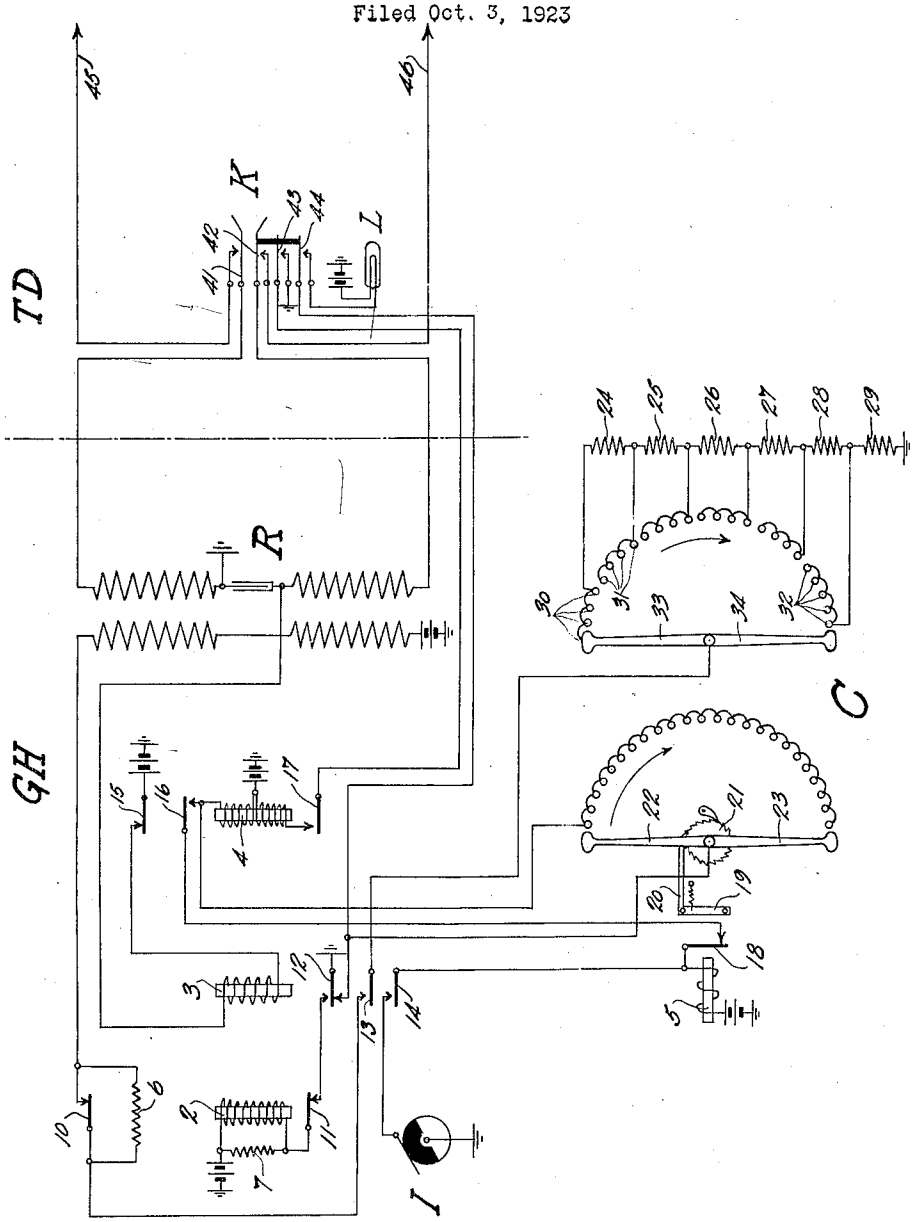
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T. F. CROCKER

HOWLER CIRCUITS

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HOWLER CIRCUITS.

Application filed October 3, 1923. Serial No. 666,225.

This invention relates in general to howler circuits for use in wire chief's testing systems; and its object, briefly stated, is the provision of a graduated howler circuit whereby a graduated howler tone can be projected out on a line for attracting the attention of a subscriber who has failed to restore the receiver to the switchhook.

