F. LUBBERGER.

TELEPHONE EXCHANGE TRUNKING SYSTEM.

APPLICATION FILED NOV. 29, 1909.

1,168,894.

Patented Jan. 18, 1916.

5 SHEETS—SHEET 1.

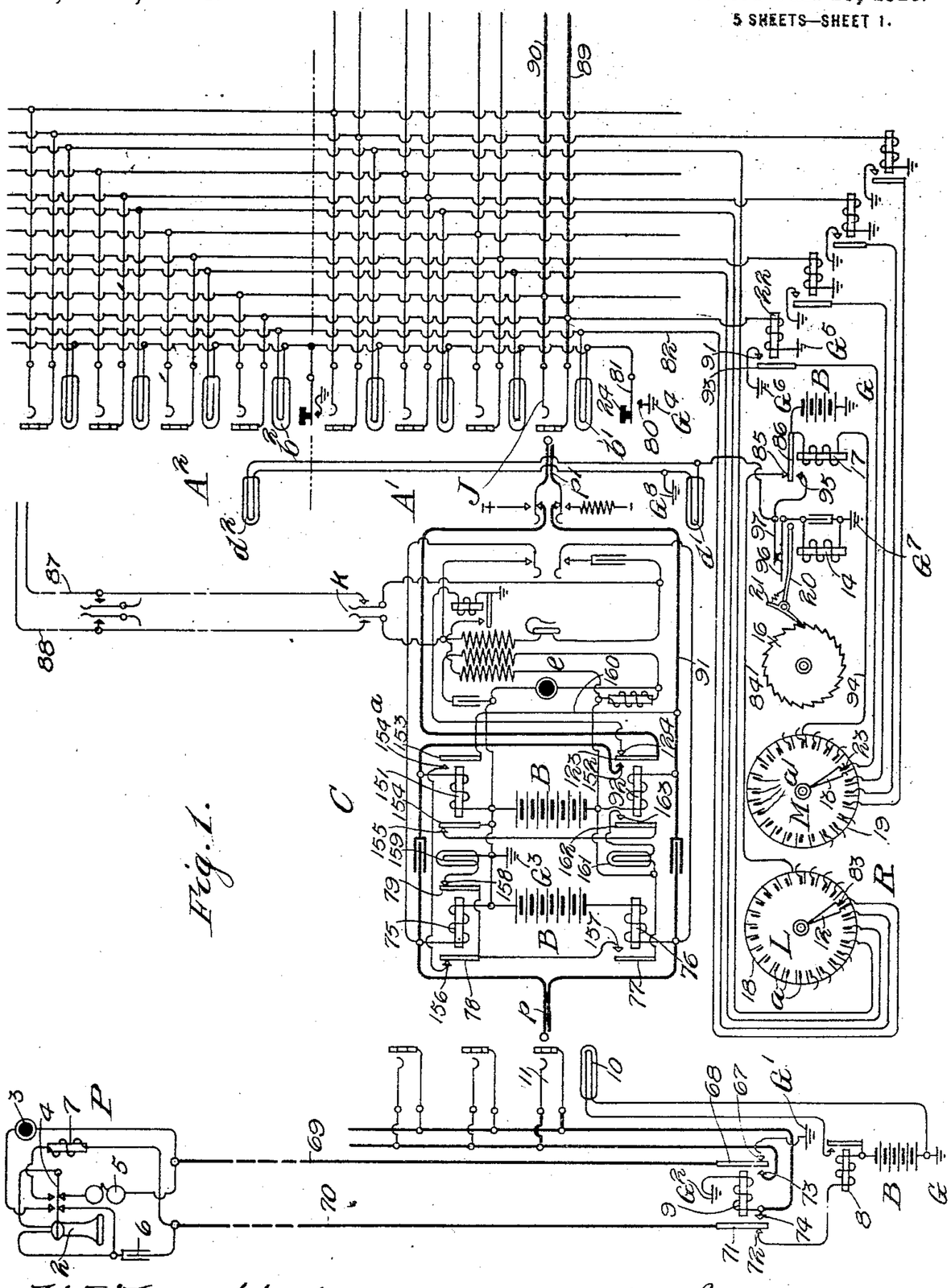

Fig. 1.

Witnesses.

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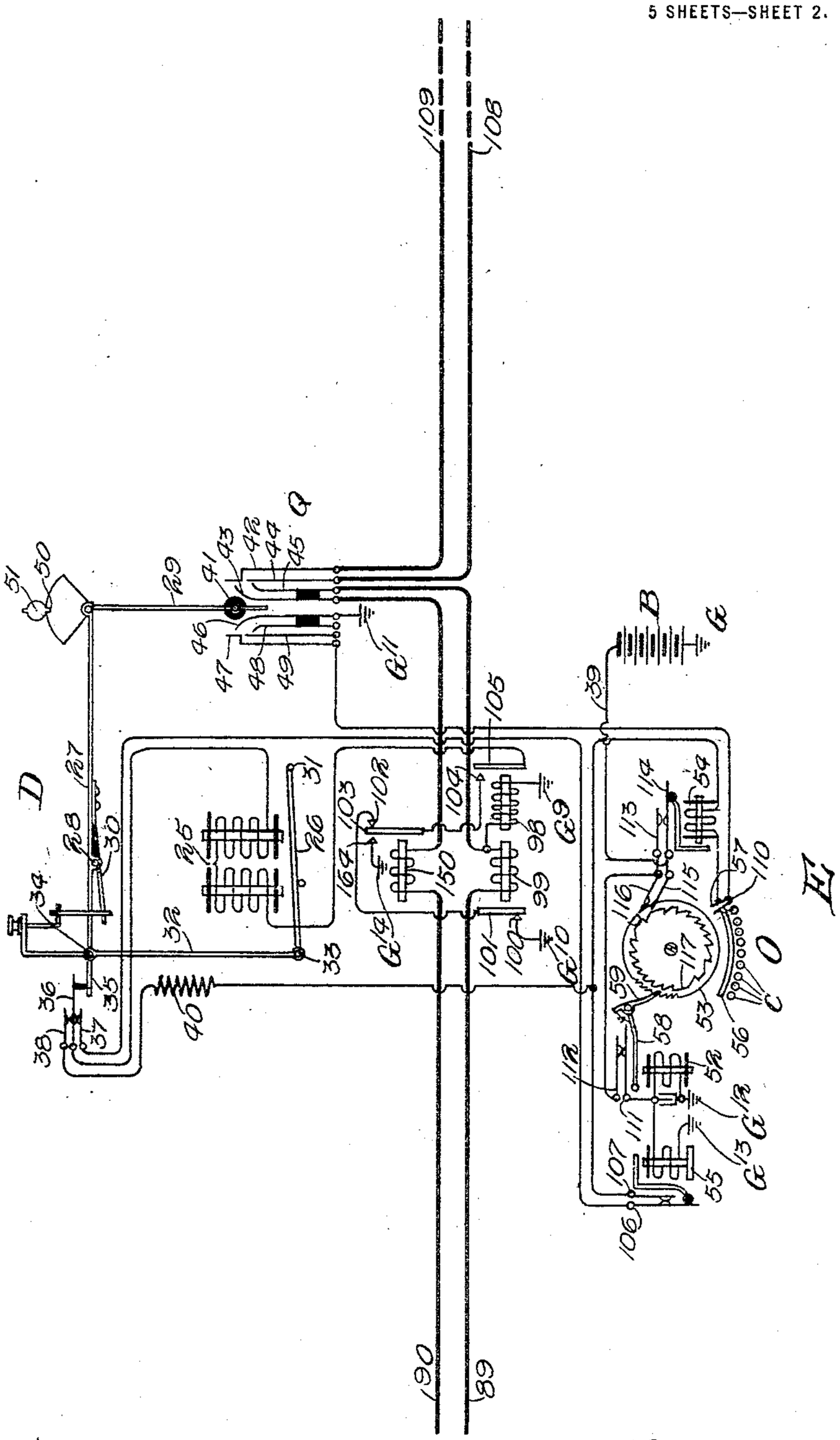

Fig. 2.

Witnesses.

