

Aug. 20, 1929.

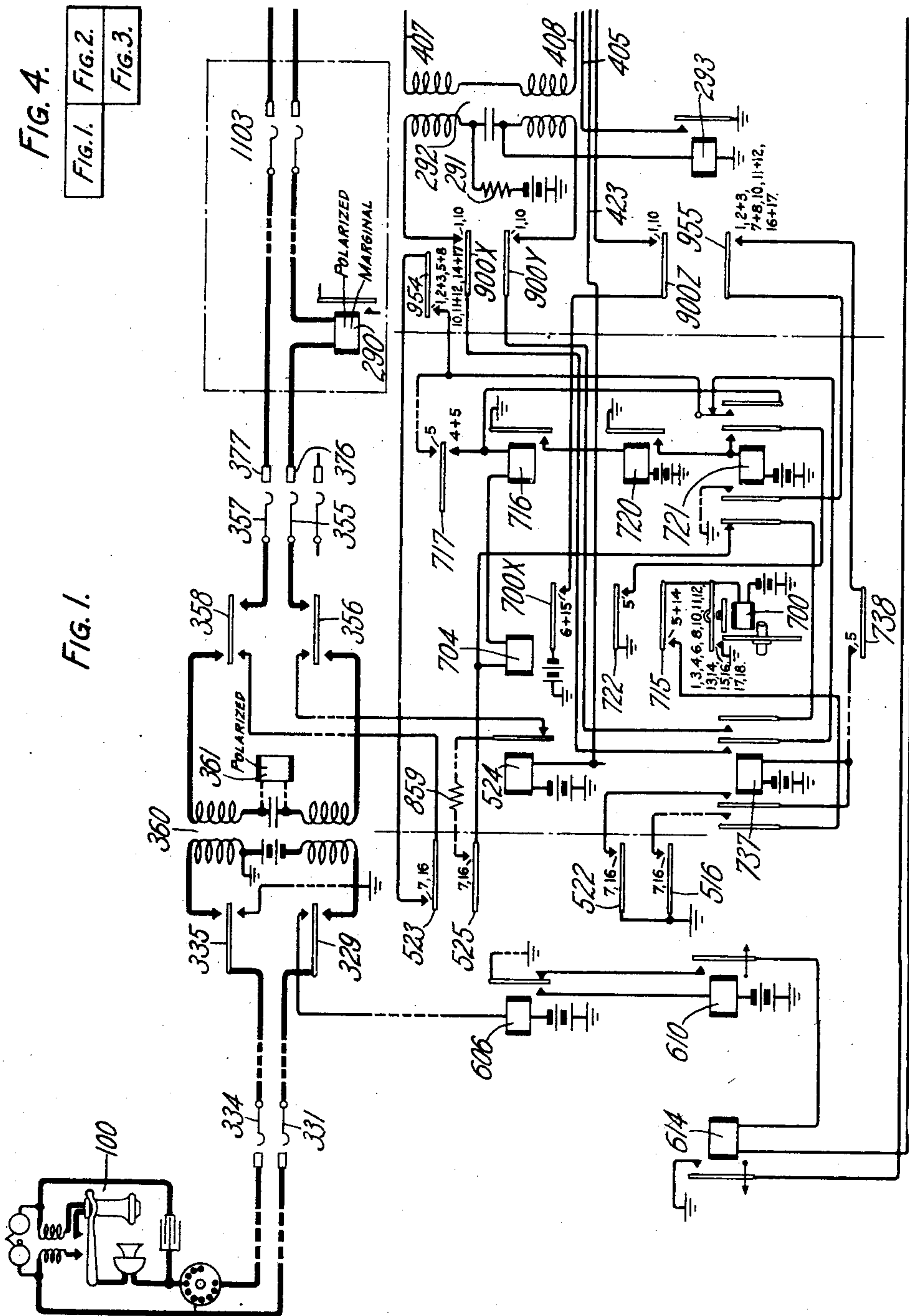
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1,724,905

