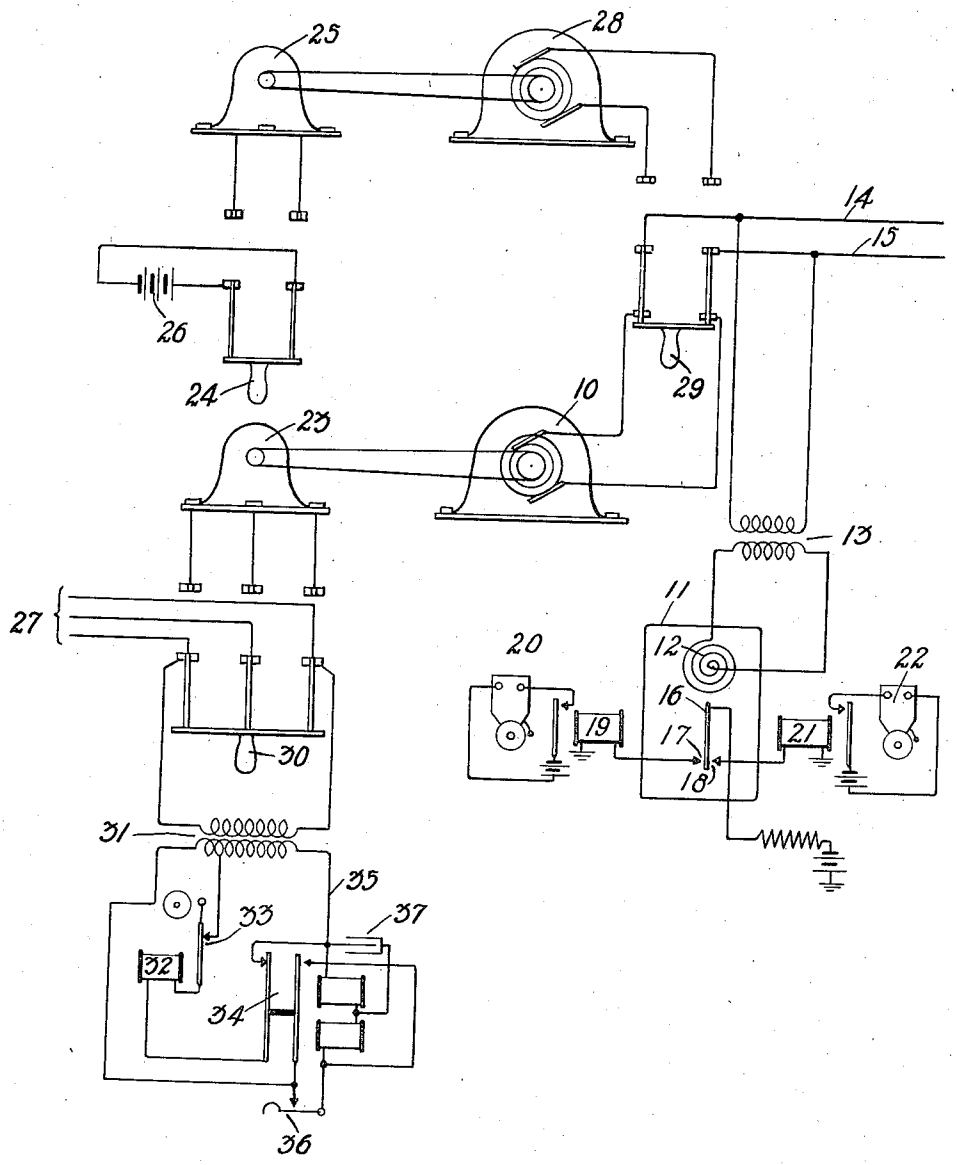
R. D. CONWAY.

SIGNALING SYSTEM.

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1,343,196.