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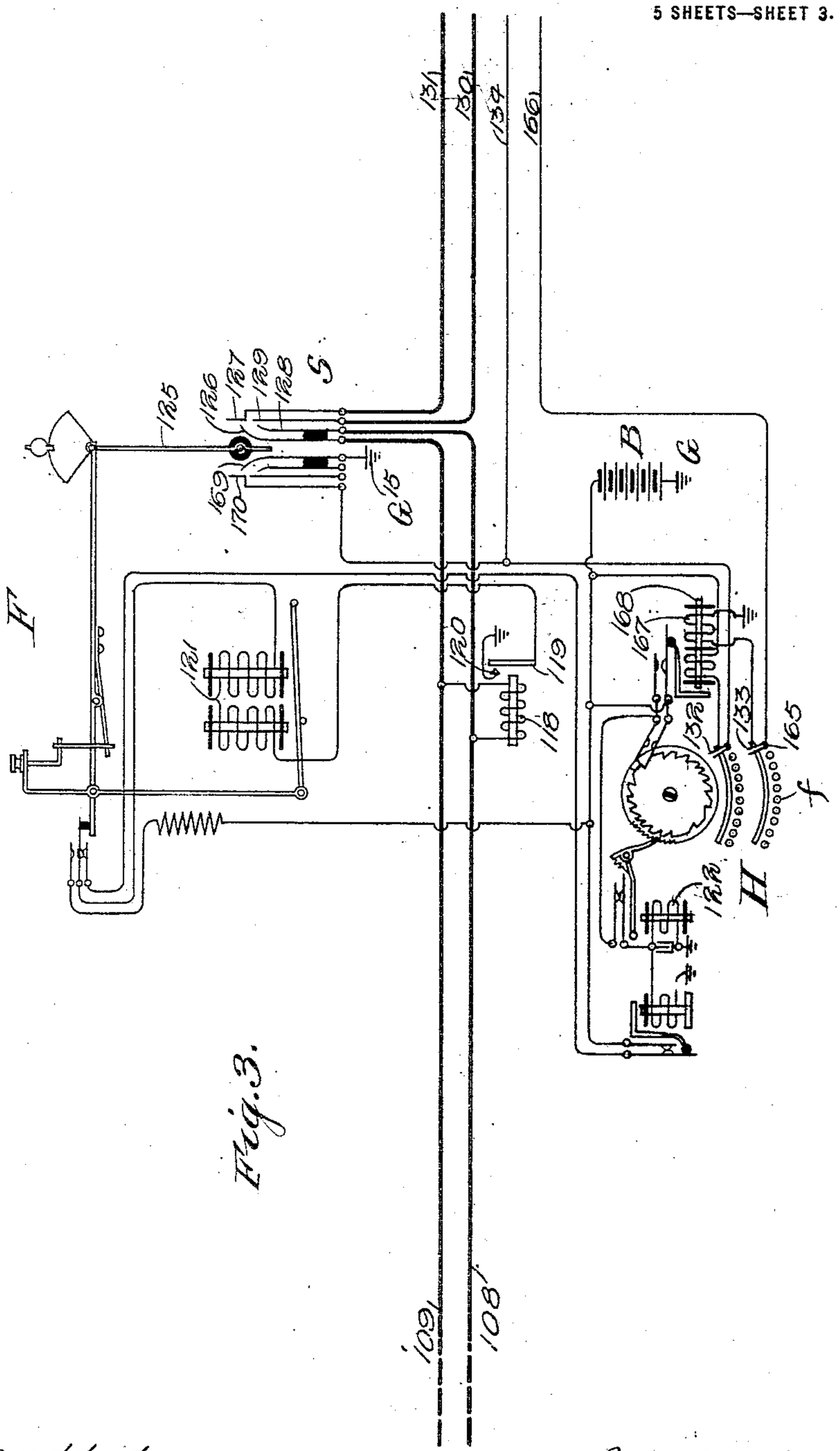

Fig. 3.

Witnesses.
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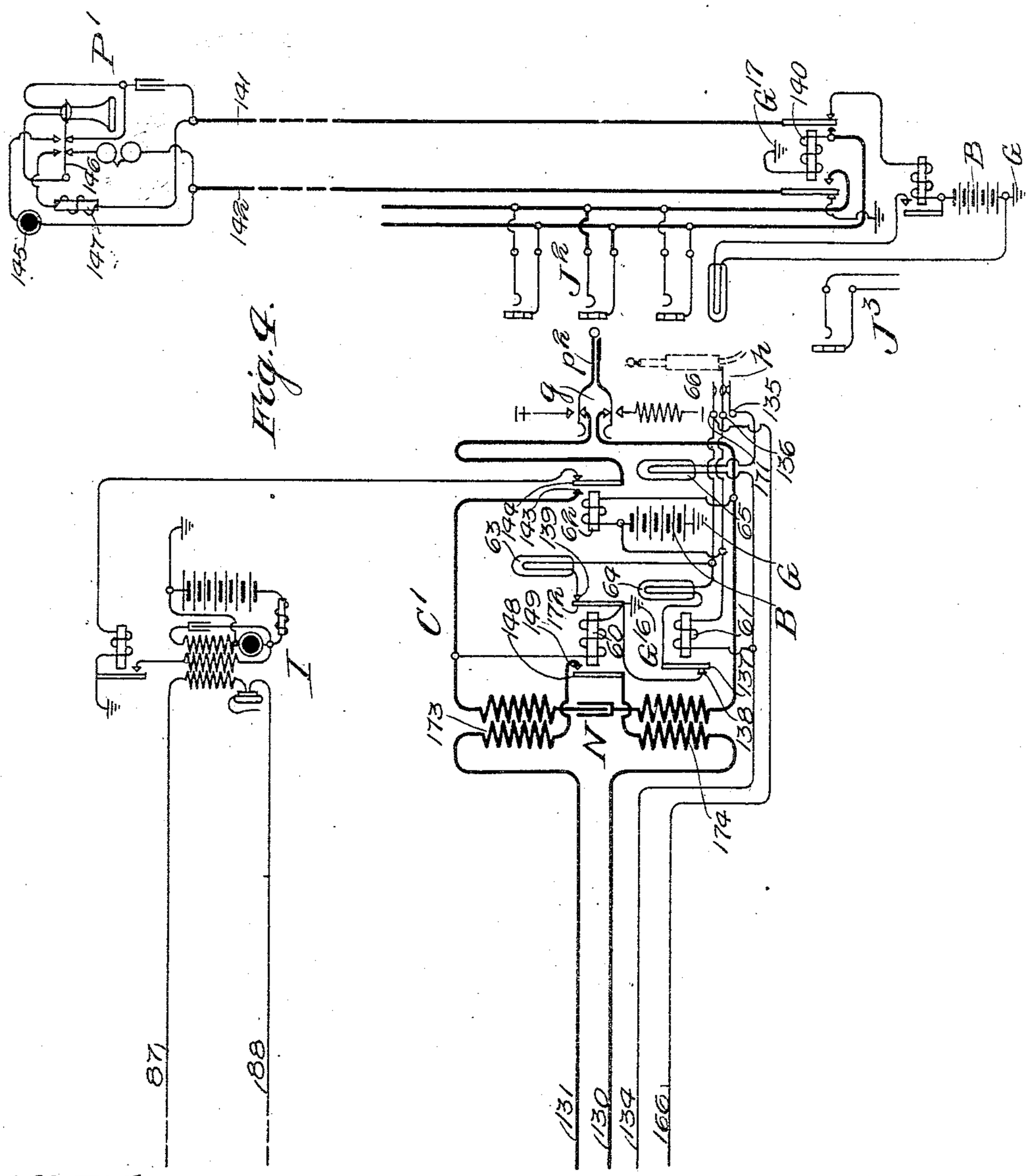

Fig. 4.

Witnesses.

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5 SHEETS—SHEET 5.

