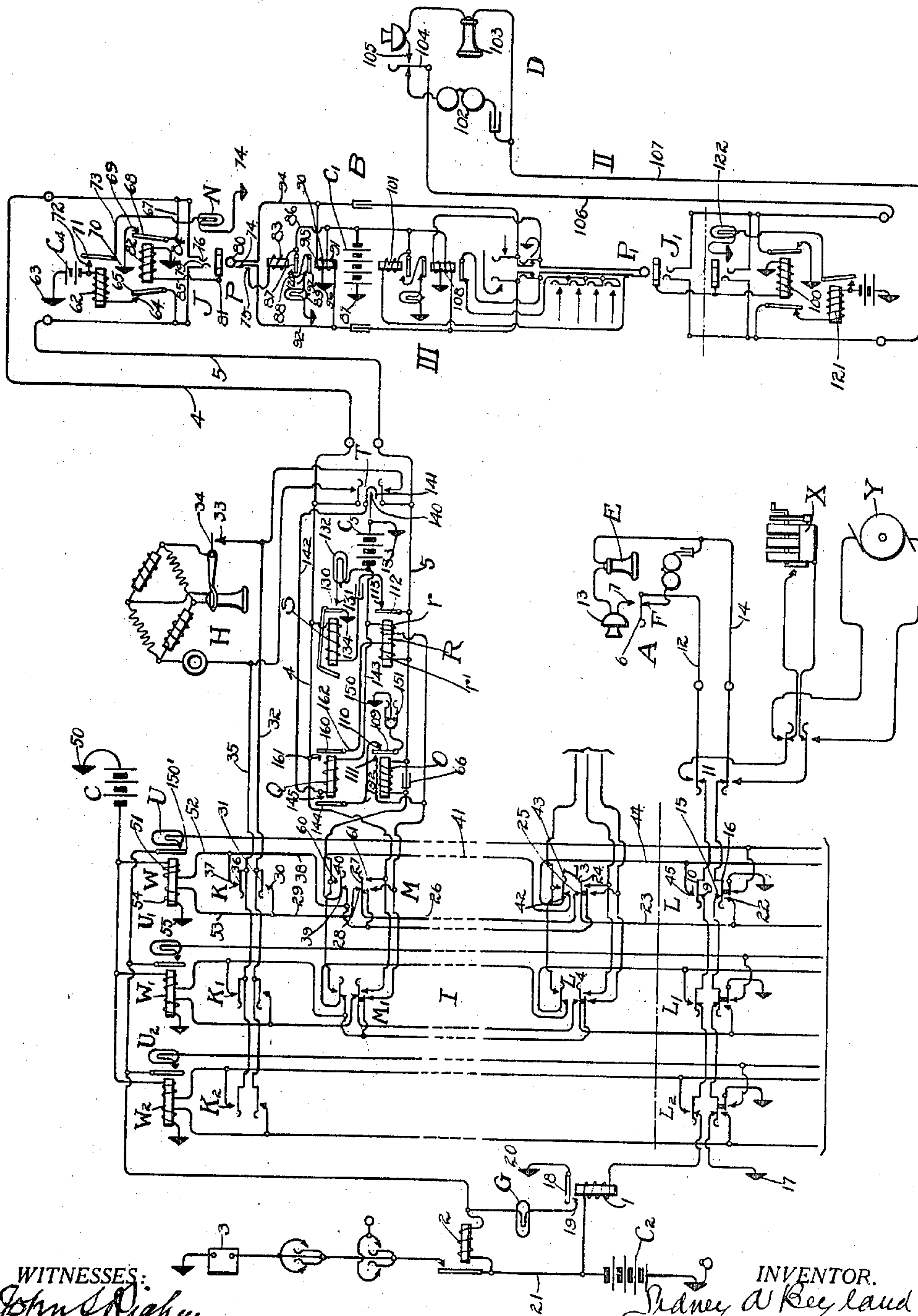


S. A. BEYLAND.
TELEPHONE SYSTEM.

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WITNESSES:

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TO STROMBERG-CARLSON TELEPHONE MFG. CO., OF ROCHESTER, NEW YORK, A COR-
PORATION OF NEW YORK.

