

Feb. 23, 1932.

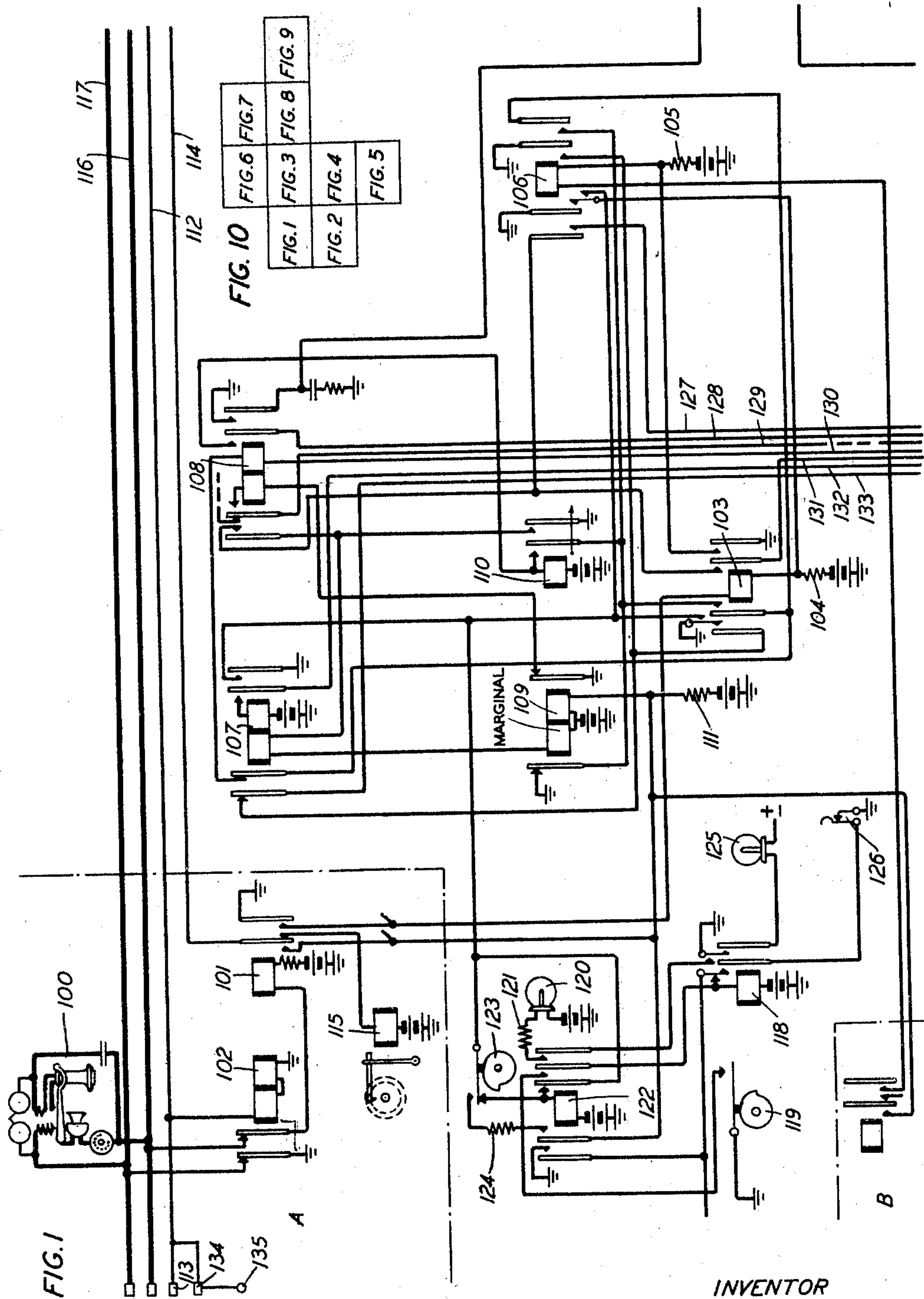
L. E. KITTREDGE

1,846,262

TELEPHONE SYSTEM

Filed May 18, 1931

9 Sheets-Sheet 1



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TELEPHONE SYSTEM

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9 Sheets-Sheet 2

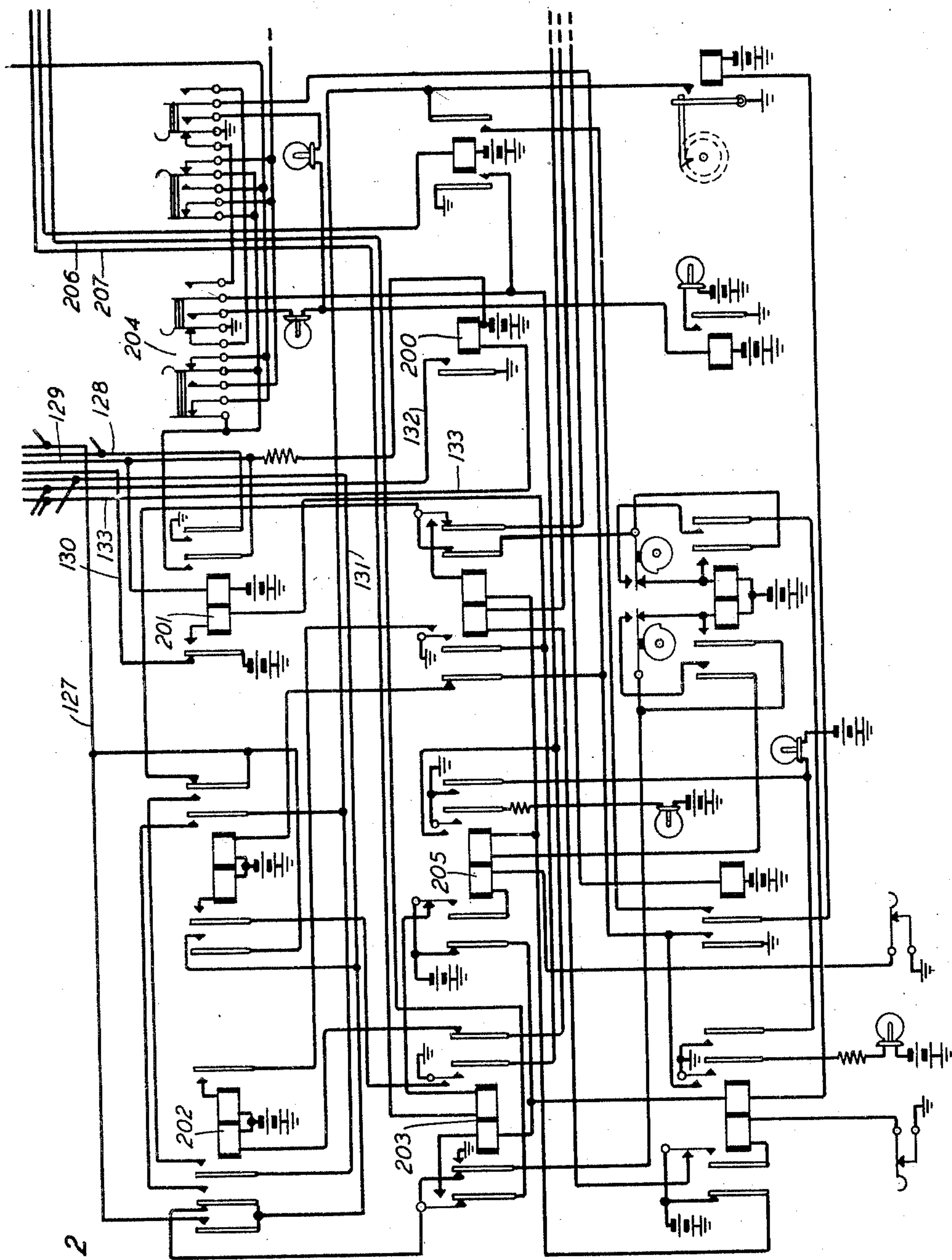


FIG. 2

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TELEPHONE SYSTEM

