—67—W—conductor 101—switch 102—to ground 103. The illumination of the lamp W indicates to the operator that the conversation is completed. It frequently happens that the operator does not immediately take down the connections, that is, withdraw the plugs from the jacks to restore the system to normal preparatory to making future connections, and it also frequently happens that during this interval, the subscriber desires a recall, that is, desires an immediate connection. In most systems now in vogue, the magnet of the relay N would continue to be actuated, so that the subscriber at A is still disconnected from his line lamp. As will be seen, however, in my system, the relay N is deenergized when the conversation is completed, so that the subscriber can immediately thereafter actuate the line lamps X and x, as previously described.

Assuming that the subscriber at A desires a recall and as soon as the conversation is completed again closes the switch 9, the line lamps will be actuated, as previously described, and assuming that a second operator answers this call by inserting the plug *p* of the cord circuit C' into the jack *j*, the relays N and L' will be operated over the following circuit: 18—magnet of N—4—5—4'—6—conductor 104—magnet of L'—battery 105—to ground 106. Thence forward the operation will be the same as described in connection with the cord C. In addition to the completing of the circuit of the relay N, a circuit will be completed for the relay K as follows: ground 110—magnet of K—conductor 111—switch 47—switch 64—26—23—4—5—4'—6—104—magnet of L'—105—to ground 106. The magnet of K will be energized, interrupting the strands of the cord circuit C at 42 and 43, and connecting the commutator G

in the circuit of the disconnect lamp W, which will be flashed, giving a special signal to the operator, indicating to her that another operator has answered the recall of the subscriber at A. Should, however, the operator controlling the cord C desire to answer the recall of the subscriber at A, the key O is operated, closing a circuit through the magnet of the relay L as follows: 18₁—13₁—L—29—120—121. L closes the circuit through M at 34 and 35. M will be energized over the circuit already described, closing a circuit for the relay N, as follows: 18—N—4—23—26—3—48—49—29—120—to ground 121. The operation of O also closes a circuit for the magnet of the relay T, as follows: 124—123—122—33—52—T—to 51. Otherwise, the operation will be the same as previously described. However, after the operation the magnet T is deenergized and the operator's set F is disconnected from the cord, when the relay L' is operated, by the opening of the circuit of the relay T at 54, in case the key O is released.

It will be readily appreciated that when the plugs of the cord C are withdrawn, the apparatus will be returned to the condition illustrated in the drawing, unless the plug of some other cord is in one of the jacks of the line I, when, of course, the apparatus of that cord will be in the conditions described in that particular stage of operation in which it exists at the time such plugs are withdrawn. If the conversation taking place over the connections put up through the cord C', as a result of a recall, is terminated, and the operator controlling the cord C' withdraws the plug *p* from the jack *j* while the cord C is still connected to the line I, the magnets of the relays K and N will again be deenergized, restoring their switches to the conditions illustrated in the drawing. This, however, will not take place in the embodiment illustrated in Fig. 2, since in that embodiment the relay K, having been once energized by the insertion of the plug *p*₁ into the jack *j*₁, a locking circuit is completed for the relay K₁, as follows: ground 200—switch 201—conductor 202—magnet of K₁—switch 203—conductor 204—switch 205—conductor 206—battery 207—to ground 208, so that the interruption of the strands of the cord C₁ prevails after the plug *p*₁ is withdrawn from the jack. Should the operator controlling the cord C₁ answer a subsequent call or recall, this locking circuit of the magnet of the relay K₁ will be broken at 201 and a coil 220 will be placed across the cord circuit. The other steps in the operation of the embodiment shown in Fig. 2 will be clear from the description of the operation of the embodiment shown in Fig. 1.

I have illustrated these two embodiments of my invention and the details thereof for the purpose of better illustrating and describing my invention. I do not wish to be limited to such embodiments or details as it will be apparent to those skilled in the art that many departures may be made therefrom without departing from the spirit of the invention.

10 I claim:—

1. In a telephone system, the combination of a main station, a plurality of telephone lines leading to the main station, a substation on one of said lines, a plurality of telephone line interconnecting mechanisms at the main station for connecting said telephone line to other lines for conversational purposes, each mechanism including a talking strand and means jointly controlled by one of said mechanisms and said substation for interrupting the strand of another of said mechanisms.

