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SIGNALING SYSTEM.

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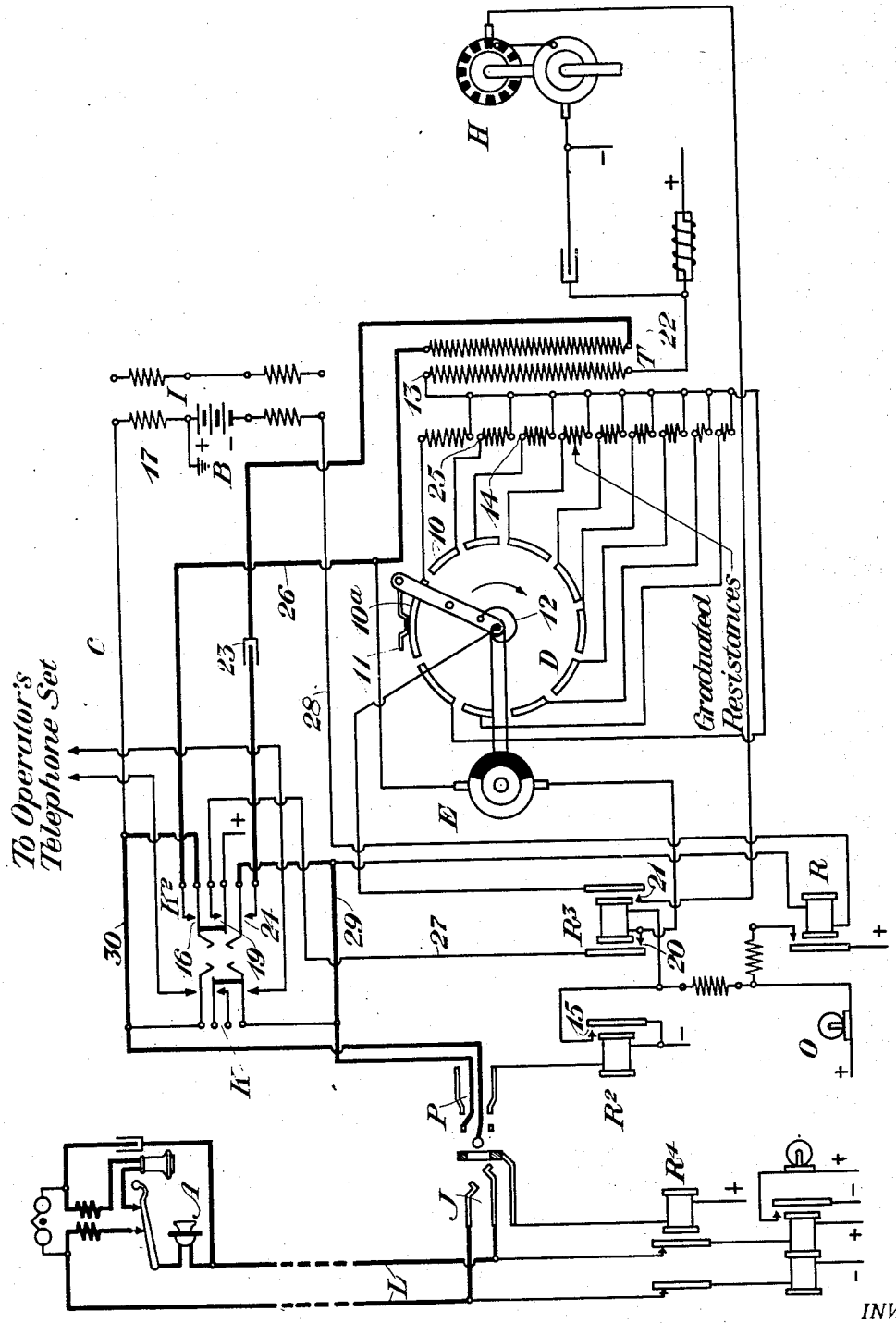
1,279,882.

Patented Sept. 24, 1918.



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SIGNALING SYSTEM.

1,279,882. Specification of Letters Patent. Patented Sept. 24, 1918.

Continuation in part of application filed March 29, 1915, Serial No. 17,697. This application filed August 27, 1917. Serial No. 188,346.

To all whom it may concern:

Be it known that I, GEORGE W. KUHN, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Signaling Systems, of which the following is a specification.

This invention relates to signaling systems, and particularly to those in which there is transmitted over a substation telephone line an intermittent current adapted to produce in a receiver which has been left off its hook, inadvertently or otherwise, for more than the time required for the proper use of the instrument, a tone to warn the subscriber of the failure to restore the substation set to its normal condition.

This application is filed as a substitute for my original application Serial No. 17,697 filed March 29, 1915, and is a continuation thereof with respect to the subject matter common to the two applications.