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9 Sheets-Sheet 3

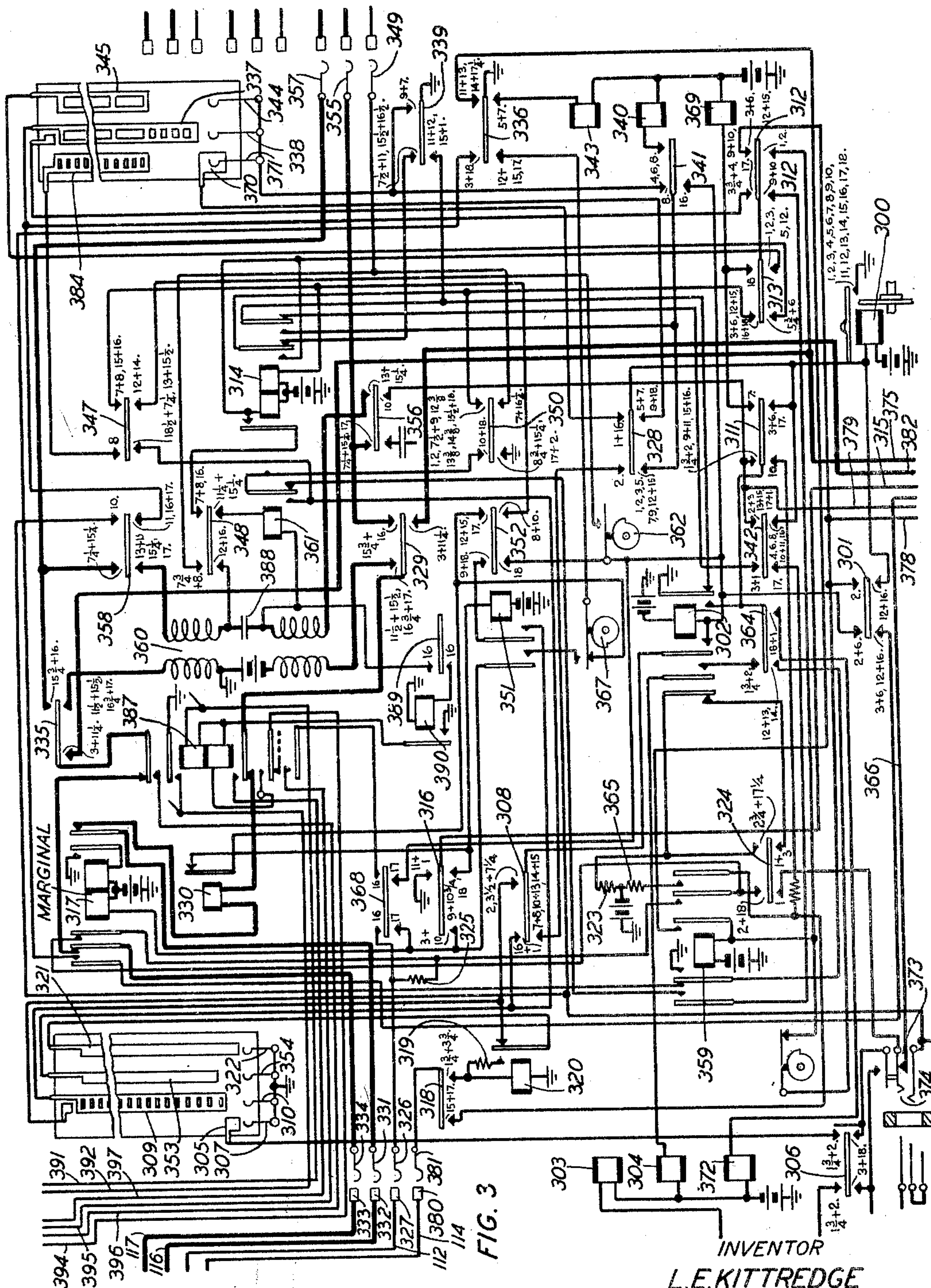


FIG. 3

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TELEPHONE SYSTEM

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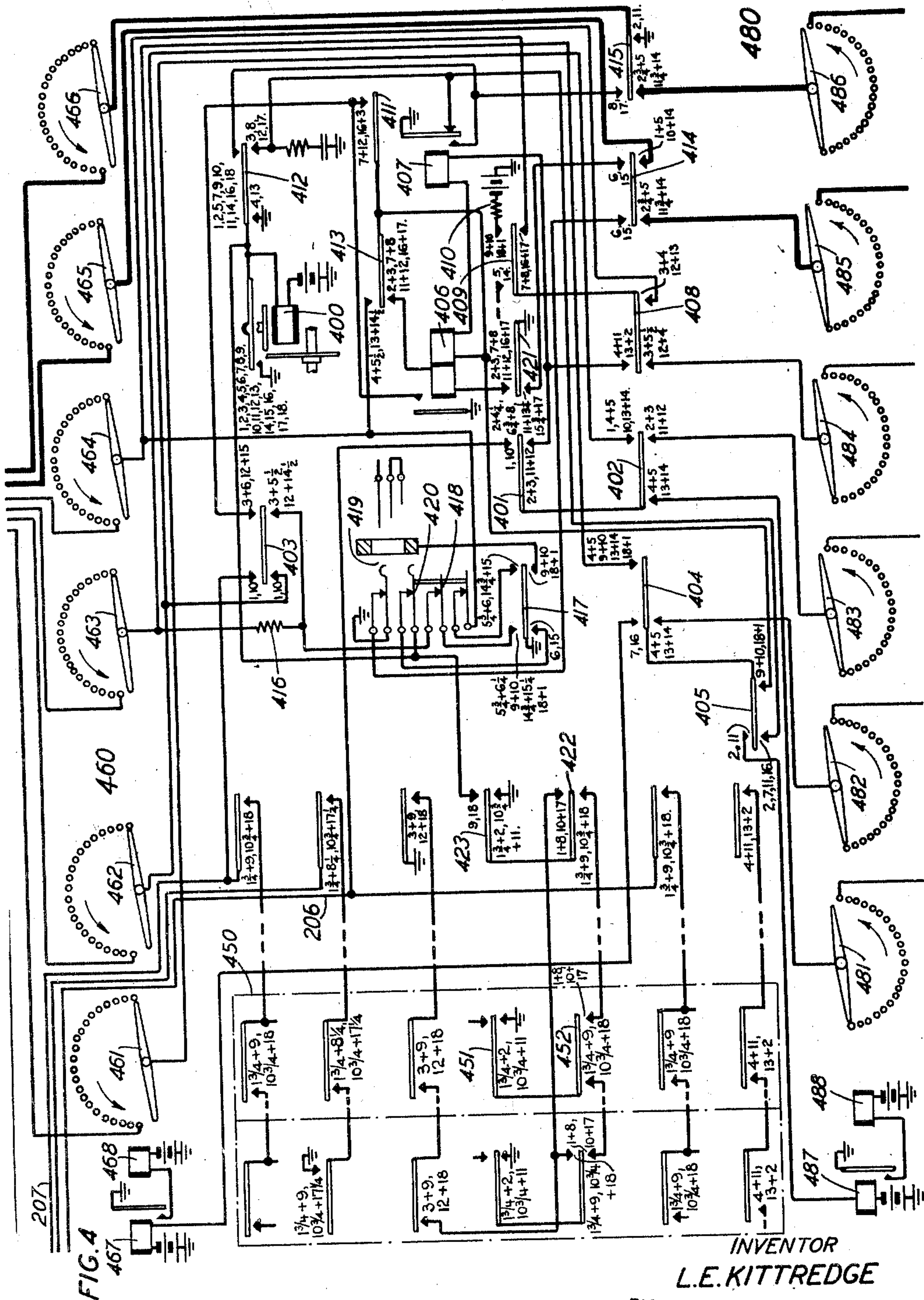


FIG. 4

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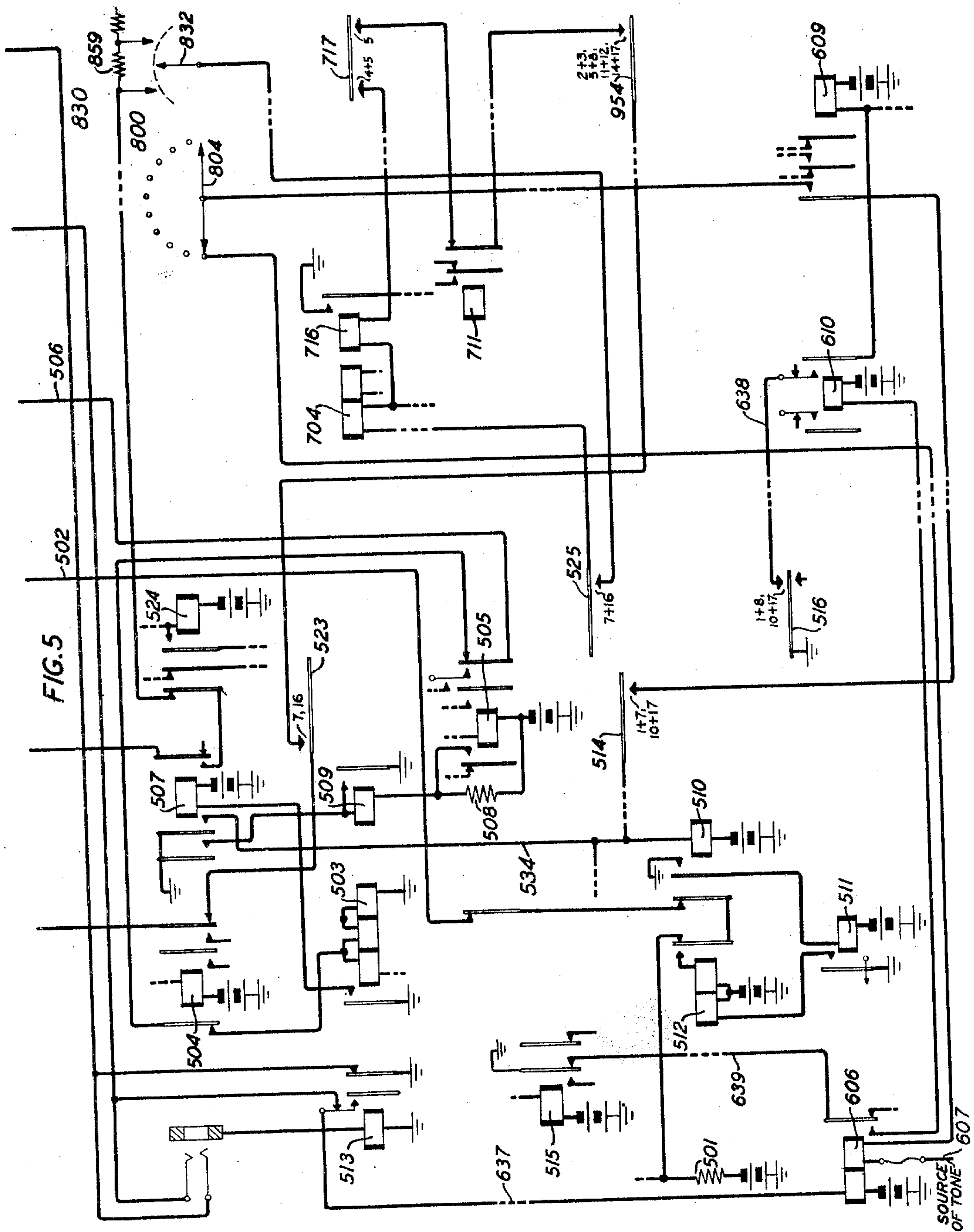
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TELEPHONE SYSTEM

