

Dec. 11, 1928.

1,695,049

E. JACOBSEN ET AL
TELEPHONE EXCHANGE SYSTEM

Filed Sept. 11, 1925

3 Sheets-Sheet 1

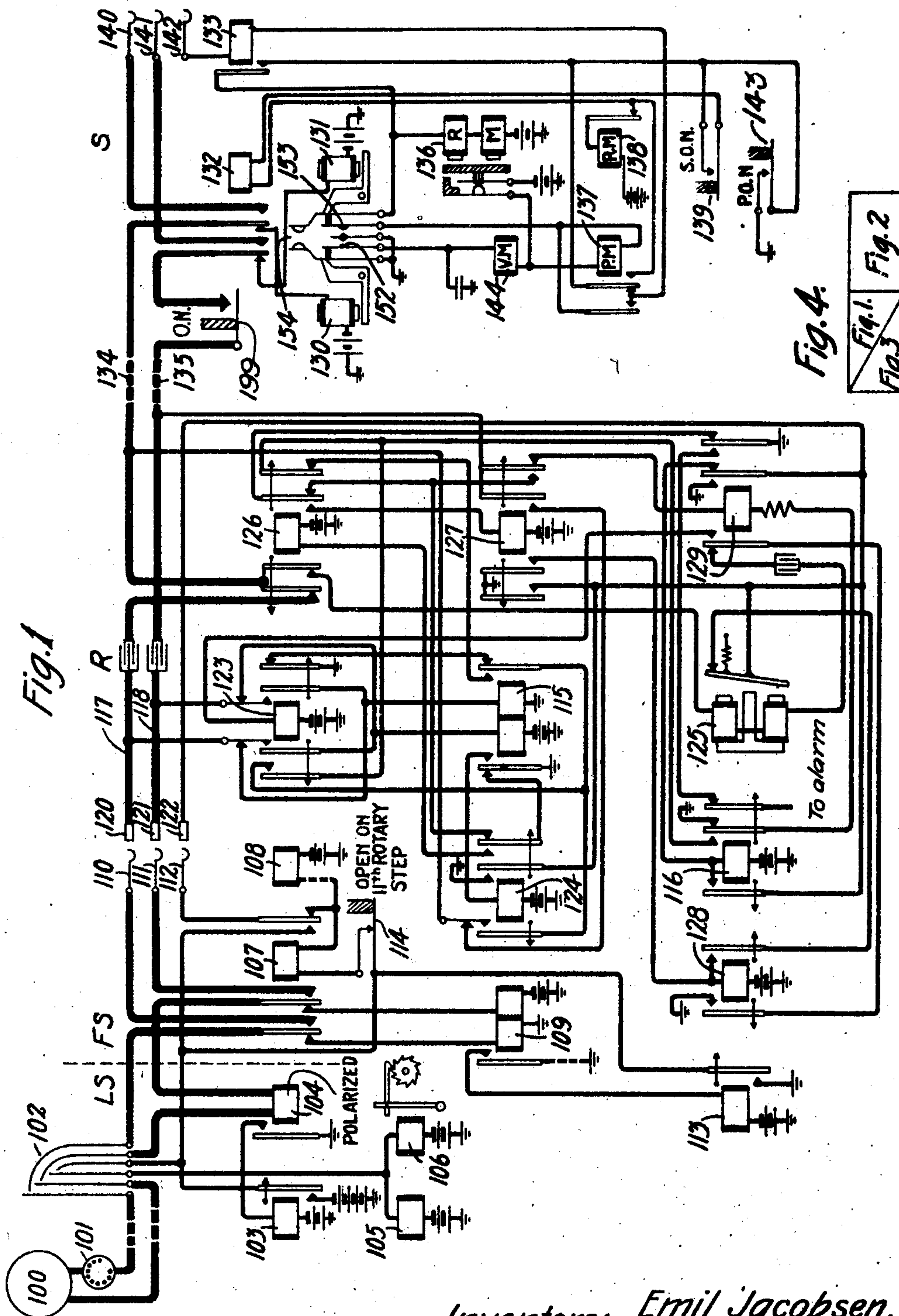
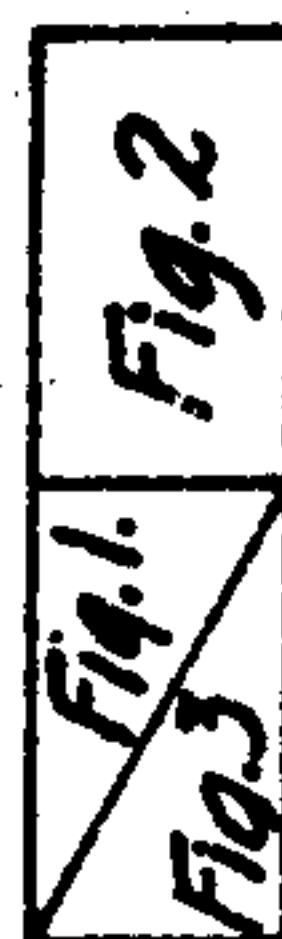