To accomplish the foregoing and other useful ends this invention comprises means which will be fully described in the specification which is to follow, reference being had to the accompanying drawing, which shows diagrammatically the apparatus and circuits involved.

The apparatus to the right of the vertical dot and dash line indicated as T D is located in a test desk while that to the left indicated as G H is assembled preferably as a unit and mounted in any suitable place in the exchange. The former consists essentially of howler key K and supervisory lamp L; while the latter consists essentially of rotary switch C, repeating coil R and interrupter I.

The rotary switch C is mechanically of the well known rotary line switch type of which the wipers move in a forward direction only, modified however, so that the wipers have a normal position. One set of wipers in rotating pass over groups of contacts which are grounded by way of resistances, the latter being in series to control the flow of current and thus produce the graduated tone, which has its minimum intensity at normal position. The other set of wipers in rotating pass over contacts that are grounded when the subscriber restores the receiver to the switchhook or when the howler key K is released, thus causing the switch to return to normal position.

Having briefly explained the purpose of the invention and the apparatus involved in carrying it out, the operation of the equipment may now be explained more in detail. For this purpose it will be assumed that the conductors 45 and 46 extend to a wire chief's test circuit such as is shown, for example, in the patent to Benson, No. 1,481,586, issued Jan. 22, 1924, and that the test circuit is connected to a telephone line on which the subscriber has failed to restore the receiver to the switchhook.

The wire chief now operates the howler key K closing a circuit as follows: from ground by way of the upper right hand winding of repeating coil R, spring 41 and its working contact, conductor 45, direct current bridge at the substation (not shown), conductor 46, working contact of spring 42 and said spring, lower right-hand winding of repeating coil R, relay 3, resting contact of armature 15 and said armature, to grounded battery. Relay 3, upon energizing, closes a circuit at armature 12 for buzzer 2 by way of resting contact at armature 11 and said armature; closes the primary circuit at armature 13; and prepares a circuit at armature 14 for ground interrupter I and rotary magnet 5. Buzzer 2 vibrates its armatures and rapidly interrupts the primary circuit at armature 10, which circuit may be traced as follows:—from ground, resistances 29—24, inclusive, grouped bank contacts 30, wiper 33, armature 13 and its working contact, armature 10 and its resting contact, upper left-hand winding of repeating coil R, and lower left-hand winding of repeating coil R to grounded battery. The non-inductive coils 6 and 7 are used at armatures 10 and 11, respectively, to prevent excessive sparking at their contacts.

Rotary magnet 5 is caused to energize and denergize from interrupted ground I, which is preferably one half second make and one half second break, and rotates wipers 22, 23, 33 and 34 of the rotary switch C step by step in a clockwise direction by means of armature 19, ratchet 20 and ratchet wheel 21. The wiper contacts are constructed large enough to make before break in rotating over the bank contacts. Wiper 33, in rotating over grouped bank contacts 30, does not alter the primary circuit, but when it reaches grouped contacts 31, the resistance 24 is cut out, thus allowing an increase in the current flow. This performance continues, successively cutting out resistances 25–28, inclusive, until a current of maximum intensity is reached with wiper 33 rotating over grouped contacts 32. When wiper 33 rotates off the last contact in group 32 its opposite wiper 34 rotates on the first contact in group 30, thus changing the current from maximum to minimum intensity and permitting a continuous performance, the wipers preferably making a complete rotation once in every twenty-five seconds.

From the above it will be seen that a rapidly interrupted, graduated current is caused to flow in the left-hand or primary windings of the repeating coil R, whereupon a high frequency alternating current varying in intensity is induced in the right-hand or secondary windings of the repeating coil and transmitted over the conductor 45 and 46 by way of howler key K, though the receiver at the subscriber's station (not shown), where the subscriber is notified by the characteristic tone or "howl" in his receiver, which is audible at some distance therefrom, that he has forgotten to hang it up.