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9 Sheets-Sheet 5



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TELEPHONE SYSTEM

Filed May. 18, 1931

9 Sheets-Sheet 6

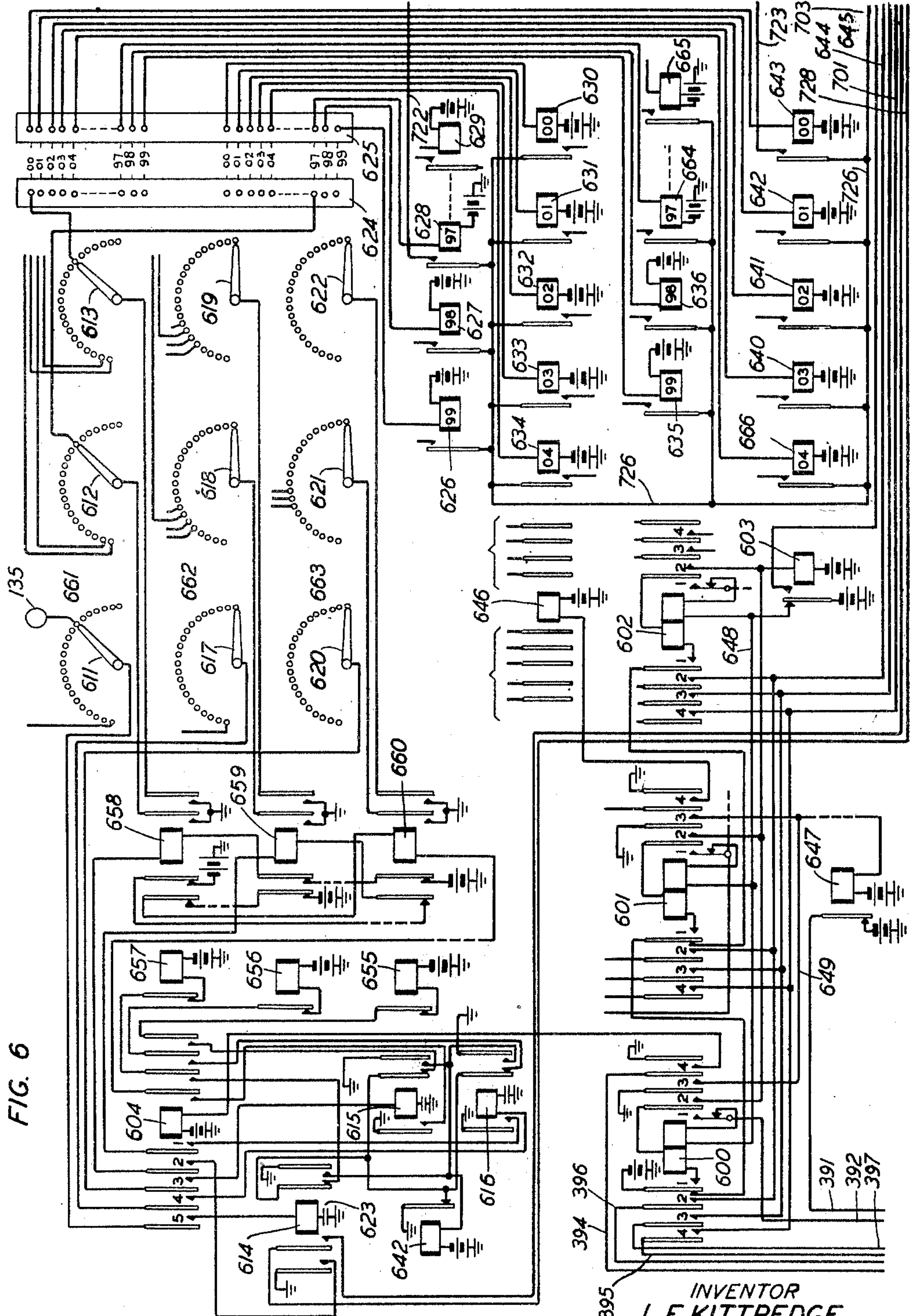


FIG. 6

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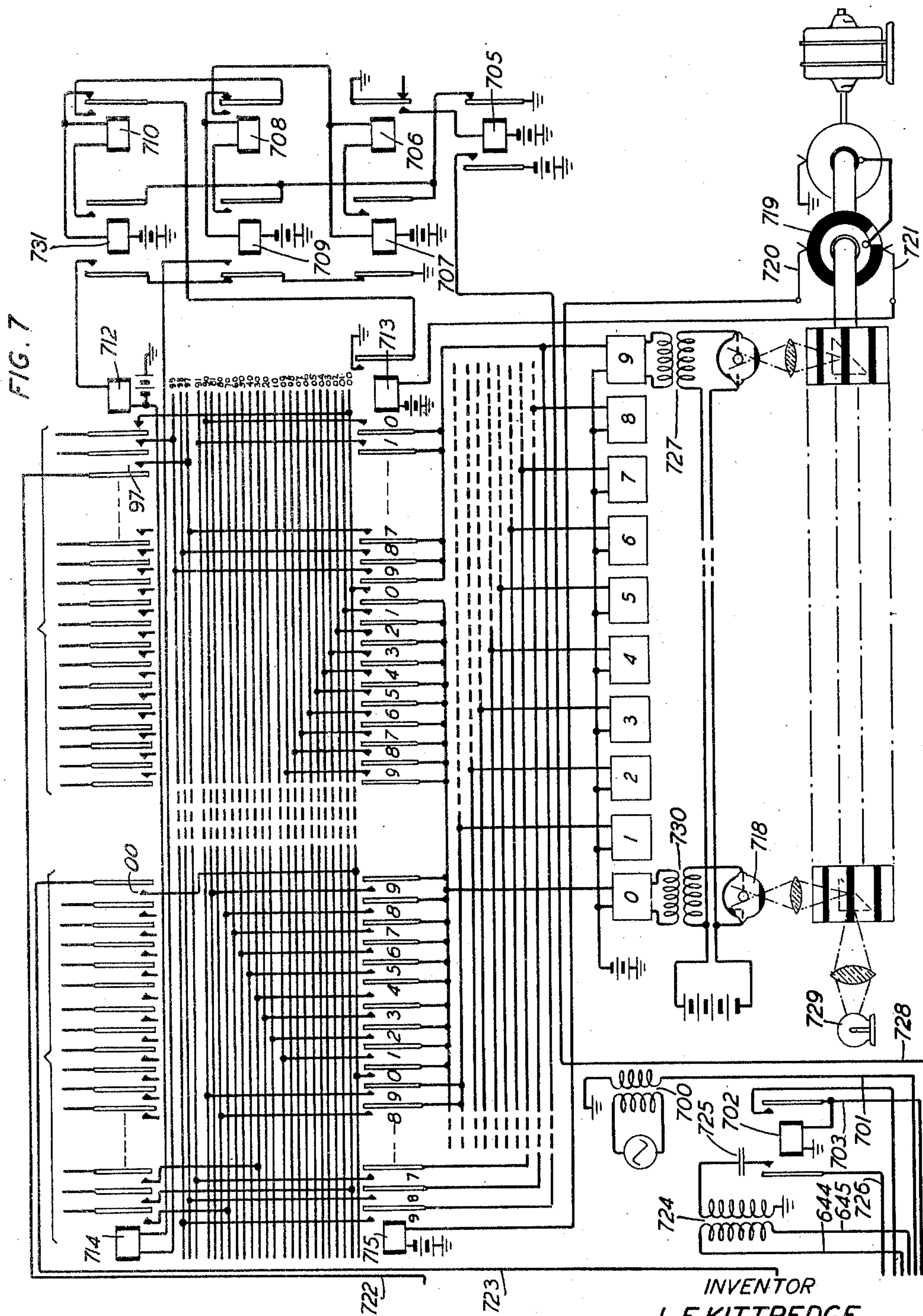
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TELEPHONE SYSTEM

Filed May 18, 1931

9 Sheets-Sheet 7



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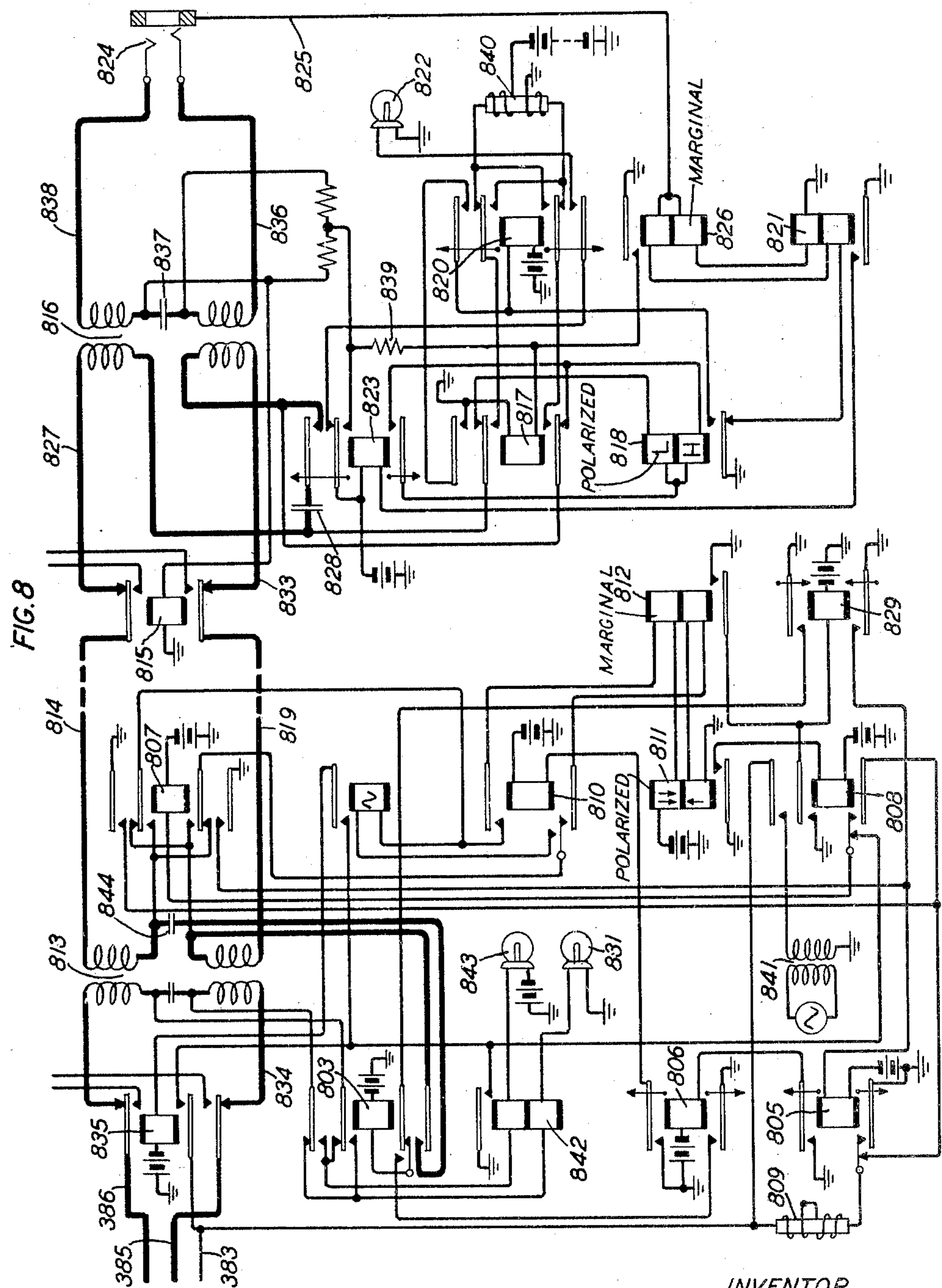
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TELEPHONE SYSTEM

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9 Sheets-Sheet 8



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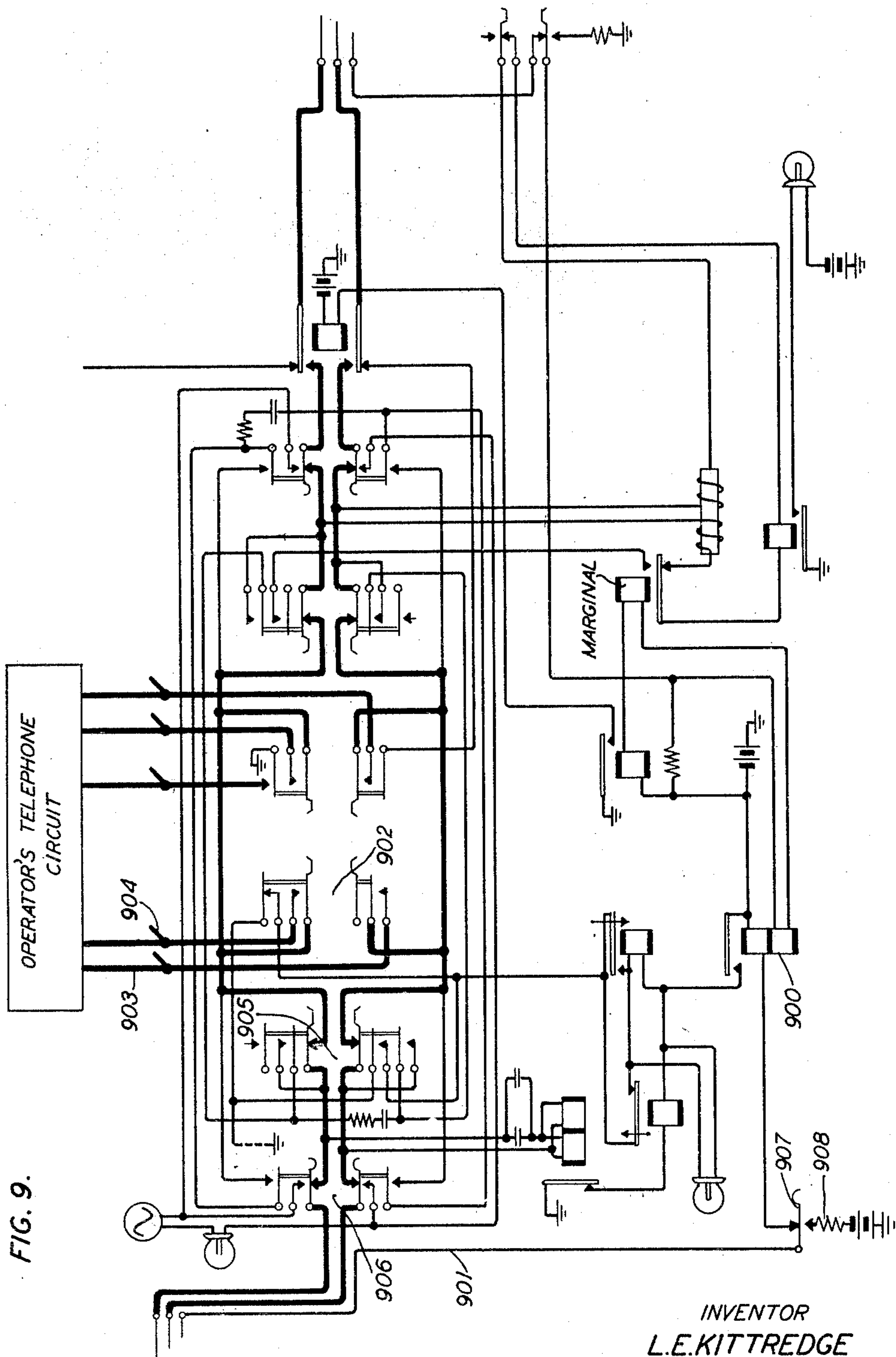
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TELEPHONE SYSTEM

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9 Sheets-Sheet 9



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UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

Application filed May 18, 1931. Serial No. 538,303.