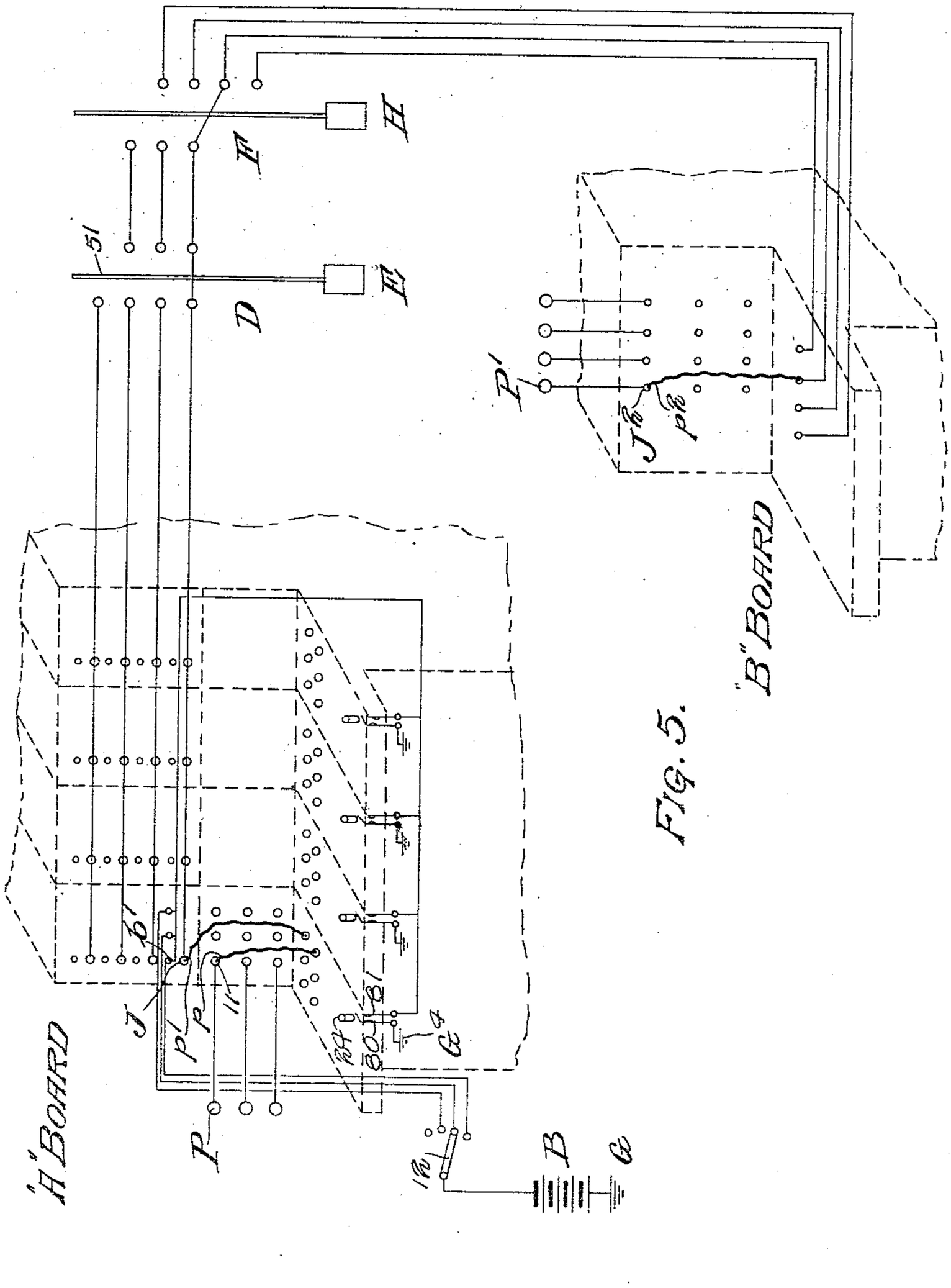

Fig. 5.

Witnesses
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UNITED STATES PATENT OFFICE.

FRITZ LUBBERGER, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE-EXCHANGE TRUNKING SYSTEM.

1,168,894. Specification of Letters Patent. **Patented Jan. 18, 1916.**

Application filed November 29, 1909. Serial No. 530,400.

To all whom it may concern:

Be it known that I, FRITZ LUBBERGER, a subject of the Emperor of Germany, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Trunking Systems, of which the following is a specification.

My invention relates to semi-automatic telephone exchange systems of that kind in which there is provision for automatic trunking between A and B operators, or between different exchanges. In systems of this kind the operator at whose board the call originates plugs into the jack of a trunk leading to a line switch—that is to say, an automatic trunking switch,—and an idle trunk is thereby selected, which trunk may lead to another board in the same exchange, or to another exchange, depending upon the character of the system. At the other board, or at the other exchange, another operator then completes the connection to the line of the called subscriber. It has been found, however, that the trunks between the different boards, or between the different exchanges, are liable to be made busy longer than necessary by reason of the fact that the operators do not always promptly withdraw the plugs from the trunk jacks as soon as the subscribers are through talking. With the arrangements employed previous to my invention the releasing of the trunks was entirely dependent upon the withdrawal of the plugs from the trunk jacks, and if this was not done the trunks were made busy and were not available for other calls.

An object of my invention is, therefore, the provision of an improved construction and arrangement whereby a trunk brought into use by a manual board operator, either automatically or otherwise, is not dependent upon the withdrawal of the plug from the jack, or upon any other act of the manual board operator, but may be released and restored to normal condition by simply hanging up the telephone at one of the two connected substations, whereby the release of a trunk thus brought into use by a manual board operator is under substation control, and whereby the failure of the manual board operator to withdraw the plug from the trunk jack, or to perform any other act, is of no particular consequence, and is not necessary for the restoration of the trunk to normal condition, or to a condition suitable for use in extending other calls.

Another object, and one which is broadly within the contemplation of my invention, is the provision of means whereby a trunk which extends between the boards of A and B operators, or between different exchanges or stations, and which has been selected and brought into use (either automatically or otherwise) by the manual switchboard operator, may be restored to normal condition by the calling subscriber or by the called subscriber, or by both, whereby the said trunk is then available for use in making other calls.

Another object is the provision of an arrangement whereby a manual board operator may know which one of several trunks is idle, consisting of a signal adapted to be displayed for the idle trunk responsive to some act on the part of the manual board operator, such as the operation of a push button or other switch, whereby a positive signal is presented for only one trunk, to-wit, the idle trunk which is at that time available for extending the connection to the called telephone line.

Another object is the provision of an automatic trunk-selecting switch for automatically selecting idle trunks, and a signaling apparatus adapted to coöperate with said automatic trunk-selecting switch, whereby a manual switchboard operator may, by operating a push button or other similar switch, receive a signal indicating the idle trunk selected by the said switch, and whereby the operator may then employ the said automatically selected trunk as a medium for reaching and operating an automatic switch, or as a medium for reaching and communicating with any other kind of switchboard apparatus.

Another object is the provision of a non-numerical trunking switch for selecting idle trunks, subject to control by a manual switchboard operator, and means controllable from a substation (which may be that of either a calling subscriber or a called subscriber) for releasing the said switch, and for thereby restoring the automatically selected trunk to normal condition in case the manual switchboard operator fails to take down the connection by means of which control was exercised over the said switch,

Another object is the provision of an arrangement whereby substation control may be exercised over an automatic switch to disconnect the same from a trunk that terminates in a plug, which substation may be that of the called subscriber, and which automatic switch may be one over which a manual switchboard operator exercised control in the establishment of the calling connection.

It is also an object to provide certain details and combinations and novel features of construction tending to increase the general efficiency of a semi-automatic telephone exchange system, as will hereinafter more fully appear.

In the accompanying drawings Figure 1 represents diagrammatically two A-operators' positions A′ and A² of a manual switchboard, an A-operator's cord circuit C, a device R for indicating idle trunks, and a subscriber's substation P, in a system embodying the principles of my invention. Fig. 2 shows a trunk line switch D and its master switch E of said system. Fig. 3 shows another trunk line switch F with its master switch H of said system. Fig. 4 shows a subscriber's substation P′, a B-operator's cord circuit C′ and telephone set I of said system. Fig. 5 is a diagrammatic representation of two manual switchboards, an A-board and a B-board, showing the arrangement of trunks between them in the system disclosed herein.

In the various figures several batteries B are shown with one pole (preferably the positive) connected to ground G. There may, however, be but one battery, or there may be one battery in each exchange.