When the subscriber hangs up the receiver and bridges the bell and condenser (not shown) across the conductors 45 and 46, direct current ceases to flow over the circuit including relay 3. Relay 3, upon deenergizing, opens at armature 12 the circuit of buzzer 2, closes the circuit of supervisory lamp L by way of spring 44 and its working contact, thereby notifying the wire chief that the receiver has been restored, and places ground on wipers 22 and 23 of rotary switch C; opens the primary circuit at armature 13; and opens at armature 14 the circuit of the rotary magnet 5, thus stopping it from energizing and deenergizing from interrupted ground at I and in turn stopping the rotation of the wipers of rotary switch C. Wipers 22 and 23 being in normal position as shown, or reversed, when ground is placed thereon, nothing happens, but if they are in other than the normal position a circuit is closed for relay 4. Relay 4, upon energizing, closes at armature 17 a locking circuit for itself by way of spring 43 and its working contact at howler key K; closes at armature 16 a circuit for rotary magnet 5, by way of armature 18 and its resting contact, bank contacts of other than normal position, wiper 22 or 23 as the case may be, resting contact of grounded armature 12 and said armature, which causes magnet 5 to act in a buzzer-like manner to rotate the wipers of switch C around to normal position; and opens at armature 15 the present inoperative circuit including relay 3 and the subscriber's loop to prevent the subscriber from again connecting up the howler circuit before the rotary switch C has returned to normal position and the wire chief has released the connection at key K. When the wipers 22 and 23 reach normal position the circuit of the rotary magnet 5 is opened, thus stopping its buzzer-like action and in turn stopping the rotation of the wipers of rotary switch C.

When the wire chief releases the howler key K the conductors 45 and 46 are disconnected at springs 41 and 42, respectively, from the howler circuit; the circuit of supervisory lamp L and the locking circuit of relay 4 are opened at springs 44 and 43, respectively, the lamp being extinguished and the relay being deenergized. Relay 4, upon deenergizing, prepares at armature 15 the circuit of relay 3; further opens at armature 16 the circuit of rotary magnet 5; and further opens at armature 17 the circuit of relay 4. All apparatus now being restored to normal the howler circuit is available for use over again.

In case the subscriber fails to restore the receiver to the switchhook after a reasonable application of the howler tone the wire chief releases the howler key K, thereby disconnecting the conductors 45 and 46 at springs 41 and 42, respectively, from the howler circuit. Relay 3 now deenergizes and opens the circuit of buzzer 2, places ground on wipers 22 and 23, opens the howler circuit, and opens the circuit of the rotary magnet 5, as described hereinbefore. If wipers 22 and 23 are not in normal position as shown, or reversed, relay 4 energizes and closes a circuit for rotary magnet 5, which acts to rotate the wipers of switch C to normal position, after which relay 4 falls back and opens the magnet circuit, as also described hereinbefore.

The principal advantages in a graduated howler circuit similar to the foregoing lie in the facts that, after the howler key is operated to connect the howler equipment with a line which has a receiver off the switch hook, the tone is produced continuously until the receiver is restored or the howler key is released; that the tone cannot be placed on the line except at its minimum intensity; and that the tone is instantly and permanently removed from the line when the receiver is restored and a supervisory lamp lighted at the test desk to notify the wire chief of the restoration.

Having described my invention, what I consider to be new and desired to have protected by Letters Patent will be pointed out in the appended claims.

What I claim is:

1. In a telephone testing system, a trunk line, a howler circuit including a source of current, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means for connecting said howler circuit to said trunk line, a relay interrupter having contacts included in said howler circuit, and means automatically responsive to the establishment of said last connection for operating said relay interrupter for generating and for projecting out over said subscriber's line a tone of varying intensity.

2. In a telephone testing system, a trunk line, a graduated howler circuit including a source of current, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means

for connecting said graduated howler circuit to said trunk line, a relay interrupter having contacts included in said howler circuit, means automatically responsive to the establishment of said last connection for operating said relay interrupter for generating and for projecting out over said subscriber's line a tone of graduated intensities, and means whereby said tone is stopped upon the restoration of the receiver to the hook.