This invention relates to telephone systems and more particularly to line number indicating devices used in such telephone systems.

In telephone systems where automatic switches are employed in completing some portion of a telephone connection it becomes necessary, when a calling subscriber desires to obtain a toll connection, to directively set one or more automatic switches to extend his line to a toll operator's position and to provide thereat some means for indicating the designation of the calling line so that the toll operator may check the number of the calling line as given by the subscriber in order to properly assess the charge for the toll connection to the calling station.

At the present time, this number checking, as it is called, is accomplished in divers ways, among which there are, for example, the well known checking multiple method; the method by which the operator, after having been given the number by the subscriber, sets a train of switches to select the calling line and thereafter impresses a tone over one of the line conductors, the tone circuit being closed over the parallel extension set up by the operator and returning by way of the switches set by the subscriber to the operator's position, so that, if the number of the calling station, as given by the subscriber, checks with the line terminals to which the operator has set the switches, the operator will hear the tone which was impressed over the line; and other methods for causing a lamp display of the calling line number, the lamp display circuit being set by trains of impulses characteristic of the calling line.

These and other means have been used with varying degrees of success but either require the operator to obtain the line designation from the calling subscriber thereby slowing down the service or involving a large amount of equipment to maintain. The object of the present invention is, therefore, to provide means whereby, in response to a calling subscriber having extended the connection to an operator's position, the operator thereat can, by the simple operation of inserting an answering cord into the jack of the extended

connection and the operation of a key, receive an announcement of the calling line number, thereby supplying the operating company with a simple and efficient means for directly receiving calling line designations without the necessity of requesting the same from the calling subscriber.

In accordance with the invention, therefore, one specific embodiment of which is disclosed herein by way of illustration, this is accomplished in the following improved manner: A hunting circuit is provided which comprises a group of selectors, each of the terminals of one of whose hunting arcs is multiplied to a sleeve conductor of each of the subscribers' lines in the office. Two other arcs of each selector are used for the line number designation and the terminals of these arcs corresponding to the terminal to which the sleeve conductor of the line is extended, are connected to a group of relays through whose contacts an organization of circuits is controlled which operates a call announcer in accordance with the terminal of the line on which the hunting switch is set.

The line announcer apparatus consists essentially of a phonographic machine constantly rotating and equipped with ten announcing drums and one timing drum, each of the announcing drums having a phonographic record of one of the ten digits.

In general, my invention functions in the following manner: When a line has been extended by the subscriber to an operator's position and the operator has received from the subscriber the office and number to which the call is to be completed, a knowledge of the number of the calling line is necessary so that toll charges will be correctly assessed therefor. In order to accomplish this, a key is depressed. The operation of this key impresses an alternating current potential on the sleeve conductor of the extended line and also causes other circuits to be closed for starting the hunting circuit to select the calling line. The alternating current potential on the sleeve conductor marks the calling line for guiding the hunting circuit to the terminals of said line. When the line to the sleeve conductor of which the alternating

current potential has been impressed is reached, the hunting circuit stops and other circuits are thereafter closed over the corresponding terminals and brushes of two separate arcs of the hunting switch for operating two relays in a control circuit, the first of which serves to give the thousands and hundreds designation, and the second tens and units designation of the calling line. These relays, in operating, serve to start the line announcer circuit which, at the proper time, closes the circuits of various phonographic records of the numerals comprising, in succession, the calling line number, and the corresponding voice currents are transmitted to the operator's telephone circuit. An announcement of the number is repeated at predetermined intervals, so that if the operator does not hear correctly the first time, she may listen as often as it is necessary to be satisfied that the calling line announcement has been correctly understood. Thereafter, the key is released, causing the hunting circuit to restore to normal and the line announcer circuit to be disconnected from the hunting circuit.

While the invention herein described is disclosed with reference to well known panel telephone systems, it is to be understood that it is not so limited and may be readily applied by those familiar with the art to any telephone system.

A clearer conception of the scope and purpose of the invention may be obtained by a consideration of the following description and attached drawings in which,

Figure 1 shows one of a group of subscribers' lines together with the line and the trip circuit common to the group of lines which serves to control a start circuit;

Fig. 2 shows the start circuit serving a plurality of groups of lines;

Fig. 3 shows a line-finder district selector circuit for extending the line to subsequent selectors and other types of outgoing trunks, such as a trunk to the recording operator's position;

Fig. 4 shows one of a plurality of link circuits serving the start circuit of Fig. 2 and having access to a plurality of line-finder district selector circuits such as shown in Fig. 3. A portion of two other links are shown;

Fig. 5 shows such parts of the circuits of the sender disclosed in Patent 1,589,402 granted to O. H. Kopp and dated June 22, 1926, as is necessary for an understanding of the present invention, wherein the designation of the apparatus in Fig. 5 is identical with that of the same apparatus in the sender of the above mentioned patent;

Fig. 6 shows the calling line hunting circuit;

Fig. 7 shows the line announcing mechanism and control circuit;

Fig. 8 shows the trunk extending from the district selector frame to the recording position;

Fig. 9 shows the toll cord and cooperating operator's telephone circuit, schematically shown, at such position; and

Fig. 10 shows the manner in which the above mentioned drawings should be arranged with respect to each other in order to disclose the invention completely.

When the subscriber at substation 100 removes his receiver from the switchhook a circuit is closed for line relay 101 extending from battery through that relay, inner contact of relay 102 over the subscriber's loop to ground at the outer contact of relay 102. Relay 101 operates and closes a circuit from battery, resistance 104, through the winding of relay 103 to ground at the outer contact of relay 101.

The operation of relay 103 closes a circuit from battery, resistance 105, to ground at the outer right contact of relay 103. This circuit is in shunt of the winding of relay 106, which relay serves the second subgroup of the group to which line 100 belongs; thus preventing the extension of a call from that subgroup, while the trip circuit is in use with line 100. The operation of relay 103 also closes a circuit from battery, through the winding of relay 200, conductor 133, outer left contact of relay 107, outermost left contact of relay 103 to ground. In addition, relay 103 closes a circuit from battery, over the back contact of relay 201, conductor 130, right winding of trip relay 108, inner left contact of relay 107, innermost left contact of relay 103, left contact of relay 109 to ground.

Relay 108 operates in this circuit and closes a locking circuit for itself from ground, right contact of relay 109, left winding and inner left contact of relay 108, over the inner left back contact of the trip relays of the other groups of lines, conductor 129, right winding of start relay 201 to battery. Relay 201 operates in this circuit. A circuit is now closed for relay 110 extending from battery through the winding of relay 110, right inner contact of relay 108, conductor 128, to ground at the outer right contact of relay 201. Relay 110 locks in an obvious circuit to ground at the left back contact of relay 109. Relay 108, together with relay 103, prepares a circuit from ground on the outer contact of relay 110, outer left front contact of relay 108, inner right contact of relay 103, conductor 131, left back contact of relay 202, outer left back contact of relay 203, conductor 206, upper contact of cam 401, upper contact of cam 402, brush 461 and its associated terminal, conductor 378, upper contacts of cam 301, winding of relay 302 to battery, assuming that the line finder of Fig. 3 had been allotted for use by the switch 460 and the se-

quence switch 300 is therefore standing in position 2.

The operation of relay 108 also closes a circuit from ground over its outer right contact through the winding of the trip magnet 303 serving the group of lines in which line 100 appears on the line finder frame, to battery. Relay 110, upon energizing, closes a circuit from battery, through the left winding of relay 109, left winding of relay 107, outer contact of relay 110 to ground. Relay 107 operates and locks through its right winding and inner right contact, conductor 132, to the contact of relay 200.

The operation of relay 302 closes a circuit from battery, through the winding of updrive magnet 304, middle left contact of relay 302, upper left contact of cam 364, right front contact of relay 302 to ground. Under the control of the updrive magnet 304 the line finder shaft is moved upwards. Due to the operation of the trip magnet 303 the set of brushes serving the group of lines to which line 100 belongs is tripped. When the shaft leaves the tripping zone a circuit is closed from ground over brush 307, through commutator segment 305, upper contacts of cam 306, outer left normal contact of key 204, inner right contact and right winding of relay 201 to battery. Relay 201 is held operated in this circuit but the circuit through the locking winding of relay 108 is shunted and that relay releases, in turn releasing the trip magnet 303. As soon as brush 307 leaves segment 305 the circuit of relay 201 is opened and that relay releases, again connecting battery to the operating windings of relay 108 and the corresponding relays in other trip circuits, so that subsequent calls may be served.

Relay 302 closes a locking circuit for itself over its inner left contact, right contact of cam 308, back contact of relay 320, commutator segment 321, brush 322 to ground, which is closed as soon as the line finder shaft moves upward. Relay 302, also closes a circuit from battery, over the inner left contact of relay 205, right winding of relay 203, conductor 207, left contacts of cam 403, brush 462 and its associated terminal, conductor 379, upper left contact of cam 311, right front contact of relay 302 to ground. The operation of relay 203 removes ground from conductor 206 thus preventing the starting of another line finder for some subsequent call until the brushes are tripped. Relay 203 locks in a circuit from battery, over the outer left contact of relay 205, left winding and outer left front contact of relay 203, left back contact of relay 202, conductor 131, inner right contact of relay 103, outer left contact of relay 108, outer contact of relay 110 to ground. The operation of relay 203 also closes a locking circuit for relay 201 from battery, left contact and left winding of relay 201, inner right contact of relay 203 to ground. The circuits just

traced are established before relay 108 is released by the shunting action of commutator segment 305. As soon, however, as relay 108 deenergizes it opens the locking circuit of relay 203, restoring the start circuit to a condition to serve subsequent calls.

When relay 302 operates it also closes a circuit from ground through its right front contact, upper left contact of cam 311, conductor 379, brush 462 and its associated contact, right contact of cam 404, lower right contact of cam 405, right winding of relay 406, winding of relay 407, upper left contact of cam 408, upper right contact of cam 409, resistance 410 to battery. Relays 406 and 407 operate; relay 406 closing a locking circuit for itself and relay 407 from battery, through resistance 410, upper right contact of cam 409, upper left contact of cam 408, winding of relay 407, right winding of relay 406, contact of cam 411, contact of relay 406 to ground. Relay 407 closes a circuit from battery, through the winding of sequence switch magnet 400, upper contact of cam 412, contact of relay 407 to ground. Magnet 400 operates advancing the link circuit sequence switch to position 2.