2. In a telephone system, the combination of a plurality of telephone lines, substations on said lines, a plurality of similar telephone line interconnecting mechanisms for connecting telephone lines together for conversational purposes, each mechanism including a plurality of talking strands and means controlled by each of said mechanisms for interrupting the strands of another of said mechanisms, pre-connected to the same telephone line as said first-named mechanism.

3. In a telephone system, the combination of a telephone line, a substation on said line, a plurality of similar telephone line interconnecting mechanisms for making connection with said telephone line for conversational purposes, each mechanism including a talking strand and an electromagnet controlled by one of said mechanisms for interrupting the talking strands of another pre-connected mechanism.

4. In a telephone system, the combination of a telephone line, a substation on said line, interconnecting cord circuits for connecting telephone lines together for conversational purposes, switching apparatus for directly connecting each cord to a telephone line and means controlled by such switching apparatus of a second connected cord circuit for causing the automatic interruption of the talking strands of another cord circuit when such switching apparatus is operated.

5. In a telephone system, the combination of a plurality of telephone lines, substations on the lines, a main station, a plurality of cord circuits at the main station for connecting telephone lines together, each cord circuit including a plurality of talking strands, switching apparatus for connecting the cord circuits to telephone lines, disconnecting relays for interrupting the talking

strands of the cord circuits and means controlled by the switching apparatus at one cord circuit for automatically causing the operation of the disconnect relays of other cord circuits connected to the telephone line to which said last-named cord circuit is connected at the time such connection is made.

6. In a telephone system, the combination of a plurality of telephone lines, substations on said lines, an interconnecting mechanism for connecting telephone lines together for conversational purposes, said mechanism including a plurality of talking strands, a disconnect relay for interrupting said talking strands, means controlled by a subscriber for conditioning said relay for operation when the subscriber retires, a second telephone line interconnecting mechanism, and means controlled by said second interconnecting mechanism for causing the operation of said disconnect relay when said second mechanism is connected to a telephone line to which the first mechanism is first connected.

7. In a telephone system, the combination of a calling telephone line, a first and second cord circuit, a switch for connecting the first cord circuit to the telephone line, said cord circuit including a talking strand, a disconnect relay for interrupting the talking strand, means controlled by the subscriber on the telephone line for conditioning said disconnect relay for operation when the subscriber thereon retires and means controlled by said second cord for causing the operation of said disconnect relay when the second cord circuit is subsequently connected to said telephone line.

8. In a telephone system, the combination of a calling line, a cut-off relay for the calling line, a cord circuit, a switch to connect the cord circuit to the calling line, means controlled by the subscriber on the calling line for causing deenergization of the cut-off relay when a subscriber on the calling line retires, a second cord circuit, means controlled by the second cord circuit for causing the reenergization of the cut-off relay when the second cord circuit is connected to the calling line and a disconnect relay for interrupting the talking strands of the first cord circuit controlled by means of the second cord circuit.

9. In a telephone system, the combination of a main station, telephone lines leading to the main station, telephone line interconnecting mechanism at the main station for connecting telephone lines together, said mechanism including talking strands and means under the joint control of two main station operators whose mechanisms are connected directly to said telephone line and a telephone line subscriber for interrupting the talking strands of the connecting mecha-

nism without disassociating said mechanism from the telephone lines.

10. In a telephone system, the combination of telephone lines, telephone line inter-
5 connecting mechanism for connecting telephone lines together for conversational purposes, said mechanism including talking strands and means under the joint control of two operators whose mechanisms are con-
10 nected directly to said telephone line and a telephone line subscriber for interrupting the talking strands without disconnecting the mechanism from the telephone lines.

11. In a telephone system, the combination of a main station, a plurality of telephone lines leading to the main station, a cord circuit at the main station including a plurality of talking strands, an operator's set and devices to connect said set to the
15 cord, switches adapted when closed to connect the cord circuit to telephone lines and when opened to disconnect the cord from telephone lines and means under the joint control of the subscriber and two main station operators, independent of said devices,
20 for interrupting the talking strands of the cord circuit without opening said switches.

12. In a telephone system, the combination of telephone lines, subscribers' stations on said lines, a plurality of operators' cord circuits, switches for connecting the cord circuit (A) to the telephone lines, said cord including talking strands, electromagnets under the joint control of the subscriber
25 and two operators' cord circuits for interrupting the talking strands of the cord circuit (A), thereby disconnecting the operative parts of the cord circuit from the telephone line.

