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G. W. JANSON

MESSENGER CALL CIRCUITS AND SWITCHING APPARATUS THEREFOR

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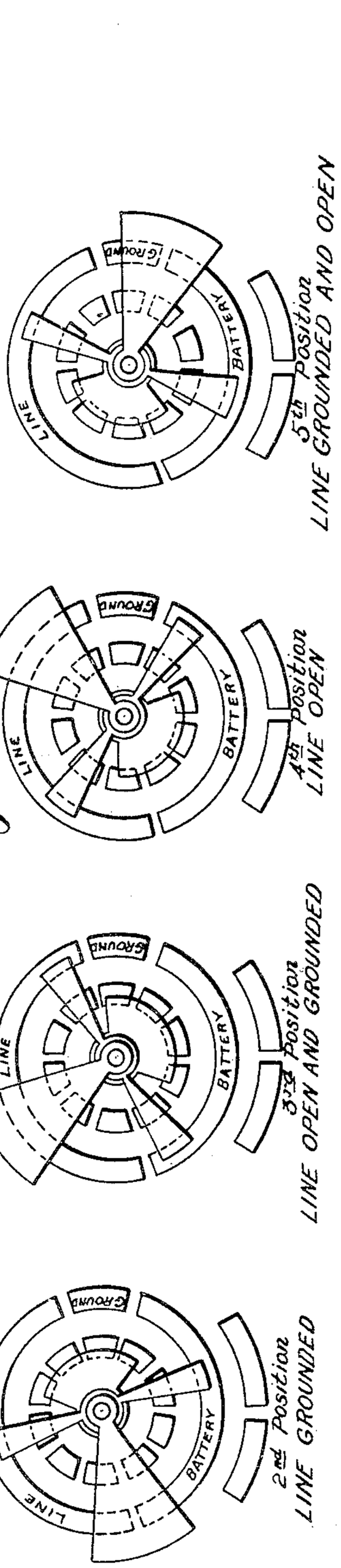

Fig. 1

Inventor

George W. Janson

By Eugene C. Brown

Attorney

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G. W. JANSON

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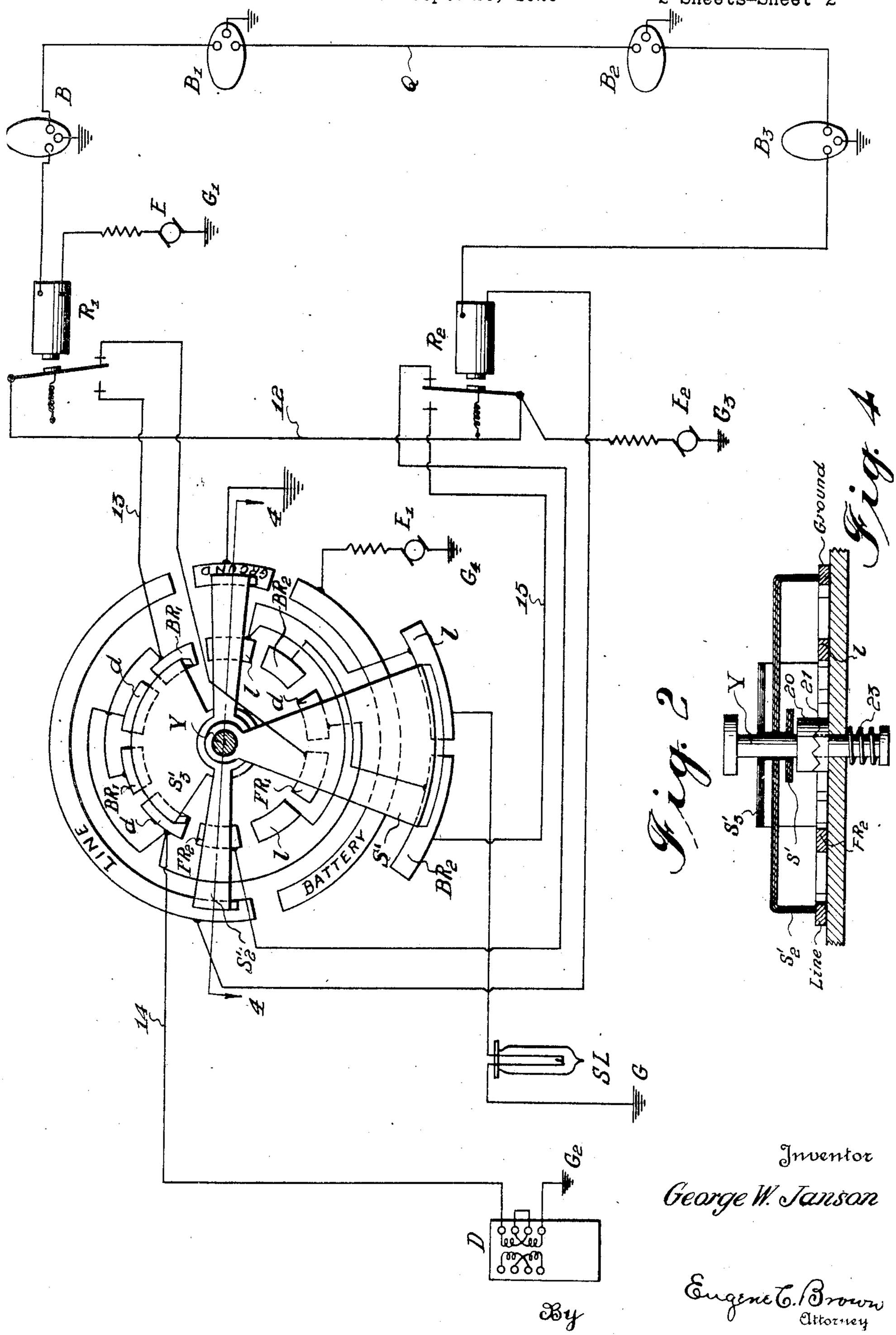