Fig. 4



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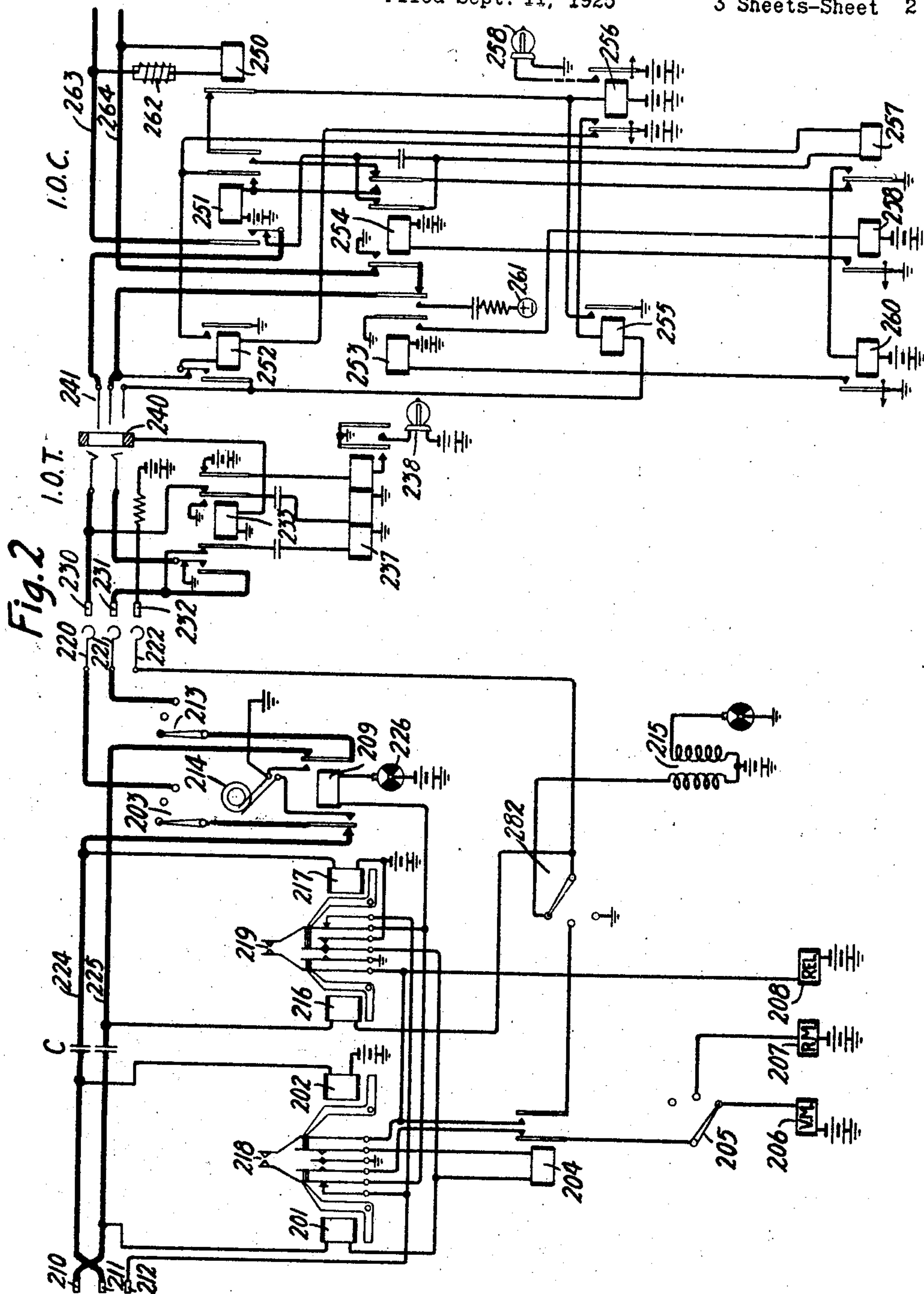
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3 Sheets-Sheet 2



