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G. W. JANSON

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SWITCHBOARD SIGNAL SYSTEM

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FIG.1.

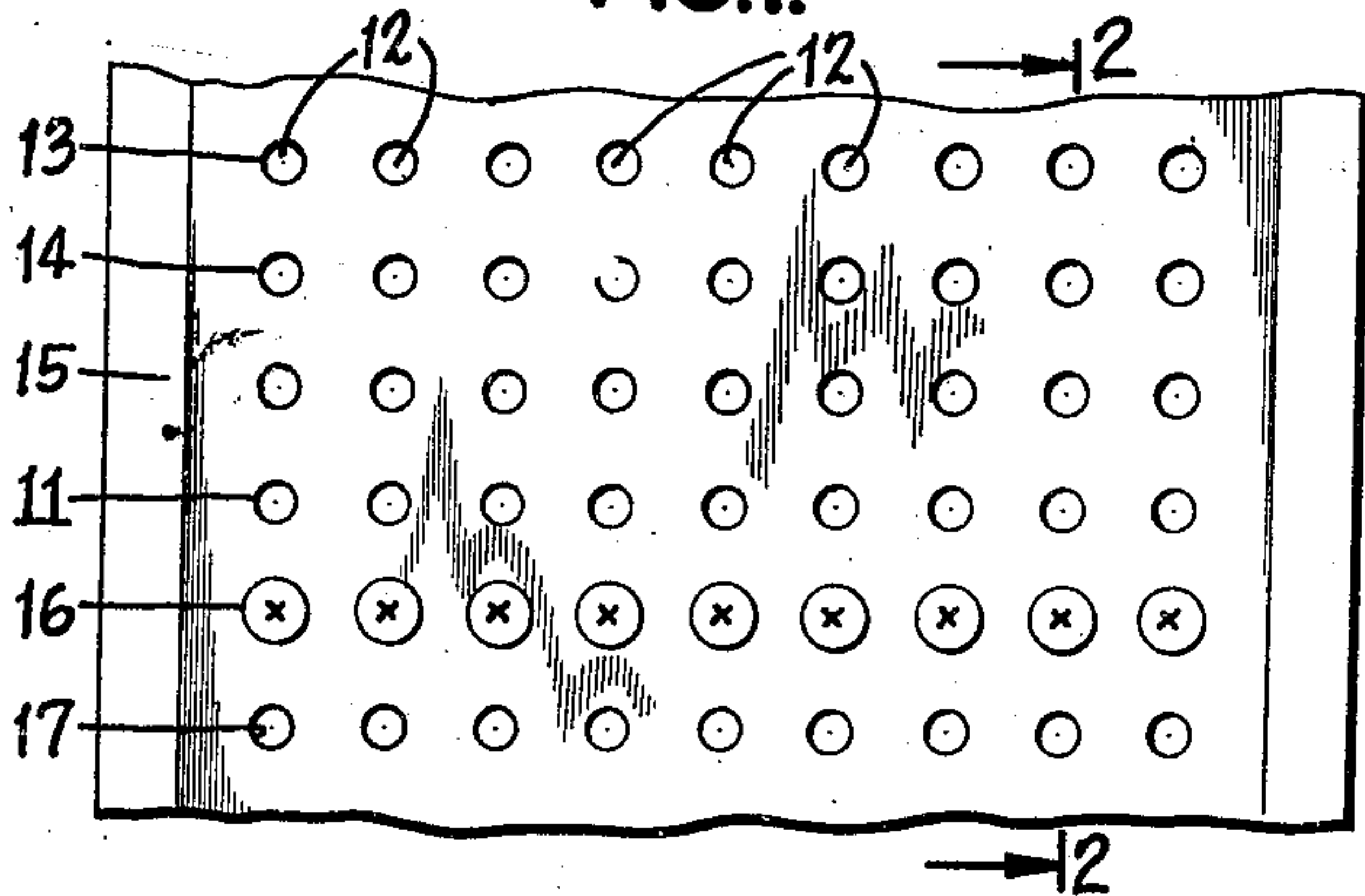


FIG.2.