13. In a telephone system, the combination of a telephone line, a connected cord circuit, a relay for interrupting one or more strands of the cord circuit, means controlled by said subscriber for conditioning said relay for operation when said subscriber's
35 substation apparatus is retired, a second subsequently connected cord circuit and means controlled by means of the second cord circuit for causing the operation of said disconnect relay when the second cord circuit is connected to the telephone line.

14. In a telephone system, the combination of a subscriber's telephone line, a cord circuit, a disconnect relay for interrupting
40 one or more strands of said cord circuit, means controlled by the subscriber for conditioning said disconnect relay for operation upon the retirement of said subscriber and means separate from the above-mentioned cord circuit controlled by an operator
45 for causing the operation of said disconnect relay.

15. In a telephone system, the combination of a main station, an operator's cord
50 circuit including a plurality of talking

strands, a disconnect relay for interrupting the talking strands of the cord circuit, means controlled by a subscriber on a telephone line for conditioning said relay for operation and mechanism subsequently controlled by a second operator for causing the operation of
70 said disconnect relay.

16. In a telephone system, the combination of a telephone line, operators' telephone line interconnecting mechanism including a plurality of talking conductors, a disconnect relay for interrupting said conductors, means controlled by a subscriber on a telephone line for conditioning said relay for operation, a second connected telephone
75 line interconnecting mechanism and means controlled by said second connected mechanism for causing the operation of said disconnect relay.

17. In a telephone system, the combination of a telephone line, an operator's telephone line interconnecting mechanism, means for operatively disconnecting said mechanism from said telephone line, apparatus controlled by a subscriber on a telephone line for conditioning said means for
80 operation, a second connected telephone line interconnecting mechanism, and devices controlled by said second connected mechanism for causing the operation of said disconnect means.

18. In a telephone system, the combination of a telephone line, a subscriber controlled switch in said line, a cord circuit for interconnecting telephone lines including a plurality of talking strands, a disconnect relay for interrupting said talking strands, means including said subscriber controlled switch for conditioning said relay for operation, a second cord circuit and
85 mechanism for causing the operation of said disconnect relay when the second cord circuit is connected to the telephone line.

19. In a telephone system, the combination of a telephone line, a cut-off relay for said line, a cord circuit, a disconnect relay in said cord circuit adapted to interrupt the talking strands of the cord circuit, a switch for connecting the cord circuit to a telephone line, means for connecting said relays in multiple to a contact of said switch, a second cord circuit and means including a source of current for completing a circuit for each of said relays when the second cord circuit is connected to the telephone line.
90

20. In a telephone exchange system, subscribers' lines, means under control of an operator for interconnecting the lines, similar switching mechanism for connecting said means to a line and apparatus controlled jointly by a subscriber and by an operator independently of said mechanism for severing in two parts the operator's interconnecting means.
95

21. In a telephone system, the combination 130

of telephone lines, a substation set including a subscriber's switch on one of said lines, a cord circuit for interconnecting said lines, an operator's set associated with said cord, 5 devices to connect said set to said cord, a plug and jack switch for connecting the cord to a line and apparatus independent of said devices controlled jointly by said subscriber's switch and another operator than the one 10 for whom said set is provided independently of said plug and jack switch for severing in two parts the operator's interconnecting cord.

22. In a telephone system, the combination 15 of a main station, telephone lines leading to the main station, substations on said lines, a plurality of cord circuits at the main station, each cord circuit including one or more talking strands, a relay in a connected cord circuit for interrupting its talking strands, and 20 a circuit for said relay including a portion of its cord circuit without any source of current therein, and a portion of a subsequently connected cord circuit including a 25 source of current.

23. In a telephone system, the combination of a main station, a plurality of telephone lines leading to the main station, substations on said lines, a plurality of cord circuits at 30 the main station for connecting telephone lines together, each cord circuit comprising a plurality of talking strands and a third conductor, a relay for interrupting the talking strands of a first-connected cord and a 35 circuit for said relay including portions of the third strand of a plurality of said cord circuits and closed automatically when a plurality of cord circuits are connected to the same line.

40 24. In a telephone system, the combination of a main station, a plurality of telephone lines leading to the main station, substations on said lines, a plurality of cord circuits at the main station for connecting telephone 45 lines together, each cord circuit comprising a plurality of talking strands and a third conductor, a relay for interrupting the talking strands of a first-connected cord and a circuit for said relay including portions of 50 the third strands of a plurality of said cord circuits, and means under the control of a subscriber governing said circuit.

