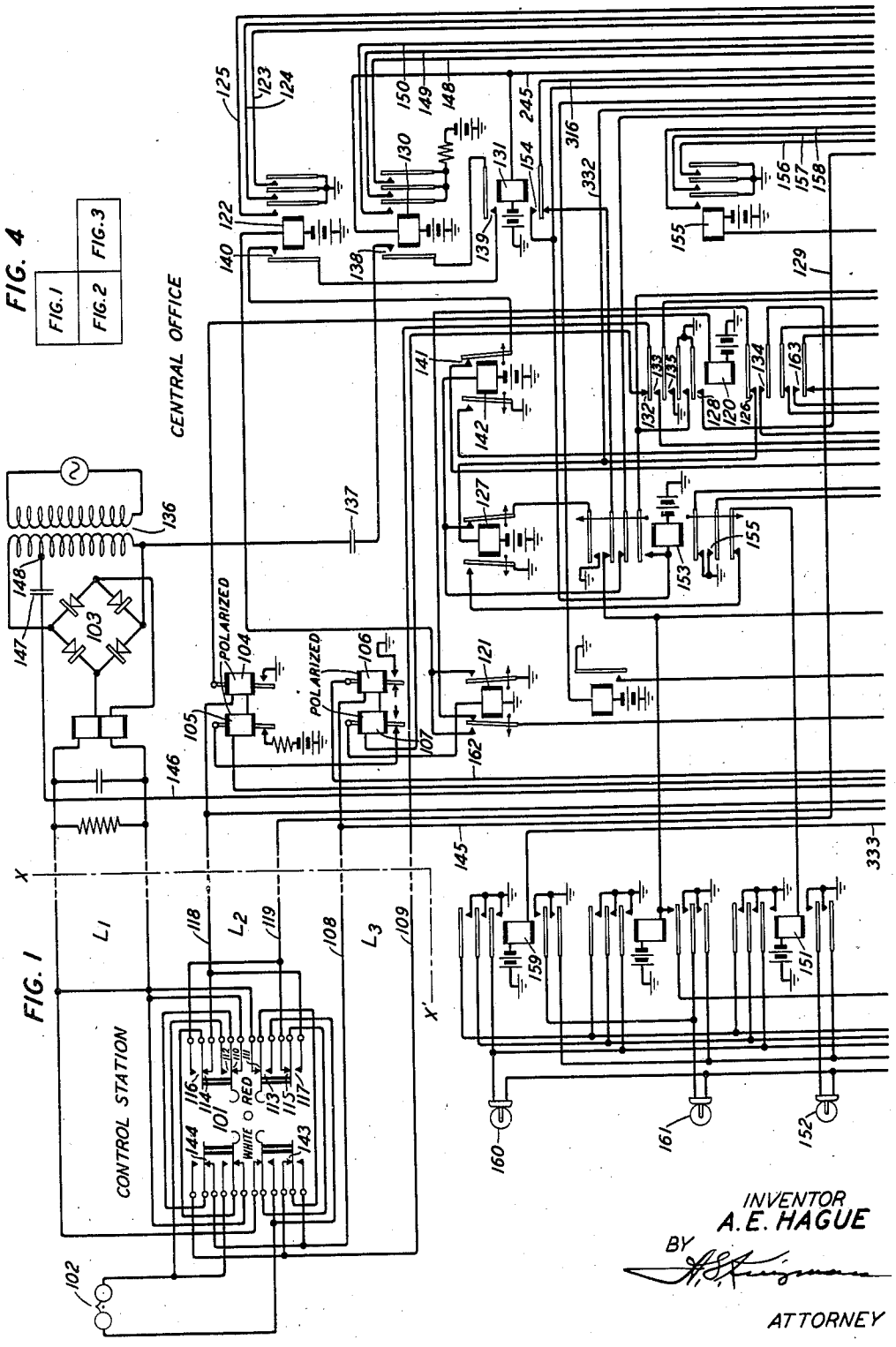
Oct. 12, 1943. A. E. HAGUE 2,331,391

SIGNALING SYSTEM

Filed Nov. 19, 1942 3 Sheets-Sheet 1



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SIGNALING SYSTEM

Filed Nov. 19, 1942 3 Sheets-Sheet 2

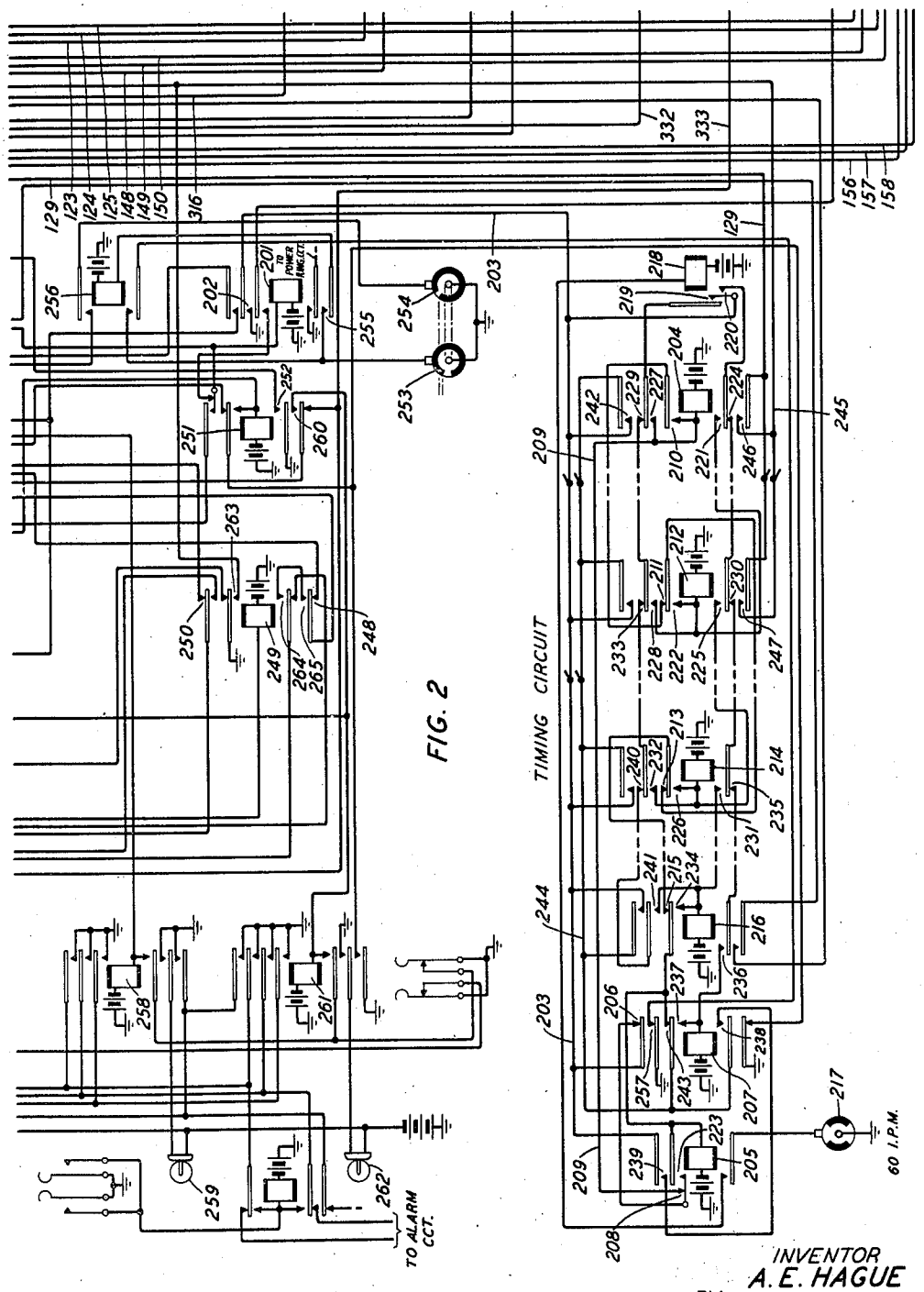

FIG. 2

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SIGNALING SYSTEM

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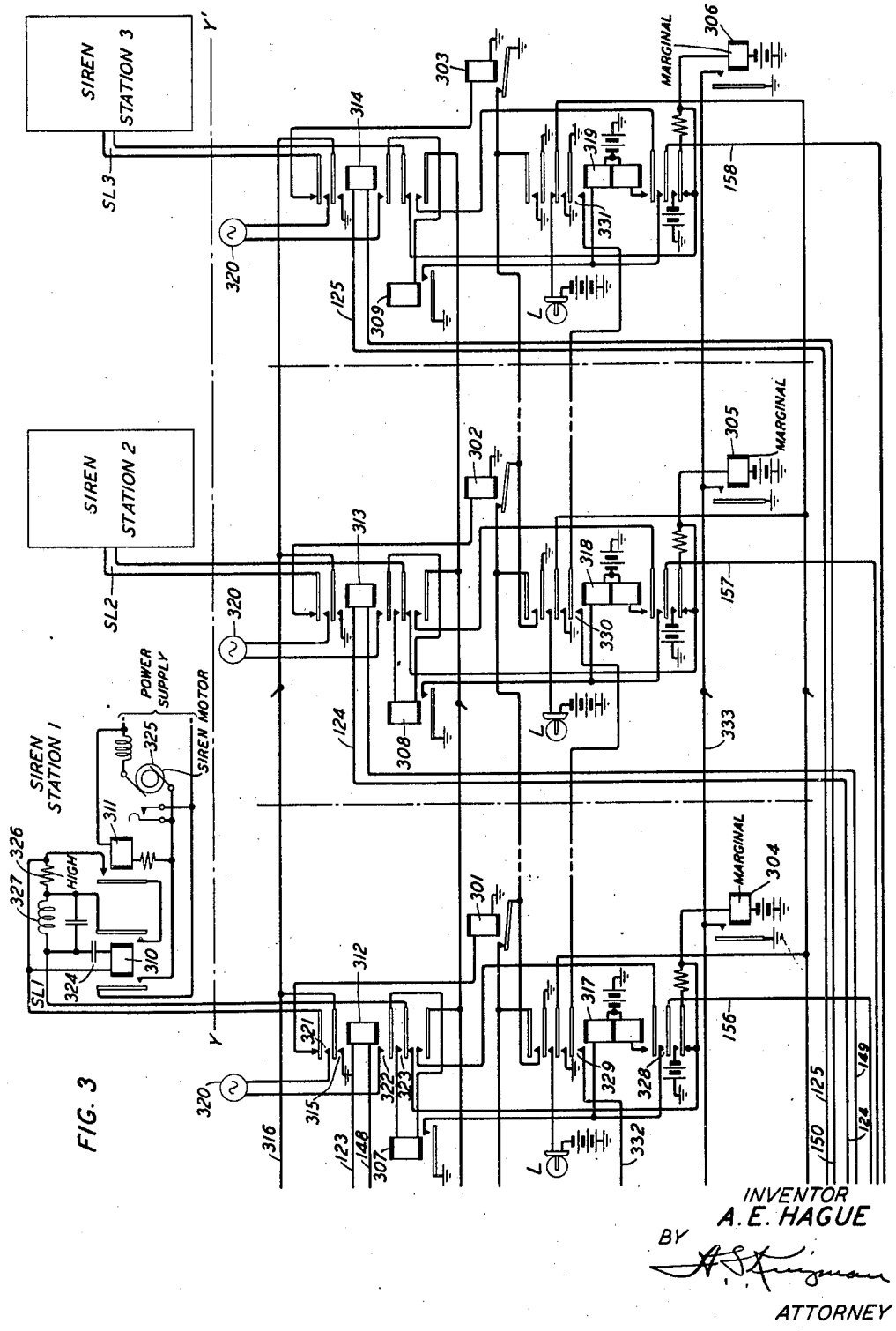

FIG. 3

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UNITED STATES PATENT OFFICE

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SIGNALING SYSTEM

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Application November 19, 1942, Serial No. 466,157

5 Claims. (Cl. 179—5)

This invention relates to signaling systems and more particularly to a continuously self-checking arrangement whereby an attendant at a control station can cause the simultaneous operation of a plurality of distant signal devices in either of two distinctive manners and receive an "answer-back" signal in the event that all the signal devices function in the manner desired.

Specifically, a feature of the invention resides in a siren control arrangement for emergency warning service comprising a control key station at a police station, firehouse, or other suitable location, a control circuit located in a telephone central office or other suitable switching point, and a plurality of outlying stations equipped with motor-driven sirens or other suitable signal devices.