3. In a telephone testing system, a trunk line, a graduated howler circuit including a source of current, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means for connecting said graduated howler circuit to said trunk line, a relay interrupter having contacts included in said howler circuit, means automatically responsive to the establishment of said last connection for operating said relay interrupter for generating and for projecting out over said subscriber's line a tone of graduated intensities, means whereby said tone is stopped upon the restoration of the receiver to the hook, and means whereby a supervisory lamp is lighted to notify the tester that said receiver has been restored.

4. In a telephone testing system, a trunk line, a graduated howler circuit including a source of current, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means for connecting said graduated howler circuit to said trunk line, a relay interrupter having contacts included in said howler circuit, means automatically responsive to the establishment of said last connection for operating said relay interrupter for generating and for projecting out over said subscriber's line a tone of graduated intensities, means whereby said tone is stopped upon the restoration of the receiver to the hook, and means for preventing the reapplication of the tone if the receiver is again removed.

5. In a telephone testing system, a trunk line, a graduated howler circuit including a source of current, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means for connecting said graduated howler circuit to said trunk line, a relay interrupter having contacts included in said howler circuit, means automatically responsive to the establishment of said last connection for operating said relay interrupter for generating and for projecting out over said subscriber's line a tone which varies in intensity, and means whereby the tone of minimum intensity only can be projected out when connection is established with said subscriber's line.

6. In a signaling system, a trunk line, a howler switch, a howler key for associating said switch with said trunk line, said trunk line being connected with a telephone line having a receiver off the hook, means whereby said switch signals the subscriber with a howl in said receiver that starts at minimum intensity and increases to a maximum intensity, and means whereby said switch operates automatically and continuously until the receiver is restored to the hook or the howler key is released.

7. In a signaling system, a trunk line, a howler switch, a howler key for associating said switch with said trunk line, said trunk line being connected with a telephone line having a receiver off the hook, means whereby said switch signals the subscriber with a howl in said receiver that starts at minimum intensity and increases to a maximum intensity, means whereby said switch operates continuously until the receiver is restored to the hook or the howler key is released, and automatic means responsive to the restoring of said receiver or the releasing of said key for returning said switch to starting position.

8. In a signaling system, a trunk line, a step by step howler switch, a howler key for associating said switch with said trunk line, said trunk line being connected with a telephone line having a receiver off the hook, means whereby said switch signals the subscriber with a howl in said receiver that starts at minimum intensity and increases step by step to a maximum intensity, and means whereby said switch operates step by step continuously until the receiver is restored to the hook or the howler key is released.

9. In a signaling system, a trunk line, a step by step howler switch having a normal resting position, a howler key for associating said switch with said trunk line, said trunk line being connected with a telephone line having a receiver off the hook, means whereby said switch signals the subscriber with a howl in said receiver that starts from said normal position at minimum intensity and increases step by step to a maximum intensity, means whereby said switch operates step by step continuously until the receiver is restored to the hook or the howler key is released, and means responsive to the restoring of said receiver or the releasing of said key for returning said switch step by step to said normal position.

10. In a telephone testing system, a trunk line, a howler switch associated with said trunk line, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, a howler circuit including a source of current, a relay interrupter having contacts included in said howler circuit, and means operative responsive to said last means for automatically starting and operating said switch and said

relay interrupter to interrupt said howler circuit to generate and project out over said subscriber's line a tone varying intensity.

11. In a telephone testing system, a trunk line, a howler switch associated with said trunk line, said switch having only two wipers, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means operative responsive to said last means for automatically starting and operating the wipers of said switch, means including a relay interrupter and one of said wipers for generating and projecting out over said subscriber's line a tone of varying intensity, and means including the other of said wipers for automatically stopping said switch responsive to the restoration of the receiver to the hook.

12. In a telephone testing system, a trunk line, a howler switch associated with said trunk line, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, a howler circuit including a source of current, a relay interrupter having contacts included in said howler circuit, means operative responsive to said last means for automatically starting and operating said switch and said relay interrupter to interrupt said howler circuit to generate and project out over said subscriber's line a tone of varying intensity, and means for automatically stopping said switch and for automatically disconnecting the tone from said trunk line responsive to the restoration of the receiver to the hook.