Fig. 1

Fig. 2

Inventor
George W. Janson

By Eugene C. Brown
Attorney

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UNITED STATES PATENT OFFICE.

GEORGE W. JANSON, OF NUTLEY, NEW JERSEY, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MESSENGER-CALL CIRCUITS AND SWITCHING APPARATUS THEREFOR.

Application filed September 26, 1925. Serial No. 58,911.

This invention relates to messenger call circuits wherein a number of call boxes in various subscribers' offices are connected in series in a loop circuit from a central office in which is located a receiving apparatus including a register for recording the signals on a moving tape.

The purpose of my invention is to provide a circuit equipment which will cause an indication at the central office upon the occurrence of any fault, such as an open circuit or a ground, and with means for immediately placing the circuit in condition to maintain the system in operation until the fault can be repaired so that there shall be no interruption in the messenger service. A further object of my invention is to provide a single switch device which will automatically place the circuit in condition to continue in operation upon being moved into one position or another position by the attendant and which will indicate when the correct position has been found, so that the attendant will know when the circuit is in operative condition and also the character of the fault.

In the following description I shall refer to the accompanying drawings, in which Figure 1 is a theoretical diagram of the circuits of a messenger call system on carrying out my invention; Fig. 2 is a theoretical diagram of the same circuits embodying my unitary fault correcting switch and showing the position of the switch blades under normal conditions when no fault exists; Fig. 3 is a diagrammatic illustration of the several positions of my switch; and Fig. 4 is a cross section of the switch on the line 4—4 of Fig. 2.

The loop circuit or line L, L_1, containing the subscribers' call boxes B, B_1, B_2, etc., is connected at the central station CS at one end through the jack J, relay R and resistance T to a source of current supply E. The other end of the loop circuit is connected at the central station through jack J_1, relay R_1, conductor 10, and contacts 1 and 4 of switch S to ground. The contacts of relays R and R_1 are connected respectively to switches S_1 and S_2 in such manner that, by changing the position of the switch levers, either the front or the back contacts of the relays may be used to operate the local register D and the buzzer Z. The triple pole switch S is arranged to remove the ground G and substitute battery E when necessary to overcome a fault in the line. This switch also changes the connections of the register and buzzer circuits. The pilot relay PR is placed in the ground connection of the signal lamp SL and thereby controls the buzzer Z.