The control station is equipped with a two-way key and a telephone ringer, receives rectified direct current over a pair of conductors from the central office and has two other signal pairs extending to the central office. When the control key is normal, direct current is connected to both of the signal pairs in parallel thereby holding two three-position polarized relays at the central office in one of their circuit closing positions. When the key is actuated to either of its operated positions it reverses the current over one of the signal pairs and substitutes the ringer for the direct current normally connected to the other signal pair. Reversal of current over the one pair causes the corresponding polar relay at the central office to open one circuit and close a second circuit and disconnection of the other signal pair from the direct current causes its associated polar relay to release and assume its neutral or open circuit condition. The reversal of the one polar relay and the release of the other causes the connection of ringing current to a plurality of siren station lines which ringing current is periodically interrupted, or continuously applied, depending upon which polar relay is reversed.

When the central office circuit functions due to a reversal over one of the signal pairs, ringing current is applied to the other signal pair, to which the ringer is connected at the control key station, which serves as an indication that the central office circuit is functioning properly. Further, if all the siren stations are in working condition and the sirens receive local starting power the ringing current remains connected to the signal pair to which the ringer at the control station is connected which ringer operates in unison with the sirens. On the other hand, if any one of the siren stations fails to operate, the ringer at the control key station is silenced, thereby indicating to the control station attendant that the system is not functioning properly.

The invention will be understood from the following description when read in connection with the accompanying drawings, the figures of which, when arranged in accordance with Fig. 4, show an embodiment of the invention in which the control station is shown to the left of the vertical broken line X—X' of Fig. 1; the siren stations are shown, above the horizontal broken line, on Fig. 3, and the balance of Figs. 1 and 3 and all of Fig. 2 show the equipment and circuits at the telephone central office.