The subscriber's substation P, as shown in Fig. 1, is of the usual common battery type and comprises a receiver 2, transmitter 3, switch hook 4, ringer 5, condenser 6 and impedance coil 7. Allotted to the line of substation P at the central office are the line and cut-off relays 8 and 9, line lamp 10 and answering jack 11. The A-operator's cord circuit C is very similar to the usual circuits used for the same purpose in manual switchboards, but is somewhat modified in order to bring about the release of the line switches D and F when the subscribers hang up their receivers. The circuit comprises the usual supervisory relays 75, 151, 76 and 92, lamps 159 and 161 and operator's telephone set *e*.

The device R for indicating idle trunks comprises two bank levels L and M which are engaged by the wipers 12 and 13, a motor magnet 14 for operating the ratchet wheel 16, which latter is designed for operating the wipers 12 and 13, and a relay 17 for controlling the energizing circuit of the motor magnet 14. The bank levels L and M each consist of a common segment 18 and 19 and a set of individual contacts *a* and *a′*. The number of individual contacts in each level corresponds to the number of trunks allotted to the A-board. The wipers 12 and 13 are adapted to keep one contact in each level in electrical connection with the common segment of that level. The motor magnet 14 is provided with an armature 20 upon the end of which is mounted a pawl 21. When the magnet 14 energizes, the pawl 21 operates the ratchet wheel 16, which in turn causes the wipers 12 and 13 to rotate over the bank contacts by means of a suitable mechanical connection (not shown). To each trunk is allotted a relay 22 which, when the plug *p′* is inserted into the jack J of the trunk corresponding to the contact 23 upon which the wiper 13 is resting, operates to close an energizing circuit through the relay 17. The relay 17 in turn operates to energize the motor magnet 14, which operates the ratchet wheel 16 to move the wipers 12 and 13 to the contacts of the next idle trunk. To each jack on the A-board is allotted a signal lamp *b′* which indicates to the operator (when the button 24 is pressed) upon what contact the wiper 12 is resting, and therefore signifying that the corresponding trunk is to be used in completing the connection.

The trunk line switch D (Fig. 2) is of the same general form as that disclosed in the "*American Telephone Journal*" of June 6, 1908, page 528. The switch D is provided with a magnet 25 that performs not only the function of a released magnet, but also an additional function which the release magnet in the said *Telephone Journal* does not perform. The magnet 25 serves both as a trip magnet and release magnet, and is designed to remain energized while the switch is in operation. When the magnet 25 is energized the armature 26 is so attracted as to move the plunger arm 27 about its pivot point 28 and thrust the plunger 29 into the bank Q. Now, when the magnet deënergizes, the plunger is restored to normal by means of the spring 30. Thus, through the medium of the magnet 25 the plunger 29 is thrust into the bank Q and then withdrawn. The armature 26 is pivotally secured to the switch frame (not shown) at the point 31, and at the other end the arm 32 is in turn pivotally secured to the plunger arm 27 at the point 34, the said arm being arranged to rotate about the pin 28. The plunger arm 27 is provided with a finger 35 which, when the plunger is thrust into the bank, shifts the spring 36 out of engagement with the spring 37 and into engagement with the spring 38. By this operation the magnet 25 is disconnected from battery direct and is connected to the battery lead 39 through the resistance 40. The said line switch is also provided with a bank of terminals,

usually ten in number but only one of which is shown at Q. As shown, the said terminal Q is displaced from its true position relative to the plunger 29, and the bushing 41 is correspondingly displaced, all for the purpose of making the diagrammatic illustrations clearer. The terminal Q comprises the springs 42 and 43, 44 and 45, 46 and 47, and 48 and 49. Said springs are normally disconnected from each other, but are forced into contact in pairs when the plunger enters the bank. When the plunger is in normal position the notch 50 is designed to engage the flange or web on the plunger shaft 51, so that when a plunger operates the shaft may move the idle plungers opposite another bank terminal.

The general operation of the switch is as follows: The magnet 25 is energized when an A-operator inserts a plug in the jack J (Fig. 1) and the armature 26 is attracted against the magnet cores. Upon thus operating, the armature 26 moves the plunger arm 27 about the pivot point 28 and thrusts the plunger 29 into the bank Q. The magnet 25 remains energized as long as conversation is being carried on, but as soon as one of the parties hangs up his receiver the said magnet deenergizes and allows the plunger 29 to restore to normal position. Also, when the plunger enters the bank the plunger shaft 51 is rotated by means of the master switch E and carries all idle plungers that are in locked engagement with it opposite the next idle bank terminal. Now, when the plunger 29 is restored the web on the plunger shaft has moved away so that the notch 50 does not engage it again, but the web slides along the fan-like tail-piece of the plunger, without moving said plunger, until the plunger shaft returns to the position from which the plunger was released. When the shaft reaches this position the notch 50 again engages the web and the plunger is then again in locked engagement with the shaft. If, after being withdrawn from the bank Q, the plunger 29 should be operated again before it has become engaged with the shaft 51 it would again enter the same bank Q.

The master switch E, which may be of any suitable or approved type, is provided for operating the plunger shaft 51, and for controlling certain circuits that will be disclosed hereinafter. It comprises the following details: The motor magnet 52 for operating the ratchet wheel 53, which latter is designed for operating the plunger shaft 51, a relay 54 for controlling the circuit of the motor magnet 52, and a relay 55 which controls the circuit of the release magnet 25 under certain conditions, as will appear hereinafter. The master switch also has a bank O comprising a set of contacts *c* and a common metallic segment 56. The wiper 57 is adapted to remain in constant engagement with the bank O and to maintain one of the contacts *c* in electrical connection with the common segment 56. The motor magnet 52 is provided with an armature 58 upon the end of which is mounted a pawl 59. When the magnet 52 energizes the pawl 59 engages the ratchet wheel 53, causing it to rotate and thus move the plunger shaft.

The line switch F and master switch H are similar to those just described, with the addition of the winding 167 on the motor magnet relay 168 and the master switch bank level *f* (Fig. 3).

The operator's cord circuit C′ (Fig. 4) is very similar to an ordinary cord used in manual service, being modified slightly in order that the hanging up of the receiver of the called party will cause the release of the trunk line switches. The cord comprises the repeating coil N, supervisory relays 60, 61 and 62, lamps 63, 64 and 65 and plug seat switch *h*.

A clearer understanding of my invention may be had from an explanation of its operation when one subscriber calls another. Suppose, for example, that the subscriber at substation P desires to speak with the subscriber at substation P′, the line of which terminates in another exchange. When the subscriber at substation P removes his receiver from the switch hook an energizing circuit is established through the line relay 8, said circuit extending from battery B through the line relay 8, contact point 72, and armature 71 to the line conductor 70, then through the substation P, over the line conductor 69, armature 68 and contact point 67 to ground G′. The line relay 8 thereupon energizes and closes a circuit through the line lamp 10. The operator then inserts the plug *p* into the answering jack 11, whereupon a circuit is closed through the cut-off relay 9. This circuit extends from ground G^2 through the cut-off relay 9, through the sleeve of the jack 11 and sleeve of plug *p*, through the relay 76, thence through battery B to ground G^3. The cut-off relay 9 thereupon energizes and attracts its armature 68 and 71 away from the contact points 67 and 72 and into engagement with the points 73 and 74. This operation breaks the circuit through the line relay 8, which latter deenergizes and extinguishes the lamp 10. The operation of the relay 9 also extends the subscribers' lines to the jack 11, and the substation P is provided with talking battery current from ground G^3 through the relay 75, tip of the plug and jack 11, contact 73, armature 68, line conductor 69, transmitter 3, switch hook 4, impedance coil 7, line conductor 70, armature 71, contact 74, sleeve conductors of the jack 11 and plug *p* and through the relay 76 to battery B. The relays 75 and 76, being included in this circuit, are energized and attract their arma-

tures 77, 78 and 79. Upon learning that a subscriber at a distant exchange is wanted, the operator presses the push button 24 to find what trunk she shall use in completing the connection. When the button 24 is pressed the lamp b' is lighted, thus indicating that the jack J is the one to be used. The circuit through the lamp b' extends from ground G^4 through the contact point 80, push button spring 81, through the lamps b', b^2, etc., in multiple (there being one lamp on each operator's position for each trunk) to the conductor 82, through the individual contact 83 of the bank L, wiper 12, common segment 18, and over conductor 84, contact point 85 and armature 86 to battery B. The operator now operates the key k to connect her telephone set to the order wires 87 and 88, and repeats the number of the desired line to the B-operator. When the B-operator is ready to complete the connection she notifies the A-operator, who then inserts the plug p' into the jack J. When the plug p' enters the jack J the line switches D and F operate to extend the connection to the cord circuit C' (Fig. 4) and light the signal lamp 65. When the lamp 65 is displayed the B-operator removes the plug p^2 from its seat and inserts it into the jack J^2 of the desired line. The operation of the various apparatus involved in this connection will now be explained. When the plug p' enters the jack J an energizing circuit is established through the relay 22, said circuit extending from ground G^5 through the relay 22 to the trunk conductor 89, thence through the sleeve of the conductors of the jack J and plug p' and relay 92 to battery B. The relays 92 and 22 energize and attract their respective armatures.