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UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

1,343,196. Specification of Letters Patent. **Patented June 15, 1920.**

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To all whom it may concern:

Be it known that I, ROY D. CONWAY, a citizen of the United States, residing at Chatham, in the county of Morris, State of New Jersey, have invented certain new and useful Improvements in Signaling Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to signaling systems and more particularly to apparatus for association with power lines to indicate the condition thereof.

The principal object of the present invention is to indicate the resumption of power in a power circuit subsequent to the interruption of the power therein. In accordance with this object, a feature of the present invention consists in the provision of a signal device operating on current derived from the power circuit initially actuated upon the establishment thereof, and a relay operating on current derived from the power circuit and serving when in actuated position to maintain the signal device in its idle condition.

Another object of the invention is to indicate when the power circuit drops below its proper operating condition. In accordance with this object, a feature of the present invention resides in the provision of a relay operating on current derived from the power circuit, which releases upon the power circuit dropping below its proper operating condition, and in the provision of a signal device operating on current derived from the power circuit which is actuated upon the release of the relay.

The drawing illustrates one embodiment of the present invention as applied to a power circuit operating a motor used to drive a signaling generator supplying signaling current to a telephone system.

In the system shown, an alternating signaling generator 10 is located at the telephone exchange and provides current for the operation of the substation signals of the lines associated with the exchange. For satisfactory operation of the substation signals, the signaling current should be maintained between certain voltages representing the lowest and highest desirable voltages. To indicate when the signaling current is below or above these limits, a voltmeter relay 11 has been shown having the winding 12 thereof connected in series with the secondary winding of a transformer coil 13, the primary winding of which is bridged across the signaling conductors 14 and 15. An arm 16 of the relay 11 is moved in accordance with changes of voltage in the signaling conductors 14 and 15, and is designed to engage a contact 17 when the voltage reaches the lower operating limit, and to engage a contact 18 when the voltage reaches the higher operating limit. Closure of contact 17 completes an operating circuit for a relay 19, which on actuation, completes a local circuit for a low voltage alarm 20; and closure of contact 18 similarly completes an operating circuit for a relay 21, which on actuation, completes a local circuit for a high voltage alarm 22. Should the voltage become too high, ringing of the high voltage alarm 22 notifies the attendant of this condition, and he will take steps to reduce the voltage thereof to a proper value.

On the other hand, should the voltage of the signaling current drop below its lower operating value, the ringing of the low voltage alarm 20 notifies the attendant of this condition. This condition generally arises where the generator 10 is not being driven with sufficient speed. In the system shown, this in turn generally results from slowing down the motor 23, used in driving the generator 10, due to interruption of the power circuit or its reduction below the value necessary for the proper operation of the motor 23. Under this condition the attendent would open the switch, thereby disconnecting the motor 23 from the power circuit and under this condition in the arrangement shown, the attendant would close a switch 24 controlling the circuit of another motor 25 to supply current thereto from a source of current 26 independent of the power circuit 27. This source of current 26 may be of any suitable character, and in many cases may be a storage battery located at the exchange. As shown, the motor 25 serves to drive an alternating current generator 28, similar to the generator 10, but could obviously be arranged to drive the generator 10, if desired. With the arrangement shown, however, the switch 29 would next be thrown to its upper position, disconnecting the generator 10 and connecting the generator 28 with the conductors 14 and 15 of the signal circuit. The switch 30 of

the power circuit would now be moved to its own position to disconnect the motor 23 from the power circuit 27.

The voltmeter relay 11 would now be operated by current derived from the generator 28 and indicate any decrease or increase of the signaling circuit below or above the operating limits as previously described.