In position 2 ground is connected from the right contact of cam 415 to brush 466 and its associated contact, conductor 375, lower right contact of cam 312, lower right contact of cam 313, left winding of relay 314 to battery. Relay 314 operates, but performs no function until the calling line has been found. Ground from the front contact of relay 406 is also extended over the contact of cam 411, lower right contact of cam 405, upper right contact of cam 404, left contacts of cam 403, conductor 207, right winding of relay 203, inner left contact of relay 205 to battery, holding relay 203 operated until the link circuit is moved out of position 1. When the link circuit arrives in position 2 relays 406 and 407 release. The release of relay 407 completes a circuit from ground at its back contact, left contacts of cam 405, winding of magnet 487 to battery. Magnet 487 operates and closes an obvious circuit for magnet 488. Magnet 488 is the rotary magnet for sender selector switch 480 and causes the switch to rotate in search of an idle sender.

An idle sender is characterized by the connection of battery through a suitable resistance, such as resistance 501, to conductor 502 and its corresponding terminal in the set engaged by brush 483. With the link circuit sequence switch in position 2 ground is connected over the upper contact of cam 421, through the left winding of relay 406, lower contact of cam 413, right winding of relay 406, winding of relay 407, lower contact of cam 401, lower right contact of cam 402, to brush 483.

When brush 483 encounters a terminal corresponding to an idle sender, to which bat-

tery is connected, relay 406 operates, short circuiting its left hand winding over its contact and the contact of cam 411, permitting relay 407 to operate in series with the right hand winding of relay 406. The operation of relay 407 opens the circuit of magnet 487 and closes a circuit from battery through the winding of sequence switch magnet 400, upper contact of cam 412, front contact of relay 407 to ground, advancing the link sequence switch to position 3.

In position 3 a circuit is prepared extending from ground through the right and middle windings of relay 503, left contacts of relay 504, right outer back contact of relay 505, conductor 506, brush 484 of sender selector 480, lower contacts of cam 408, brush 464 of district finder 460 to conductor 315, left contact of cam 316, left winding of relay 317 to battery, which circuit is not completed until the district sequence switch reaches position 3.

In the meantime the line finder shaft continues to move upwards until it reaches the terminal corresponding to the calling subscriber's line. When these terminals are encountered a circuit is completed from battery, through the right winding of relay 109 in parallel with resistance 111, inner front contact of line relay 101, conductor 114, terminal 380, brush 381, right contact of cam 318, winding of relay 320 to ground. Relay 320 operates and closes a circuit in shunt of its winding through resistance 319, right front contact of relay 320, commutator segment 321, brush 322 to ground. Relay 109, which is marginal, is so adjusted as not to operate in the circuit previously traced in series with relay 107 or in the circuit traced through the winding of relay 320. With resistance 319 in parallel with relay 320, however, relay 109 does operate. The operation of relay 109 opens the locking circuit of relay 110 and relay 110 releases after an interval due to the fact that relay 110 is slow to release.

Relay 320 opens the locking circuit of relay 302 and that relay releases as soon as brush 310 encounters an insulating segment on centering commutator 309. The release of relay 302 opens the circuit of updrive magnet 304 and stops the line finder on the calling subscriber's line. It also connects battery through resistance 323 and its left back contact, lower right and upper left contacts of cam 324, right inner back contact of relay 317, resistance 325, brush 326 and terminal 327, over conductor 112, windings of cut-off relay 102 to ground. Relay 102 operates and releases line relay 101 thereby removing the calling condition from terminal 380. The release of relay 101 opens the circuit through the right winding of relay 109 permitting its release as soon as relay 110 releases. The release of relay 101 permits relay 103 to release and also opens the circuit

of relay 320. The connection of battery with terminal 327 marks terminal 113 and the other multiplied terminals of calling line 100 in the terminal banks of final selectors with reduced battery potential to render the line busy at such final selectors. The release of relay 302 closes a circuit from battery through the winding of sequence switch magnet 300, lower left contact of cam 328, outer right front contact of relay 314, right back contact of relay 302 to ground. Sequence switch 300 is advanced in this circuit to position 3.

When sequence switch 300 leaves position 2 the circuit of relay 314 is opened and that relay releases. When the sequence switch 300 reaches position 3, the previously traced circuit for relays 503 and 317 is completed. Relay 317, being marginal, does not operate at this time. Relay 503 operates and closes an obvious circuit for relay 507 which, in turn, closes a circuit from battery, through resistance 508, winding of relay 509, outer left front contact of relay 507 to ground. Relay 509 operates and locks over its inner right front contact. Relay 507 closes a circuit for relay 510 from battery, winding of relay 510, conductor 534, to ground, at the inner left front contact of relay 507. The operation of relay 510 closes an obvious circuit for relay 511 which, in turn, closes an obvious circuit through the right winding of relay 512.

The operation of relay 512 opens the circuit previously traced from battery, through resistance 501, to relays 406 and 407 and these relays release. The release of relay 407 closes a circuit from battery, through the winding of sequence switch magnet 400, lower right contact of cam 412, back contact of relay 407 to ground. Sequence switch 400 is advanced to position 4 from which position it is moved to position 5 by means of ground over the lower left contact of cam 412.

In position 5 of the link sequence switch the dialing leads are cut through directly from the district selector to the sender circuit. The dialing circuit may be traced from battery, through the left winding of relay 606, Fig. 5, conductor 637, right normally made contacts of relay 513, sender selector brush 485, and its corresponding terminal, lower contacts of cam 414, district finder brush 465 and its corresponding terminal, conductor 382, lower contact and cam 329, bottom inner back contact of relay 387, winding of relay 330, right back contact of relay 317, line finder brush 331, terminal 332, conductor 116 through the subscriber's station, conductor 117, terminal 333, brush 334, middle left back contact of relay 317, top outer back contact of relay 387, left contact of cam 335, conductor 375, brush 466 and its associated terminal, lower left contact of cam 415, brush 486 and its associated terminal,

outer right back contact of relay 513, to ground. When the dialing circuit above traced is completed, relay 606 operates and closes a circuit from battery, through the winding of relay 610, front contact of relay 606, conductor 639, inner right back contact of relay 515 to ground. Relay 610 operates and closes a circuit from battery, through the winding of relay 609, right front contacts of relay 610, conductor 638, upper left contact of cam 516 to ground. As soon as relay 609 operates the dialing tone circuit is completed as follows: from source of tone 607, right winding of relay 606, normal terminal and brush 804 of register steering switch 800, Fig. 5, outermost left contact of relay 609, lower contact of cam 514, to ground at the inner left front contacts of relay 507.

Due to the closure of this circuit a tone is induced in the left winding of relay 606, Fig. 5 and over the dialing circuit to the receiver of the subscriber's telephone to indicate that dialing may be started. The subscriber now dials the assigned long distance code number as the first step in extending his connection to the proper operator's position from which position the connection is then further extended to the wanted long distance subscriber.

The operation of the sender in response to the manipulation of the subscriber's dial and the consequent operation of the sender in causing the district selector to hunt for and connect with an idle trunk to the operator's position are no part of the present invention, are completely described in the above identified patent to Kopp, and hence are not included as a part of this description; but, reference is made to that patent for a complete description of its operation.

When, in accordance with the operation described in the above patent, the district selector has connected with an idle trunk extending to the operator's position regardless of whether such a position is in the same office or in another office, the district switch is advanced to position 10 and a trunk closure test is made of the trunk from the sender. The circuit for this test extends from ground, ballast lamp 831, lower winding of relay 842, top outer back contacts of relay 803, lower left winding of repeating coil 813, conductor 834, bottom outer back contacts of relay 835, conductor 385 and cooperating terminal, brush 355, left upper and right lower contacts of cam 356, conductor 379, brush 462 and cooperating terminal, right upper and lower contacts of cam 404, brush 482 and cooperating terminal, right front contacts of relay 507, outer back contacts of relay 524, compensating resistance 859, brush 832 of translator 830, lower contact of cam 525, left winding of relay 704, winding of relay 716, lower contacts of cam 717, outer back contacts of relay 711, right contact of cam 954, left contact of cam 523, right outer back con-

tacts of relay 504, brush 481 and cooperating terminal, left lower and right upper contacts of cam 402, brush 461 and cooperating terminal, conductor 378, left inner back contacts of relay 359, upper contacts of cam 358, brush 357, conductor 386 and cooperating terminal, upper back contacts of relay 835, left upper winding of repeating coil 813, top inner back contacts of relay 803, upper winding of relay 842, ballast lamp 843 to battery. Relay 716 operates in this circuit but relays 842 and 704 do not. The operation of relay 716 functions to advance the sender to make the proper talking selection in the district, advance it to position 15 and thereafter to dismiss the sender, all in accordance with the manner disclosed in the above mentioned patent.

With the district selector in position 15 a circuit is closed over the above traced battery and ground path in the operator's trunk circuit to brushes 357 and 355, respectively, left contacts of cam 358, upper right winding of repeating coil 360, lower contacts of cam 348, winding of relay 361, lower right winding of repeating coil 360, upper contacts of cam 356, brush 355 and thence through the above traced circuit at the operator's position, including relay 842. The resistance of this circuit is such that the quantity of current flowing through it is sufficient to operate relay 842, but its direction is opposite to that necessary to operate relay 361. Relay 842 operates and closes a circuit for relay 807 from ground on the contacts of relay 842, bottom normally made contacts of relay 808, winding of relay 807 to battery. Relay 807 operates relay 805 over an obvious circuit and relay 805 operates relay 806. Relay 805, over its bottom front contacts, connects ground through coil 809 to conductor 383 and cooperating terminal in order to hold the district selector under conditions more particularly noted hereinafter. Relay 806, in operating, operates relay 810. Relay 810 closes a circuit from battery through the upper winding of relay 811, upper winding of relay 812, top contacts of relay 810, top inner front contacts of relay 807, right upper winding of repeating coil 813, conductor 814, top back contacts of relay 815, upper left winding of repeating coil 816, top inner back contacts of relay 817, both windings in series of polarized relay 818, bottom back contacts of relay 817, left lower winding of repeating coil 816, bottom back contacts of relay 815, conductor 819, right lower winding of repeating coil 813, bottom inner front contacts of relay 807, bottom contacts of relay 810, lower winding of relay 812, lower winding of relay 811 to ground. Relay 818 operates in the circuit just traced, but relay 812 does not operate because the resistance of the circuit is too high, and polarized relay 811 does not operate because

the windings are differential for the quantity of current flowing through the circuit. Relay 818 causes the operation of relay 820 over an obvious circuit, and opens, at its back contacts, the lower winding of relay 821. The operation of relay 820 closes a circuit from battery on the top inner back contacts of relay 823, bottom outer contacts of relay 820, lamp 822 to ground. Lamp 822 lights as an indication that a call is awaiting on the trunk.