When the armature 162 engages the contact point 163 a circuit is established through the lamp 161. This circuit extends from ground G^3 through the armature 154, contact point 155, armature 162, contact point 163 and lamp 161 to battery B. The engagement of the armature 123 with the contact point 152 extends the connection to the conductors 90 and 89. The engagement of the armature 93 with the contact point 91 closes a circuit through the motor magnet relay 17. This circuit extends from ground G^6 through the contact point 91, armature 93, individual contact point 23 of the bank level M, wiper 13, common segment 19, over conductor 94 and through relay 17 to battery B. The motor magnet relay 17 upon energizing attracts its armature 86 away from the contact point 85, bringing it into engagement with the contact point 95, thereby closing an energizing circuit through the motor magnet 14. This circuit extends from ground G^7 through the magnet 14, interrupter springs 96 and 97, contact point 95 and armature 86 to battery B and thence to ground G. The magnet 14 then attracts its armature 20, the pawl 21 engaging a tooth of the ratchet wheel 16 which rotates the wipers 12 and 13. The armature 20, being provided with the interrupter springs 96 and 97, opens and closes the circuit through the magnet 14, causing it to operate in a manner similar to that of a buzzer to give the ratchet wheel a continuous motion until the wiper 13 is carried off the contact 23, thereby opening the circuit through the motor magnet relay 17, which in turn deënergizes and breaks the circuit through the motor magnet. If the trunk corresponding to the next contact is busy, however, the relay will remain energized until the wiper 13 finds a contact which is not grounded. The wiper 12 moves with the wiper 13 and always rests upon a contact corresponding to the same trunk as that upon which the wiper 12 is resting. Whenever the relay 17 is energized, and, therefore, the rotary magnet is operating, a circuit is closed through the lamps d', d^2, etc., there being one of these lamps on each operator's position. The circuit through these lamps extends from ground G^8 through the lamps d', d^2, etc., in multiple, contact point 95, armature 86 to battery B, and thence to ground G. The lighting of these lamps then indicates to the operator that the wipers 12 and 13 are rotating and no connection should be made until the lights are extinguished. If all the trunks are busy the lamps d', d^2, etc., will remain lighted until one of the trunks is freed. When the plug p' enters the jack J a circuit is also closed through the relay 98, said circuit extending from ground G^9 through the relay 98, relay 99, trunk conductor 89, sleeve conductors of the jack J and plug p' and relay 92 to battery B. The relay 98 thereupon energizes, but it has such a high resistance that sufficient current does not flow to energize the relay 99. The relay 98 upon energizing attracts its armature 105 into engagement with the contact point 104, thereby closing an energizing circuit through the magnet 25 of the line switch D, causing it to attract its armature and thrust the plunger 29 into the bank Q. The circuit through the magnet 25 extends from ground G^{10} through the contact point 100, armature 101, contact point 102, armature 103, contact point 104, armature 105, through the magnet 25, springs 36 and 37 and springs 106 and 107 to the battery lead 39, thence through battery B to ground G. When the magnet 25 attracts its armature 26 the spring 36 is shifted out of engagement with the spring 37 and into engagement with the spring 38, whereby a new circuit is established through the magnet 25. This circuit extends from ground G^{10} through the magnet 25 to the spring 36, as previously traced, thence through the spring

38 and resistance coil 40 to battery lead 39. This circuit maintains the magnet 25 in an energized condition and holds the plunger 29 in the bank Q. When the plunger 29 enters the bank Q the springs 43 and 45 are pressed into engagement with the springs 42 and 44, respectively, thereby extending the conductors 89 and 90 through to the trunk conductors 108 and 109. The plunger 29 also forces the spring 46 into engagement with the spring 47, whereby an energizing circuit is closed through the motor magnet relay 54 of the master switch E. This circuit extends from ground G^{11} through the springs 46 and 47 to the individual contact 110, through the wiper 57, common segment 56 and relay 54 to the battery lead 39, thence through battery B to ground G. The relay 54 upon energizing closes the springs 114 and 113 in contact, thus completing an energizing circuit through the motor magnet 52. This circuit extends from ground G^{12} and ground G^{13} through the magnet 52 and relay 55 to the interrupter springs 111 and 112, thence through the springs 113 and 114 to the battery lead 39, and through battery B to ground G. The motor magnet now operates to advance all idle plungers which are in locked engagement with the shaft 51 to a position opposite the next idle bank similar to the terminal Q.

Before the motor magnet begins to operate, the spring 116 rests upon the top of a tooth of the toothed wheel 117, but as soon as the ratchet wheel 53 is moved one step by the pawl 59 the spring 116 slips off the tooth and engages the spring 115, whereby the circuit through the motor magnet is maintained, regardless of the springs 113 and 114, until the ratchet wheel has advanced far enough for the spring 115 to drop down into the next notch of the wheel 117. By this time the wiper 57 will have moved off the contact point 110 and onto the next one, allowing the relay 54 to deenergize and open the contact between the springs 113 and 114. If, however, the next trunk is busy the wiper will find ground on the next contact, the relay 54 will not be energized and the shaft will continue to rotate until the plungers come opposite an idle trunk. As previously mentioned, the relay 55 is energized at the same time as the motor magnet 52, and being a slow-acting relay it remains in an energized condition as long as the motor magnet is in operation, thus cutting off battery current at the springs 106 and 107 from the release magnets of all the idle line switches to which the master switch E is allotted. Thus it will be seen that it is impossible to operate any of the line switches while their plungers are being moved from one bank terminal to another.

As soon as the conductors 89 and 90 are extended to the trunk conductors 108 and 109 an energizing circuit is established through the relay 118, causing it to attract its armature 119 into engagement with the contact point 120, thereby closing an energizing circuit through the magnet 121 of the line switch F. The circuit through the relay 118 extends from ground G^3 through the relay 151, contact point 152, armature 123, tip of plug p', conductor 90, relay 150, springs 43 and 42, conductor 109, relay 118, conductor 108, springs 44 and 45, relay 99, conductor 89, sleeve of plug p' and relay 92 to battery B. The relay 118 has a resistance sufficiently high so that enough current does not flow to energize the relays 150, 99 and 151. When the circuit through the magnet 121 is closed the said switch operates in a manner similar to that described for the line switch D. The plunger 125 is forced into the bank S, the conductors 108 and 109 are extended through the springs 126 and 127, and 128 and 129 to the conductors 130 and 131, the idle plungers are moved opposite the next idle trunk, and the master switch wipers 132 and 133 are moved to the bank contacts corresponding to that trunk. Also, when the plunger enters the bank S an energizing circuit is closed through the supervisory lamp 65 and relay 61 of the cord circuit C'. This circuit extends from ground G^{15} through the springs 169 and 170 to the conductor 134, thence through the relay 61 to battery B; also, from conductor 134 a branch extends through the lamp 65, plug seat springs 135 and 136 to the battery B, thence to ground G. The relay 61 upon energizing attracts the armature 137 away from the spring 138. When the B-operator sees the signal lamp 65 light she removes the plug p^2 from its seat and inserts it into the jack J^2 corresponding to the line asked for by the A-operator. When the plug p^2 is removed from its seat the spring 136 is shifted out of contact with the spring 135 and into contact with the spring 171, whereby the circuit through the lamp 65 is broken and a circuit is established through the lamp 63. This circuit extends from ground G^{16} through the armature 172, contact point 139, lamp 63, springs 171 and 136, and through battery B to ground G. When the plug p^2 is inserted into the jack J^2 an energizing circuit is established through the cut-off relay 140 of the substation P' and relay 62 of the cord circuit C'. This circuit extends from ground G^{17} through the relay 140, sleeve conductors of the jack J^2 and plug p^2 and relay 62 to battery B, thence through battery B to ground G. These two relays upon energizing complete a circuit from the repeating coil N through the plug p^2 and jack j^2 to the line conductors 141 and 142. The substation may now be signaled by any suitable or ap-

proved means, as, for instance, by operating the key *g*, whereby the trunk is cut off from the line and a ringer generator bridged across the line.