The principal objects of the invention are to provide a system giving a tone effective for this purpose, and applied to the receiver in such a manner that it would not cause disagreeable results if the subscriber chanced to have the receiver at his ear.

The accompanying drawing represents diagrammatically one arrangement by which the invention may be carried out. At A appears the usual apparatus and circuit of a telephone substation united by a line L to its answering jack J at the central station and to line equipment thereat. In addition to the customary line-connecting cord circuits, each operator may be provided with a special cord circuit C having a plug P for cooperation with the jack J and receiving talking current through a repeating coil I from the central station battery B. This cord circuit is shown as including a key K for connecting the operator's telephone set thereto and having a supervisory lamp O controlled by a relay R, which elements, however, are not directly concerned with this invention.

Associated with the cord C is a source of intermittent current suitable for generating a signaling tone. This may be of such a character as to give alternating current, but it appears here as a rotary interrupter H continuously driven from some source of power, to the conducting segments of which interrupter battery is connected, and from which the current impulses are taken off by a brush or wiper. The character of the tone is determined independently of the interrupter by a controlling apparatus comprising a contact device D and a plurality of resistances associated with the primary winding of the induction coil T. The contact device D is illustrated as a circumferential series of fixed contacts 10 over which travels a brush or movable contact member 11 under the influence of some power means, as a spring 12, which is wound by the operator, and upon its release causes the brush automatically to pass over all the contacts 10 a certain number of times. The fixed contacts 10 of the contact device D are shown connected with terminals 25, 14, etc. of graduated resistances of decreasing value downward, the opposite terminals of which are connected with the primary winding 13 of said induction coil having its secondary connected as shown in the talking circuit. A pick-up interrupter E is located in the initial energizing circuit of relay R^3 and adapted to rotate synchronously with the brush 11 of the interrupter device D to insure that a weak tone is produced in the subscriber's receiver at the time of first connecting the howler equipment to the line. When the operator inserts the plug P in jack J and depresses key K^2, relay R^3 is energized as soon as the pick-up interrupter E reaches a position where the two brushes rest upon the same metallic segment, and thereby closes at contact 21 the circuit through primary winding 13 and interrupter H. Due to the fixed relation existing between the pick-up interrupter E and the brush 11 of contact device D, the two brushes of interrupter E will rest on the same metallic contact of said interrupter only when the brush 11 rests on contact 10^a, and consequently relay R^3 will be energized, and the primary circuit will be closed through contact 21 only at that instant when the maximum resistance is connected in series with interrupter H, and the minimum current is flowing through said primary circuit.

It will be seen that the graduated resistances 25, 14, etc. are successively introduced into this circuit as brush 11 advances from contact to contact, each resistance being less than the preceding one, and thereby increasing the current strength in winding 13 and inductively the current strength in

the talking circuit, and consequently the volume of the tone in the subscriber's receiver.

The nature of the invention will be seen more clearly from the following description of the operation of the system:—It being observed from the condition of the signals associated with the line L of substation A that the subscriber has neglected to replace the receiver upon its hook, the operator, wire chief, or other attendant at the central station inserts the plug P of cord C in a jack of the line, as J, depresses key K^2 and makes ready the contact device D. When the plug P was inserted in jack J, the circuit was closed through the winding of relay R^2, sleeve contacts of plug P and jack J and winding of the cut-off relay R^4, whereby both relay R^2 and relay R^4 are energized. Relay R^2 closes a circuit through contact 15 and lamp O, thereby tending to cause the said lamp to light, but its lighting is prevented by the operation of relay R which is energized by current flowing through a circuit from battery B, conductor 28, winding of relay R, conductor 29, ring contacts of plug P and jack J through the line L and substation A, tip contacts of jack J and plug P and conductor 30 to ground. Relay R is thereby energized, which closes a circuit through its front contact which short circuits lamp O and thereby prevents its lighting. If the two brushes of the pick-up interrupter E are upon the same metallic segment, a circuit is closed through contact 15 of relay R^2, winding of relay R^3, interrupter E, conductor 26, contact 16 of key K^2, winding 17 of repeating coil I to ground, whereby relay R^3 is energized. Relay R^3 is locked up by a current which flows over a circuit through contact 15, the winding and contact 20 of relay R^3, conductor 27, and contact 19 of key K^2. At its front contact 21 relay R^3 closes the circuit of the primary 13 of induction coil T and the interrupter H. The current impulses through the primary cause corresponding impulses in the secondary, the effect of which upon the substation circuit depends upon which contact 10 of the device D its brush 11 has reached. Assuming the brush to be upon the next contact following the normal contact 10^a (movement being in direction of the arrow) a comparatively feeble tone impulse will flow from terminal 22 of the induction coil secondary through condenser 23 (which prevents the passage of battery current through the secondary of the induction coil), contact 24 of key K^2, ring contacts of plug P and jack J over the line L and through the winding of the receiver at A, tip contacts of the jack J and plug P, conductor 30, contact 16 of key K^2 to the other terminal of the secondary of induction coil T.