TELEPHONE SYSTEM

Filed Oct. 4, 1927

3 Sheets-Sheet 1



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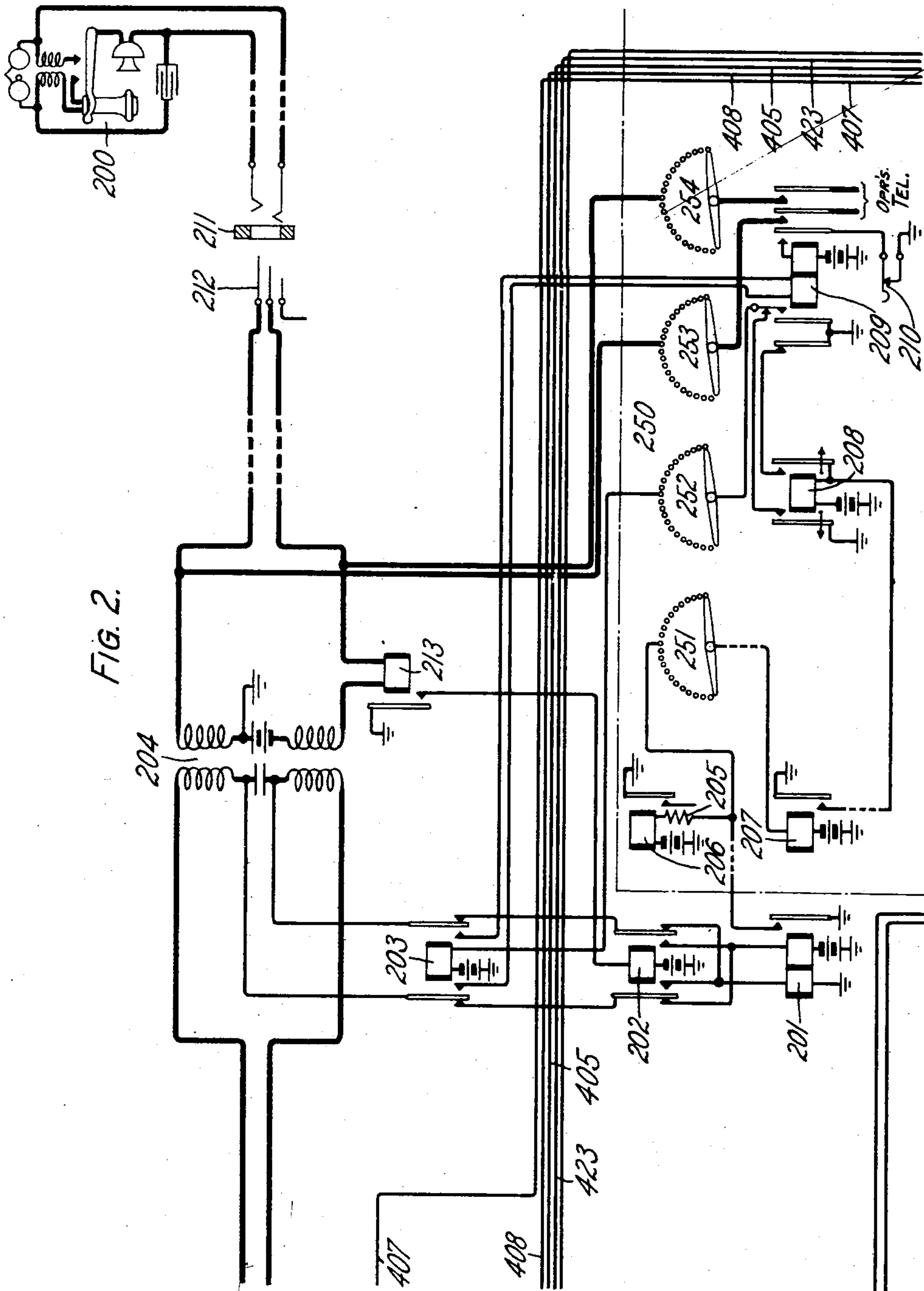
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3 Sheets-Sheet 2



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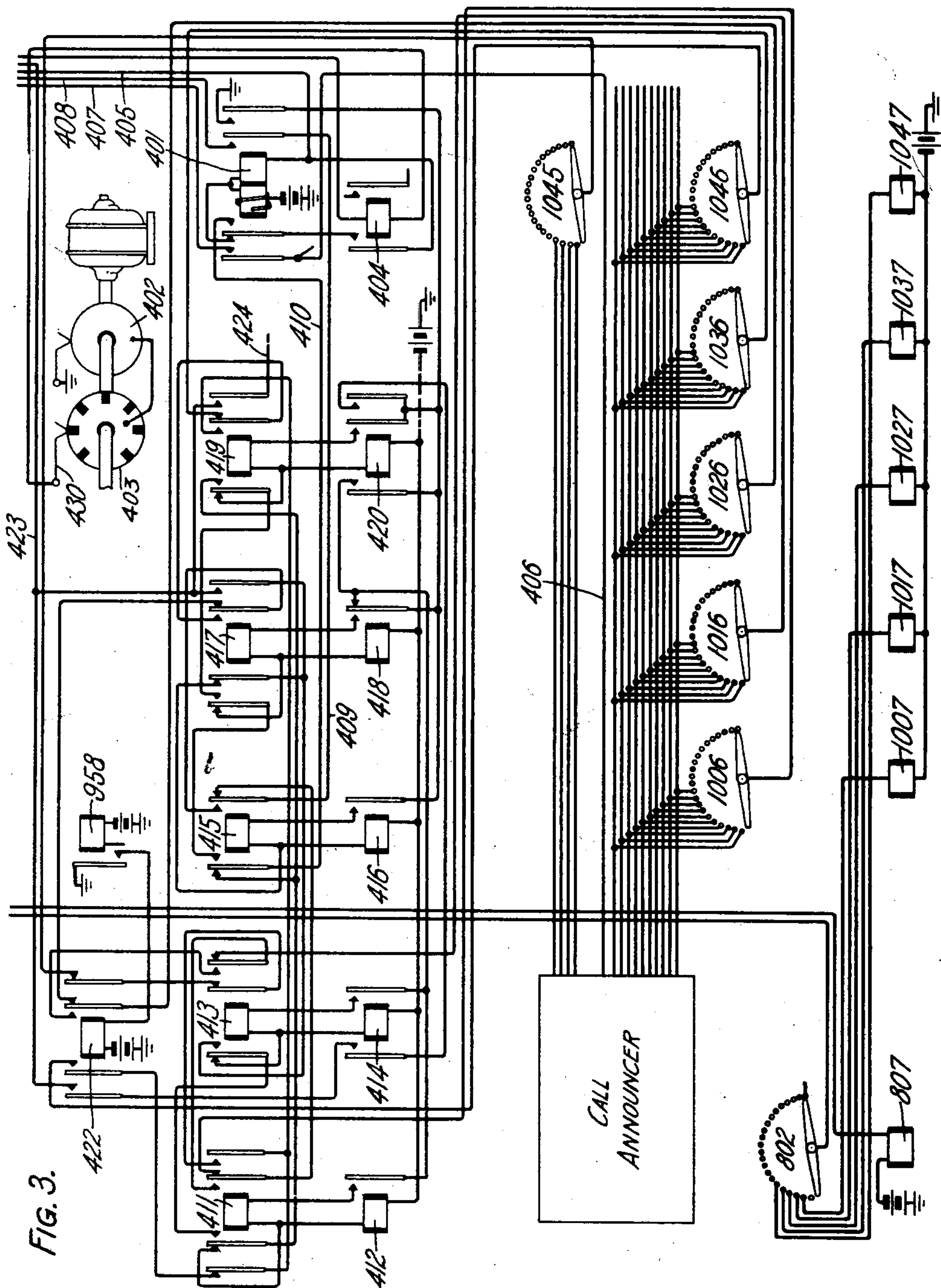
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TELEPHONE SYSTEM