When the subscriber at substation P′ removes his receiver from the hook an energizing circuit is established through the relay 60, said circuit extending from ground G^{16}, relay 60, contact point 143, armature 144, tip of plug and jack to the conductor 142, transmitter 145, switch hook 146, impedance coil 147, line conductor 141, sleeve of the plug and jack and relay 62 to battery B thence through battery B to ground G. The relay 60 upon energizing attracts its armature 172 away from the contact point 139 and closes contact between the armature 148 and contact point 149. The opening of the contact between armature 172 and contact point 139 extinguishes or retires the lamp 63, thus signifying to the operator that the subscriber has answered. When the contact between the armature 148 and contact point 149 is closed the relay 118 is bridged by the windings 174 and 173 of the repeating coil N. When this occurs sufficient current then flows through the relays 150, 99 and 151, over the circuit already traced, to cause them to attract their respective armatures. When the armature 154 disengages the contact point 155 the circuit through the lamp 161 is broken and the A-operator knows that the subscriber at substation P′ has answered. When the relay 150 energizes, the holding ground for the magnet 25 of the line switch D is shifted from ground G^{10} to ground G^{14}.

After a connection has been completed in the manner described, and the called subscriber has answered, then as soon as either party hangs up his receiver the line switches D and F immediately release and leave the trunk lines 108 and 109 between the two exchanges ready for another connection, regardless of the length of time the plugs remain in the jacks. It will first be explained how the line switches release when the subscriber at substation P restores his receiver to the switch hook before the subscriber at substation P′ has hung up. When the receiver is hung up at substation P the energizing circuit of the relay 75 is broken, allowing the armatures 78 and 79 to fall back into engagement with their respective contact points. The relay 76, however, does not deënergize, its holding circuit extending from ground G^2 through the cut-off relay 9, sleeve of the plug *p′* and relay 76 to battery B. When the armature 79 engages the contact point 158 a circuit is established through the supervisory lamp 159. This circuit extends from ground G^3 through the lamp 159, contact point 158, armature 79, contact point 157 and armature 77 to battery B. The lighting of the lamp 159 therefore indicates to the A-operator that the subscriber at substation P has hung up his receiver. When the armature 78 engages the contact point 156 the relay 92 is short-circuited and it allows its armature 123 to fall back from the contact point 152 and engage the contact point 124. The short-circuit of the relay 92 extends from battery B through said relay 92, conductor 160, armature 153, contact point 154^a, contact point 156, armature 78, contact point 157 and armature 77 back to battery. When the contact between the contact point 152 and armature 123 is broken the relay 151 deënergizes and removes the short-circuit from the relay 92, which again energizes, but at the same time the relay 92 deënergizes the line switch D (Fig. 2) releases and opens the trunk, so that the relay 151 does not again energize when the relay 92 energizes. When the relay 92 energizes this second time a circuit is closed through the supervisory lamp 161, which indicates to the operator that the switch D has released. The circuit through the lamp 161 extends from ground G^3 through armature 154, armature 162, contact point 163, lamp 161 to the non-grounded pole of the battery B.

The release of the line switch D takes place as follows: When the relay 92 deënergizes, the circuit through the relay 150 and relay 118 is opened, whereupon the armature 103 falls out of engagement with the grounded contact point, the magnet 25 deënergizes and the plunger 29 is withdrawn from the bank Q. The relay 99, after being once energized, will be maintained in that condition by the circuit through the relay 98, so that the said relay 99 remains energized during the release of the switch D. When the plunger 29 restores to normal the trunk connection is broken between the springs 42 and 43, and 44 and 45. When the circuit through the relay 118 is broken said relay deënergizes and opens the circuit through the magnet 121 of the line switch F. The switch F thereupon releases and the trunk conductors 108 and 109 are available for another connection. A guarding potential for the conductors 131 and 130 is maintained at the contact point 165 of the bank of the master switch H as long as the plug p^2 remains up, so that after the switch F releases, these conductors cannot again be seized before the operator has had time to remove the plug. This guarding potential extends from the battery B through the springs 136 and 171, conductor 166 to the contact point 165. If, now, the wiper 133 passes onto this contact the winding 167 of the motor magnet relay 168 becomes energized, and the plungers are rotated onto the next trunk. When the line switch F releases and opens the contact between the springs 169 and 170, the ground is removed from the relay 61 and

said relay deënergizes and establishes a circuit through the lamp 64, thus giving the B-operator the disconnect signal. When the plug is removed from the jack and restored to its seat all relays restore to normal, and the guarding potential is removed from the master switch bank.

If the subscriber at substation P′ hangs up his receiver first, the line switches D and F also immediately release as follows: When the receiver at substation P′ is restored to the hook the energizing circuit through the relay 60 is opened. The armature 148 falls out of engagement with the contact point 149, which opens the energizing circuit through the relay 150 (Fig. 2), causing the release of the switch D, which is followed by the release of the switch F, as before explained. When the armature 172 engages the contact point 139 a circuit is established through the lamp 63, signifying to the B-operator that the subscriber has hung up his receiver. The lighting or displaying of this lamp, together with the lighting of the lamp 64, which signifies that the switches D and F have released, notifies the operator that the connection may be removed. The release of the switches D and F is also made known to the A-operator by the lighting of the lamp 161, which takes place as follows: When the switches release, the energizing circuit of the relay 151 is destroyed and the armature 154 engages the contact point 155, thus establishing a circuit through the said lamp 161. This circuit extends from ground G^3 through the armature 154 and contact point 155, armature 162, contact point 163 and lamp 161 to the non-grounded pole of the battery B. When the receiver at substation P is restored the lamp 159 is lighted in the same manner as when the receiver at substation P is first restored. The glowing of the two lamps 159 and 161 indicates to the operator that the connection may be taken down. The busy back jack J^3 is provided at the B-office, said jack being connected to a source of busy-signaling current. When the B-operator tests a desired line and finds it busy, she inserts the plug p^2 in the jack J^3 and thus connects the calling subscriber to the busy-signal.

From the foregoing it will be seen that I provide a system of automatic trunking between different switchboards, or between different exchanges, which automatic trunking is controlled by manual switchboard operators. It will also be seen that, in a system of this kind, I provide means for automatically selecting idle trunks leading to the automatic switches for selecting idle trunks between the different switchboards, or between the different exchanges. In this way, and by reason of the signaling apparatus provided in conjunction with the said automatic trunk-selecting apparatus, the manual switchboard operator at whose board the call originates, or to whose board the call is transmitted before it is extended to the other exchange, may know which trunk jack to use, as when she presses a button or other switch a signal is immediately given or displayed for the purpose of indicating which trunk jack is idle. Thus means are provided for automatically selecting trunks, and additional means are then provided for enabling a manual switchboard operator, by simply operating a push button or other device, to know which is the idle trunk that has been automatically selected for the next call. Upon extending connection to this idle trunk the operator thereby causes another switch to automatically extend connection to another preselected trunk, which latter trunk may lead to another switchboard or to another exchange, depending upon the character of the system. The trunk extending between the two boards, or between the two exchanges, is then automatically released and restored to normal condition when the receiver is hung up at either the calling or called substation. In this way the release or restoration of the trunks between the A and B boards, or between different exchanges, is not dependent upon the withdrawal of the plugs from the trunk jacks, nor upon any acts of the manual switchboard operators, such release or restoration being under the control of the subscribers themselves. Consequently the retention of a plug in a trunk jack after the subscribers are through talking does not result in making a trunk busy longer than is necessary, inasmuch as the trunk between the different switchboards, or between different exchanges, which was brought into use as the result of the insertion of the plug in the trunk jack, is restored to a non-busy or idle condition as soon as either of the two connected subscribers hangs up his receiver at the substation thereof. Broadly stated, therefore, I provide means for enabling a subscriber to release and restore to a non-busy or idle condition the trunk that was brought into use by a manual switchboard operator. More specifically considered, this is a trunk for extending connection from one manual switchboard to another. Also, broadly considered, I provide a series of trunks which terminate at a manual switchboard, and means for automatically selecting idle trunks ahead of the calls, together with means for enabling the manual switchboard operator to know which idle trunk has been selected for the next call. More specifically considered, these trunks are for use in extending connection from one manual switchboard to another. I do not, therefore, limit myself to the use of the different novel features and combinations in a system of the exact character shown and described.

