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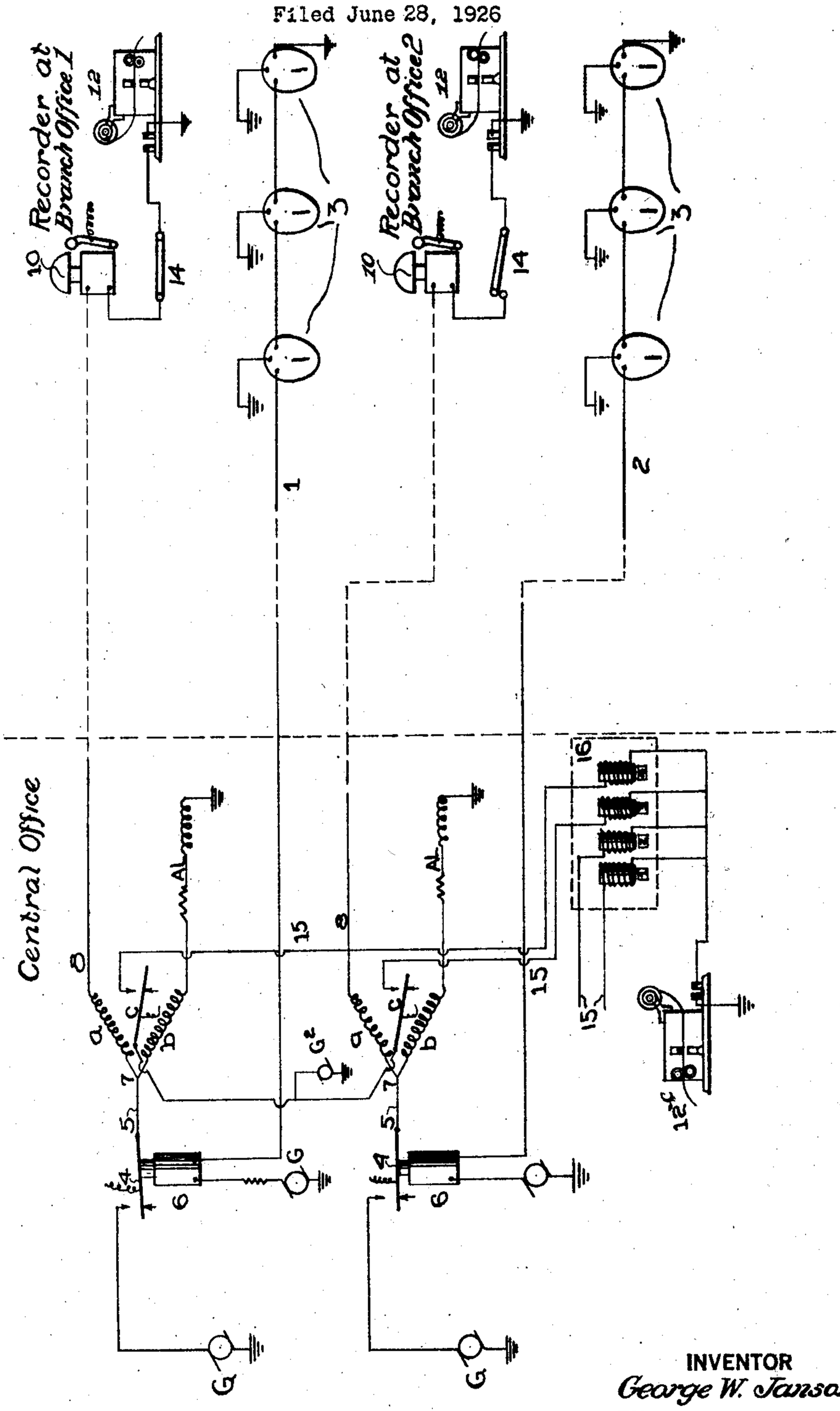

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TROUBLE DETECTOR FOR MESSENGER CALL CIRCUITS.

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My invention relates to electric signaling systems and particularly to the equipment at the central station which is connected with the various outlying branch offices.

Each branch office is provided with a recording instrument and with audible signal devices for receiving the signals or calls transmitted from the call-boxes in the messenger call circuit which terminates at that office. Such call circuits are well known and are clearly described in patent to Hamblin No. 808,451. It is important that the service upon all of the messenger call circuits should be maintained without interruption and that any line trouble should be known instantly at the main or central office. It is also important to maintain the entire system in condition to receive signals from the boxes in any of the branch circuits during the entire twenty-four hours.

The object of my invention is to provide an arrangement of circuits and an equipment which will indicate to the central office attendant the existence of any open or ground fault on the conductor connecting the central office switchboard to an outlying branch office, together with means for recording signals which are sent from any call-box during the continuance of the trouble on that line.

Another object of my invention is to provide an arrangement which will automatically transfer the record of incoming calls from any branch office to the central office whenever the attendant at that branch office desires to leave and close the office.

The accompanying drawing illustrates diagrammatically a system of circuits and an equipment embodying my invention.