In the following description the two characteristically different signals sounded by the sirens will be hereinafter referred to as red and white signals, a red signal being defined as the intermittent sounding of the sirens at such a rate as to produce intermittent or undulating sound and a white signal being defined as the continuous operation of the sirens for a period of about two minutes.

General description

Referring to the drawings, the control station, Fig. 1, is equipped with a lever type key 1 having a normal and two locking positions, one of which positions is the warning or "red" position and the other the all-clear or "white" position.

The control station key 1 is connected to the central office over three pairs of line conductors L_1, L_2 and L_3, one pair, L_1, being a current supply line while the other two pairs, L_2 and L_3, serve as red and white signaling lines, respectively.

Associated with the key at the control station is a telephone ringer 2 which sounds upon operation of the key in either direction and continues to do so in unison with the sirens, intermittently in the case of the red signal and steadily in the case of the white. The ringer 2 ceases operation if any siren fails to receive starting power. Further, when the key is first actuated to either of its locking positions, the failure of the ringer to respond indicates trouble in the lines between the control station and central office or in certain of the central office relays.

At the central office, shown at the right of the vertical broken line X—X', on Fig. 1, is located a current supply circuit and a set of polar relays associated with the three control station lines L_1, L_2 and L_3, together with various relay equipments for transmitting red and white signals to the siren stations simultaneously and for return-

ing a response signal to the control station. In addition there is shown auxiliary equipment for keeping a continuous check upon the lines and for operating central office alarms under trouble conditions.

Supplying the control station with direct current is a varistor-rectifier **3** which in turn is supplied from the regular central office ringing generator, which arrangement affords a non-grounded source of direct current which is independent of commercial power failure and is free of the effect of ground on the control station lines. Similarly, the non-grounded operation of the control station ringer **2** previously mentioned makes the ringer operation independent of grounds on the line. This method of supplying direct current to the control station makes it possible to use reverse battery signaling over the red and white lines so that ordinary line troubles do not cause false operation of the polar relays at the central office. Short circuits on the control lines are detectable by the release of the polar relays and the operation of an alarm.

A continuous check for open siren station lines, at the top of Fig. 3, is made by means of relays **301**, **302**, etc. which are normally held operated in series with marginal relays **304**, **305**, etc., the station lines, and the siren stations. Short circuits in the siren station lines are detected by the operation of the respective marginal relays **304**, **305**, etc., as are also trouble grounds which interfere with signaling. Signaling over the siren station lines is transmitted to the sirens by supplying ringing current through tripping relays **307**, **308**, etc. to ringing relays, such as **310**, located at the siren station. The latter relays, **310**, apply power directly to the siren motor. Upon closure of the power circuit a check relay **311** at the siren station operates to bridge the line with a low resistance shunt which operates the tripping relay, **307**, for example, at the central office.

At the central office a red signal is communicated to the siren network by intermittent operation of the siren line ringing relays **312**, **313**, etc. under control of a relay timing circuit as shown at the bottom of Fig. 2. This timing circuit may be set to produce such closed and open intervals as may be required to give an intermittent or undulating tone on the sirens or other warning devices. The central office control circuit checks to see that all the siren stations receive local power, as indicated by the operation of all tripping relays in the siren station line and then it continues the operation of the control station ringer in unison with the sirens. If any siren station fails to respond the control station ringer is silenced and a central office alarm is given.

The white signal, which is continuous, and usually of about two minutes duration, is transmitted in the same way as the red signal except that in this case the timing relays are not brought into play to interrupt the ringing current which controls the sirens.

Initiation of a red signal

We will first assume that a so-called red or warning signal is to be sounded by the siren, shown at the top of Fig. 3, which warning signal is initiated by an attendant at the control station, shown in the upper left corner of Fig. 1 by operating the key **101** to the right, or red position.

It will be noted that when key **101** is normal, rectified direct current, supplied over line L_1, by the rectifier **103** at the central office, is connected, by means of the normal contacts of the key in parallel with the signal lines L_2 and L_3, which lines in turn are connected in series with respective polar relay pairs **104**, **105** and **106**, **107** in such a direction that the contacts of relays **104** and **106** are open and the contacts of relays **105** and **107** are closed.

When key **101** is operated to the right, conductors **108** and **109** of the line L_3 are disconnected at contacts **110** and **111** of key **101** from the current supply line L_1 and transferred to the ringer **102** whereupon relays **106** and **107** release, permitting their armatures to assume a mid, or neutral position. Key **101** also opens its contacts **114** and **115** and closes its contacts **116** and **117** thereby reversing the polarity of the direct current connected to conductors **118** and **119** whereupon relays **104** and **105** at the central office move their armatures to the right whereby battery is disconnected from the armature of relay **105** and ground is connected to the armature of relay **104**.