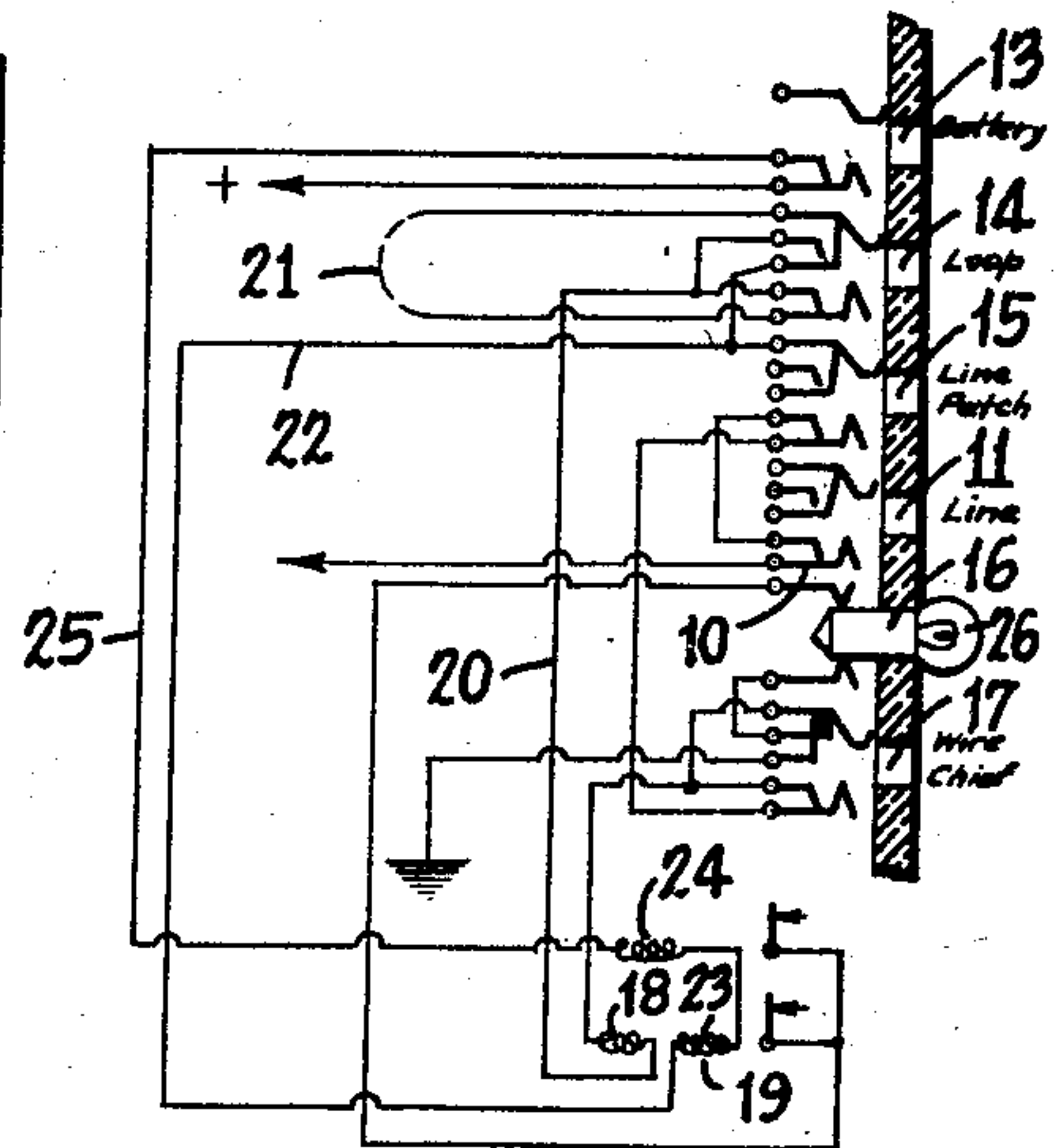