What I claim as my invention is:—

1. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, and substation-controlled means for restoring said trunk to non-busy or idle condition.

2. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, calling substation-controlled means for restoring said trunk to non-busy or idle condition, and automatic means for giving a signal when the trunk is released.

3. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also means controlled at said board for bringing said trunk into use, substation-controlled means for restoring said trunk to non-busy or idle condition, another manual board to which said trunk leads, and means for connecting said last-mentioned board with the called line.

4. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, calling substation-controlled means for restoring said trunk to non-busy or idle condition, another manual board to which said trunk leads, and means for connecting said last-mentioned board with the called line.

5. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also means controlled at said board for bringing said trunk into use, substation-controlled means for restoring said trunk to non-busy or idle condition, a set of switchboard cords, and an automatic switch for said trunk adapted to automatically select idle cords.

6. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, calling substation-controlled means for restoring said trunk to non-busy or idle condition, a set of switchboard cords, and an automatic switch for said trunk adapted to automatically select idle cords.

7. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also means controlled at said board for bringing said trunk into use, substation-controlled means for restoring said trunk to non-busy or idle condition, a manual trunk, and means for connecting said first-mentioned trunk with said manual trunk.

8. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, calling substation-controlled means for restoring said trunk to non-busy or idle condition, a manual trunk, and means for connecting said first-mentioned trunk with said manual trunk.

9. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, calling substation-controlled means for restoring said trunk to non-busy or idle condition, and metallic line circuits over which said restoring means are controlled, each line circuit including the two sides of a line in series.

10. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, means for extending a connection from said trunk to a called line, calling substation-controlled means for restoring said trunk to non-busy or idle condition, and common battery means for supplying talking current to substations connected through the medium of said trunk.

11. In a telephone system, calling and called subscribers' lines, means for establishing a connection between said lines, said means including a trunk, a manual switchboard, automatic means controlled at said board for bringing said trunk into use, substation-controlled means for restoring said trunk to non-busy or idle condition, and common battery means for supplying talking current to substations connected through the medium of said trunk.

12. In a telephone system, a plurality of trunks, an operator's automatic switch, and signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call.

13. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, and means on a manual switchboard for indicating the preselected trunk to the operator.

14. In a telephone system, a plurality of trunks, an operator's switch, signaling means responsive to said switch for indicating which is the next trunk to be used in

extending a call, and automatic switches in which said trunks terminate for connecting therefrom.

15. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, means on a manual switchboard for indicating the preselected trunk to the operator, and automatic switches in which said trunks terminate for connecting therefrom.

16. In a telephone system, a plurality of trunks, an operator's automatic switch, signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call, and means including a manual switchboard for completing calls from said trunks to the lines of the called subscribers.

17. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, means on a manual switchboard for indicating the preselected trunk to the operator, and means including a manual switchboard for completing calls from said trunks to the lines of the called subscribers.

18. In a telephone system, a calling line, a plurality of trunks, means including an operator's switch for extending a connection from said line to one of said trunks, signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call, other trunks for connection with said first-mentioned trunks, and substation-controlled means for restoring said other trunks to a non-busy or idle condition.

19. In a telephone system, a calling line, a plurality of trunks extending to a manual switchboard, means for automatically selecting idle trunks ahead of the calls, means on said manual switchboard for indicating the preselected trunk to the operator, other trunks for connection with said first-mentioned trunks, and substation-controlled means for restoring said other trunks to a non-busy or idle condition.

20. In a telephone system, a plurality of trunks, an operator's automatic switch, signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call, and means for manually extending connection to said trunks in response to calling subscribers.

21. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, means on a manual switchboard for indicating the preselected trunk to the operator, and means for manually extending connection to said trunks in response to calling subscribers.

22. In a telephone system, a plurality of trunks, an operator's automatic switch, signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call, subscribers' lines, means for manually including said trunks in talking circuits with said lines, line signals for said subscribers' lines, and supervisory signals for the manual operators.

23. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, means on a manual switchboard for indicating the preselected trunk to the operator, subscribers' lines, means for manually including said trunks in talking circuits with said lines, line signals for said subscribers' lines, and supervisory signals for the manual operators.

24. In a telephone system, a plurality of trunks, an operator's automatic switch, signaling means responsive to said switch for indicating which is the next trunk to be used in extending a call, devices for bringing the said selected trunk into use between calling and called substations, and common battery means for supplying current to said substations for talking and operating purposes.

25. In a telephone system, a plurality of trunks, means for automatically selecting idle trunks ahead of the calls, means on a manual switchboard for indicating the preselected trunk to the operator, devices for bringing the said selected trunk into use between calling and called substations, and common battery means for supplying current to said substations for talking and operating purposes.

26. In a telephone system, a trunk, a manual-switchboard, means controlled at said board for bringing said trunk into use, a relay at said switch-board, means for energizing said relay, and means to short-circuit said relay to restore said trunk to non-busy or idle condition.

27. In a telephone system, a calling line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also means controlled at said board for bringing said trunk into use, a relay at said switchboard, means for energizing said relay, and substation-controlled means to short-circuit said relay to restore said trunk to non-busy or idle condition.

28. In a telephone system, a trunk, a manual switchboard, automatic means controlled at said board for bringing said trunk into use, a relay at said switchboard, means for energizing said relay, and means to short-circuit said relay to restore said trunk to non-busy or idle condition.

29. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, a relay at said

switchboard, means for energizing said relay, and substation-controlled means to short-circuit said relay to restore said trunk to non-busy or idle condition.

30. In a telephone system, a trunk, a manual switchboard, means controlled at said board for bringing said trunk into use, a pair of relays at said manual switchboard, one of said relays controlling the circuit of the other, means for energizing said first relay, and means to deënergize said first relay to restore said trunk to non-busy or idle condition.

31. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also means controlled at said board for bringing said trunk into use, a pair of relays at said manual switchboard, one of said relays controlling the circuit of the other, means for energizing said first relay, and substation-controlled means to deënergize said first relay to restore said trunk to non-busy or idle condition.

32. In a telephone system, a trunk, a manual switchboard, automatic means controlled at said board for bringing said trunk into use, a pair of relays at said manual switchboard, one of said relays controlling the circuit of the other, means for energizing said first relay, and means to deënergize said first relay to restore said trunk to non-busy or idle condition.

33. In a telephone system, a subscriber's line, a trunk, means including a manual switchboard for extending a connection from said line to said trunk including also automatic means controlled at said board for bringing said trunk into use, a pair of relays at said manual switchboard, one of said relays controlling the circuit of the other, and substation-controlled means to deënergize said first relay to restore said trunk to non-busy or idle condition.

34. In a telephone system, a cord circuit, a pair of relays in said cord circuit, means for energizing said relays, one of said relays controlling the energizing circuit of the second, and a short-circuit around the first relay controlled by the second.

35. In a telephone system, subscribers' lines, and means for establishing a talking connection between said lines, said means including a manual switchboard, a trunk circuit, automatic switching means controlled over said trunk circuit for establishing a connection thereover, a relay in a talking conductor of said trunk, and means controlled by said relay to restore said trunk to non-busy or idle condition.

36. In a telephone system, a subscriber's line, a trunk circuit, means including a manual switchboard for extending a connection from said line to said trunk, automatic switching means controlled over said trunk circuit for establishing a connection thereover, a relay in said trunk, and substation-controlled means controlled through said relay to restore said trunk to non-busy or idle condition.