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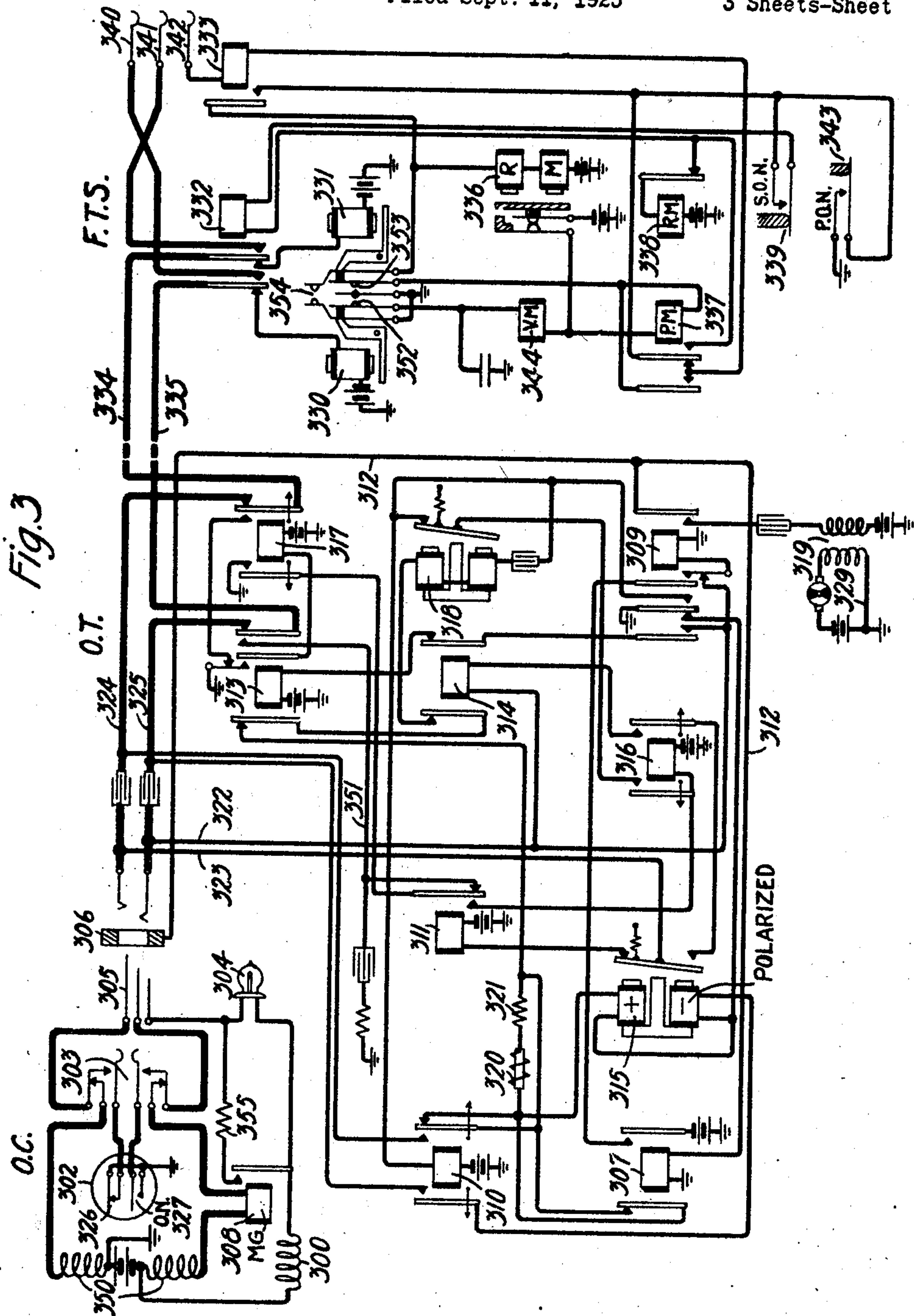
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Inventors: Emil Jacobsen.
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UNITED STATES PATENT OFFICE.

EMIL JACOBSEN, OF PORT WASHINGTON, AND ARTHUR B. SPERRY, OF NEW YORK, N. Y.; SAID JACOBSEN ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK, AND SAID SPERRY ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE-EXCHANGE SYSTEM.

Application filed September 11, 1925. Serial No. 55,652.

This invention relates to telephone systems and more particularly to circuits for automatically extending connections to intercepting operator's positions.

5 In certain telephone exchange areas there are machine switching equipments designed to operate on the so-called three-wire basis, that is, controlling impulses from subscribers' lines are directed over two circuits in the sub-
10 station, each comprising one of the talking conductors and a ground lead. In such areas, when it becomes necessary to add additional equipment to care for the growth of the exchange, it is desirable and more economical to
15 install equipment of a more modern character which is designed to function over full metallic circuits extending to the substations, thereby eliminating the ground return. When such modern equipment is added to an exist-
20 ing exchange, it becomes necessary to provide means whereby the two types of apparatus may function together so that all subscribers may have access to each other's lines and to the several operator's positions.

25 The object of this invention is therefore to provide an improved means for intercepting calls from a dial station in a two-wire office to a dial station in a three-wire office.

30 A feature of the invention is in the provision of means in trunk circuits responsive to automatically operable means in an intercepting operator's cord circuit to prevent operation of call charging apparatus.

35 Fig. 1 of the drawings shows at its upper left hand corner a subscriber's station in a two-wire office connected to a line switch LS and a two-wire first selector FS which in turn has access to a repeater R. The repeater is extended to the three-wire office by the
40 trunk designated by conductors 134 and 135 which terminate in the first trunk selector S.

Fig. 2 shows on its left hand side a connector C in a three-wire office which has access to the intercepting operator's trunk IOT.
45 An intercepting operator's cord circuit is shown at IOC on the right hand side of this figure.

50 Fig. 3 at its upper left hand corner shows a manual operator's cord circuit OC. The outgoing trunk OT extending between the two-wire office and the three-wire office, is

designated by 334 and 335, which is in turn connected to the first selector FTS.