When the line is in normal condition, current flows from the source E through the resistance T, relay R, jack J and the line containing the call boxes B, B_1, B_2, etc., returning through jack J_1, relay R_1, contact points 1 and 4 of switch S to ground at G. The armatures of relays R and R_1 are thus held against their front contacts, thereby keeping the local buzzer and register circuits open. When any call box such as B is operated, the break or signal wheel W opens the line the number of times required to produce the signal of that particular box. Each break causes the armatures of both relays R and R_1 to fall against their back contacts, thus closing the circuits of the local signal lamp SL, pilot relay PR, buzzer Z and register D. Current now flows from source E through the armature and back contact of relay R, contacts 6 and 3 of switch S, resistance T_2 and register D to ground at G_2, thus causing the register to record the signal or box number on the tape. Simultaneously current flows from the source E through the armature and back contact of relay R_1, signal lamp SL, contacts 5 and 2 of switch S, and the pilot relay PR to ground at G_3. This causes the signal lamp SL to glow and the pilot ready PR to close the local circuit containing the buzzer Z.

Each signal box is provided with two "break" wheels W and W_1, the former opening and closing the circuit as the spring tongue *t* moves across the gap between adjacent teeth on the wheel W; and the other toothed wheel W_1 applying a ground connection through the tongue t_1, after the opening of the circuit by the first wheel. The teeth of the two wheels are staggered so that the ground applied by the wheel W_1 and tongue t_1 is maintained for a time equal to that during which the wheel W had opened the circuit. It will be seen, therefore, that the relay R_1 will be deprived of current by the grounding at the tongue t_1 and thus allow its armature to remain on the back contact during the transmission of each digit of any signal, due to the fact as above ex-

plained, that a call box opens and thereafter both closes and grounds the line simultaneously, thereby shunting out the portion of the line containing the relay R_1. When the signal has been completed, however, the line is again placed in its normal closed condition, so that the relay R_1 again attracts its armature against its front contact as shown in Fig. 1.

Let us now assume that a break occurs in the line at some point Q. Relays R and R_1 will then be deprived of current, thus allowing their armatures to fall against their back contacts and close the buzzer and register circuits. The signal lamp will glow and the register and buzzer will operate continuously until the trouble has been temporarily overcome. This may be done by changing the position of switch S from the left to the right. This changes the local circuit so that the register is connected to the front contacts of both relay R and R_1 and at the same time applies battery to the end of the line which was formerly grounded at G. Now when any call box such as B_2 is operated, the break wheel applies a ground to line L_1 and causes current to flow in that particular portion of the line and through the relay R_1. The armature of relay R_1 is then drawn against its front contact, causing current to flow from the source E, through the front contact and armature of the relay R_1, switch S_2, points 8 and 3 of switch S, and the register D, thus causing the register to record the signal on the tape. As either relay will now operate the local circuit it will be seen that the operation of a call box on the other side of the break will also repeat the signal into the register.

Now let us suppose that instead of breaking, the line had become accidentally grounded at the point Q. So long as the switch S remained in its left hand position, that portion of the line containing the call boxes B_2, B_3, and the relay R_1 would be deprived of current, thus causing the armature of relay R_1 to fall against its back contact and close the local signal lamp and buzzer circuits. Buzzer Z will then buzz continuously and signal lamp SL will remain lighted until the trouble has been temporarily overcome. This may be done by changing the position of the switch S from the left to the right and throwing switches S_1 and S_2 downward. The changing of these switches applies battery to both ends of the line and at the same time changes the local circuit connections so that the front contacts of the relays R and R_1 are disconnected, while their back contacts are connected to the register. Each portion of the main line circuit and the relay included therein operate independently of the other, each relay responding only to signals sent from call boxes included in the portion of the line between that relay and the ground. Now when any call box is operated, that portion of the circuit is broken a number of times corresponding to the signal number of that box and the signal is repeated into the local circuit containing the register. It will be noted that the register D is controlled by the contacts of both relays R and R_1 and that the buzzer and signal lamp will not operate because the local circuit containing these instruments was opened by changing the position of switch S.