Relay **104** in closing its right-hand contacts completes the circuit to operate relay **120** and relay **107** in releasing opens the normally closed circuit for slow-to-release relay **121**, which relay in closing its normal or back contacts operates relay **122** thereby connecting ground over conductors **123**, **124** and **125** to one terminal of relays **312**, **313** and **314**, respectively.

Relay **120** in operating opens its contacts **126** thereby deenergizing relay **127** which relay, however, is slow to release and before it releases is reenergized in a circuit from ground at contacts **331** of relay **319** over contact **330** of relay **318** and contact **329** of relay **317**, to be later referred to. Relay **120** also closes its contacts **128** thereby connecting ground to conductor **129** to prepare an operating circuit for relays **130** and **131** when the timing circuit functions. Further, relay **120** in operating opens its contacts **132** thereby disconnecting relays **106** and **107** from line L_3 and by closing its contacts **133** and **134** prepares a circuit to apply ringing current to line L_3, and its connected ringer **102**, when relays **122**, **130** and **131** all become operated. Still further, relay **120** in operating closes its contacts **135** to operate relay **201** which grounds, at its contact **202**, the start conductor **203** for the timing circuit shown at the bottom of Fig. 2.

The relays of the timing circuit operate as follows: Ground on start conductor **203** causes operation of relays **204** and **205** in the order named. The operating circuit of relay **204** can be traced from ground on conductor **203**, contacts **206** of relay **207**, contacts **208** of relay **205**, conductor **209** and winding of relay **204**. Operation of relay **204** in this circuit closes its contacts **210** thereby extending ground present on conductor **209**, to the winding of relay **205** over contacts **211** of relay **212**, contacts **213** of relay **214**, and contacts **215** of relay **216**. A parallel operating circuit of relay **205** can also be traced from ground on conductor **203**, contacts **242** of relay **204**, conductor **244**, contact **243** of relay **207** to the winding of relay **205**. Relay **205** in operating locks in a circuit including its contacts **223** and contacts **236** of relay **207** to ground on conductor **203**.

When relay **205** operates, if the brush of interrupter **217** is on a grounded segment, relay **218** operates immediately and, while holding relay **204** operated over its own contacts **219** and contacts **227** of relay **204**, it extends ground over its contacts **220**, and contacts **221** of relay **204**, to the winding of relay **212** which thereupon operates.

When the interrupter 217 removes ground from relay 218 this relay releases thus opening its contacts 219 which release relay 204 while relay 212 remains operated in a holding circuit completed at its own contacts 222 to ground over contacts 213 of relay 214, contacts 215 of relay 216, contacts 223 of relay 205, and contacts 206 of relay 207 to ground on conductor 203 maintained at contacts 202 of relay 201.

The next closure of ground at interrupter 217 reoperates relay 218 which now extends ground over its contacts 220, contacts 224 of relay 204 and contacts 225 of relay 212 to the winding of relay 214 which relay operates and locks, at its contacts 226, over contacts 215 of relay 216, contacts 223 of relay 205, and contacts 206 of relay 207 to ground on conductor 203.

Relay 214 in operating opens its contacts 213 thereby interrupting the previously traced holding circuit for relay 212 but this relay is held operated in a circuit including its own contacts 228, contacts 229 of relay 204 and contacts 219 of relay 218 during the interval relay 218 is operated.

The next time relay 218 releases, due to removal of ground by the interrupter, it opens its contacts 219 which release relay 212. When relay 218 again operates it extends ground over its contacts 229 to operate relay 216, which circuit includes contacts 224 of relay 204, contacts 230 of relay 212, and contacts 231 of relay 214 to the winding of relay 216 which now operates thereby opening, at its contacts 215, the holding circuit for relay 214 previously traced. This relay, however, does not release at this time as it is held operated over its contacts 232, contacts 233 of relay 212, contacts 229 of relay 204, and contacts 219 of relay 218 while this latter relay remains operated.

Relay 216 locks itself at its contacts 234 over contacts 223 of relay 205 and contacts 206 of relay 207 to conductor 203. When relay 218 again releases, it opens its contacts 219 thus releasing relay 214.

The next operation of relay 218 extends ground, as before, to operate relay 207 the circuit for which can be traced from ground on conductor 203, contacts 220 of relay 218, contacts 224 of relay 204, contacts 230 of relay 212, contacts 235 of relay 214, and contacts 236 of relay 216 to the winding of relay 207, which relay operates and opens its contacts 206, thus opening the original locking circuit for relay 216 but due to the fact that relay 214 is now released an alternative holding circuit for relay 216 is now established during the period relay 218 is operated which circuit can be traced from ground on conductor 203, contacts 219 of relay 213, contacts 229 of relay 204, contacts 233 of relay 212, contacts 240 of relay 214, contacts 241 and the winding of relay 216 to battery. This circuit, just traced, for holding relay 216 also holds start relay 205 operated as long as relay 218 remains operated, although the original locking circuit for relay 205 is opened at contacts 206 of relay 207 when that relay operated. As long as relay 205 remains operated, relay 207 is locked in a circuit including its own contacts 237 and 238 and contacts 239 of relay 205 to ground on conductor 203.