37. In a telephone system, a manual switchboard, a trunk circuit, automatic switching means controlled over said trunk circuit for establishing a connection thereover, a relay in said trunk controlling the continuity of the same, and means operative through the deënergization of said relay to restore said trunk to non-busy or idle condition.

38. In a telephone system, a subscriber's line, a trunk circuit, means including a manual switchboard for extending a connection from said line to said trunk; automatic switching means controlled over said trunk circuit for establishing a connection thereover, a relay in said trunk controlling the continuity of the same, and substation-controlled means operative through the deenergization of said relay to restore said trunk to non-busy or idle condition.

39. In a telephone system, a trunk line, an automatic switch, another line terminating in said switch, means for operating said switch over two sides of said other line in series to seize said trunk, means for rendering said trunk busy to prevent a second switch from seizing said trunk when the same has been seized by said first-mentioned switch, and means for maintaining said trunk busy after said first switch has been disconnected from said trunk.

40. In a telephone system, a trunk line, a group of line switches, a master switch controlling said line switches, means for operating one of said line switches to seize said trunk, means associated with said trunk for rendering said trunk busy to prevent a second line switch from establishing connection with said trunk after said first line switch has been operated, and means for maintaining said busy condition after said first-mentioned line switch has been released to disconnect from said trunk.

41. In a telephone system, an operator's board, a trunk line terminating therein, an automatic switch for seizing said trunk, means for rendering said trunk busy when the same is seized to prevent a second switch from establishing connection therewith, and means controlled from said operator's board for maintaining said busy condition after said first-mentioned switch has been released from said trunk.

42. In a telephone system, an operator's board, a trunk line terminating therein, means including an automatic switch for extending a connection to said trunk, means controlled by said operator for extending said connection from said board, means for

rendering said trunk busy when the same is seized by said switch, and means for maintaining said busy condition after said switch is released and until said operator takes down said connection extending from the operator's board.

43. In a telephone system, an operator's board, a trunk line terminating therein, a plurality of line switches any one of which is adapted to connect with said trunk, a master switch for controlling the operation of said line switches, means for rendering said trunk busy when the same is seized to prevent a second switch from establishing connection therewith, and means controlled from said operator's board for maintaining said busy condition after said first-mentioned switch has been released from said trunk.

44. In a telephone system, an operator's board, a trunk line terminating therein, a plurality of line switches any one of which is adapted to connect with said trunk, a master switch for controlling the operation of said line switches, means controlled by said operator for extending said connection from said board, means for rendering said trunk busy when the same is seized by said switch, and means for maintaining said busy condition after said switch is released and until said operator takes down said connection extending from the operator's board.

45. In a telephone system, an A-board, an A-operator's cord circuit thereat, a subscriber's line terminating therein, a station on said line, a B-operator's cord circuit, means including automatic switches for extending a connection between said cord circuits, and means in said A-operator's cord circuit for controlling the release of said switches, said means under the control of said station.

46. In a telephone system, an A-operator's cord circuit, a B-operator's cord circuit, means including automatic switches for extending a connection between said cord circuits, and means in said B-operator's cord circuit for controlling the release of said switches.

47. In a telephone system, a plurality of subscribers' lines, means including an A-operator's cord circuit and a B-operator's cord circuit for establishing a connection between said lines, together with automatic switches for extending a connection from said A-operator's cord to said B-operator's cord, and means in said A-operator's cord circuit controlled by the calling subscriber for releasing said automatic switches.

48. In a telephone system, a plurality of subscribers' lines, means including an A-operator's cord circuit and a B-operator's cord circuit for establishing a connection between said lines, together with automatic switches for extending a connection from said A-operator's cord to said B-operator's cord, and means in said B-operator's cord circuit controlled by the called subscriber for releasing said automatic switches.

49. In a telephone system, a plurality of subscribers' lines, means including an A-operator's cord circuit and a B-operator's cord circuit for establishing a connection between said lines, together with automatic switches for extending a connection from said A-operator's cord to said B-operator's cord, means in said A-operator's cord circuit controlled by the calling subscriber for releasing said automatic switches, and means in said B-operator's cord circuit controlled by the called subscriber for releasing said automatic switches.

50. In a telephone system, an operator's board, a plurality of trunks terminating therein, an automatic progressively movable trunking switch for each of said trunks, means for preselecting an idle trunk, said means including a movable switch-operating mechanism, a signal on said board for indicating to the operator when said mechanism is operating, a subscriber's line terminating in said board and means in said board through the medium of which any one of said switches may be controlled from said line.

51. In a telephone system, an operator's board, a plurality of trunks terminating therein, each of said trunks provided with multiple jacks for testing purposes, and means for indicating to the operator when she may test for an idle trunk.

52. In a telephone system, an operator's board, a plurality of trunks provided with multiple jacks terminating therein, a signal associated with each of said multiple jacks, a movable switch for preselecting an idle trunk, and an operator's key for closing a circuit through the signal associated with said preselected trunk.

53. In a telephone system, an operator's board, a plurality of trunks provided with multiple jacks terminating therein, a signal associated with each of said multiple jacks, a movable switch for preselecting an idle trunk, an operator's key for closing a circuit through the signal associated with said preselected trunk, and a second signal for indicating to the operator when said switch is operating.

54. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, and means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner.

55. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, and means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated.

56. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated, and a cord circuit for seizing the trunk indicated and for operating the said mechanism to prepare the circuit of the next trunk to be used.

57. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, and means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order.

58. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, and means under the control of the operator for operating the signal of the circuit which has been prepared whereby the next idle trunk to be used is indicated.

59. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated, and a cord circuit for seizing the trunk indicated for operating said mechanism to prepare the circuit of the next trunk to be used.

60. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, and a busy test circuit for each trunk, said means including said busy test circuit.

61. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, a busy test circuit for each trunk, said means including said busy test circuit, and means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated.

62. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, a busy test circuit for each trunk, said means in-

cluding said busy test circuit, means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated, and a cord circuit for seizing the trunk indicated and for operating the said mechanism to prepare the circuit of the next idle trunk to be used.

63. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, and a busy test circuit for each trunk, said means including said busy test circuit.

64. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, a busy test circuit for each trunk, said means including said busy test circuit, and means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated.

65. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, a busy test circuit for each trunk, said means including said busy test circuit, means under the control of an operator for operating the signal of the circuit which has been so prepared whereby the next idle trunk to be used is indicated, and a cord circuit for seizing the trunk indicated and for operating the said mechanism to prepare the circuit of the next trunk to be used.

66. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated, and means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared.

67. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared, and a cord circuit for seizing the trunk indicated, and for operating the said mechanism to prepare the circuit of the next trunk to be used.

68. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said mechanism may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, and means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared.

69. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said mechanism may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared,

and a cord circuit for seizing the trunk indicated and for operating said mechanism to prepare the circuit of the next trunk to be used.

70. In a telephone system, an operator's board, a plurality of trunks, terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signal, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, a busy test circuit for each trunk, said means including said busy test circuit, and means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared.

71. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means whereby said mechanism may be operated to select said circuits consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same manner, a busy test circuit for each trunk, said means including said busy test circuit, means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared, and a cord circuit for seizing the trunk indicated and for operating the said mechanism to prepare the circuit of the next trunk to be used.

72. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, a busy test circuit for each trunk, said means including said busy test circuit, and means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared.

73. In a telephone system, an operator's board, a plurality of trunks terminating in said board, a signal for each trunk, a circuit for each signal, said circuits uniting in a common conductor, a source of current for operating said signals, an automatic progressively movable switching mechanism common to said circuits, means for making some of said trunks busy and whereby said switch may select the said circuits of the idle trunks consecutively to prepare them consecutively whereby the corresponding signals may be operated in the same order, a busy test circuit for each trunk, said means including said busy test circuit, means under the control of a plurality of operators for operating the signal, the circuit of which has been so prepared, and a cord circuit for seizing the trunk indicated and for operating the said mechanism to prepare the circuit of the next trunk to be used.

Signed by me at Chicago, Cook county, Illinois, this 26th day of November, 1909.

FRITZ LUBBERGER.

Witnesses:
EDWARD D. FALES,
ARTHUR J. RAY.