Fig. 4 is a diagram showing the manner in which the several figures may be combined
55 to completely disclose the invention.

Of the two embodiments of the invention illustrated in the above figures the one shown in Figs. 1 and 2 is preferred.

60 A clearer idea of the operation of the invention may be had from the following detailed description.

When subscriber 100 removes the receiver from the switchhook, line switch LS operates and closes spring combination 102 in a man-
65 ner well known in the art. Relay 104 is a polarized relay and does not operate at this time, as it is used for controlling the message register circuit and is under the control of the called party. Subscriber 100 now oper-
70 ates dial 101. Relay 109 in the first selector FS operates over a circuit from ground through the left winding of relay 109, outer left back contact of relay 107, tip of spring
75 combination 102, dial 101, subscriber's loop, ring of spring combination 102, winding of polarized relay 104, inner left back contact of relay 107, to battery through the right
80 winding of relay 109. Relay 109 follows the interruptions of dial 101 and operates slow to release relay 113 in an obvious circuit. The usual primary stepping magnet which
85 functions under the control of the relays 109 and 113 to step the brushes 110, 111 and 112 to the desired group of bank terminals has been omitted from the disclosure for the sake
of brevity. As soon as the primary move-
90 ment of the switch is completed, a circuit is established in the usual well-known manner for the secondary magnet 108 which functions to step the brushes in search of an idle
95 trunk in the selected group. When an idle trunk is found the stepping magnet 108 ceases to operate and relay 107 operates and closes the tip and ring leads through to con-
ductors 117 and 118 of repeater R. When
100 brushes 110, 111 and 112 make contact with terminals 120, 121 and 122 a circuit is closed from battery through the winding of relay 116, inner right back contact of relay 129, terminal 122, brush 112, right front contact of relay 107, to ground on the front contact of

relay 113. Relay 116, operated, locks to ground over the circuit hereinbefore traced and prepares through its inner right front contact a circuit for relay 129 which is completed later. Another circuit is closed from battery through the left winding of relay 115, inner right back contact of relay 123, conductor 118, terminal 121, brush 111, inner left front contact of relay 107, winding of relay 104, through the spring combination 102, subscriber's station 100, dial 101, spring combination 102, outer left front contact of relay 107, brush 110, terminal 120, conductor 117, inner left back contact of relay 123 to ground through the right winding of relay 115. The operation of relay 115 closes an obvious circuit for the operation of relay 124. Relay 124 at its inner right front contact also connects ground to the holding circuit of relay 116 and over terminal 122, brush 112, right front contact of relay 107, replacing the ground supplied by relay 113 before relay 113 deenergizes following the cutting through of the talking conductors of switch FS. When the dial 101 at the subscriber's station 100 is operated relay 115 releases in response to the interruptions of its circuit and transmits pulses over a circuit from ground on the outer right back contact of relay 123, right back contact of relay 115, left front contact of relay 124, conductor 134, inner left back contact of relay 132, through the winding of vertical relay 130 of switch S.

The operation of vertical relay 130 closes a circuit from ground on contact 152 through the winding of vertical magnet 144 to battery on the back contact of release magnet 136, thereby operating the vertical magnet a certain number of times according to the digit dialed and causing brushes 140, 141, and 142 to move upward. Upon the first release of relay 115 with relay 124, operated, a circuit is closed from ground on the left back contact of relay 115, outer right front contact of relay 124, to battery through the winding of relay 126. Relay 126 being slow to release does not release upon the opening of the circuit by the operation of relay 115 while following the dial pulses. The operation of relay 126 closes a circuit for the operation of relay 127 from ground on the outer right back contact of relay 129, inner right front contact of relay 126 to battery through the winding of relay 127. The operation of relay 127 closes an obvious circuit for the operation of relay 128. Relay 128, operated, locks over a circuit from ground over the inner right contact of relay 124, normal contact of relay 125 to battery through the right front contact and winding of relay 128.

When dial 101 returns to normal, relay 115 remains operated holding relay 124 operated but the operating circuit for relay 126 is opened, allowing it to release. The release of relay 126 opens the circuit for relay 127,

and, as relay 127 is slow to release, its contacts will still be closed after the contacts of relay 126 are opened. Therefore, a circuit will be closed for operating rotary relay 131 from ground on the outer right back contact of relay 129, inner right back contact of relay 126, outer right front contact of relay 127, conductor 135, off-normal contact 199, outer back contact of relay 132 to battery through the winding of rotary relay 131. The operation of relay 131 closes a circuit from battery at the contact of release magnet 136, winding of private magnet 137 to ground on contact 153 of relay 131. The operation of magnet 137 closes a circuit from battery winding of rotary magnet 138 and contact thereof, inner front contact of magnet 137 to ground at the primary off-normal springs 134 which closed when the switch advanced one step in its vertical movement. The magnet 138 advances the switch brushes one step in a rotary direction to the terminals of the first trunk in the selected group. If this trunk is busy magnet 137 is held energized over a circuit extending from battery at the contact of release magnet 136, winding and outer front contact of magnet 137 through the winding of relay 133 to ground over test brush 142. The circuit of magnet 138 is thus maintained and the switch brushes are advanced in a hunting movement until an idle trunk is found when magnet 137 will deenergize and open the circuit of rotary magnet 138. Relay 133, which was included in the circuit of magnet 137, does not receive sufficient current in series with magnet 137 to operate at this time. A circuit is now closed from battery through the rotary magnet, winding of relay 132, secondary off-normal spring combination 139, to ground on the primary off-normal spring combination 143. Relay 132 operates and closes conductors 134 and 135 through to brushes 140 and 141.