Filed Oct. 4, 1927

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed October 4, 1927. Serial No. 223,881.

This invention relates to telephone systems and has for its object the increase of the simplicity, economy and reliability of equipment for controlling the transmission of telephone designations between offices.

More specifically, the invention relates to systems in which called line designations are transmitted verbally by means of a call announcer mechanism which comprises as many announcing elements as there are characters to be announced. In order to insure that the announcer mechanism does not start to function until the operator at the manual office is ready to receive the announcement, two circuits are successively established over the two wires of the trunk which connects the offices, one completed by a bridge at the calling office to cause the association of the operator's equipment with the interoffice trunk, and a second completed by a bridge at the called office effective to initiate the operation of the call announcer. This second circuit remains closed throughout the call announcing. The digits to be announced are selected by the registers of the sender at the calling office and a set of counting relays is employed to render the registers successively effective. In order to simulate the manual practice of pausing between certain digits, a pair of counting relays is interpolated in the series to measure an interval equal to the announcement of one digit. According to the type of number to be announced, this time interval is introduced after different numbers of digits have been announced. Also in accordance with the type of number to be announced, certain pairs of counting relays are used once or twice and are effective to direct the announcing circuit to the announcing mechanism. The opening of the interoffice connections and the establishment of the talking circuit is effected after different numbers of digits have been announced according to the type of number used. The counting relays are operated from an interrupter associated with the announcing mechanism and in order to insure their becoming effective only at the beginning of a word, a relay is provided to close the talking circuit, which relay is shunted over its own back contact during the closed period of said interrupter and operates at the first open period to connect the interrupter to the counting relays over its front contact at the same time that it closes

the above circuit. The open period of the interrupter is, of course, the same as the silent period on the announcing elements.

The present invention has been embodied in a telephone system of the sort shown in U. S. Patent 1,589,402, granted to O. H. Kopp June 22, 1926 and reference is made to that patent for a more complete description of the system as a whole.

In the present disclosure Fig. 1 shows a calling subscriber's substation and portions of a district selector, office selector and sender. The numerals applied to the apparatus of the greater portion of this figure are those employed in the Kopp patent above mentioned for corresponding elements;

Fig. 2 shows a portion of the apparatus at a manual office to which calls are extended;

Fig. 3 shows another portion of the sender particularly associated with the call announcer; and

Fig. 4 shows the manner of arranging Figs. 1 to 3 inclusive.

It should be mentioned that all reference characters between 200 and 299 and between 400 and 499 refer exclusively to the present disclosure, while all other numbers indicate that that piece of apparatus corresponds to similar apparatus bearing the same number in the disclosure of the Kopp patent.

Let it be assumed that a subscriber at substation 100, which is located in a machine switching office, wishes to converse with a subscriber at substation 200 located in a manual office and that the machine switching office transmits called line numbers to this office by means of a call announcer mechanism. The subscriber at substation 100 initiates the call in the usual manner, a line finder represented by brushes 334 and 331 extending the calling line to a district selector whence it is connected with an idle sender in any desirable manner, for example, as described in the above identified Kopp patent. A dialing circuit is then established extending from battery through the winding of relay 606, upper contact of cam 329, brush 331, through the subscriber's substation, brush 334, lower contact of cam 335 to ground. Relay 606 operates in this circuit, in turn operating relay 610. When the subscriber dials the wanted line number, relay 606 releases at each interruption of its circuit, completing a circuit from ground over