The next time interrupter 217 releases relay 218 the circuit just traced for holding relays 216 and 205 is opened and both relays release. The release of relay 205 opens the locking circuit of relay 207 and this relay releases. The release of relay 205 also closes its contacts 208 thereby again completing a circuit to reoperate relay 204 which relay initiates another cycle of operation by completing a circuit to reoperate relay 205 as previously described, whereupon a circuit is again prepared for operating relay 218 when the interrupter 217 again supplies ground to the lower armature of relay 205, following which another cycle of the timing circuit takes place which is repeated as long as relay 201 remains operated.

During the period between the operation of relay 204 and the subsequent release of relay 212 conductors 129 and 245 are connected at either contacts 246 of relay 204 or contacts 247 of relay 212, thereby operating relays 130 and 131 in parallel, the circuit for which can be traced from ground, contacts 128 of relay 120, conductor 129, contacts 246 or 247 of relay 204 or 212, respectively, conductor 245 and to battery and ground through the winding of relays 130 and 131 in parallel.

When relays 130 and 131 operate they close a circuit to operate ringer 102 at the control key station which can be traced from the lower terminal of the secondary winding of the ringing current transformer 136, condenser 137, contacts 138 of relay 130, contacts 139 of relay 131, contacts 140 of relay 122, contacts 141 of relay 142, contacts 248 of relay 249, contacts 133 of relay 120, to conductor 109 of the line L_3 extending to the control key station and thence over contacts 143 and 113 of key 101, through the ringer 102, over contacts 112 and 144 of key 101 to line conductor 108, thence over conductor 145, contacts 134 of relay 120, contacts 250 of relay 249, conductor 146 and condenser 147, to a predetermined point 148 in the secondary winding of transformer 136.

Ringer 102 operates in this circuit and indicates at the control key station that the central office circuit has functioned properly. In this connection it will be noted that the circuit for ringer 102 includes contacts 141 of relay 142 which relay is normally held operated from ground over a chain of contacts formed by the operated condition of relays 301, 302 and 303 and the release of any one of which will cause relay 142 to release, thus silencing the ringer 102. This feature will be later referred to.

Simultaneous with the operation of ringer 102, relay 130 connects battery to conductors 148, 149 and 150 which extend to relays 312, 313 and 314, respectively, and, previously, when relay 122 operated upon the initiation of the red signal it connected ground at its right-hand contacts to conductors 123, 124 and 125 which extend to the remaining terminals of relays 312, 313 and 314 and, therefore, upon the operation of relay 130 relays 312, 313 and 314 operate immediately.

Directing our attention first to relay 312 it will be noted that its operation disconnects checking relays 301 and 304 from the line SL_1 extending to siren station 1.

This relay 312 in operating also closes its contacts 315 thereby operating relay 153 in a circuit including conductor 316 and contacts 154 of relay 131. Relay 153 locks to ground at contacts of relay 120, opens its lowermost contacts to release relay 151, if operated, and by closing its contacts 155 operates relay 251 which locks to ground at the lowermost contacts of relay 207 in the timing circuit. Relay 251 in operating closes, at its contacts 252, a circuit to operate relay 155 which connects ground over conductors 156, 157 and 158 to prepare a holding

circuit for relays 317, 318 and 319, respectively, when they operate.

Reverting to relay 312, which is now operated under control of relay 130, ringing current, from source 320, is connected over its contacts 321, 322 and 323 to the line SL_1, in series with tripping relay 307, to which line is connected a ring-up relay 310 in series with condenser 324. Relay 310 operates in response to ringing current supplied by source 320 and by closing its left-hand contacts connects the power supply circuit to the siren motor in parallel with relay 311 which relay operates if the power supply circuit is energized.

Relay 311 operated closes its contacts which closure, in cooperation with the right-hand contacts of relay 310, short-circuits high resistance 326 which is normally connected, in series with inductance 327, in parallel with the ringing relay 310 across the line SL_1. This short circuit around resistance 326 lowers the effective resistance of the line SL_1, as seen from the ringing current source 320 at the central office and consequently an increased current flows through the tripping relay 307 sufficient to cause its operation thus connecting ground to operate relay 317 which locks up at its contacts 328 to ground supplied over conductor 156 by relay 155 previously referred to. As the timing circuit continues to function relay 130 continues to operate and release, as determined by the timing circuit, thereby operating and releasing relay 312 which in turn causes the siren to operate intermittently.