The connection has now been completed to connector C which has been found idle and brushes 140, 141 and 142 are resting on contacts 210, 211 and 212. The connector disclosed is substantially identical with the connector switch shown in the patent to Fales 1,186,563 and operates in a manner fully disclosed therein. It is of course obvious that any well-known connector switch of the three-wire type might be used in place thereof. A circuit is partially closed from battery through the middle back contact of spring combination 219, winding of vertical relay 201, terminal 210, brush 140, inner front contact of relay 132, conductor 134, left front contact of relay 124, to the right armature of relay 115. When subscriber 100 operates dial 101 to dial the next digit, relay 115 will release, completing this circuit through its right back contact to ground at the outer right back contact of relay 123 and operating relay 201

over the above traced circuit. Relay 201, operated, closes a circuit from ground on the left middle front contact of spring combination 218, inner back contact of private or side switch magnet 204, side switch wiper 205 to battery through the vertical magnet 206. This operation causes the brushes 220, 221 and 222 to move upward in search of a group of subscriber's lines. When the dial 101 returns to normal, relays 126 and 127 function as described above to send out an impulse for operating rotary relay 202 over a circuit traced from ground on the outer right back contact of relay 129, inner right back contact of relay 126, outer right front contact of relay 127, conductor 135, outer front contact of relay 132, brush 141, terminal 211, to battery through the winding of rotary relay 202. Relay 202 operates and closes a circuit from ground on the right middle front contact of spring combination 218 through the winding of side-switch magnet 204 to battery through the right middle back contact of spring combination 219. Side-switch magnet 204 operates and moves the side-switch wipers 203, 205, 282 and 213 to their second position. When subscriber 100 again operates dial 101 the dial circuit above traced is again closed through relay 201, the only difference being that relay 201 now closes a circuit for rotary magnet 207. This operation causes the connector C to connect with a set of terminals corresponding to the number dialed.

If such number represents an unassigned line, one denied service, or one on which for any other reason calls are to be intercepted, these terminals will be connected to apparatus appearing before an intercepting operator in a jack such as jack 240. Terminals 230, 231 and 232 have been shown connected to such an intercepting operator's trunk IOT. In case the intercepting operator's trunk is busy, there will be ground on the sleeve terminal 232 from the side switch wiper 282, position 3 of another connector switch such as C which has made connection to such trunk and the connector C will be released over a circuit from ground on sleeve brush 222, second position of side-switch wiper 282, outer front contact of side-switch magnet 204 to battery through the winding of release magnet 208. Private magnet 204 will be energized at this time over the circuit previously traced in response to the rotary impulse transmitted following the operation of the rotary magnet 207.

Assuming, however, that the intercepting operator's trunk IOT is idle, side-switch magnet 204 will release following the last rotary impulse and step the side-switch wipers to the third position. In the third position, ground is connected to brush 222 from side-switch wiper 282 as a guarding potential. Relay 209 is operated when the connector is first seized over a circuit from

battery, interrupter 226, winding of relay 209, outer left back contact of spring combination 218, sleeve terminal 212, brush 142, winding of relay 133, inner left back contact of magnet 137 to ground on the primary off-normal spring combination 143. Therefore, when side-switch wipers 203 and 213 are moved to position 3, ringing current from generator 214 is connected intermittently through the front contacts of relay 209, side-switch wipers 203 and 213, brushes 220 and 221, terminals 230 and 231, inner back contacts of relay 233 to ground through the left and middle windings of relay 237. Relay 237, being responsive to ringing current, operates and closes an obvious circuit for lighting lamp 238 as an indication of an incoming call to the intercepting operator. Relay 237, locks over a circuit from battery on the outer right back contact of relay 233, right winding of relay 237 to ground through its inner right front contact.