the back contact of relay 606, front contact of relay 610, which is slow to release and holds its armature attracted, winding of relay 614, brush 802 of the register control switch in its normal position, to battery through the winding of the magnet of the first office register (not shown). Relay 614 operates in this circuit and because of its slow to release nature remains operated throughout the dialing of the first digit. Relay 614 closes a circuit from battery through the winding of the stepping magnet 807 of the register control switch to ground at the front contact of relay 614. At the completion of each digit, relay 614 releases, permitting magnet 807 to advance the register control switch to the next register. The second office register is set in response to the second digit dialed but this register is also not shown. The third, fourth, fifth, sixth, and seventh digits cause the operation of magnets 1007, 1017, 1027, 1037, and 1047 of the thousands, hundreds, tens, units and stations registers respectively, and these registers are positioned in accordance with the digits dialed.

Following office selections the sender controls the translator is positioned, in turn positioning the class sequence switch in the well-known manner for the purpose of controlling the extension of the connection. The class sequence switch controls cams 954, 955, 900X, 900Y and 900Z. It has been assumed that position either 1 or 10 corresponds to a call extended by means of the call announcer mechanism and that the class sequence switch is set in position 1. The district selector represented by brushes 357 and 355 and the office selector 1103 are positioned in the well-known manner to select a trunk outgoing to the manual office.

Following office selections the sender control sequence switch, to which cams 516, 522, 523 and 525 belong, is in either position 7 or 16 and the sender sequence switch 700 is in position 5. At this time the fundamental circuit is extended to the distant office for the purpose of testing the interoffice trunk before proceeding with the establishment of the connection. This circuit may be traced from battery through the right winding of relay 201, left back contacts of relays 202 and 203, upper left winding of repeating coil 204, through the office selector 1103, terminal 377, brush 357, lower contacts of cam 358, contact of cam 523, contact of cam 954, contacts of cam 717, winding of relay 716, winding of relay 704, contact of cam 525, compensating resistance 859, back contact of relay 524, upper contacts of cam 356, brush 355, terminal 376, winding of relay 290, through the office selector 1103, lower left winding of repeating coil 204, right back contacts of relays 203 and 202, left winding of relay 201 to ground. Relay 201 operates

in this circuit connecting ground over its front contact to a terminal corresponding to the particular interoffice trunk in the arc served by brush 251 and through resistance 205 to the winding of relay 206 and battery. Relay 206 starts switch 250 to hunt for the marked trunk. When that trunk is found the ground connected to the terminal of brush 251 is connected to the winding of relay 207 and battery, operating relay 207. Relay 207 in turn operates relay 208 which locks to the back contact of relay 209. Relay 208 closes a circuit from ground at its left contact over the inner left back contact of relay 209 and brush 252 to the winding of relay 203 and battery. Relay 203 transfers the interoffice trunk from relay 201 to the left winding of relay 209.

At the machine switching office relay 716 also operates in the fundamental circuit as first traced, in turn operating relays 720 and 721. Relay 721 locks over its inner right front contact to the contact of cam 722 and ground. Relay 721 also closes a circuit from ground over its left front contact, contact of cam 955, contact of cam 738 to the winding of relay 737 and battery. Relay 737 operates and locks over its inner left front contact to ground at the contact of cam 522. Relay 737 thereupon closes a circuit from ground over cam 516, outer left contact of relay 737, contact of cam 715 to the winding of sequence switch magnet 700 and battery, advancing the sender sequence switch to position 15. Relays 716, 720, and 721 are maintained operated while sequence switch 700 is moving from position 5 to position 15 by means of a circuit which extends to cam 954 as before traced over the lower contact of that cam, right alternate contact of relay 721, windings of relay 716 and 704 and thence as previously traced. This circuit is independent of sequence switch 700 and depends solely at this time on the distant office. The continued operation of relay 716 holds relays 720 and 721 operated.

When the relay 203 transfers the interoffice trunk from relay 201 to relay 209 it disconnects the battery supply from the fundamental circuit and relay 716 therefore releases, in turn releasing relays 720 and 721. With relay 721 released and relay 737 operated the fundamental circuit extends from ground through the winding of relay 293, lower left winding of repeating coil 292, contact of class cam 900Y, outer right contact of relay 737, left back contact of relay 721, contact of cam 525, resistance 859, back contact of relay 524, upper contacts of cam 356, through the district selector and office selector, lower left winding of repeating coil 204, right front contact of relay 203, left winding of relay 209, left front contact of relay 203, upper left winding of repeating coil 204, back through the office

and district selectors, lower contacts of cam 358, contact of cam 523, contact of cam 954, right back contact of relay 721, inner right contact of relay 737, contact of class cam 900X, upper left winding of repeating coil 292, resistance 291 to battery. Battery is now supplied to the circuit from the machine switching office through resistance 291, permitting relay 209 at the manual office to operate. It may be noted that the current at this time through relay 290 of the office selector is in the opposite direction from that in the first traced fundamental circuit. Likewise the resistance included in this circuit is less than in the previously traced circuit so that relay 290 which is both polarized and marginal is enabled to operate. Office selector 1103 is of the two-wire type in which a relay such as relay 290 serves to control the advance of the office selector from a "selections beyond" condition to a talking condition. For a complete description of such an office selector, reference is made to U. S. Patent 1,567,271 to L. H. Johnson, December 29, 1925.