Again let us suppose that a break occurs in the line on one side of the accidental ground which already exists at the point Q, leaving a portion of the line L_1 open, while the other portion L remained grounded. The switch S_2 should now be thrown in the upward position, in order to change local circuit connections from the back to the front contact. Each relay now responds only to such calls as are sent from call boxes included in that portion of line between that relay and the break or ground. The operation of the portion of the line L_1 is the same as explained above for a break at Q and the operation of the portion of the line L is the same as explained in the last paragraph. If the open had occurred on the other side of the ground, the switch S_1 would occupy the upward position and the switch S_2 would occupy the lower position. As soon as any trouble is discovered the switches should be thrown in such positions as to temporarily overcome that trouble, but as soon as the trouble has been cleared the switches should again be placed in their normal positions.

The maintenance of operation when a fault exists as above described requires the manipulation of three separate switches in various ways until some arrangement of the switches is found in which the signal lamp is extinguished, the buzzer silenced and the register magnet is not energized. For the purpose of reducing the switches to a single operable device which will automatically cause the circuit changes required to maintain service when a fault exists and which will also indicate by the position of the parts, the nature of the particular fault, I have devised a switch mechanism illustrated in Figs. 2, 3 and 4.

This trouble indicator and circuit changing switch comprises several series of concentrically arranged segments and a plurality of switch blades secured to a rotatable central stem or shaft by which they are simultaneously moved over said segments.

The circuits of the messenger call box system shown in Fig. 2 will be readily understood from the previous description of Fig. 1, like parts being designated by the same reference characters.

The blades may each consist of a plurality of superposed spring leaves extending radi-

ally from the rotary shaft Y to which they are fixed, being insulated therefrom and from each other. Only the outer margins of the blades engage the segments, the outer edges being bent downwardly perpendicular to the blades for this purpose.

The switch blade S′ contacts with and is movable over the two outer segments BR_2 and *l*, the former being connected to the back contact or relay R_2 and *l* the latter being connected to the signal lamp SL. The intermediate brush S'_2 extends in opposite directions from the central shaft, its outer bent down edges moving in contact with the middle circle of segments which are connected as indicated to line, battery and ground, respectively. The inner brush S'_3 moves over the inner circular series of segments and has its bent down margin of a width sufficient to simultaneously contact with four adjacent segments. The segments, marked *l* are connected to the signal lamp, those marked FR_1 are connected to the front contact of relay R_1, those marked BR_1 to the back contact of relay R_1, those marked FR_2 to the front contact of relay R_2, those marked BR_2 to the back contact of relay R_2, and those marked *d* to the register D.

It will be evident that when the blades of the circuit changing switch are in the normay position indicated in Fig. 2, and both of the relays R_1 and R_2 are energized, the circuits from the front contacts of the relays are open at the switch segments FR_1 and FR_2. When one of the call boxes B, B_1, B_2, etc., is operated, each time the code wheel opens the circuit the armature of relay R_1 moves over against its back contact and closes a circuit through the register D from source E_2, through conductor 12, armature and back contact of relay R_1 conductor 13, segment BR_1 switch blades S'_3, segment *d*, conductor 14 to register D and ground at G_2. Relay R_2 is also deenergized and its armature closes a circuit through signal lamp SL from source E_2 armature and back contact of relay R_2, conductor 15 segment BR_2 switch blade S′ segment *l* and lamp SL to ground at G. It will be evident that the pilot relay PR and buzzer Z shown in Fig. 1 may also be connected in the ground connection from the signal lamp if desired. When the code wheel of a call box makes a ground connection the relay R_1 will be energized from the source E but the ground at the box shunts the relay R_2 and hence at each ground contact of the code wheel, the armature of relay R_2 moves against its back contact and closes the circuit above traced through the signal lamp.

As previously described in connection with Fig. 1, if a break occurs in the line at some point as Q, the relays will be deprived of current thereby allowing their armatures to fall back against their back contacts and close the signal lamp and register circuits and these will operate continuously until the trouble has been temporarily overcome. This may be accomplished by turning the shaft Y of the switch around by means of a thumb nut, dial member or other means fastened to the shaft. As the shaft is rotated so that the blades move from normal position shown in Fig. 2 to the second position and again to the third position, as indicated in Fig. 3, the signal lamp will continue to glow, thus showing that the trouble still persists. When the blades are moved into the fourth position, the lamp will be extinguished and the operator will thereby know that the circuits have been temporarily shifted or adjusted to overcome the fault and the signals will be received in the manner as if switch S in Fig. 1 were thrown to right hand position and switches S_1 and S_2 were in their upper positions. The operator will also know by the position of the switch that the fault is an open line. In practice the designation of the nature of the faults corresponding to the several positions of the switch are indicated on the handle or on the face of the switch casing. This switch therefore indicates the nature of the fault in addition to adjusting for the fault condition.