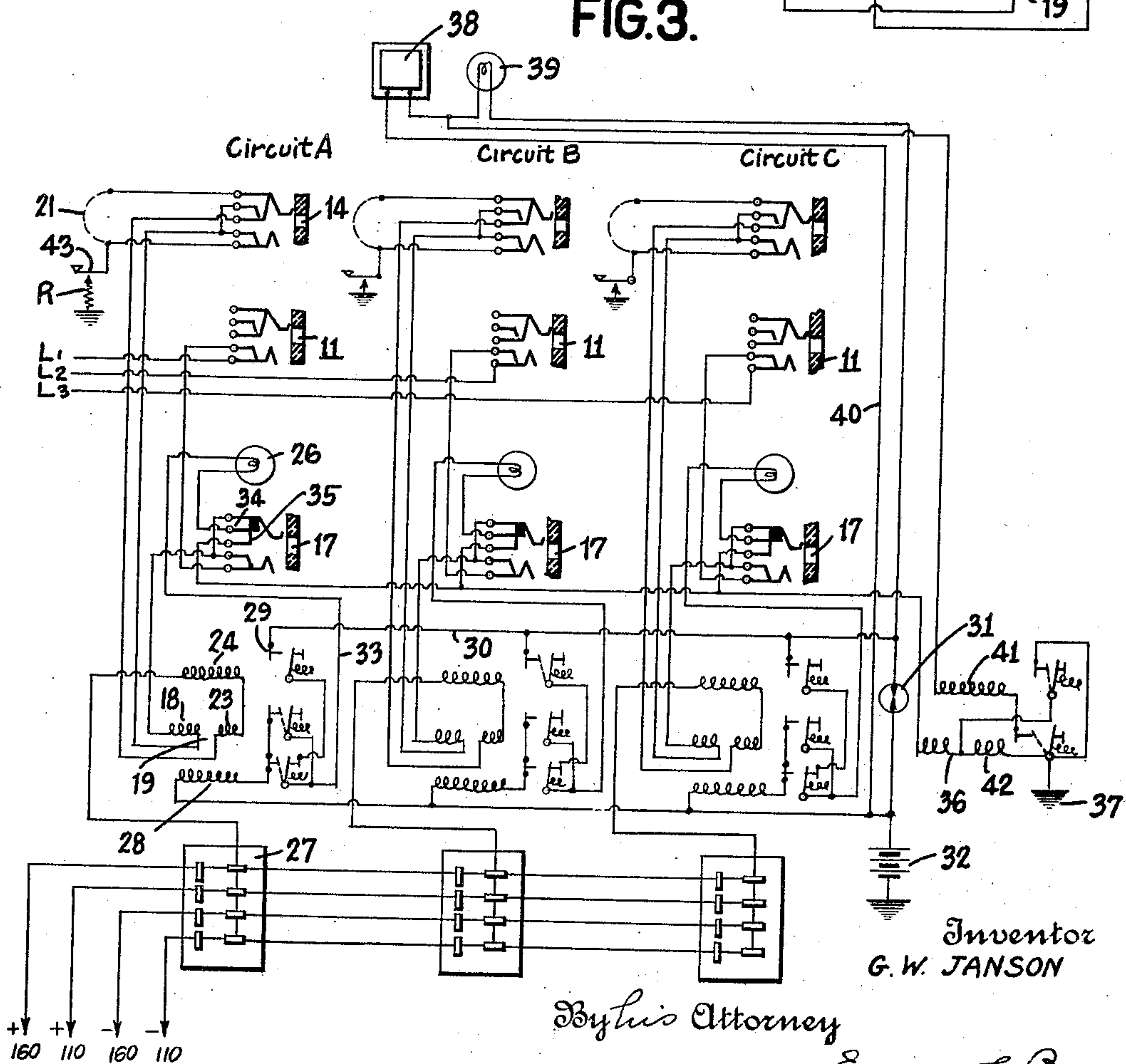