Relay 209 in operating locks over its inner right contact and contact of key 210 to ground. Relay 209 also connects ground over its left make-before-break contact to the winding of relay 203, while it opens the locking circuit of relay 208 at its outer left contact. Relay 208 is made slow to release to insure the closure of ground by relay 209 before its removal by the release of relay 208. The operating circuit of relay 208 is open at this time since the transfer of the trunk circuit away from relay 201 permits that relay to release, in turn releasing relays 206 and 207. Relay 209 in operating also connects the operator's telephone to the right windings of the repeating coil 204 over brushes 253 and 254 of switch 250, so that she may listen to instructions coming from the machine switching office. The connection of the operator's telephone to the repeating coil is made dependent on the operation of relay 209 so that the clicks due to the trunk closure may not cause a disagreeable noise in her telephone. Relay 293 also operates in the circuit of relay 209 completing a circuit from ground over its front contact, conductor 405, through the right inductive winding and left non-inductive winding of relay 404 to battery for the purpose of initiating the call announcement.

The call announcer itself is indicated by the rectangle at the left hand side of Fig. 3 and may be of any desirable character, for example, of the type shown in the application of H. C. Caverly, Serial No. 223,880, filed Oct. 4, 1927, resulting in Patent 1,678,103, granted July 24, 1928, or in the patent to H. M. Bascom, No. 1,645,573, granted Oct. 18, 1927. In general it consists of a sound record of each of the digits from 0

to 9 and each of the letters used for stations designation. These sound records may be selected by the registers in accordance with their settings, and are associated therewith through amplifying apparatus. The register brushes shown have been given the same numbers as the brushes of the corresponding registers of the Kopp patent disclosure which are employed for controlling call indicator transmission. It is apparent that extra brushes on these registers may be employed or that the class sequence switch may be used to transfer the circuits from control of the call indicator to control of the call announcer. The commutator 403 and feed disc shown at the upper right corner of Fig. 3 are driven by the same motor which drives the call announcer. In either of the types of call announcer above mentioned the sound record is duplicated several times for each revolution and the duplicate records are separated by blank spaces. Commutator 403 has its insulating segments, represented by the black segments, arranged to make contact with the brush 430 at the same time that the blank spaces of the sound record are effective.

When the conducting segments of commutator 403 make contact with the brush 430 a circuit is closed from ground through disc 402 and commutator 403, brush 430, winding of relay 404, contact of class cam 900Z, lower contact of sender cam 700X to battery. With relay 404 operated a shunt is closed around the inductive winding of relay 401 extending over the back contact of relay 401, and the front contact of relay 404. Therefore if the above traced circuit for relay 401 is closed while relay 404 is operated, that is, during a talking period, relay 401 cannot operate and thus mutilation of the transmission of the first digit is prevented. When relay 404 releases at the time brush 430 engages an insulating segment relay 401 operates and opens the shunt around its winding.

Relay 401 in operating supplies locking ground to the transfer relays 411 to 420 inclusive. It also completes an announcing circuit which may be traced from the call announcer over common conductor 406, outer left front contact of relay 401, conductor 407, through the right windings of repeating coil 292, conductor 408, inner right contact of relay 401 to conductor 409 and thence variously through the contacts of the counting relays to the registers and the call announcer. When relay 401 is first operated, i. e., during the first talking period this announcing circuit extends from conductor 409 over the right back contacts of relays 415 and 411 to brush 1006 of the thousands register and the corresponding section of the call announcer. When relay 404 reoperates during the first talking period following the

operation of relay 401 a circuit is closed from grounded conductor 405 over the front contact of relay 404, inner left front contact of relay 401, conductor 410, left back
 5 contact of relay 415, inner left back contact of relay 411, winding of relay 412 to battery. Relay 412 operates and locks through the winding of relay 411, front contact of relay 412, back contact of relay 418 to
 10 ground at the outer right contact of relay 401. Relay 411 cannot operate at this time since it is shunted by the operating ground of relay 412. Thus, during the first talking period the thousands digit of the wanted
 15 subscriber's number is transmitted through repeating coils 292 and 204 to the operator at the manual office. At the next silent period relay 404 releases and relay 411 operates. For each operation and release
 20 of relay 404 a pair of counting relays is operated and locked, i. e., during the first talking period relay 412 is operated, during the second, relay 414, during the third, relay 416, during the fourth, relay 418, during the
 25 fifth, relay 420 and at the successive silent periods the second relay of each pair operates. The operation of relay 418 opens the locking circuit of relays 411 to 414 inclusive. Following the operation of relays 420 and
 30 419 the operating circuit is extended back to relay 412, and the sixth and seventh operations of relay 404 cause the reoperation of relays 412 and 414 with their corresponding relays 411 and 413. The locking circuit for
 35 these relays now extends over the left contact of relay 420 to ground at the outer right contact of relay 401.