13. In a telephone testing system, a trunk line, a howler switch associated with said trunk line, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, a howler circuit including a source of current, a relay interrupter having contacts included in said howler circuit, means operative responsive to said last means for automatically starting and operating said switch and said relay interrupter to interrupt said howler circuit to generate and project out over said subscriber's line a tone of varying intensity, means for automatically stopping said switch and for automatically disconnecting the tone from said trunk responsive to the restoration of the receiver to the hook, and means for preventing reapplication of the tone if the receiver is again removed.

14. In a telephone testing system, a trunk line, a howler circuit, means for extending said trunk line into connection with a subscriber's line having a receiver off the switch hook, means for connecting said howler circuit to said trunk line, a relay automatically operated over the subscriber's line responsive to said last connection, and means including contacts on said relay through which a tone of varying intensity is projected out over said subscriber's line.

15. In a telephone testing system, a trunk line, a howler circuit, means for extending said trunk line into connection with a subscriber's line having a receiver off the switch hook, means for connecting said howler circuit to said trunk line, a relay automatically operated over the subscriber's line responsive to said last connection, means including contacts on said relay through which a tone of varying intensity is projected out over said subscriber's line, a second relay having contacts controlling the circuit of said first relay, said first relay being deenergized responsive to replacement of the receiver, contacts on said first relay for energizing said second relay, and means for locking said second relay in energized position to prevent reenergization of said first relay and the application of said tone to said subscriber's line in case the subscriber again removes his receiver.

16. In a telephone testing system, a trunk line, a graduated howler circuit including an automatic step by step switch associated with said trunk line, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, a relay and a battery connected in bridge of said trunk line responsive to said last connection, said relay being operated responsive to said last connection, contacts on said relay through which the motor magnet of said switch is controlled, and means including other contacts on said relay through which a tone of varying intensity is projected out over said subscriber's line.

17. In a telephone testing system, a trunk line, a graduated howler circuit including an automatic step by step switch associated with said trunk line, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, a relay and a battery connected in bridge of said trunk line responsive to said last connection, said relay being operated responsive to said last connection, contacts on said relay through which the motor magnet of said switch is controlled, means including other contacts on said relay through which a tone of varying intensity is projected out over said subscriber's line, a relay interrupter automatically operated responsive to the operation of said first relay, and contacts on said relay interrupter for intermittently interrupting said tone circuit.

18. In a telephone testing system, a trunk line, a graduated howler circuit including an automatic step by step switch, said switch having only two wipers, means for extending said trunk line into connection with a subscriber's line having a receiver off the hook, means operative responsive to said last means for automatically starting and operating said wipers step by step until the receiver is replaced, circuit arrangements in-

cluding one of said wipers for generating and projecting out over said subscriber's line a tone of varying intensity, and means including the other of said wipers for continuing the step by step operation of said wipers to normal position after the receiver is replaced.

19. In a telephone testing system, a repeating coil having a primary and a secondary winding, a trunk line terminating in said secondary winding, a howler circuit including a source of current, said primary winding, and a variable resistance, means for connecting said trunk line with a subscriber's line having a receiver off the hook, a relay automatically operated over the subscriber's line responsive to said connection, and means controlled by said relay for intermittently interrupting said howler circuit thereby producing a variable tone which is induced in said secondary winding and projected out over said subscriber's line.

20. In a telephone testing system, a repeating coil having a primary and a secondary winding, a trunk line terminating in said secondary winding, a relay and a battery connected in series with said trunk line, a howler circuit including a source of current, said primary winding, and a variable resistance, a relay interrupter having contacts in said howler circuit, means for connecting said trunk line with a subscriber's line having a receiver off the hook, said first relay operated responsive to said connection for closing said howler circuit, and contacts on said first relay for operating said interrupter relay to intermittently interrupt said howler circuit thereby producing a variable tone which is induced in said secondary winding and projected out over said subscriber's line.

In witness whereof, I hereunto subscribe my name this 28th day of September, A. D., 1923.

THOMAS F. CROCKER.