FIG.3.



UNITED STATES PATENT OFFICE

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SWITCHBOARD SIGNAL SYSTEM

Application filed July 11, 1930. Serial No. 467,343.

This invention relates to signal means for telegraph switchboards and more particularly to means for giving a visible and/or audible signal at a switchboard section whenever faulty conditions occur in any line terminating at the switchboard and whenever an operator in a loop circuit desires to call the attendant at the switchboard.

Heretofore, in accordance with the usual practice, each main line circuit terminating at a telegraph switchboard receives its battery through a limiting resistance lamp arranged so as to be visible at the top of the switchboard, the lamp serving as an indicator whenever grounds or similar faults on the line cause an excessive flow of current in the line circuit. There are certain inherent disadvantages to this arrangement and in a copending application, Serial No. 483,650, filed Sept. 22, 1930, entitled "Switchboard," there is shown an improved arrangement in which the current limiting lamps or equivalent resistances are entirely enclosed in a separate compartment of the switchboard. The present invention in one of its aspects is particularly applicable to switchboards employing the potential distributing arrangement of said copending application, one of the objects of the present invention being to provide a faulty line signal operating independently of the current limiting element of the circuit.

Another object is to provide a faulty line signal which may be both audible and visible and in which separate signals are operated to indicate the section of the switchboard at which the faulty line terminates and the individual switchboard circuit associated with the faulty line.

Another object is to provide an improved call signal system for a switchboard circuit in which a visible and/or audible signal is provided.

A still further object is to provide a faulty line and call signal system employing the same signal elements, in which the signal elements operate in a distinctive manner to indicate whether a faulty line condition or call signal is being registered and in which the operation of the signals can be discon-

tinued only by the switchboard attendant going in on the line to answer the call. Other objects and advantages will hereinafter appear.

In accordance with the present invention, an individual signal lamp is associated with each telegraph circuit terminating at a switchboard section and suitable circuit connections and control apparatus are provided whereby the lamp is caused to glow whenever a faulty condition of the line exists or in response to a call signal originating at one of the operator's positions. In the case of a call signal the glow is steady and in the event a faulty line condition a periodic flashing of the lamp is produced.

Each section of the switchboard is also provided with a large signal lamp and a buzzer or other audible signal which gives an additional signal of greater intensity to indicate the particular section at which the call or faulty line condition has been registered.

The signal circuits, after they have once been completed, can only be interrupted by the switchboard attendant going in on the line with his test set.

In order that the invention may be more fully understood reference will be had to the accompanying drawings in which:

Figure 1 is a fragmentary view of the front of a switchboard panel showing the arrangement of the jacks and signal lamps on the panel;

Figure 2 is a section on the line 2—2 of Figure 1 showing a typical circuit arrangement for a main line circuit; and

Figure 3 is a circuit diagram including a number of switchboard circuits having the signal control system of the present invention applied thereto.

Each telegraph line entering the telegraph office terminates at the switchboard, at the tip contact 10 of a line jack 11 and has associated with it a plurality of other jacks arranged in a vertical row, a number of which rows are shown at 12 in Figure 1. The jacks associated with each line may comprise a battery jack 13, a loop jack 14, line patch jack 15, a signal lamp 16 and wire

chiefs jack 17. One of such switchboard circuits is shown in Figure 2, the circuit being traced from the tip and tip normal contacts of the line jack 11 through the tip normal and tip contacts of the patching jack 15 to the tip contact of the wire chiefs jack 17. The circuit then continues from the tip normal contact of wire chiefs jack through the winding 18 of a differential control relay 19 and then by conductor 20 to the tip normal and tip contacts of the loop jack 14, the circuit continuing through the loop 21 to the sleeve and sleeve normal contacts of the loop 14 and thence by conductor 22 through the opposite winding 23 of the differential control relay 19 and the winding 24 of a faulty line relay. The circuit then continues by the conductor 25 to the tip normal and tip contacts of the battery jack 13 and thence to a source of potential. The contacts of differential relay 19 are arranged to apply a steady current to the lamp 26 and those of the faulty line relay 24, to apply an intermittent current.

In Figure 3 I have shown circuits for three line circuits A, B and C, terminating at the switchboard, the line patching and battery jacks having been omitted for simplicity of illustration. The lines L1, L2 and L3 which terminate at the line jacks 11 are continued directly through the contact of the wire chiefs jacks 17 to the winding 18 of differential relays 19 and thence to the loop jacks 14 through the loops 21 and thence to the differential windings 23 of the relays 19, the circuit continuing through windings 24 of the faulty line relays and thence directly to a potential distributing block 27 and to the desired source of potential. A locking relay 28 is also provided for each switchboard circuit.