During the second talking period the announcing circuit above traced extends from
 40 conductor 409 over the right back contact of relay 415, inner right front contact of relay 411, outer right back contact of relay 413 to brush 1016 of hundreds register. During the third talking period, at which time relay
 45 416 has been operated but relay 415 has not, conductor 409 is extended as traced for the hundreds digit to the outer right armature of relay 413 but with relay 413 operated the circuit now extends to the front contact of
 50 relay 422 which is not operated and therefore the announcing circuit is open and no announcement is made during the third talking period. At the fourth talking period relay 415 has been operated and conductor
 55 409 extends over the right front contact of relay 415, right back contact of relay 417, inner right back contact of relay 422 to brush 1026 of the tens register. During the fifth talking period with relay 417 operated the
 60 circuit extends over the right front contact of relay 415, inner right front contact of relay 417, right back contact of relay 419 to brush 1036 of the units register. At the sixth talking period relay 419 is operated
 65 and the announcing circuit is extended over

contacts of relays 415 and 417 as before, inner right front contact of relay 419, outer
 left back contact of relay 411 to the inner left armature of relay 422. Since relay 422
 is not operated the announcing circuit is 70 again open and no announcement is made during this talking period. At the seventh talking period with relay 411 reoperated the circuit above traced extends over the outer
 right front contact of relay 411, inner right 75 back contact of relay 413, outer right back contact of relay 422 to brush 1045 of the stations register. It is therefore apparent that a pause is introduced between the hundreds
 digit and tens digit and between the units 80 digit and the stations digit, thus simulating the customary pauses inserted by the manual operator. When relay 413 operates at the end of the seventh talking period a circuit
 is closed from grounded conductor 405, front 85 contact of relay 404, inner left front contact of relay 401, conductor 410, left front contacts of relays 415, 417, 419, 411 and 413, outer right front contact of relay 417, con-
 ductor 423, through the winding of relay 524 90 to battery. Relay 524 opens the fundamental circuit between the two offices, advances the sender and the district selector to make talking selection, and thereby connects the
 calling subscriber with the manual operator 95 and dismisses the sender. The opening of the fundamental circuit releases relay 293 which in turn releases relay 401 and unlocks the counting relays. Relay 290 is also re-
 leased at this time to perform its change- 100 over functions as described in the above identified patent to L. H. Johnson.

If the operator at the manual office has understood the wanted line number she will
 operate key 210, releasing her position equip- 105 ment from the trunk, test the jack 211 of the wanted line and if the line is idle insert plug 212 therein, after which ringing will take place in any well-known manner. The
 operation of key 210 opens the locking cir- 110 cuit of relay 209 and that relay releases, in turn releasing relay 203 and restoring the trunk to connection with relay 201. Relay
 201 may be rendered ineffective to operate switch 250 at this time in any desirable man- 115 ner. When the called subscriber answers, supervisory relay 213 is operated in series with the called line and closes an obvious circuit for relay 202 which reverses the con-
 nection of relay 201 and therefore of bat- 120 tery and ground to the inter-office trunk for supervisory purposes. If the operator is not sure of the called line number she may delay operating the key 210 until the district
 selector has advanced to connect the calling 125 line to the interoffice trunk at which time she may converse with the calling subscriber.

The foregoing description assumed that the number was less than 10,000 and accom-
 panied by a stations designation. If the 130

number were without a stations digit the stations register would not be positioned and the announcing circuit would be open at the register and there would be a longer pause before opening the fundamental circuit. However, the system disclosed in the Kopp patent to which reference has been made is provided with a time alarm arrangement which measures the time in which a particular function of the sender should be completed and actuates an alarm if there is an unreasonable delay. If a function is completed within the time allowed, the timing mechanism is reset to time the next operation. One such function is the registration of the number of the wanted line. Mechanical offices, as a general rule, employ only four place numbers while manual offices may employ only four place numbers, or may use in addition four place numbers with a stations letter, five place numbers lying between 10,000 and 10,499, or both stations designations and five place numbers. The timing mechanism is therefore arranged to insure a time interval long enough for the registration of four digits in the case of calls to machine switching offices and of five digits for calls to manual offices. However, it is apparent that, if neither stations digits nor five place numbers are used by the called office, it would be possible to reset the time alarm as soon as four digits have been registered and there are other cases in which it is not necessary to wait for the registration of a fifth digit before resetting the time alarm. For this purpose several circuits are provided which depend upon the setting of the translator which indicates the type of number employed by the wanted office, and also upon whether or not the number dialed lies within the five digit range. Whenever these facts indicate a four digit number, the resetting circuit is closed through an arc of the units register. A branch of this circuit connects ground to conductor 424. In this case the operation of relay 419 following the announcement of the units digit connects ground from conductor 424 over the outer right front contact of relay 419 to conductor 423, operating relay 524 and advancing the sender to talking selection without further delay.