TELEPHONE SYSTEM.

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To all whom it may concern:

Be it known that I, SIDNEY A. BEYLAND, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, 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 improvements in telephone systems, and especially to the type of system which is known as a house or intercommunicating system from the fact that it is especially adapted to be used where all of the stations associated therewith are within the curtilage, but which is adapted to be placed in communication with other systems through suitable means, such as trunking connections.

One of the objects of my invention is to place the supervision in the trunking connection under control of the subscriber in the intercommunicating system.

Another object of my invention is to provide means whereby the local battery in the intercommunicating system is employed for all purposes in connection with local calls and the regular battery in the main exchange employed for all purposes in connection with the trunking call, except possibly the supervisory signaling between the intercommunicating substation and attendant station.

Other objects of my invention and the invention itself will probably be better understood from a description of an embodiment thereof.

The figure shows diagrammatically one embodiment of my invention.

The private branch exchange system is shown generally at I. The main station of the general telephone system is shown at III and at II is shown a telephone line representing one of a number of lines connecting the main station with the substations. At A I illustrate in detail one of a number of substations in the intercommunicating system. At H is indicated the operator's set of a special station, known as the attendant station, which is provided with means for controlling the trunking connections to the main exchange at III. Various apparatus is as-

sociated with the attendant operator's set at her station, consisting of ringing means X and Y, line lamp G, line relay 1, pilot relay 2, pilot signal 3, the switches L, L₁, L₂, L₃, L₄, M, M₁, K, K₁, K₂, lamps U, U₁, U₂, relays W, W₁, W₂, and the apparatus illustrated in the left-hand end of the trunk line 4—5. The apparatus in the right-hand end is located at the main station III, as is the cord circuit B and the apparatus in the left-hand side of the line II.

The character of the individual pieces of mechanism employed in the embodiment illustrated will be clear from the symbols employed in the diagram to represent these elements, and the invention will probably be better understood, as well as its functions, from a description of the operation, which is as follows:

Assuming, first, that the subscriber at A desires to communicate with the subscriber at D, the subscriber at A removes the receiver E from the hook switch 6, which being spring pressed upward, rises and engages the contact 7, completing a circuit through the relay 1, as follows: ground at 8—battery C₂—relay 1—contacts 9 and 10 of the switch L—contacts of the key 11—the conductor 12—6—7—transmitter 13—E—conductor 14—the contacts 15 and 16 of the key L through the contacts of the keys L₁ and L₂, to ground at 17. The relay 1 attracts its armature 18, closing the switch 18—19 and a circuit through the lamp G, as follows: ground 20—18—19—G—2—conductor 21—battery C₂—to ground 8. This will energize the relay 2 and complete a circuit through the night alarm signal 3, as will be apparent. The lamp G will be lighted and will be perceived by the attendant, who will operate the keys K and L, placing her set at H in communication with the subscriber at A, over the following circuit: beginning at contact 7 of the station A—7—13—E—14—16—22—conductor 23—contacts 24 and 25 of the key L₃—conductor 26—contacts 27 and 28 of the key M—conductor 29—contacts 30 and 31 of the key K—conductor 32—now closed contacts 33 and 34—the substation set at H—conductor 35—contacts 36 and 37 of key K, conductor 38—contacts 39 and 40 of key M—conductor 41—contacts 42 and 43 of key L₄—conductor 44—contacts