The front contact 29 of relay 24 is connected by a conductor 30, in multiple with the front contacts of the corresponding relays of each of the other switchboard circuits, to one terminal of a current interrupter or intermittent make and break device 31, the opposite terminal of which is connected to a grounded source of potential 32. The front contact of differential relay 19 is connected to one terminal of the locking relay 28, the opposite terminal of which is connected, in multiple with the relay 28 of each of the other switchboard circuits, to the source of potential 32. The back contact of relay 28 is connected to the contact tongue of relay 24, and the front contact is also connected to the winding of the relay 28. The tongue of relays 19 and 28 are joined by a conductor 33 to one side of the lamp 26, the opposite side of the lamp being connected through the spring contacts 34 and 35 of the wire chiefs jack 17 to one end of the winding of a section relay 36, the opposite end of which is grounded at 37.

Relay 36 controls the operation of an au-

dible signal 38, such as a buzzer, and a visible signal 39, such as a lamp of greater intensity than the individual switchboard circuit lamps 26. The signals 38 and 39 are common to a large number of switchboard circuits. Usually the switchboard is divided into a number of sections, each having forty or more switchboard circuits terminating thereat, and I prefer to provide one audible signal 38 and one visible signal 39 for each switchboard section.

The buzzer 38 has one terminal connected to the source of current 32 by a conductor 40, the other terminal being connected to one end of a winding of a relay 41 and thence to the front contact of relay 36. The function of the relay 41 is to cause a large proportion of the winding of the section relay 36 to be short circuited after the relay is operated, and for this purpose a portion 42 of the winding is shunted through the tongue and front contact of the relay 41. The tongue of relay 36 is connected to the ground 37.

The lamp 39 has one terminal connected to the circuit interrupter 31, the opposite terminal of the lamp being connected to the winding of relay 41.

In the normal operation of the circuit, battery supplied from the potential distributing block 27 passes through the faulty line relay 24, winding 23 of the differential relay 19, loop 21 and winding 18 of relay 19, and thence to the line L1, L2 or L3. The normal current flow through the relay 24 is insufficient to operate the same, and the current through each of the windings of the differential relay 19 is equal and of opposite direction, so that the armatures of both of these relays remain open. The circuit to the signal lamps 26 thus remain open at the relay contacts. When an operator in the loop circuit 21 desires to call an attendant or wire chief at the switchboard, she grounds the loop circuit through a resistance R by means of a manual key 43, thus causing the current in the winding 18 of the differential relay to fall off, disturbing the balance of the relay and causing the same to pull up. The resistance R is of such value as to maintain the intensity of the current in the winding of the relay 24 substantially constant, however, so that this relay is not affected by the call signal.

Relay 19 upon operating, completes a circuit from the source of current 32 through the winding of the locking relay 28, contacts of relay 19, and the conductor 33, to the lamp 26, thence through spring contacts 34 and 35 of the wire chiefs jack 17 to the grounded winding of the section relay 36. Lamp 26 is thus caused to glow. Relay 28 pulls up at this time and completes a holding circuit for the lamp through the front contact thereof. At the same time section

relay 36 operates to apply the ground 37 through the front contact thereof and winding of relay 41 to the buzzer 38 and signal lamp 39, thus causing the buzzer to operate continuously and the signal lamp 39 to operate intermittently through the action of current interrupter 31. Upon the completion of these circuits, the relay 41 operates to bypass the portion 42 of the windings of the relay 36, the remaining turns being sufficient to maintain the relay contacts closed.

The signal lamp 26, buzzer 38, and section signal lamp 39 continue to operate until the switchboard attendant accepts the call by coming in on the line and inserting a plug in the jack 17. This operation interrupts the locking circuit of relay 28 and restores the system to normal.