The class sequence switch is also arranged to vary the order in which the registers are associated with the call indicator impulse switch according to whether the number is over or under 10,000 and a circuit is closed when the thousands and units registers are set in positions 1 and 0 respectively, for operating relay 958 which then discriminates between two settings of the class switch. Relay 958 in turn operates relay 422 which in the case of a call announcer call is effective to alter the manner of announcing the digits so that the pause occurs between the

third and fourth digits, instead of between the second and third, and the pause between the fourth and fifth digits is omitted. The successive operation of the counting relays is independent of the operation of relay 422 but the extension of the announcing circuit is altered by that relay. It will be remembered that with relay 413 operated the announcing circuit was extended to a front contact of relay 422 so that during the third talking period no announcement was made since relay 422 was not operated at that time. With relay 422 operated the announcing circuit extends over the inner right armature of relay 422 to brush 1026 of the tens register and the third digit is announced. In the previous case the operation of relay 415 extended the announcing circuit to the inner right back contact of relay 422 whence it extended to brush 1026. With relay 422 operated, the announcing circuit is open at its back contact and no announcement is made during the fourth talking period. Again in the previously discussed case, with relay 419 operated, the announcing circuit extended to the inner left armature of relay 422 and that relay being unoperated, no announcement was made during the sixth talking period. With relay 422 operated the front contact of this armature is closed and the announcing circuit is extended to brush 1046 of the stations register on which the fifth digit is recorded. With relay 422 operated the operation of relay 414 at the beginning of the seventh talking period extends conductor 423 over the outer left contact of relay 422, left front contact of relay 414, outer left front contact of relay 420 to ground at the outer right front contact of relay 401, so that relay 524 is operated and the sender advanced immediately following the announcement of the fifth digit.

What is claimed is:

1. In a telephone system, a machine switching office, a manual office, means for establishing a connection between said offices, a call announcer at said machine switching office, operator's equipment at said manual office, means for completing a circuit over the two wires of said established connection in series, said circuit being supplied with battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means thereupon effective to establish a second circuit over the two wires of said connection supplied with current from said machine switching office, and means responsive to the establishment of said second circuit for initiating the operation of said call announcer equipment.

2. In a telephone system, a machine switching office, a manual office, means for establishing a connection between said offices, a call announcer at said machine switching

office, operator's equipment at said manual office, means for completing a circuit over the two wires of said established connection in series, said circuit being supplied with
 5 battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means automatically responsive to the association of said
 10 operator's equipment with said connection to establish a second circuit over the two wires of said connection supplied with current from said machine switching office, and means responsive to the establishment of said
 15 second circuit for initiating the operation of said call announcer equipment.

3. In a telephone system, a machine switching office, a manual office, means for establishing a connection between said offices, a
 20 call announcer at said machine switching office, operator's equipment at said manual office, means for completing a circuit over the two wires of said established connection in series, said circuit being supplied with
 25 battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means automatically responsive to the association of said op-
 30 erator's equipment with said connection to establish a second circuit over the two wires of said connection supplied with current from said machine switching office, means responsive to the establishment of said sec-
 35 ond circuit for initiating the operation of said call announcer equipment, and means effective following the operation of said call announcer equipment to disconnect said operator's equipment from said connection.

4. In a telephone system, a machine switching office, a manual office, means for establishing a connection between said offices, a
 40 call announcer at said machine switching office, operator's equipment at said manual office, means for completing a circuit over the two wires of said established connection in series, said circuit being supplied with
 45 battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means automatically responsive to the association of said
 50 operator's equipment with said connection to establish a second circuit over the two wires of said connection supplied with current from said machine switching office, means responsive to the establishment of said sec-
 55 ond circuit for initiating the operation of said call announcer equipment, and manual means for disconnecting said operator's equipment from said connection, said means being effective only after said call announcer
 60 equipment has been operated.

5. In a telephone exchange system, a tele-
 65 phonic connection, a plurality of registers

for registering telephone designations, means selectable by said registers for generating currents characteristic of each possible element of said designation, a series of count-
 70 ing relays for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection, and a pair of counting re-
 75 lays interpolated in said series to introduce a pause between certain elements of said designation.

6. In a telephone exchange system, a tele-
 phonic connection, a plurality of registers for registering telephone designations, means
 80 selectable by said registers for generating currents characteristic of each possible element of said designations, a series of counting relays for rendering said registers successively effective to selectively transmit the
 85 elements of registered designations over said connection, means to render one pair of counting relays ineffective in order to introduce a pause between certain elements of said designations, and means operated in ac-
 90 cordance with the nature of said designations to render different pairs of relays ineffective in order to introduce a pause following the transmission of different numbers of elements.

7. In a telephone exchange system, a tele-
 95 phonic connection, a plurality of registers for registering telephone designations, means selectable by said registers for generating currents characteristic of each possible element of said designations, a series of count-
 100 ing relays for rendering said registers successively effective to selectively transmit the elements of registered designations over said connection, means to render one pair of counting relays ineffective in order to intro-
 105 duce a pause between certain elements of said designations, and means to vary the effectiveness of said counting relays in accordance with the nature of the designation to be transmitted.
 110

8. In a telephone exchange system, a tele-
 phonic connection, a plurality of registers for registering telephone designations, means
 115 for generating currents characteristic of each possible element of said designations, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection, and means effective
 120 to reoperate certain of said series of counting relays to control the transmission of an additional element.