When the intercepting operator inserts the plug 241 in jack 240, relay 252 operates over a circuit from ground on the left back contact of relay 233 ring of jack 240 and plug 241 winding of relay 252 to battery on the left back contact of relay 256. The operation of relay 252 closes an operating circuit for relay 233 from ground through its winding, sleeve of jack 240 and plug 241, left front contact and winding of relay 252 to battery on the left back contact of relay 256. The operation of relay 233 opens the operating and locking circuit for relay 237 thereby extinguishing lamp 238. Another circuit is also closed from battery through the winding of relay 217, left back contact of relay 209 (during the released period of this relay) side-switch arm 203, brush 220, terminal 230, tip of jack 240 and plug 241, left back contact of relay 251, right inner back contact of relay 254, winding of relay 257 to ground on the right front contact of relay 252. The operation of relay 217 opens at one point the operating circuit for relay 209 through the right contact of spring combination 219. Relay 217 in operating completes a circuit from battery through the winding of relay 202, terminal 211, brush 141, outer contact of relay 132, conductor 135, outer back contact of relay 127, winding of relay 129, inner right front contact of relay 116, outer right contact of relay 126, right front contact of relay 115, left contact of relay 124, conductor 134, thence over the other side of the line through the winding of relay 201 to ground at the left contact of the combination 219. Relays 201 and 202 operate and relay 201 opens the other branch of the circuit of relay 209. Relay 209 will therefore release. The operation of relay 257 closes an obvious circuit for relay 260 which in turn closes an obvious circuit for relay 253. The operation of relay 253 connects ringing current source 261 to the ring of plug

241 thereby connecting ringing current for operating relay 125 over a circuit described below. The operation of relay 253 closes an obvious circuit for relay 258 and relay 258, operated, closes an obvious circuit for relay 254. The operation of relay 254 opens the operating circuit for relay 257 which in turn opens the circuit for relay 260. Relay 260 is made slow to release to give the current from generator 261 a sufficient length of time to operate relay 125. The release of relay 260 releases relay 253 thereby disconnecting current source 261 from the ring of the plug. The release of relay 257 is sufficiently fast so that ground on its back contact may be connected through the outer right front contact of relay 254 to battery through the winding of relay 251 thereby operating it. Relay 251 locks to ground on the right front contact of relay 252 over an obvious circuit. The operation of relay 251 connects the tip side of plug 241 to conductor 263 and thence to the intercepting operator's telephone circuit. Through the release of relays 260, 253 and 258, following the deenergization of relay 257, relay 254 has released and a circuit is now closed from ground on the back contact of relay 257, outer right back contact of relay 254, outer right front contact of relay 251, back contact of relay 250, to battery through the winding of relay 256. Relay 256, operated, lights lamp 258. As soon as relay 251 has operated the tip and ring conductors are extended to the bridge 250 across the operator's cord circuit. Relays 216 and 217 operate in series with this bridge and the relay 209 is thus prevented from reoperating.

The operator may insert the plug 241 during a ringing interval, namely, during the time the relay 209 is operated. In this case the relay 257 is operated in a circuit from the grounded generator 214 to the left front contact of relay 209, wiper 203, brush 220, terminal 230, and thence as previously traced to ground at the contact of relay 252. The relay 257 operates in series with the generator 214. If the relay 254 operates before the next silent interval, relay 257 is maintained by a circuit leading through the condenser in parallel with the inner right contact of relay 254. When the next silent interval occurs, relay 257 releases and from this point the circuits function as hereinbefore described. It will be noted that if relay 217 has operated in series with relay 257, it is released by the operation of relay 254 to release in turn the relay 129 to prepare the circuit of relay 125 before current is transmitted from the source 261.

On a call to a subscriber, a circuit is closed through the subscriber's loop to operate relay 216. Relay 216 connects ground to conductor 210, through the winding of relay 201, and thence to conductor 134, left front con-

tact of relay 124, right front contact of relay 115, outer right back contact of relay 126, inner right front contact of relay 116, winding of relay 129, outer right back contact of relay 127, to conductor 135, and thence to battery through relay 202. Relay 129 is thereby operated to close a circuit from ground on the left front contacts of relays 128 and 129 to battery through the winding of relay 123. The operation of relay 123 reverses the circuit hereinbefore traced through relay 115 thereby supplying battery over conductor 117 instead of over conductor 118, causing message register 106 to operate and charge the call.

As there is no charge made for a call to an intercepting operator, it is desired to prevent message register 106 from operating. This is done by means of slow-to-release relay 128 and alternating current relay 125. Relay 128 is made slow-to-release for the purpose of keeping the circuit for relay 125 closed should false ringing current be transmitted momentarily over lead 134.

The operation of relay 125 was mentioned above and its operating circuit may be traced from ground on the left front contact of relay 128, left back contact of relay 129, winding of relay 125, inner left back contact of relay 126, conductor 134, inner front contact of relay 132, brush 140, terminal 210, conductor 225, right back contact of relay 209, side-switch wiper 213, brush 221, terminal 231, outer left front contact of relay 233, ring of jack 240 and plug 241 to ringing generator 261 through the outer front contact of relay 253. The operation of relay 125 opens the locking circuit of relay 128, thereby opening the above traced circuit for relay 123. It is therefore apparent that the measured interval of ringing current from the intercepting operator's cord will prevent the operation of register 106.