When the toll operator answers by inserting the plug of a toll cord circuit, such as shown in Fig. 9, into the trunk answering jack 824, a circuit is closed from battery through the upper winding of relay 900, top contacts of key 907, conductor 901, sleeve of cord and jack, conductor 825, lower winding of relay 826, upper winding of relay 821 to ground. Relays 821 and 826 operate in the above circuit. Relay 821 causes the operation of relay 823 over an obvious circuit and opens the circuit of lamp 822 thereby extinguishing it. Relay 823 by closing its top outer contacts connects the left lower winding of repeating coil 816, through condenser 828 and thence to the left upper winding of the said repeating coil, and short circuits, through its bottom contacts, the high resistance bottom winding of relay 818. Due to the corresponding increase of current in the circuit above traced and including relays 811, 812 and 818, relay 812 operates. Relay 812, in turn, causes the operation of relay 829. Relay 829 causes the operation of relay 803 over a circuit from ground on the top contacts of relay 829, bottom inner normally made contacts of relay 803, winding of relay 803 to battery. Relay 803 in operating, locks over its bottom inner make contacts to ground on the bottom contacts of relay 806, reverses the direction of current flow in the trunk circuit path above traced and including relay 361 in the district selector. The current flow is now in the proper direction to operate relay 361, which, on operating, closes a circuit for relay 314 from ground on the left contacts of cam 350, front contacts of relay 361, left lower and right upper contacts of cam 347, right winding of relay 314 to battery. Relay 314 operates and closes a circuit from ground on cam 339 and left lower contact thereof, right outer front contacts of relay 314, left lower contact and cam 328, winding of switch magnet 300 to battery. The switch magnet operates and advances the sequence switch to position 16 which is the "talking to operator" position, and in which position the district selector repeating coil 360 is removed from the trunk loop and talking battery is supplied to the calling subscriber from battery through the ballast lamp 843, upper winding of relay 842, thence as traced to the upper right contact of cam 329, thence as traced over the calling line loop to cam 335 and the upper contact thereof thence as traced through the lower

winding of relay 842 to ground. Relay 842 now holds over the said loop. In position 16, relay 314 is held locked over a circuit from ground on the bottom front contacts of relay 805, through coil 809 to conductor 383 and co-operating terminal as previously described, brush 349, right contacts of cam 350, right inner front contacts of relay 314, left winding of relay 314 to battery. The operation of relay 803 also completes, over its bottom outer contacts, the talking circuit by connecting condenser 844 to the two right windings of repeating coil 813.

It will be noted that the trunk circuit above described and connecting the district selector with the operator's position is one of a well known type which is used when the operator's position is located at a distance from the originating central office and in which but two trunk conductors, namely, 814 and 819, extend from the said office to the said position. Consequently, the method of signaling the outgoing end of the trunk from the said position to connect an alternating potential to the sleeve conductor of the connection as described hereinafter is one specifically adapted to the type of trunk herein used to illustrate the invention. However, it is understood that the invention is not limited to any particular kind of trunk as it is realized that the connection between the first switching stage and the operator's position may be accomplished in a variety of ways, all of which would be satisfactory for use with the present invention provided that the trunk contains facilities, or can be modified to contain facilities, which are responsive to an operation at the operator's position for connecting an alternating potential to the sleeve conductor of the extended connection as described hereinafter.

When the toll operator wishes to check the number of the calling subscriber, talking key 902 and number checking key 907 are operated. Key 907 disconnects the cord sleeve circuit from that of the trunk and substitutes battery therefor through high resistance 908. Relays 821 and 826 release; relay 821 momentarily, due to the switching of the circuit at the contacts of key 907 and relay 826 due to the decrease in current. Relay 823, however, does not momentarily release in consequence of the release of relay 821 due to its slow to release characteristic. Relay 821 reoperates when the key connects resistance 908 to the sleeve circuit. The release of relay 826 removes the shunt around the winding of relay 817 and this relay now operates in a circuit from battery through the top inner front contacts of relay 823, resistance 839, winding of relay 817 to ground. The operation of relay 817 disconnects the windings of relay 818 from the trunk conductors causing it to release. Relay 820, however, does not release by the release of relay

818 since it is slow releasing, and is subsequently locked in a circuit over its top outer contacts to ground on the top outer contacts of relay 817. The operation of relay 817 connects a battery of a higher voltage to the trunk conductors over a path from battery through the upper winding of retard coil 840, bottom inner front contacts of relay 820, bottom front contacts of relay 817, left lower winding of repeating coil 816, conductor 833, bottom back contacts of relay 815, conductor 819, right bottom winding of repeating coil 813, bottom inner front contact of relay 807, bottom contacts of relay 810, bottom winding of relay 812, bottom winding of relay 811 to ground. Another circuit also exists from ground through the bottom winding of retard coil 840, top inner front contacts of relay 820, top inner front contacts of relay 817, left upper winding of repeating coil 816, conductor 827, top back contacts of relay 815, conductor 814, right upper winding of repeating coil 813, top inner front contacts of relay 807, top contacts of relay 810, top winding of relay 812, top winding of relay 811 to battery. Due to the difference in current flow between the circuit through the upper winding and that through the lower winding of relay 811 caused by circuits of different battery potentials, the opposing characteristics of the windings of relay 811 are overcome and sufficient current now flows through the lower winding of relay 811 to overcome the effects of the opposing current through the upper winding so as to cause relay 811 to operate. Relay 811, in turn, causes the operation of relay 808. The operation of relay 808 closes a circuit from ground through the secondary winding of a transformer 841 connected to a source of alternating current, top outer contacts of relay 808, sleeve conductor 383 and cooperating terminal, brush 349, right contacts of cam 350, right inner front contacts of relay 314, left contacts of relay 314, right upper and left lower contacts of cam 348, condenser 388, contacts of cam 389, winding of relay 390 to ground. Relay 390 operates and closes a circuit for relay 387 from ground on the contacts of relay 390, top winding of relay 387, conductor 391, which is in parallel with the top winding of each relay 387 in each of the district selectors, to battery on the back contacts of relay 647. Relay 387 operates in this circuit and connects the district selector connected to the calling line to the common calling line start circuit of Fig. 6. Relay 387 connects ground through its top inner contacts to conductor 392. This conductor is connected to one relay of a group of which relays 600, 601, 602 are representative and each relay of the said group is common to one group of line finder-district selectors serving a group of subscribers on a line finder frame; there being as many relays in the

said group as there are groups of line finder-district selectors serving separate groups of subscribers. In accordance with the manner in which subscribers' lines are arranged and distributed as shown in the above identified patent to Kopp, there is a group of line finder-district selectors to each line finder frame. There is, however, but one common calling line test circuit for the whole office in the present embodiment of my invention so that when a district selector is taken into use on which calling line verification is necessary, the common calling line test circuit must identify the line finder frame which holds the calling subscriber's line to the terminals of which the selected line finder end of the district selector is connected. This is accomplished, in the present embodiment of the invention, by connecting conductor 392 to the top middle contact of relay 387 of all district selectors having accessibility to the same line finder frame and connecting conductor 392 to a relay, such as relay 600 in the calling line test circuit which identifies that frame; there being as many conductors 392 in the office as there are separate line finder-district selector groups having accessibility to different line finder frame groups of subscribers.

When, therefore, conductor 392 is grounded as before described, the associated line finder frame identifying relay 600 is operated over a circuit from ground on conductor 392, normally made contacts of the right No. 1 contact set of relay 600, right winding of relay 600, conductor 648, to battery on the back contacts of relay 603. Relay 600 operates, locks in a circuit from battery through the left No. 1 front contacts and left winding of relay 600, right No. 1 front contacts of relay 600, to ground on conductor 392. Relay 600 also connects battery through the winding of relay 647, conductor 649, right No. 3 contacts of relay 600, conductor 394, bottom middle front contacts and lower winding of relay 387, to ground on the contacts of relay 390. Relay 387 locks in the above circuit while relay 647 operates and removes operating battery from the top winding of all relays 387 in the district selector. The bottom middle back contact of relay 387 of the district selector shown in Fig. 3 is connected to the bottom middle armature of relay 387 of the next district selector. Every selector, therefore is connected to every other in a series preference chain connected to the winding of the battery supply relay 647. Hence when one district selector is connected to the common calling line test circuit, no other district selector in the office can, at the same time, become connected to it since, with the operation of relay 647 in the locking circuit of relay 387 of the district then associated with the test circuit, operating battery for all other relays 387 is removed

at the contacts of relay 647. This condition remains undisturbed until the calling line test circuit has identified the calling line as will more clearly appear hereinafter.

5 Relay 600 causes the operation of relay 604 over an obvious circuit. Relay 604 closes the circuits of all rotary selector magnets such as 655, 656, 657; there being as many selectors associated with a relay such as 604, for ex-
10 ample, as are needed to accommodate on the contacts of their associated test arcs the sleeve conductors, such as 135, from all the subscriber's lines terminating on the line finder frame or frames identified by relay 600
15 and hence by relay 604. There are other relays, like 646, which control separate groups of switches whose test arcs are wired to the sleeve conductors of subscribers' lines terminating in another line finder frame or
20 frames which are identified by relays such as 601 and 602. Only the complete circuit of one group is shown; other groups being identical with the one disclosed. Relay 604 also connects, through its left contacts, test brush
25 611 of switch 661 to the winding of relay 614, test brush 617 of switch 662 to the winding of relay 616 and test brush 620 of switch 663 to the winding of relay 615.

Meanwhile as soon as relay 600 operates,
30 an alternating current circuit is closed from ground through the secondary winding of transformer 700, conductor 701, left No. 4 contacts of relay 600, conductor 395, bottom outer contacts of relay 387, top contacts of
35 cam 368, brush 326, terminal 327, conductor 112 to sleeve terminals 113 and 134. Now the sleeve of each subscriber's line is multiplied to a contact on the arc of a switch such as switch 661, in the calling line test circuit.
40 Consequently, in the case under consideration, terminal 134 is cross-connected to a similarly marked terminal 135 wired to a contact on the arc of switch 661 cooperating with test brush 611.

45 When relay 604 operated, as already described, the operating circuits of the switch magnets 655, 656 and 657 were closed and these magnets operated to rotate their respective brushes over the three correspond-
50 ing cooperating contact arcs. As soon as brush 611 makes contact with terminal marked 135, the aforetraced alternating current path to terminal 135 is completed over brush 611, left No. 5 contacts of relay 604,
55 winding of relay 614, condenser 623 to ground. Relay 614 operates and, over its right outer contacts, closes an obvious circuit for relay 642 which operates. On its right inner contacts, relay 614 opens the circuit of
60 switch magnet 657 and relay 642 opens the circuit of switch magnets 656 and 657 causing the switches 661, 662 and 663 to stop. The brushes 611, 612 and 613 of switch 661 are brought to rest on the contacts with which
65 they make, as is likewise the case with the

brushes of switches 662 and 663. Relay 614, over its left outer contacts completes a circuit for relay 658 from ground on the left outer contacts of relay 614, left No. 2 contacts of relay 604, winding of relay 658, left inner
70 contacts of relay 659 to battery on the left inner contacts of relay 660. Over its left inner contacts, relay 614 partially prepares a circuit for relay 702 which may be traced as follows: ground through the winding of
75 relay 702, conductor 703, left inner contacts of relay 614, conductor 728 to battery on the left contacts of relay 705 when this relay is operated as described hereinafter.

Relay 658 in operating, connects ground
80 over its right contacts to the two brushes 612 and 613 which are on the same shaft as brush 611 and are in contact with terminals corresponding to terminal 135 of the arc cooperating with brush 611. At its left contacts relay
85 658 removes operating battery for relays 659 and 660.