On account of the relatively large resistance represented by resistance 25 which is in series with the primary of the induction coil, a relatively small amount of current will flow through the said primary so that a relatively small current is induced in the secondary, and consequently the impulses will affect the diaphragm of the receiver only slightly. As the brush advances, the successive resistances diminish in value so that the current strength through the primary increases in value and consequently the current in the secondary gradually increases in intensity until it reaches its maximum value when the brush is on a contact 10 next preceding the contact 10^a. The current then begins again at its minimum, repeating the cycle as long as the power means 12 is operative.

When the receiver at substation A is replaced upon its switchhook, the circuit previously traced through the winding of relay R is opened, whereby relay R is deenergized and its front contact opened, thereby removing the short circuit around lamp O, thus permitting said lamp to glow brightly. Upon the receipt of this signal, indicating that said receiver has been replaced upon its hook, the operator restores key K^2 to its normal position, thereby opening at contacts 16 and 24 the circuit previously traced through the secondary of induction coil T and the line L, and also opening at contact 19 the circuit previously traced through the winding and contact 20 of relay R^3, whereby the circuit through the primary winding 13 and interrupter H is opened. When the operator removes plug P from jack J, the signaling system is restored thereby to its normal inoperative condition.

It will thus be seen that an efficient attention-attracting signal of gradually varying volume is attained, the initial application of which to the substation line is always when it is feeblest, so that if the subscriber has applied the receiver to his ear just before the plug P is placed in the line jack he can remove it before the strength of the tone makes the effect unpleasant.

What is claimed is:

1. The combination with a subscriber's telephone line, of means for applying signaling current thereto, means for automatically and gradually varying the effective strength of said current, and means whereby the period of application of said current may be limited.

2. The combination with a subscriber's telephone line provided with a receiver, of means for applying signaling current thereto, and means for automatically and alternately varying the effective strength of said current for increasing and decreasing the intensity of tone produced by said receiver.

3. In a signaling system, a circuit including a source of signaling current, and means for automatically and gradually varying the effective strength of said current, and means operated by said current-varying means for controlling said circuit and for rendering said source of signaling current effective at a predetermined strength of current.

4. The combination with tone producing means, of means for automatically varying said tone between a minimum and a maximum, and other means operated by said tone-varying means for rendering the tone producing means initially effective to produce a tone of minimum intensity.

5. The combination with a substation line, of a source of signaling current and controlling means therefor, a connecting circuit for applying the signaling current to the substation line, and switching means under the joint influence of the controlling means and connecting circuit for rendering the signaling current effective.

6. The combination with a substation line, of a source of signaling current and controlling means for gradually varying the strength of said current, a connecting circuit for applying the signaling current to the substation line, and switching means operable when the connecting circuit is joined to the substation line and the controlling means is in a particular position for rendering the signaling current effective.

7. The combination with a substation line, of tone-generating means, means for gradually varying the intensity of the tone, a connecting circuit for the tone-generating means and substation line, an electromagnetic switching device for rendering the tone effective, and a circuit for said switching device including contacts closed when the connecting circuit is joined to the substation line and the tone is of a minimum intensity.

8. A tone-generating means, intensity varying means therefor provided with contacts, a connecting circuit with which the tone-generating means is associated, a relay for rendering said tone-generating means effective in said circuit, and an energizing circuit for the relay extending through contacts of the intensity varying means when the tone is of predetermined intensity.

9. A tone-generating means, controlling means therefor provided with contacts, a connecting circuit with which the tone-generating means is associated, a relay for rendering said tone-generating means effective in said circuit, an energizing circuit for the relay extending through contacts of the controlling means in its initial position, and a locking circuit for the relay independent of the controlling means.

10. The combination with a subscriber's telephone line and receiver, of means for applying a signaling current thereto whereby said receiver is made to produce an audible warning signal, and automatic means for gradually varying the effective strength of said signaling current.

11. The combination with a subscriber's telephone line and receiver, means whereby said receiver is made to produce an audible warning signal, and means for automatically varying the intensity of said audible signal.

12. The combination with a subscriber's telephone line and receiver, means whereby said receiver is made to produce an audible warning signal, automatic means for varying the intensity of said signal, and means for rendering the signal effective at a predetermined intensity.

In testimony whereof, I have signed my name to this specification this fourteenth day of August 1917.

GEORGE W. KUHN.