When a manual operator is requested to obtain a connection with a subscriber in a three-wire office, plug 305 of the operator's cord circuit OC (shown on Fig. 3) is inserted in jack 306. Relay 307 operates over a circuit from ground through its winding, conductor 312, sleeve of jack 306 and plug 305, lamp 304, resistance 300, to battery. At the same time relay 311 is operated over a circuit from battery through its winding, back contact of relay 315, conductor 323, tip of jack 306 and plug 305, upper normal contact of key 303, upper winding of repeat coil 350 to ground. Relay 309 also operates over a circuit from ground through its winding and inner left back contact conductor 322, ring of jack 306 and plug 305, lower normal contact of key 303, winding of relay 308, lower winding of repeat coil 350 to battery. The operation of relay 307 closes a locking circuit for relay 309 which may be traced from battery on the right front contact of relay

307, inner left front contact of relay 309 to ground through its winding. The operation of relay 309 also connects relay 313 to the ring side of the trunk over conductor 322 and operates relay 310 over a circuit from ground on the middle left front contact of relay 309 to battery through the winding of relay 310. Relay 313 does not operate at this time. To mark the trunk as busy, relay 309 upon operating connects the make busy circuit 329 through the coil 319 over the right front contact of relay 309 to the sleeve of jack 306. The operation of relay 310 connects the windings of relay 315 in series with resistance 321 and coil 320 across conductors 324 and 325 but relay 315 does not operate at this time. Its operation will be described later. The circuit is now in condition for dialing and the manual operator operates key 303, thereby connecting dial 302 across the tip and ring of the cord. Relay 311 remains operated through contact 326 of the dial. When the dial is moved off normal, ground is connected to the ring through off-normal contact 327, lower make contact of key 303, ring of plug 305 and jack 306, conductor 322, outer left front contact of relay 309, right back contact of relay 314 to battery through the winding of relay 313. The operation of relay 313 connects conductor 351 to conductor 335 and operates relay 317 over an obvious circuit. Relay 317 operated disconnects conductor 334 from conductor 324 and connects ground from its left front contact, over the front contact of relay 311 through the winding of relay 316 to battery, thereby operating relay 316. Relay 316 locks over a circuit from battery through its winding, left front contact, back contact of relay 318 to ground on the middle left front contact of relay 309.

While the dial 302 returns to normal, the pulsing contacts 326 open and close the operating circuit for relay 311 a certain number of times corresponding to the digit dialed. The operation and release of relay 311 intermittently connects ground to conductor 335 for operating the vertical relay 330 in the first trunk selector FTS over a circuit from ground, on the left front contact of relay 317, back contact of relay 311, outer right front contact of relay 313, conductor 335 to battery through the winding of vertical relay 330. The operation will be the same is described above for the first trunk selector S with the exception of the rotary impulse from the trunk OT. When the dial reaches normal, the off-normal contact 327 is opened and relay 313 releases opening the circuit through relay 317. Relay 317, however, being slow to release, releases after an interval during which time ground from the right inner back contact of relay 313 (which contact is a make-before-break spring combination) is connected to conductor 334 causing

relay 331 to operate and cause the trunk selector to rotate as hereinbefore described. It will be noted that the numbering for this particular circuit is the same on both figures with the exception of the hundreds numeral which corresponds to the figure number. The connector C and intercepting operator's circuits will function in the same manner as described above until ringing source 261 is applied to the connection.

On a call successfully completed to a subscriber's substation, when the subscriber removes the receiver from the switchhook, relay 216 is operated as previously described, completing a circuit from ground through relay 201 over the connection to conductor 325 through the left front contact of relay 310, through the windings of relay 315, coil 320, resistance 321 and the right front contact of relay 310 to conductor 324 and battery at relay 202. The operation of relay 315 opens the circuit for relay 311 releasing it, and closes a circuit for relay 314 from ground through the upper winding of repeat coil 350, upper normal contact of key 303, tip of plug 305 and jack 306, conductor 323, front contact of relay 315, right front contact of relay 316, winding of relay 314, conductor 322, ring of jack 306 and plug 305, lower normal contact of key 303, winding of relay 308, lower winding of repeat coil 350 to battery. The resistance of relay 314 is such that it allows relay 308 to operate and connect resistance 355 across the lamp 304 extinguishing it. The extinguishing of lamp 304 indicates to the originating operator that the connection has been successfully completed and she may operate means to charge the calling subscriber.

It is therefore not desirable to give the operator a signal on a call to an intercepting operator. This is effected by means of ringing source 261 over a circuit from ground on the middle left front contact of relay 309, winding of relay 318, left back contact of relays 314 and 313, right front contact of relay 310, conductor 324, right back contact of relay 317, conductor 334, inner left front contact of relay 332, brush 341, terminal 211, conductor 225, right back contact of relay 209, side-switch wiper 213, brush 221, terminal 231, outer left front contact of relay 233, ring of jack 240 and plug 241, to ringing source 261 through the inner right front contact of relay 253. Relay 318 operates in this circuit and opens the locking circuit for slow-to-release relay 316. This relay is made slow to release in order that it may hold during short impulses of ringing current which may occur at times other than required. It is necessary for relay 318 to buzz a certain length of time in order to release relay 316. The release of relay 316 opens the operating circuit for relay 314, and the circuit for operating supervisory relay 308 is not there-

fore effective and no supervisory signal is received by the manual operator.