The messenger call-box circuits indicated at 1 and 2 are each provided with a plurality of call boxes 3 of the usual type, such as shown in patent to Clokey, No. 1,164,069, and the equipment at the central office may be arranged substantially in the manner shown in the Hamblin patent. I connect a circuit closer 4, which may be the armature of a relay magnet 6, or other signal responsive device, at the central office in circuit with a conductor 5, connected to a grounded source G.

At the central office the conductors 5 are connected respectively to relays 7, having one coil *a* connected to a line 8 leading to the respective branch office and the other coil *b*, connected to an artificial line AL having elements which bear a relation to those of the line 8 and the apparatus connected thereto, approximating the relation of the number of turns or coils on coil *b* to the number of turns on coil *a*.

At the branch offices the lines 8, terminate in an audible signal device, such as a single tap bell 10, and a recording apparatus 12. Under normal conditions, with the switches 14 at the branch office closed, the signals sent in by the call boxes 3 are repeated by the relay magnets 6 and transmitted through the lines 5 and 8, leading to the branch office, being recorded by the recording apparatus 12 at said branch office. Inasmuch as the currents branch through the coils *a* and *b* of the relay at the central office, in the inverse ratio of the turns on these coils, the magnetic effects are balanced and the armatures are unaffected.

If now trouble develops in one of the lines 8 leading from the central office to a branch office, the recorder will not respond to any incoming signals. At the central office, however, the magnetic effect of the coils *a* and *b* is unbalanced, since the characteristics of the artificial line AL are no longer proportionate to those of the grounded or open line. Consequently, any signals coming in on the line 5 will cause corresponding movements of the armature *c* and the signals will thus be repeated over the corresponding conductor 15, energized from source G^2 thereby actuating the appropriate magnet of the annunciator 16 and causing the call box signal to be recorded on the recorder 12^c at the central office. The attendant at the central office is thus apprised of the number of the call box sending the signal and the particular branch circuit is indicated by the drop on the annunciator and hence the attendant can dispatch a messenger to the calling party or else notify the attendant at the branch office by phone or telegraph. Hence the service is maintained and at the same time the central office is made aware of the trouble on the wire connecting the central and branch offices.

Many branch offices are open only during certain business hours and yet signals are liable to be sent from subscriber's call boxes during the remaining hours. My invention

provides for this contingency by automatically transferring the record of incoming calls from any branch office to the central office. Before closing the branch office the attendant opens the switch 14, thereby opening the circuit 8 of his recorder. As previously explained, this unbalances the corresponding relay 7 at the central office and the signals from all call-boxes in the messenger call-box circuit connected to that branch office will be repeated by the relay and actuate the annunciator 16 and recorder 12^c.

It will be apparent that my system is susceptible of many variations and modifications to adapt it for particular conditions, and I do not limit myself to the particular details illustrated and described.

I claim:

1. In a signaling system, the combination with a central station and one or more branch stations, recording means at each branch station, circuits extending from said central station including one or more call boxes, line circuits connecting said recording means to the central station, auxiliary recording means at said central station, means at the central station to repeat the signals from said call boxes into the corresponding line circuits, and means operating to actuate said auxiliary recording means from any call box circuit when the circuit of the corresponding branch station is defective.

2. In a signalling system, the combination of a central station and a circuit having a plurality of make and break devices extending therefrom to a remote point, repeating means at said station responsive to signals from said devices, a distant station and a line connecting said distant station to the central station, a recorder located at said distant station and controlled by said repeating means; an artificial line at the central station connected to said line, a relay having one winding connected in said line in series with the recorder and a second winding connected in series with said artificial line, the circuits of said relay windings and said artificial line being so balanced that the relay is normally unaffected by the operation of the repeating means but is responsive when any alteration in the line circuit interferes with the operation of the recorder.

3. In a signaling system, the combination of a central office and a plurality of call circuits distant therefrom, each provided with a plurality of signal transmitters, signal responsive means located at the central office and included in said call circuits, branch offices distant from the central office, recorder circuits corresponding to the respective call circuits connecting the branch offices with the central office, circuit closing means in said recorder circuits controlled by said responsive means, signal recorders in the circuits at each branch office, and a common recorder at the central office, relays at the central office connected in said recorder circuits and unresponsive to said signals when the signal recorders operate, and means controlled by said relays to cause said common recorder to respond to the transmitters in any call circuit upon the occurrence of a changed condition in the corresponding recorder circuit which interferes with the operation of the corresponding recorder.

4. In a signalling system as set forth in claim 3, an annunciator at the central office having its indicator magnets connected respectively in circuits including the armatures and contacts of said relays.

5. In a signalling system, a signal transmitting station having means for transmitting signal impulses, a signal receiving station having means for receiving said impulses, a central station remote from both of said stations and having signal receiving means thereat, a line connecting the transmitting station and the central station and a line connecting the central station with the receiving station, means at the central station whereby signal impulses originating at the transmitting station and transmitted over the first line are retransmitted to the receiving station over the second line to actuate the receiving device thereat, and means at the central station for rendering the receiver thereat unresponsive to the signals transmitted from the transmitting station while the second line is in condition to retransmit the signals.

In testimony whereof I affix my signature.

GEORGE W. JANSON.