If a faulty line condition, such as a ground, occurs on one of the main lines L1, L2 or L3, this causes an increase in the current flow through the windings of the differential relay 19 and faulty line relay 24. Since this current is balanced in the windings of the differential relay, it does not respond, but relay 24, responding to the increased current, picks up and completes a circuit from the source of potential 32 through the circuit interrupting device 31, front contact 29 of relay 24, back contact of relay 28 and conductor 33 to the lamp 26, and thence through the contacts of the jack 17 to the grounded relay 36. Lamp 26 is thus caused to glow intermittently through the action of circuit interrupter 31. Since the relay 36 is directly in the lamp circuit, its contact tongue oscillates back and forth to apply intermittent ground to the circuit for the buzzer 38 and section signal lamp 39, thus causing these signals to operate intermittently. All of the signal devices continue to operate in this manner until their circuits are interrupted by the wire chief coming in on the line at the jack 17 with his test set.

The circuit interrupter 31 may be of any suitable periodically operating switch, such as the usual thermostatic interrupter.

It will be noted that the lamp 26 and buzzer 38 operate steadily in response to a call signal, and intermittently in response to a faulty line condition. Section lamp 39 is caused to glow intermittently for both call signals and faulty line conditions, so as to more readily attract the attention of the wire chief should he be at a distant section of the switchboard, but it is to be understood that the lamp 39 may be caused to glow steadily in response to a call signal by applying the battery 32 directly thereto instead of through the circuit interrupter 31.

Obviously, other variations and changes in the circuit arrangements will occur to those skilled in the art, without departing from the spirit or essential attributes of the invention, and therefore, I do not desire to be limited to

the exact details shown and described, except in accordance with the appended claims.

What I claim is:

1. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means for causing said lamp to glow in response to a signal originating at said loop circuit, and means for causing said lamp to glow in a different manner in response to a faulty condition of said line circuit.

2. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means for causing said lamp to glow steadily in response to a signal originating at said loop circuit, and means for causing said lamp to flash intermittently in response to a faulty condition of said line circuit.

3. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a wire chiefs jack and a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means responsive to a signal originating at said loop circuit for causing said lamp to glow, means for maintaining said lamp in operation after said signal has ceased, and means for discontinuing the operation of said lamp upon insertion of a plug in the wire chiefs jack.

4. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, a differential relay having a winding in said line circuit at each side of said loop circuit, said relay being responsive to predetermined electrical conditions of said loop circuit to cause said lamp to operate, and means arranged at the switchboard for discontinuing the operation of said lamp.

5. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, a differential relay having a winding in said line circuit at each side of said loop circuit, said relay being responsive to predetermined electrical conditions of said loop circuit to cause said lamp to operate, a second relay in said line circuit responsive to electrical conditions of said main line circuit to cause said lamp to glow intermittently when predetermined conditions occur in said main line circuit, and means arranged at the switchboard for discontinuing the operation of said lamp.

6. A signal system for a telegraph switchboard at which a plurality of main line

circuits terminate, comprising a signal device associated with each line circuit, a loop circuit included in each line circuit, a differential relay having a winding in said main line circuit at each side of said loop circuit, a circuit for said signal device, a wire chiefs jack having contacts in said signal circuit, said relay being responsive to a grounded condition of said loop circuit to complete said signal circuit, and a locking relay for maintaining said signal circuit closed after cessation of operation of the differential relay, said signal circuit being interrupted by insertion of a plug in the wire chiefs jack.

7. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp individual to each line circuit, an audible and visible signal common to each line circuit, a loop circuit included in each line circuit, and means responsive to a predetermined electrical condition of said loop circuit to cause said lamp and audible signal to operate continuously, and said visible signal to operate intermittently.

8. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp individual to each line circuit, an audible and visible signal common to each line circuit, a loop circuit included in each line circuit, means responsive to a predetermined electrical condition of said loop circuit to cause one or more of said signals to operate continuously, and another of said signals to operate intermittently, and means responsive to a predetermined condition of said main line circuit to cause all of said signals to operate intermittently.

9. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp associated with each line circuit, a signal device common to each line circuit, means responsive to predetermined conditions of said circuit for causing said lamp and signal device to operate, means normally retaining said lamp and signal device in operation after said predetermined line condition has ceased, and means at the switchboard for discontinuing the operation of said lamp and signal device.

10. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp associated with each line circuit, a signal device common to each line circuit, a loop circuit included in each line circuit, a differential relay having windings in said main line circuit at each side of said loop circuit, a second relay in said main line circuit, a circuit for said signal device, said differential relay being responsive to a predetermined condition of said loop circuit to complete said signal circuit, a circuit interrupter, said sec-

ond relay being responsive to a predetermined condition of said main line to complete said lamp circuit independent of said differential relay through said circuit interrupter, and a relay for said signal device having a winding in said lamp circuit whereby said signal device is operated simultaneously with said lamp.

11. A signal system for a telegraph switchboard at which a plurality of lines terminate, comprising a lamp individual to each line, a signal device common to each line, a relay for each lamp and a relay for said signal device, said first relays being responsive to predetermined line conditions to initiate the operation of the lamp associated with the line at which such condition occurs, and said second relay being responsive to the operation of said first relay to initiate the operation of said signal device and a locking means for the first relay actuated by operation of said relay to maintain said lamp and signal device operated independently of said line condition.

12. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means responsive to a signal originating at said loop circuit for causing said lamp to glow, means for maintaining said lamp in operation after said signal has ceased, and means at the switchboard for discontinuing the operation of said lamp.

13. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp individual to each line circuit, a signal device common to each line circuit, a loop circuit included in each line circuit, and means responsive to a predetermined electrical condition of said loop circuit to cause said lamp to operate in a characteristic manner and for causing said common signal device to operate in a different distinctive manner.

In testimony whereof I affix my signature.
GEORGE W. JANSON.

DISCLAIMER

1,814,931. *George W. Janson*, Nutley, N. J. SWITCHBOARD SIGNAL SYSTEM.
Patent dated July 14, 1931. Disclaimer filed June 24, 1933, by the assignee,
The Western Union Telegraph Company.

Hereby enters this disclaimer to the claims in said specification which are in the following words, to wit:

"3. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a wire chiefs jack and a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means responsive to a signal originating at said loop circuit for causing said lamp to glow, means for maintaining said lamp in operation after said signal has ceased, and means for discontinuing the operation of said lamp upon insertion of a plug in the wire chiefs jack."

"4. A signal system for a telegraph switchboard at which a plurality of mainline circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, a differential relay having a winding in said line circuit at each side of said loop circuit, said relay being responsive to predetermined electrical conditions of said loop circuit to cause said lamp to operate, and means arranged at the switchboard for discontinuing the operation of said lamp".

"6. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal device associated with each line circuit, a loop circuit included in each line circuit, a differential relay having a winding in said main line circuit at each side of said loop circuit, a circuit for said signal device, a wire chiefs jack having contacts in said signal circuit, said relay being responsive to a grounded condition of said loop circuit to complete said signal circuit, and a locking relay for maintaining said signal circuit closed after cessation of operation of the differential relay, said signal circuit being interrupted by insertion of a plug in the wire chiefs jack".

"9. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp associated with each line circuit, a signal device common to each line circuit, means responsive to predetermined conditions of said circuit for causing said lamp and signal device to operate, means normally retaining said lamp and signal device in operation after said predetermined line condition has ceased, and means at the switchboard for discontinuing the operation of said lamp and signal device".

"11. A signal system for a telegraph switchboard at which a plurality of lines terminate, comprising a lamp individual to each line, a signal device common to each line, a relay for each lamp and a relay for said signal device, said first relays being responsive to predetermined line conditions to initiate the operation of the lamp associated with the line at which such condition occurs, and said second relay being responsive to the operation of said first relay to initiate the operation of said signal device and a locking means for the first relay actuated by operation of said relay to maintain said lamp and signal device operated independently of said line condition."

"12. A signal system for a telegraph switchboard at which a plurality of line circuits terminate, comprising a signal lamp associated with each line circuit, a loop circuit included in each line circuit, means responsive to a signal originating at said loop circuit for causing said lamp to glow, means for maintaining said lamp in operation after said signal has ceased, and means at the switchboard for discontinuing the operation of said lamp."

"13. A signal system for a telegraph switchboard at which a plurality of main line circuits terminate, comprising a signal lamp individual to each line circuit, a signal device common to each line circuit, a loop circuit included in each line circuit, and means responsive to a predetermined electrical condition of said loop circuit to cause said lamp to operate in a characteristic manner and for causing said common signal device to operate in a different distinctive manner."

[*Official Gazette July 25, 1933.*]