When the conversation is completed, the calling subscriber replaces his receiver on the switchhook. The operator at position OC takes down the connection, releasing the relays 201 and 202. The connector C is now restored to normal by means of a circuit from battery, through the winding of release magnet 208, upper contacts of the combination 219, left normal contacts of the spring combination 218 to ground on the terminal 212. Magnet 208 causes the connector to restore to normal and relay 333 operates to bring about the release of the selector in the well-known manner. The withdrawal of the plug 305 from the jack 306 releases relay 307, which in turn, releases relay 309. The release of relay 309 opens the circuit of relay 310.

If the operator at OC desires to break down the connection after it has been extended to the trunk IOT, but before the operator at IOC has answered, she may do so by withdrawing the plug 305, whereupon relays 307, 309 and 310 release. The release of relay 310, which is a slow-releasing relay, permits the connection of ground over two circuits, one from battery, through the winding of relay 201, thence over the circuit previously traced to the outer left front contact of relay 332, conductor 335, outer right back contact of relay 313, conductor 325, left front contact of relay 310, lower winding of relay 315, to ground at the middle left back contact of relay 309. The other circuit may be traced from battery through the winding of relay 202, thence as traced to the inner left front contact of relay 332, conductor 334, right back contact of relay 317, conductor 324, right front contact of relay 310, left back contact of relay 307, upper winding of relay 315, to ground at the middle left back contact of relay 309. The operation of relays 201 and 202 closes a circuit from battery through the winding of release magnet 208, upper contacts of the spring combination 218, right contacts of the spring combination 219 to ground over the terminal 212.

The release of the line switch and the first selector on a call from a subscriber is well known in the art and the release of repeater R is effected when the brushes 110, 111 and 112 break contact with contacts 120, 121 and 122 thereby releasing the operated relays and closing a circuit for operating relays 201 and 202 in a manner similar to that described.

What is claimed is:

1. In a telephone exchange system comprising automatic switches employed for extending calls from one subscriber to another and call charging means automatically operable upon completion of such calls, intercepting operator position circuits to which certain

calls are automatically extended, apparatus to disable the operating circuit for said call charging means, an intercepting operator's cord circuit, and means in said cord circuit automatically operable to operate said disabling apparatus.

2. In a telephone exchange system comprising automatic switches employed for extending calls from one subscriber to another and call charging means automatically operable upon completion of such calls, intercepting operator's position circuits to which certain calls are automatically extended, an alternating current relay for disabling the operating circuit of said call charging means, an intercepting operator's cord circuit and means in said cord circuit to automatically supply alternating current to operate said relay.

3. In a telephone exchange system comprising automatic switches employed for extending calls from one subscriber to another and call charging means automatically operable upon completion of such calls, intercepting operator's position circuits to which certain calls are automatically extended, an alternating current relay effective when operated for a measured length of time to disable the operating circuit of said call charging means, an intercepting operator's cord circuit and means in said cord circuit to automatically supply alternating current to operate said relay for said measured length of time.

4. In a telephone exchange system comprising automatic switches employed for extending calls from one subscriber to another and call charging means automatically operable upon completion of such calls, intercepting operator's position circuits to which said calls are automatically extended, an alternating current relay, means under the control of said relay effective when said relay is operated for a measured length of time to disable the operating circuit of said call charging means, an intercepting operator's cord circuit, and means in said cord circuit to automatically supply alternating current to operate said relay for said measured length of time.

5. In a telephone exchange system comprising automatic switches employed for extending calls from one subscriber to another and call charging means automatically operable upon completion of such calls, intercepting operator's position circuits to which certain calls are automatically extended, an alternating current relay effective when operated for a measured length of time to disable the operating circuit for said call charging means, an intercepting operator's cord circuit, means in said circuit to automatically supply alternating current to operate said relay for said measured length of time, and means to render said disabling means inef-

fective if said alternating current relay is operated for less than said measured length of time.

5 6. In a telephone system having a plurality of lines, automatic switches for extending connections from an originating point to a called line, a current responsive device at the originating point, means controlled by the called party in answering for operating said
10 device, an intercepting operator's position and a cord circuit thereat, means for causing said switches to extend certain connections to said position, means in the operator's cord circuit for sending a discriminatory signal
15 back over the extended connection to the originating point, and means operated in response to said signal for disabling the means for operating said current responsive device.

20 7. In a telephone system, a calling office and a called office, trunk lines interconnecting said offices, automatic switches for ex-

tending connections from the calling office over the trunk lines to a subscriber's line in the called office, a current responsive device at the calling office, means controlled over 25 the connection by the called subscriber for operating said current responsive device, means for disabling said current responsive device, an intercepting operator's position at the called office, means for causing said 30 switches to route certain connections to said position, a cord circuit at the operator's position, and means in said cord circuit for causing the operation of said disabling means to prevent the operation of said current respon- 35 sive device in the calling office.

In witness whereof, we hereunto subscribe our names, this 27th day of August, A. D., 1925.

EMIL JACOBSEN.
ARTHUR B. SPERRY.