45 and 10 of the key L— 12— 6 back to 7. This circuit will receive current from the battery C as follows: ground at 50— winding 51 of W— conductor 52 on one side—
 5 conductor 53— winding 54 of W to ground at 55. Over this circuit the attendant at H learns that it is the subscriber at B that is wanted. She accordingly operates the key M which disconnects her set H from the
 10 subscriber at A at 39—40 and 27—28 and connects the subscriber at A to the trunk 4 and 5 at the contacts 40, 60 and 27, 61. A circuit will then be completed through the line relay 62 at the main station III as follows: 63— battery C₁— 62— contacts 64—
 15 65— conductor 5— the relay O and condenser 66 in multiple— the contact 60— 40— 41— 44— 12— substation set at A— 14— 23— 26— 27— 61— conductor 4— 67— 68—
 20 69— ground 70. The relay 62 will attract its armature 71, closing a switch 71—72, completing a circuit through the lamp N as follows: 63— C₁— 72— 71— 73— N— ground 74. The lamp N will be energized,
 25 and being observed by the operator at III, the plug P is inserted into the jack J, the tip 80, the sleeve 74 and the ring 75 engaging, respectively, with the tip spring 76, the ring spring 79, and the sleeve 81
 30 of the jack. A circuit will be completed through the cut-off relay 82 and the sleeve supervisory relay 83, as follows: ground 84— 82— 85— 81— 75— 83— 86— battery C₁— to ground 87, energizing the relays 82
 35 and 83. The relay 82 attracts its armatures 65 and 68, cutting off the line signal and lamp from the line, and the relay 83 attracts its armature 87, closing a switch 87— 88 in the circuit of the supervisory lamp
 40 89, which would be energized except that at the same time a circuit is completed through the relay 90, as follows: 87— C₁— winding 91 of relay 90— side 92 of the cord— 74— 79— 5— through the intercom-
 45 municating system over the same circuit as described in connection with the operation of the line relay 62, which includes the talking bridge at the station A— back over the side 4 of the trunk— 76— 80— 94—
 50 the winding 95 of the relay 90— to ground at 96. The relay 91 attracts its armature 97, opening up the circuit of the lamp 89 and preventing the energization thereof at this time. The operator at III now bridges
 55 her set across the cord, and is thereby placed in communication with the person at A over the same circuit as described in connection with the supervisory relay 90, except as to the bridge at station III.
 60 Having learned that it is the station at D that is wanted, the line II is tested in the well known way, by well known apparatus, and having been found idle as we will assume, the plug P₁ is inserted into the jack

J₁. This will cause the operation of the cut-off relay 100 and the supervisory relay 101 65 in the same manner as described in connection with these relays in the other end of the cord circuit. The operator will then actuate the bell 102 at the substation D, 70 through any convenient means, and when the operator at D responds, she removes her receiver 103 from the hook 104, which being spring pressed upward, will engage the contact 105, completing a circuit through the 75 talking set at the station D. The talking set at D will now be in circuit with the station at A over the sides 106 and 107 of the line II— the talking strands of the cord— the sides 4 and 5 of the trunk and 80 through the intercommunicating system over the same circuit as described in connection with the operation of the line relay 62, current being supplied by the battery C₁ through the coils of the supervisory relays 85 108 and 90.

During these periods the relay O will be actuated by current passing over the trunk, attracting its armature 109 and opening a switch 109—110 and closing a switch 90 110—111 through the winding *r* of the relay R, which will cause the attraction of the armature 112, opening the switch 112— 113 and opening the bridge of the drop signal S. The opening of the switch 109— 95 110 broke the locking circuit of relay Q. When the conversation is terminated, the subscriber at A replaces the receiver E upon the hook switch 6, breaking the circuit previously described, which includes the con- 100 tacts 6 and 7 and the relay 90. The relay 90 will be deenergized, letting go the armature 97, which will close a circuit 97—120 in the circuit of the lamp 89, which will be lighted indicating to the operator at the 105 station III that the subscriber at A has finished, whereupon the plug P will be withdrawn from the jack J and that end of the system restored to normal, the opening of the switch 6—7 breaking the circuit of re- 110 lay O. In the same manner, the calling end of the cord will be released and restored to normal.

Assuming that the subscriber at D desires to communicate with the subscriber at A, the 115 receiver 103 is removed from the hook 104, which as explained, will engage the contact 105 and a circuit will be completed through the line relay 121, which will cause the actuation of the line lamp 122 in the same 120 manner as was previously described in connection with the line relay 62 and lamp N. Observing the burning of the lamp 122, the operator at III will insert the plug P into the jack J₁, causing the energization of the 125 cut-off relay 100 and supervisory relay 83, as previously described in connection with the other line circuit. For the same reasons