9. In a telephone exchange system, a tele-
 phonic connection, a plurality of registers for registering telephone designations, means
 125 for generating currents characteristic of each possible element of said designations, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of a registered designation
 130

over said connection, and means for reoperating certain of said series of counting relays to control the transmission of an additional element and to introduce a pause before the transmission of said element.

10. In a telephone exchange system, a telephonic connection, a plurality of registers for registering telephone designations, means for generating currents characteristic of each possible element of said designations, a series of counting relays effective for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection, and means to vary the effectiveness of said counting relays in accordance with the nature of the designation to be transmitted.

11. In a telephone exchange system, a telephonic connection, a plurality of registers for registering telephone designations, means for generating currents characteristic of each possible element of said designations, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection, and means operative to open said telephonic connection after the transmission of a variable number of elements in accordance with the nature of the designation registered.

12. In a telephone exchange system, a calling subscriber's line, a called line, an operator's position at which said called line terminates, a sender comprising a plurality of registers, means controlled by said calling subscriber to register the designation of said called line, means for establishing a connection between said sender and said operator's position, means selectable by said registers for generating currents characteristic of each possible element of said designation, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of said designation to said operator's position, and means controlled by said counting relays for establishing a connection between said calling subscriber's line and said operator's position.

13. In a telephone exchange system, a calling subscriber's line, a called line, an operator's position at which said called line terminates, a sender comprising a plurality of registers, means controlled by said calling subscriber to register the designation of said called line, means for establishing a connection between said sender and said operator's position, means selectable by said registers for generating currents characteristic of each possible element of said designation, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of said designation to said operator's position, means to establish a connection between said calling subscriber's line and said operator's po-

sition, and means to render said last mentioned means effective following the transmission of different numbers of elements in accordance with the nature of the designation recorded.

14. In a telephone exchange system, a calling subscriber's line, a called line, an operator's position at which said called line terminates, a sender comprising a plurality of registers, means controlled by said calling subscriber to register the designation of said called line, means for establishing a connection between said sender and said operator's position, means selectable by said registers for generating currents characteristic of each possible element of said designation, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of said designation to said operator's position, means controlled by said counting relays to establish a connection between said calling subscriber's line and said operator's position, and means to render different pairs of counting relays effective to operate said last mentioned means in accordance with the nature of the designation recorded.

15. In a telephone exchange system, a telephonic connection, means to register telephonic designations, means for generating current characteristic of each element of said designation, means for transmitting the elements of a registered designation over said connection, an interrupter associated with said generating means, a relay for operating said transmitting means, and means to prevent the premature operation of said transmitting means comprising a shunt for said relay closed over its back contact by said interrupter during the closed period of said interrupter.

16. In a telephone exchange system, a telephonic connection, a plurality of registers for registering telephone designations, means for generating currents characteristic of each possible element of said designations, a series of counting relays for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection, an interrupter associated with said generating means and closed when said generating means is effective for operating said counting relays, a relay for completing said telephonic connection and for connecting said interrupter with said counting relays, and means to prevent the premature closure of said telephonic connection comprising a shunt for said relay closed over its back contact by said interrupter during the closed period of said interrupter.

17. In a telephone system, a machine switching office, a two-wire office, a manual office, means for establishing a connection between said machine switching office and

said manual office extending through said two-wire office, a call announcer at said machine switching office, a marginal polarized relay at said two-wire office to control a selector thereat, operator's equipment at said manual office, means for completing a circuit over the two wires of said established connection including said relay, said circuit being supplied with battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means automatically responsive to the association of said operator's equipment with said connection to establish a second circuit over the two wires of said connection supplied from said machine switching office with current of increased strength and opposite polarity to operate said relay, means responsive to the establishment of said second circuit for initiating the operation of said call announcer equipment, and means effective following the operation of said call announcer equipment to disconnect said operator's equipment from said connection and to release said relay.

18. In a telephone system, a machine switching office, a two-wire office, a manual office, means for establishing a connection between said machine switching office and said manual office extending through said two-wire office, a call announcer at said machine switching office, a marginal polarized relay at said two-wire office to control a selector thereat, operator's equipment at said manual office, means for completing a circuit

over the two wires of said established connection including said relay, said circuit being supplied with battery from said manual office, means responsive to the completion of said circuit to automatically associate said operator's equipment with said connection, means automatically responsive to the association of said operator's equipment with said connection to establish a second circuit over the two wires of said connection supplied from said machine switching office with current of increased strength and opposite polarity to operate said relay, means responsive to the establishment of said second circuit for initiating the operation of said call announcer equipment, means for releasing said relay, and manual means for disconnecting said operator's equipment from said connection, said releasing means and said manual means being effective only after said call announcer equipment has been operated.

19. In a telephone system, a telephonic connection, a plurality of registers for registering telephone designations, a plurality of generating means for generating currents characteristic of each possible element of said designation, said generating means being selectable by said registers, and a series of counting relays for rendering said registers successively effective to selectively transmit the elements of a registered designation over said connection.

In witness whereof, I hereunto subscribe my name this 3 day of October, A. D. 1927.

HARRY C. CAVERLY.