The foregoing operation also takes place for the other siren stations under control of relays 313 and 314, respectively. When relays 318 and 319 have also operated and locked under control of relay 155 a chain circuit is established, including contacts 329 of relay 317, contacts 330 of relay 318, and contacts 331 of relay 319 and conductor 332 to hold relay 127 operated, which relay due to its slow characteristic does not release quickly when relay 120 operated. Relay 127 holds relay 142 thus maintaining the circuit closed for the ringer 102 which continues to operate under control of relays 130 and 131 as they alternatively operate and release under control of the timing circuit.

Any trouble on the lines L_1, L_2 or L_3 between the control station and the central office, while no signal is being sent, which results in the release of relay 105 or 107, will release relay 121 followed by the release of relay 127 which causes alarm relay 151 to operate thus lighting lamp 152.

If a siren line, such as SL_2, should become open test relay 302 will release thereby opening the normal operating circuit of relay 142 which relay releases and by closing its left back contact energizes relay 159 to light lamps 160 and 161. This same alarm is produced in the case of a short-circuit of line SL_2, for example, which operates marginal relay 305 thereby connecting ground to conductor 333 which also operates relay 159.

Should the power supply for any siren station fail, for example station 1, relay 311 will not operate and the resistance of the line will remain high and relay 307 will not operate. Consequently, relay 317 will not operate and hence relay 127 will not receive holding ground, at contacts 329 of relay 317, and will release thus opening the locking circuit for relay 142 which releases and closes its left contact to operate relay 261 in a circuit including contacts 260 of relay 251. Relay 261 lights lamp 262. Relay 142 in opening its right-hand contact silences the ringer 102, which up to this time has been controlled by relays 130 and 131, as previously described.

Checking the timing circuit

Interrupters 253 and 254 are provided for the purpose of checking the operation of the timing circuit. When relay 201 operates, in response to operation of relay 120, upon the initiation of a red signal, the timing circuit is started upon its cyclic operation, as previously described. At the same time, relay 201 closes its contacts 255 to prepare a circuit to operate a so-called pick-up relay 256 when interrupter 253 connects ground thereto. When relay 256 operates it closes its bottom contacts to establish a locking circuit for itself under control of relay 207 in the timing circuit which can be traced from ground at contacts 257 of relay 207, lower contacts of relay 256, contacts 255 of relay 201, and winding of relay 256. The interrupters 253 and 254, whose commutators are mounted on the same shaft, operate at such a slow rate that under normal conditions relay 207 will operate and remove the holding ground for relay 256 before ground is applied at the contacts of interrupter 254. If, however, the timing circuit should stop before relay 207 operates, thus holding relay 256 operated until interrupter 254 applies ground, a circuit will be established to operate relay 258 and light lamp 259 over contacts 163 of relay 120.

White signal

Now we will assume that a so-called "white" or all-clear signal is to be sounded by the siren which signal is identified as a continuous or non-interrupted blast lasting for a considerable interval of time, for example, for upwards of two minutes.

The "white" signal is initiated, as previously indicated, by operating key 101 to the left thereby disconnecting conductors 118 and 119 of the line L_2 from the direct current source supplied over line L_1 and connecting them to the ringer 102, and also reversing the conductors 108 and 109 of line L_3 with respect to the conductors of the current supply line L_1 thereby reversing the current flowing through the polar relay pair 106 and 107 whereupon relay 106 moves its armature to the right to connect ground to conductor 162 thus operating relay 249. Relay 105 releases and relay 107 moves its armatures to the right thus opening at two points the normally closed circuit for relay 121, which releases.

Relay 121 in releasing opens its left front contact thus opening the normal energizing circuit for relay 127 but this relay is slow to release and will be reenergized and held operated by ground on conductor 332 if relays 317, 318 and 319 operate immediately responsive to the sirens at stations 1, 2 and 3 receiving power, as previously described.

When relay 121 closes its back contacts it connects ground to operate relay 122 which in turn connects ground to one terminal of each of the ringing control relays 312, 313 and 314. Relay 249, which is now operated, connects ground at its contacts 263 to operate relays 130 and 131 directly which relays, at their contacts 138 and 139, respectively, complete a circuit for actuating the ringer 102 at the control station which includes contacts 264 and 265 of relay 249. Relay 130 in operating con-

nects battery to conductors 148, 149 and 150 thereby completing operating circuit for relays 312, 313 and 314 to initiate operation of the sirens at stations 1, 2 and 3 in the same manner as described in connection with the red signal.

Due to the fact that relay 104 is deenergized during the transmission of the while signal, relay 120 remains released and consequently the timing circuit does not function and, therefore, as long as the key 101 is operated to the left or white position, relay 249 will hold relays 312, 313 and 314 operated thus causing the sirens to sound a continuous (all-clear) signal.

Trouble on the lines L_1, L_2 or L_3, failure of power supply at any of the siren stations, or trouble on any of the siren station lines will be indicated in the same manner as previously described.