Now the terminals on the arcs cooperating with brushes 612 and 613 are cross-connected to cross-connecting rack 624 and, in accord-
90 ance with the subscriber's line number, to the appropriate identifying relays some of which are represented by relays 626 to 636, 664, 665, 666, 640 to 643. There are two groups of identifying relays: one group consists of one
95 hundred relays to designate the thousands and hundreds digit of the line number, and are, for the sake of convenience, designated from 00-99 and are represented, in part, by relays 626 to 630, inclusive. Another
100 group, likewise designated 00-99, identifies the tens and units digit of the line number and are represented in part by relays 635, 636, 664, 665, 666, 640 to 643. The winding of each of these relays is connected to the
105 cross-connecting rack 625 and the conductors from the switch banks cooperating with brushes 612 and 613, or 618 and 619 or 621 and 622 and wired to rack 624 are then cross-connected to the appropriate relays of the
110 two groups in accordance with the subscriber's line number as represented by any two corresponding terminals on the switch banks of switches 661, 662 and 663 and similar
115 switches of other groups in the calling line test circuit. The terminals of the arc cooperating with brush 612, or those corresponding to it in other switches, have to do with the first two digits of the number and the contacts of the arc cooperating with
120 brush 613, or those corresponding to it in other switches, with the last two digits. Thus, for instance, if the line number is 9700, the conductor connected with the terminal on the arc cooperating with brush 612 and corre-
125 sponding to conductor wired to terminal 135, will be connected to relay 628 through the cross-connecting racks 624-625, which relay is the 97th relay of the group for designating the thousands and hundreds digits. Ter-

minal 00 of the terminal rack 624, on the other hand, is connected with the corresponding terminal on arc cooperating with brush 613 and is also cross-connected to terminal 00 on rack 625 which, in turn, is connected to the winding of relay 643; this relay being the first of the group of one hundred relays designating the tens and units digit.

Referring back to the operation of the circuit, the fact that brushes 612 and 613 are in contact with terminals which are cross-connected to terminals wired to the windings of relays 628 and 643, respectively, causes both of these relays to operate from the aforementioned ground to the said brushes from the contacts of relay 658. The function of these relays will be apparent from a consideration of the line announcing mechanism and controlling circuit given below.

The line announcing mechanism, shown in Fig. 7, illustrates one form which such a mechanism may take. It comprises a series of drums having opaque and partially transparent sections, the partially transparent sections being photographic records of the sound corresponding to digits from zero to nine. The light from a source, such as lamp 729 may be directed by any suitable means through the speech record to a photoelectric cell, such as 718, connected to one side of a transformer, such as 730. The output currents from the transformer are amplified through amplifier units, such as "0", and transmitted to the trunk line in the manner hereinafter described. The line announcing mechanism such as disclosed in Patent No. 1,645,573 patented October 18, 1927, in the name of H. M. Bascom may also be employed.

The line announcer connecting circuit shown in Fig. 7 also illustrates one manner in which the connection between the calling line announcing mechanism and the calling line identifying relays of Fig. 6 can be made. It comprises a plurality of multi-contact relays of a structure well known to the art, arranged in two separate groups. To the separate armatures of the relay of each of these groups is connected a conductor wired to the contact of some relay in one of the two groups of calling line identifying relays. To the armature contacts of multi-contact relay 712 are connected the conductors coming from the contacts of the group of relays 626—634 identifying the thousands and hundreds digits, while to the armature contacts of relay 714 are connected the conductors coming from the contacts of the group of relays 635, 636, 664, 665, 666, 640, to 643 identifying the tens and units digits.

Two other multi-contact relays, namely relays 713 and 715 are also provided, each of these relays having 100 contact pairs divided into 10 groups of 10 pairs of contacts each. The armatures of each group are strapped together and connected to one side of a particu-

lar amplifier. The mates of the contacts of all the 10 groups are connected to a group of common conductors designated from 00 to 99 and the order in which these contacts are wired to the said common conductors depends upon the particular amplifier to which the common armatures of any group are connected. For example, one side of the amplifier 0 is connected, so far as multi-contact relay 713 is concerned, to the armatures 0 to 9 of one group which are multiplied together. The contact making with armature 0 is cross-connected to conductor 00, the contact making with armature 1 is cross-connected to conductor 01 and so on with all, the contact making with armature 9 being cross-connected to conductor 09. In the same way, one side of the amplifier 1 is connected to the second group of armatures and their corresponding contacts are likewise connected in the numerical order to conductors 10 to 19. In a like manner the remaining announcing drums are each connected to a group of 10 armatures of relay 713 and the corresponding contacts of each group are connected to those common conductors the first digit of whose numerical designation is the same as the number of the amplifier, while the second corresponds to the number of the armatures. That is, the 100 common conductors, being designated 00 to 99, the amplifiers are connected through relay 713 in such a manner that each drum is multiplied to the 10 conductors whose first numerical designation is the same as the number of the amplifier.

The contacts of relay 715 are likewise divided into 10 groups of 10 pairs of contacts each and one side of each amplifier is likewise connected to a separate group of 10 armatures. The contacts making with these armatures, however, instead of being connected to the various ones of the 100 conductors in accordance with the identity of the first numerical digit of its designation with the numerical designation of the amplifier, are now connected in the order of the second digit of the numerical designation of the said 100 conductors. That is, the contact making with armature 0 of the group of armatures connected to amplifier 0 is connected to conductor 00, the contact making with armature 1 of the same group is connected to conductor 10, the contact making with the armature 2 is connected to conductor 20 and so on, the contact making with armature 9 being connected to conductor 90. In the same way the contacts making with the group of armatures connected to one side of the amplifier 1 are connected to common conductors 01, 11, 21, 31, 41, 51, 61, 71, 81 and 91 and likewise all contacts making with the armatures of the remaining groups are connected to those common conductors whose last digits are identical with the numbers of the ampli-

fiers to which the cooperating group of armatures is connected.

The subscriber's numerical designation in the office in which his line terminates is divided into two parts by the identifying relays in Fig. 6, the first part consisting of the thousands and hundreds and the second of tens and units as already described. One contact of each of the relays in the thousands-hundreds identifying group is carried to an armature of multi-contact relay 712 while the contact of each of the relays in the tens-units identifying group is each carried to an armature of multi-contact relay 714. The contacts of multi-contact relay 712 making with their respective armatures are each connected to the common conductor of like numerical designation as the identifying relay to the contact of which is connected the cooperating armature. The armatures of relay 714 are likewise connected to the common conductors bearing a similar numerical designation as the identifying relays to the contacts of which are connected the respective armatures of relay 714.

The manner in which the line announcing mechanism as well as the connecting circuit operate to give an oral pronouncement of the calling subscriber's line will now be described.

The time at which announcements are made corresponds with the period when the unshaded segment of the timing drum 719 is in contact with brushes 720 or 721. As already explained, the circuit of relay 702 is not completed until relay 705 is operated, which event occurs only during periods of no announcement. Assuming, therefore, that relay 705 is operated, the above traced circuit of relay 702 is completed to battery on the front contacts of relay 705 and relay 702 locks to battery on the front contact of relay 603. Starting from the instant when the unshaded or commutating segment of the timing drum makes contact with brush 721 an obvious circuit is closed for multi-contact relay 713, causing it to operate. Relay 713, at its right contacts, closes a circuit for relay 731 from ground on the right contacts of relay 713, back contacts of relay 710, winding of relay 731 to battery. Relay 731 operates and completes a circuit for relay 712 from ground on the back contacts of relays 707 and 709, left contacts of relay 731, winding of relay 712 to battery. Relay 712 operates and closes its contacts to connect with the contacts of the first group of identifying relays in Fig. 6.

It was assumed hereinbefore that the calling subscriber's line designation was 9700. Consequently relays 628 and 643 are energized in the manner already described. The contact of relay 628 is connected to conductor 722 which, in turn, connects with the 97th armature of multi-contact relay 712, while

the contact of relay 643 is connected to conductor 723 which connects with the first or 00 armature of multi-contact relay 714. When, therefore, multi-contact relays 713 and 712 operate as above described, a circuit is closed from ground through the right winding of repeating coil 724, condenser 725, left contacts of relay 702, conductor 726, contacts of relay 628, conductor 722, contact pair 97 of multi-contact relay 712 corresponding contacts of multi-contact relay 713, through amplifier 9 to battery. The circuit for the oral pronouncement of the numeral 9 is thus made and is repeated over the trunk of the established connection to the recording operator as follows: battery through the ballast lamp 843, upper winding of relay 842, top outer front contacts of relay 803, left lower winding of repeating coil 813, bottom back contacts of relay 835, conductor 385 and associated terminal, brush 355, right contact of cam 329, bottom inner front contacts of relay 387, conductor 397, left No. 3 contacts of relay 600, conductor 645, left winding of repeating coil 724, conductor 644, left No. 2 contacts of relay 600, conductor 396, top outer front contacts of relay 387, cam 335 and right upper contact thereof, brush 357, conductor 386 and associated terminal, top outer back contacts of relay 835, left upper winding of repeating coil 813, top inner front contacts of relay 803, bottom winding of relay 842, ballast lamp 831 to ground. The oral pronouncement is further repeated over the following closed loop: one side of condenser 844, right upper winding of repeating coil 813, conductor 814, top back contact of relay 815, conductor 827, left upper winding of repeating coil 816, condenser 828, top outer contacts of relay 823, left lower winding of repeating coil 816, conductor 833, bottom back contacts of relay 815, conductor 819, right lower winding of repeating coil 813, bottom outer contacts of relay 803 to other side of condenser 844. Finally the signal is repeated to the operator's telephone circuit over the following path: conductor 903 connecting with the operator's telephone circuit, not shown, bottom contact of key 902, which is operated, bottom normal contacts of key 905, bottom normal contacts of key 906, ring trunk conductor 836, right lower winding of repeating coil 816, condenser 837, right upper winding of repeating coil 816, tip conductor 838, top inner normal contacts of key 906, top inner normal contacts of key 905, top inner make contacts of key 902, to conductor 904, connecting with the operator's telephone circuit. The operator thus hears the oral pronouncement 9 for the thousands digit of the calling subscriber's line designation.

The pronouncement is completed at the time brush 721 of the timing drum engages an insulating segment, at which time relay

713 releases. Relay 710, which during the announcement is held normal by the shunting ground from the right contacts of relay 713 to one side of its winding, now operates in series with relay 731 and locks over the right contacts of relay 731 to ground on the right contacts of relay 705, this last relay having released meanwhile as explained hereinafter. When the timing drum has rotated to the position in which the commutating segment engages brush 720 an obvious circuit is closed for multi-contact relay 715. With the operation of this relay and relay 712 remaining energized, a circuit is again closed over the previously traced path over conductor 726 to conductor 722 through the 97th pair of contacts on relay 712, the 7th pair of contacts of the 7th group of armatures of relay 715 connected to the No. 7 amplifier, through the No. 7 amplifier, to battery. The operator now hears the pronouncement of the second or hundreds digit of the subscriber's number, which, in the illustration assumed, is 7. The pronouncement is completed when the timing drum is rotated so that the commutator segment no longer engages brush 720 at which time relay 715 releases and disconnects the announcing drums from the contacts of relay 715. When the timing drum rotates to where its commutating segment engages brush 721, the previous circuit is again closed for operating relay 713 and the closure of the right contacts of this relay closes a circuit for relay 709 from ground on its right contacts, front contact of relay 710, back contacts of relay 708, winding of relay 709 to battery. Relay 709 operates in this circuit, opens the circuit of multi-contact relay 712 and closes the following circuit: battery, winding of relay 714, left front contacts of relay 709, back contacts of relay 707 to ground. Relay 708, meanwhile, remains short circuited from ground on one side of its winding through the back contacts of relay 705 and right front contacts of relay 709 and also by ground on the other side of its winding through the front contacts of relay 713, as already traced. Relay 713 connects the announcing amplifiers to the contacts of said relay and relay 714, in operating, likewise connects all of the conductors of which conductor 723 is one, from the second set of identifying relays in Fig. 6 to the armatures of multi-contact relay 714. Remembering that the tens numerical designation of the calling subscriber's line is zero, a circuit is now closed over a previously traced path on conductor 726, contacts of relay 643, conductor 723, the number 00 armature of relay 714, armature 0 of relay 713, number 0 amplifier, to battery. The operator now hears the pronouncement 0 which is the tens digit of the calling subscriber's number.