25. In a telephone system, the combination of a telephone line, a substation on said line, 55 a plurality of telephone line interconnecting mechanisms, one of which is a first-connected mechanism and includes a talking conductor, a relay for interrupting said conductor, a circuit for said relay including portions of a 60 plurality of said mechanisms and means governed by a subscriber on said line controlling said circuit.

26. In a telephone system, the combination of a telephone line, a substation on said line, 65 a plurality of cord circuits, one of which is a

first-connected cord circuit, for connecting telephone lines together, switches for connecting the cord circuits to the telephone lines, each cord circuit comprising a plurality of talking strands, means independent 70 of said switches for interrupting the talking strands of a first connected cord circuit, and a circuit for said means including portions of a plurality of said cord circuits.

27. In a telephone system, the combination 75 of a telephone line including line conductors and the contacts of a subscriber's receiver hook switch, a cord circuit including talking strands, a plug and jack switch for connecting the cord to the telephone line, a 80 relay having contacts in the cord circuit, said relay adapted when actuated to interrupt the talking strands of the cord circuit, thereby severing the cord and leaving the plug in the jack, a circuit for said relay, a 85 second relay controlling the circuit of the first relay, a circuit for the second relay including the line conductors and contacts of the switch hook, a disconnect signal, a circuit for said signal and a commutator and 90 means controlled by said first-named relay to connect the commutator in the circuit of the disconnect lamp.

28. In a telephone system, the combination of a subscriber's telephone line, an 95 operator's telephone line interconnecting means, a switch for connecting said line and means together, apparatus under the joint control of a subscriber and two operators for 100 disconnecting said means from said line for operative purposes, without disturbing said switch.

29. In a telephone system, the combination of a subscriber's telephone line, a subscriber's telephone on said line, a line signal 105 associated with said line at a main station, subscriber controlled means to operate said line signal, operators' connecting means to connect said telephone line to other telephone lines, said connecting means having 110 talking strands and a relay, said relay being adapted when operated to interrupt said strands, means controlled by the main station operator in the act of making connection with the telephone line to remove the 115 control of the line signal from the subscriber and means under the control of the subscriber to restore the control of the line signal to the subscriber, and means to operate said relay to interrupt said talking strands, said means including a switch in the circuit of a second operator's connecting means.

30. In a telephone system, a telephone line, substation apparatus on said line, a line signal associated with said line, manually operated 125 connecting means to connect said telephone line with other telephone lines, said manually operated connecting means adapted when operated to remove the control of the line signal from the substation appa- 130

ratus, electromagnetic means under the control of the subscriber for restoring said control of said line signal to the subscriber, a second manually operated connecting means 5 to connect with the telephone line to which said first named connecting means has been previously connected, and means including a circuit including a portion of said second named connecting means to disconnect the 10 talking strands of said first named operator's connecting means.

31. In a telephone system, the combination of a subscriber's telephone line, an operator's telephone line interconnecting 15 means, a switching terminal associated with said line, a second switching terminal associated with said interconnecting means, means associated with said interconnecting means for placing a busy potential upon said 20 first named switching terminal, subscriber's controlling apparatus for removing said busy potential from said switching terminal, means for severing the talking strands of said interconnecting means, said means including a circuit which includes in part 25 a portion of a second interconnecting means subsequently associated with the telephone line.

32. In a telephone system, a cord circuit, 30 a line circuit and a second cord circuit, a switch to connect said first named cord cir-

cuit to said line circuit, a substation connected to said line circuit, electromagnetic apparatus in said cord circuit under the control of said sub-station apparatus, a disconnect 35 signal controlled by said substation apparatus and associated with said first named cord circuit, and a switch to subsequently associate the said second named cord circuit with said telephone line, and means asso- 40 ciated with said first named cord circuit to alter the character of the disconnect signal when said last named switch is operated.

33. In a telephone system, the combination of a telephone line, including subscribers' 45 substation apparatus, line signal apparatus associated with said line and normally under the control of the subscriber, telephone line interconnecting mechanism and a switch for connecting said mechanism to said line, 50 means actuated when said switch is closed to remove the control of said line signal apparatus from the subscriber, apparatus for restoring the control of the line signal apparatus to the subscriber when the subscriber 55 retires, without disconnecting said mechanism from said line, and apparatus controlled by a second operator for operatively disconnecting said mechanism from said line.

I have hereunto signed my name this 12th 60 day of July, 1915.

FRANK M. SLOUGH.

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