Except for the elimination of the timing circuit and holding relays 130 and 131 operated as long as the key 101 is operated, the circuit functions in the same manner as previously described for the sending of a red signal.

What is claimed is:

1. In a signaling system, a source of direct current, first and second pairs of conductors, multiposition switching means adapted when in a first position to connect one end of each pair of conductors in parallel with said source, when actuated to a second position to reverse the conductors of the first pair with respect to the source and disconnect the second pair therefrom, and when actuated to its third position to reverse the conductors of the second pair with respect to the source and disconnect the first pair therefrom, a polarized relay terminating the other end of each pair of conductors, each relay having a neutral or open circuit position when the relay is deenergized and being adapted to close one or the other of two circuits, depending upon the direction of the flux therein when the relay is energized, a signal device and means controlled by said polarized relays for selectively actuating said signal device in either of two manners depending on whether said switching means as actuated to its second or third position.

2. In a signaling system, a source of direct current, first and second pairs of conductors, multiposition switching means adapted when in a first position to connect one end of each pair of conductors in parallel with said source, when actuated to a second position to reverse the conductors of the first pair with respect to the source and disconnect the second pair therefrom, and when actuated to its third position to reverse the conductors of the second pair with respect to the source and disconnect the first pair therefrom, a pair of polarized relays terminating the other end of each pair of conductors, each relay of each pair having a neutral or open circuit position when deenergized and each pair being adapted to close one or the other of two circuits, depending upon the direction of the flux therein when energized, a plurality of signal devices, means controlled by said polarized relays for simultaneously actuating all of said devices in either of two distinctive manners, depending on whether said switching means is actuated to its second or third position, and means for giving an alarm if any one of said signal devices fails to respond.

3. In a signaling system, a source of direct current, first and second pairs of conductors, multiposition switching means adapted when in a first position to connect one end of each pair of conductors in parallel with said source, when actuated to a second position to reverse the conductors of the first pair with respect to the source and disconnect the second pair therefrom, and when actuated to its third position to reverse the conductors of the second pair with respect to the source and disconnect the first pair therefrom, a pair of polarized relays terminating the other end of each pair of conductors, each relay of each pair having a neutral or open circuit position when deenergized and each pair being adapted to close one or the other of two circuits, depending upon the direction of flux therein when energized, a plurality of signal devices, a local source of electrical power for operating each of said devices, means controlled by said polarized relays for selectively applying said power to said devices in either of two distinctive manners depending on whether said switching means is actuated to a second or third position, and means for giving an indication if any of said devices fail to receive power.

4. In a signaling system, a control station, a central station, a source of direct current, first and second pairs of conductors between said control and central stations, multiposition switching means at said control station adapted when in a first position to connect one end of each pair of conductors in parallel with said source, when actuated to a second position to reverse the conductors of the first pair with respect to the source and disconnect the second pair therefrom, and when actuated to its third position to reverse the conductors of the second pair with respect to the source and disconnect the first pair therefrom, a pair of polarized relays terminating the other end of each pair of conductors, each relay having a neutral or open circuit position when the relay is deenergized, one relay of each pair being adapted to close a circuit when said pairs of relays are energized in one direction and the other relay of each pair being adapted to close a circuit individual thereto when energized in an opposite direction, a plurality of signal devices, a local source of electrical power for each of said devices, means controlled by said polarized relay for selectively applying said power to said device, in either of two distinctive manners depending on the energized direction of said polarized relay, a check signal device at said control station, means for operating said check signal responsive to the deenergization of one of said pairs of polar relays and a reversal of energization of the other pair, and means responsive to failure of any one of said signal devices to receive power to silence said check signal device.

5. In a signaling system, a control station, a central station, a source of direct current, first and second pairs of conductors extending between said control and central stations, multiposition switching means at said control station adapted when in a first position to connect one end of each pair of conductors in parallel with said source, when actuated to a second position to reverse the conductors of the first pair with respect to the source and disconnect the second pair therefrom, and when actuated to its third position to reverse the conductors of the second pair with respect to the source and disconnect the first pair therefrom, a pair of polarized relays terminating the other end of each pair of conductors, each relay having a neutral or open circuit position when the relay is deenergized, one relay of each pair being adapted to close a circuit when said pairs of relays are energized in one di-

rection and the other relay of each pair being adapted to close a circuit individual thereto when energized in an opposite direction, a plurality of signal devices, a local source of electrical power for each of said devices, means controlled by said polarized relays for simultaneously applying said power to said devices in either of two distinctive manners depending on the energized direction of said polarized relays, a check signal device at said control station, means for operating said check signal responsive to the deenergization of one of said pairs of polar relays and a reversal of energization of the other pair, and means responsive to failure of any one of said signal devices to receive power, to silence said check signal device, said means for operating said check signal device including the conductor pair disconnected from the direct current source.

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