When the timing drum is disengaged from brush 721, relay 713 disconnects the amplifiers

from the common conductors. The release of relay 713 also removes the short circuit around the winding of relay 708 so that this relay now operates and locks in series with relay 709 to ground on the right contacts of relay 705. Relay 714, however, remains operated.

When the timing drum commutator segment again engages brush 720, multi-contact 715 again operates as already described and the amplifiers are again connected to the common conductors and to the conductors connected with the second set of identifying relays and hence to conductor 723 through multi-contact relay 714. The circuit previously described over conductors 726 and 723 is again closed to the 0 amplifier and the operator hears the oral pronouncement 0 of the units digit of the calling subscriber's number. When brush 720 is disengaged from the timing drum, relay 715 releases, thereby disconnecting the amplifiers from the common conductors and hence from the conductors to the identifying relays. When the commutating surface of the timing drum makes with brush 721, relay 713 operates and over its right contacts, closes a circuit for relay 707 from battery through the winding of relay 707, front contacts of relay 708, front contacts of relay 710 to ground on the front contacts of relay 713. Relay 707 operates and the consequent breaking of its back contacts causes the release of multi-contact relay 714, thereby disconnecting the test conductors from the line announcer connecting circuit. During this period therefore, due to the released condition of both multi-contacts 712 and 714, no announcement is transmitted to the recording operator. When the commutator segment disengages brush 721, relay 713 releases. The shunt around relay 706 is thereby removed and relay 706 operates and locks in series with the winding of relay 707 to ground on the right contacts of relay 705 by way of the front contacts of relay 707. Relay 706 closes an obvious circuit for relay 705, which, in operating, unlocks relays 707, 706, 709, 708, 731 and 710.

It is during this period of no announcement that relay 705 is operated and consequently furnishes battery for relay 702, in order to prevent a connection being set up to the operator's telephone circuit from the line announcer circuit in the midst of a pronouncement. When relay 706 releases, relay 705 likewise releases and if, prior to its release, ground through relay 702 is still connected to conductor 728, relay 702 will reoperate and the above cycle of operations is repeated thereby giving the operator another pronouncement cycle of the calling subscriber's number. This pronouncement is repeated for every cycle of operation described above, there being two pulsing intervals of the timing drum between each pronouncement.

After the operator has heard the announce-

ment of the calling line number, key 907 is released and relay 826 reoperates over the previously traced circuit. The operation of relay 826 causes ground through its contacts to be applied to the winding of relay 817 which is now shunted and released. Relay 817 disconnects the high potential battery through coil 840 from the trunk and reconnects polarized relay 818 to the trunk. The removal of high potential battery from the circuit including relays 811 and 812 causes relay 811 to release since the current through both windings of relay 811 is again differential. Relay 811 releases relay 808 and relay 808 opens the alternating current circuit from the path previously described and including relay 389. Relay 389 releases and in turn releases relay 387. Relay 387 disconnects the district selector from the common line connecting circuit, releases relay 647 of the calling line test circuit which, on releasing, reconnects operating battery to the upper winding of relay 387 in each district selector. The release of relay 387 further releases relay 600. Relay 600 releases relays 604 and 603. Relay 604 releases relay 658 and the release of relay 658 releases the number identifying relays 628 and 643. The common line test circuit is now normal with the brushes of the various switches remaining connected to the terminals on which they are standing.

The connection established to the operator's position is now in the same condition as it would be for the operator to complete the connection to the distant office by means of the calling plug of the cord shown in Fig. 9. This invention, however, is not concerned with the operating features of the connections subsequent to the oral pronouncement of the calling line number, the connection being established in the well known manner. Reference is further made to the above identified patent to Kopp for a further description of the operation and release of the district selector and associated line finder since these features are the same, the district selector only having been modified over that shown in the above patent to include necessary features for the disclosure of the present invention.

What is claimed is:

1. In a telephone system, a calling telephone line having an arbitrary designation, a receiving station, means for connecting said calling line to said receiving station, a selective device capable of selecting said calling line, means responsive to an operation at said receiving station after said calling line has been extended thereto for operating said selective device to select said calling line, and means responsive to said selection for audibly indicating the arbitrary designation of said calling line.

2. In a telephone system, a calling telephone line having an arbitrary designation,

a receiving station, means for connecting said calling line to said receiving station, a selective device capable of selecting said calling telephone line, and means responsive to the connection of said calling telephone line to said receiving station and the selection of said line by said selective device for audibly indicating the arbitrary designation of said calling line.

3. In a telephone system, a plurality of lines each having an arbitrary designation, an operator's position, means for connecting a calling telephone line to said operator's position, a selective device capable of selecting said calling telephone line, and means responsive to the connection of said calling telephone line with said operator's position and the selection of said line by said selective device for audibly indicating the arbitrary designation of said calling line at said operator's position.

4. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, an operator's position, means for extending a calling telephone line to said operator's position, an announcer, means responsive to said extension for operating said selective device to select the test conductor of said calling telephone line, and means responsive to said selection for operating said announcer to audibly announce the arbitrary designation of said calling telephone line.

5. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, an announcer, an operator's position, means for extending a calling telephone line to said operator's position, means responsive to an operation at said position for applying an alternating potential to the test conductor of said calling line, means responsive to said operation for operating said selective device to select the test conductor of said calling line, and means responsive to said selection for operating said announcer to audibly announce the arbitrary designation of said calling telephone line at said operator's position.

6. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising a switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, an operator's position, an operator's telephone circuit at said position, means for extending a calling telephone line to said operator's position, an announcer, means for operating said selective device for selecting the test conductor of said

calling telephone line, and means responsive to the connection of said calling line with said position and the selection of said test conductor by said selective device for operating said announcer to transmit to said operator's telephone circuit the arbitrary designation of said calling telephone line.

7. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, an announcer, an operator's position, an operator's telephone circuit at said position, means for extending a calling telephone line to said operator's position, means responsive to an operation at said position for applying an alternating potential to the test conductor of said calling line, means responsive to said operation for operating said selective device to select the test conductor of said calling line, and means responsive to said selection for operating said announcer to transmit the arbitrary designation of said calling line to said operator's telephone circuit.

8. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, an announcer, an operator's position, an operator's telephone circuit at said position, a trunk line, switching means in said trunk line for connecting said trunk to said selective device, means for extending a calling telephone line to said operator's position over said trunk line, means responsive to an operation at said position for applying an alternating potential to the test conductor of said calling line, means at said position for operating said switching means in said trunk line and for operating said selective device to select the test conductor of said calling line, and means responsive to said selection for operating said announcer to transmit through said selective device, said switching means in said trunk and said trunk the arbitrary designation of said calling line to said operator's telephone circuit.

9. In a telephone system, a plurality of telephone lines each having an arbitrary designation, a selective device comprising switching means, a test conductor for each of said plurality of telephone lines extending to said switching means, registering means in said selective device, means for connecting a calling telephone line to said operator's position, an announcer, means responsive to an operation at said position for operating said selective device to select the test conductor of said calling line, means responsive to such selection for registering on said registering means the arbitrary designation of

said calling line, and means responsive to said registration for operating said announcer to audibly pronounce the arbitrary designation of said calling line as registered on said registering means.

10. In a telephone system, a plurality of telephone lines arranged in groups, each of said plurality of telephone lines having an arbitrary designation, line extending switches arranged in groups each group of line extending switches having access to a different group of lines, a selective device comprising a switching means for each group of said telephone lines, a conductor extending from each of said telephone lines to said associated switching means, an operator's position, means for extending a calling telephone line to said operator's position through one of the line extending switches of the group having access to said calling line, an announcer, means responsive to the extension of said calling line to said operator's position for operating the switching means in said selective device having access to the group of said calling line for selecting the test conductor of said calling line, and means responsive to said selection for operating said announcer to audibly announce the arbitrary designation of said calling telephone line.

11. In a telephone system, a plurality of telephone lines arranged in groups, each of said plurality of telephone lines having an arbitrary designation, line extending switches arranged in groups, each group of line extending switches having access to a different group of lines, a selective device comprising a switching means for each group of said telephone lines, a conductor extending from each of said telephone lines to its associated switching means, a register in said selective device, an operator's position, means for extending a calling telephone line to said operator's position through one of the line extending switches of the group having access to said calling line, an announcer, means responsive to the extension of said calling line to said operator's position for operating the switching means in said selective device having access to the group of said calling line for selecting the test conductor of said calling line, means responsive to such selection for recording in said registering means the arbitrary designation of said calling line, and means responsive to said registration to cause said announcer to audibly pronounce the arbitrary designation of said calling line as registered on said register.

12. In a telephone system, a plurality of telephone lines arranged in groups, each of said lines having an arbitrary designation, line extending switches arranged in groups for cooperation with separate groups of said telephone lines, a selective device comprising a switch for each group of telephone lines, a test conductor for each telephone

line extending to its corresponding switch in said selective device, means for operative-ly connecting a line extending switch of any group with said selective device, an opera-
 5 tor's position having a connecting cord, means for extending a calling telephone line to said operator's position through one of said line extending switches accessible to the group of said telephone lines containing said
 10 calling line, a source of alternating current, an announcer, means responsive to the operative connection of said cord with the extension of said calling line over said line extending switch to said position and the ap-
 15 plication thereof of said alternating current source for applying a potential to the test conductor of said calling line extending to said switch in said selective device, means for operating said switch to select said test
 20 conductor, and means responsive to a connection of said switch with said conductor for operating said announcer to audibly pronounce the arbitrary designation of said calling line.

25 13. In a telephone system, a calling line having an arbitrary designation, an identifying conductor therefor, a selective device comprising a switching and marking means for connecting with and marking said con-
 30 ductor, a group of registers actuated by said marking means, an announcing mechanism, an announcing control circuit comprising a first plurality of switching devices and a second plurality of switching devices, a com-
 35 mon group of conductors connected to the said first and to said second switching devices whereby, upon connection of said announcing control circuit to said selective de-
 40 vice, successive pronouncement circuits are established from said announcing mechanism to said operated registers over said first and second plurality of switching de-
 45 vices and over one of said common conductors.

14. In a telephone system, a calling line having an arbitrary designation, a conduc-
 50 tor therefor having an identifying potential thereon, a line selective device comprising a line selecting circuit capable of selecting said identifying conductor, a register responsive to the selection of said identifying conduc-
 55 tor for recording the arbitrary designation of said calling line, and an announcer responsive to said registration for pronouncing the arbitrary designation of said calling line.

15. In a telephone system, a calling line having an arbitrary designation, an opera-
 60 tor's position, a selective device capable of selecting said calling line, means for oper-ably associating said line with said position, an announcer adapted to reproduce verbal announcements at repeated intervals, means responsive to an operation at said position
 65 after said calling line has been extended

thereto for operating said selective device to select said calling line, and means responsive to said selection for operating said announcer to audibly announce the arbitrary designation of said calling line at stated intervals. 70

In testimony whereof, I have signed my name to this specification this 15th day of May, 1931.

LINUS E. KITTEDGE. 75

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