as stated before, the lamp 89 will not be lighted, owing to the energization of the relay 90. When the operator at the station III learns that it is the station A that is wanted, she will insert the plug P_1 into the jack J, operating the cut-off relay 82 and the supervisory relay 101, as will be apparent from the description of the other portion of the system. Ringing current is then applied to the trunk line by bridging a ringing machine across the calling end of the cord in the well known manner. The ringing current will flow from the tip of the cord over the side 4 of the trunk—the drop S—switch 113—112—side 5, back to the sleeve side of the cord. The drop S will be attracted, releasing its armature 130, which falls back and closes a switch 130—131 in the circuit of the lamp 132, which will be actuated over the following circuit: ground 133—battery C_5 —132—131—130—ground 134. The attendant at H seeing the lighted lamp 132 operates the key T, bridging her set H upon the cord and at the same time closing a switch 140—141, completing a circuit through the relay Q as follows: Q—142—141—140— C_5 —143. The relay Q will be energized, closing the switch 144—145 and a locking circuit for itself as follows: ground at 150—the key 151—switch 109—110—144—145—relay Q—143—battery C_5 to ground at 133. The attraction of the armature 160 closes a switch 160—161 and completes a holding bridge 162 including the coil r' of the relay R. This is for the purpose of holding the trunk during the calling and connection of the subscriber at A. The attendant at H then depresses the ringing key 11 and operates the bell at the substation A. When the subscriber at A responds, that fact will be indicated by the illumination of the lamp G if the key L has not been depressed, and if the key L has been depressed, the relay W will be energized over a circuit including the conductors 29—26—23—14—substation set at A—12—44—41—38 and the battery C. The relay W will attract its armature 150 and break the circuit of the lamp U. The operator then depresses the key M which places the subscriber in communication with the subscriber at D over the same circuit as previously described when the operation was described in the other direction. The relay O will be energized, as described before, opening the switch 109—110 in the locking circuit of the relay Q, thereby breaking the holding bridge 162.

When the conversation is completed, the subscribers will restore their receivers to the hook and the supervisory signal will be given to the operator at the main station III, as previously described. The operator

will withdraw the plugs from the jacks, restoring the system to normal.

When the subscriber at A desires to communicate with a subscriber in an intercommunicating system, such as at the substation H, the keys K and L are depressed, placing these two parties in communication, as previously described, employing the battery C as a source of talking current.

I have illustrated this particular embodiment of my invention and the form and details of the embodiment and of the apparatus employed therein for the purpose of describing and illustrating one form of my invention. I do not wish to be limited to these forms and details thereof, as I contemplate numerous and extensive departures from such forms and details without departing from the spirit of the invention.

I claim:

1. In a telephone system, the combination of an intercommunicating system, an attendant substation therein, a telephone exchange, a trunk line connecting the exchange to the intercommunicating system, a holding device for said trunk line, apparatus for connecting the attendant's station to the trunk line, electromagnetic mechanism associated with the trunk line controlling the holding device, a circuit for said electromagnetic mechanism governed by said apparatus, locking mechanism for said electromagnetic mechanism, including contacts governed by said electromagnetic mechanism and a trunk relay in said trunk having contacts in said locking mechanism controlled by said trunk relay.

2. In a telephone system, the combination of an intercommunicating system, an attendant substation therein, a telephone exchange, a trunk line connecting the exchange to the intercommunicating system, a holding bridge for said trunk line, a listening key for connecting the attendant's station to the trunk line, a relay associated with said trunk line having contacts in the holding bridge, a circuit for said relay including contacts controlled by said listening key, a locking circuit for said relay, including contacts of said relay and a trunk relay in said trunk having contacts controlled by said trunk relay in the locking circuit of said first-named relay.

3. In a telephone system, the combination of an intercommunicating system, a plurality of substations in said intercommunicating system, including an attendant's station, a subscriber's set at each of said substations, a regular telephone exchange and a trunk circuit connecting said exchange and said intercommunicating system, a trunk relay in said trunk circuit, a holding bridge for said trunk circuit, a relay having contacts in the holding bridge, a circuit for said relay,

means for connecting the attendant's set to the trunk circuit, controlling said relay circuit, and a locking circuit for said relay including contacts controlled by said trunk
5 relay.

In witness whereof, I have signed my

name in the presence of two witnesses this 4th day of September, 1914.

SIDNEY A. BEYLAND.

Witnesses:

GEO. E. ROBERTS,

M. J. ARNDT.

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