If instead of being open, the line had been grounded, the lamp SL would have been extinguished when the switch was turned to the second position. Likewise if the line had been open and also grounded, the fault would have temporarily overcome when the circuits were connected in the arrangement provided by the switch in the third position. The circuits for the several positions of the switch may be readily traced from an inspection of Fig. 2.

Upon the repair of a ground fault, that fact is indicated at the central station by the lighting of the signal lamp and the operation of the register.

As shown in Fig. 4, the stem Y of the switch carries a circular block 20 having a lower serrated or notched surface which engages the upper correspondingly notched or serrated surface of a block 21 secured to the base of the switch. These blocks are yieldingly held together by any suitable means. For this purpose, I have shown the stem extending through an aperture in the base and surrounded by a spiral spring 23. The serrations are so dimensioned and positioned that the switch blades are in one of the switching positions whenever the teeth of the blocks are in mesh as shown. The spring always moves the blocks into meshing position whenever the knob or fingerpiece on the end of the stem is released. Whenever the switch stem is turned to change the position of the switch blades the serrations exert a wedging action to lift the

blades from contact with the contact segments and hold them suspended as the segments move across each other and then permit the blades to descend and contact with the segments at the next succeeding switch position. This construction ensures the accurate positioning of the blades and also ensures a pressure engagement of the blades upon the segments whenever the stem is released by the hand of the operator.

I claim:—

1. In a signaling system having outgoing and return lines forming a closed circuit containing a plurality of signal transmitting devices having contact mechanism for controlling the circuit and also for connecting it to ground, a current source having one terminal normally connected to ground and the other terminal connected to one side of said circuit, relays included in opposite sides of said circuit, signaling devices controlled respectively by said relays, and a unitary switch device having a plurality of segments connected to the front and back contacts of said relays, to the grounded end of the line and to said signaling devices, and provided with a rotary shaft and blades movable thereby to different positions to interconnect said segments in a manner to cause the signals from said signal transmitting devices to be received, when the line is in normal condition or is open, or open and grounded, or grounded, or grounded and open.

2. In a signaling system having outgoing and return lines forming a closed circuit containing a plurality of signal transmitting devices having contact mechanism for controlling the circuit and also for connecting it to ground, a current source having one terminal normally connected to ground and the other terminal connected to one side of said circuit, relays included in opposite sides of said circuit, signaling devices controlled respectively by said relays, and a unitary switch device having a plurality of segments connected to the front and back contacts of said relays, to the grounded end of the line and to said signaling devices, and provided with a rotary shaft and blades movable thereby to different positions to interconnect said segments in a manner to indicate, in cooperation with said signaling devices, when the line is in normal condition or is open, or open and grounded, or grounded, or grounded and open.

3. In a signaling system having outgoing and return lines forming a closed circuit containing a plurality of signal transmitting devices having contact mechanism for controlling the circuit and also for connecting it to ground, a current source having one terminal normally connected to ground, and the other terminal connected to one side of said circuit, relays included in opposite sides of said circuit, signaling devices controlled respectively by said relays, and a unitary rotary switch device interconnected with said relays and said signaling devices and rotatable to different positions to permit the reception of signals when the line is in normal condition, or is open, or open and grounded, or grounded, or grounded and open.

4. In a signaling system having outgoing and return lines forming a closed circuit containing a plurality of signal transmitting devices having contact mechanism for controlling the circuit and also for connecting it to ground, a current source having one terminal normally connected to ground and the other terminal connected to one side of said circuit, relays included in opposite sides of said circuit, signaling devices controlled respectively by said relays, and a unitary switch device interconnected with said relays and said signaling devices and movable to different positions to indicate, in cooperation with said signaling devices, when the line is in normal condition, or is open, or open and grounded, or grounded, or grounded and open.

In testimony whereof I affix my signature.

GEORGE W. JANSON.