The power circuit 27 will ordinarily be used to develop signaling current, and the auxiliary source 26 will be used as little as possible especially if it be a storage battery. It is accordingly intended to limit the use of the source 26 to such times as the power circuit 27 is interrupted or below a proper operating value. In order to indicate the reëstablishment of the power circuit 27 to the attendant, the primary winding of a transformer coil 31 is bridged across a pair of the conductors of the power circuit 27, and an audible signal 32 is normally serially included in circuit with a portion of the secondary winding thereof. This circuit extends from a point of the secondary winding through a vibratory contact 33 and winding of the signal 32, outer armature and normal contact of an alternating current relay 34, conductor 35 and the secondary winding of coil 31, to the point of beginning. The power circuit 27 shown is supplied with alternating current of any suitable voltage and frequency for the operation of motor 23. As soon as current is present in the power circuit 27, this alternating current passing through the primary of the coil 31 induces corresponding currents in the circuit of the signal 32 and upon this induced current reaching the operating value of the signal 32, the signal is operated, interrupting its own circuit at the contact 33. The operation of the signal 32 continues until the attendant responds and closes a key 36 controlling the operating circuit of the relay 34. The relay 34 is preferably so adjusted that it will not operate, even though the circuit thereof is closed, until the value of the power circuit 27 is sufficiently high to satisfactorily actuate the motor 23. Assuming that this is sufficiently high, upon the closure of the key 36, the relay 34 is operated over a circuit extending through the entire second winding of the coil 31, key 36, both windings of relay 34 and conductor 35. Immediately upon actuation, the relay 34 completes a locking circuit for itself, extending through its inner armature and alternate contact. A shunt circuit including a condenser 37 extends about the upper winding of the relay 34 to displace the phase of the current passing therethrough, so that the relay will hold up on the alternating current passing therethrough. The operation of relay 34 opens the circuit of the signal 32, and maintains it open so long as the relay 34 remains in operated position.

The attendant will now close the switch 30, and upon the motor 23 reaching proper speed, to develop the proper voltage from the generator 10, will throw the switch 29 to its lower position, disconnecting the generator 28, and reëstablishing the connection of the generator 10 with the conductors 14 and 15 of the signal circuit. The switch 24 would now be opened to disconnect the motor 25 from the source of current 26, thus returning the system to its normal operating condition.

The relay 34 may be so adjusted that it will release when the power circuit 27 falls below a proper operating value for the motor 23, and in so doing, reëstablishes the operating circuit for the signal 32. The signal is preferably so adjusted that it will operate on much less current than that on which relay 34 releases, and accordingly on the release of relay 34, due to decreasing current, the signal 32 is operated, thus indicating that the current has fallen below its proper operating strength. Should this signal cease operating thereafter, the attendant will know that the current in the power circuit is below that necessary to operate the signal 32, or has ceased entirely. In this situation the low voltage alarm 20 would undoubtedly have been operated so that the attendant would resort to the auxiliary source of current 26 for the development of the signaling current, and disconnect the motor 23 from the power circuit 27 as previously explained.

Should the signal 32 continue in operation for a considerable period after the release of the relay 34, and the low voltage alarm 20 not be operated, it is probable that the diminution of current of the power circuit existed only for a few moments, and that then the current in the power circuit returned to a proper operating value. In order to determine whether or not such is the case, the attendant would close the key 36, thus completing the operating circuit for the relay 34, which would operate in event the current had returned to a proper operating value. If the relay 34 should not be actuated, however, the attendant would know the current in the power circuit was still below the proper operating value, and prepare to develop signaling current from the auxiliary current source 26 upon the actuation of the low voltage alarm 20.

If desired, the motors 23 and 25 could be arranged to interchangeably drive the generator 10, in which case the generator 28 and switch 29 could be omitted; or the motor 23 could be of a type which would operate either from the power circuit 27 or the auxiliary source of current 26, in which case the motor 25 could also be omitted.

What is claimed is:

1. A signaling system comprising a power circuit, a second circuit closed during the

absence of current in the power circuit and deriving current from the power circuit, a signal in the second circuit actuated upon the presence of current in the power circuit, a third circuit deriving current from the power circuit, a relay in the third circuit serving upon actuation to open the second circuit to prevent further actuation of the signal therein, attendant controlled means governing the initial closure of the third circuit, and a locking circuit for the relay completed upon actuation thereof.

2. A signaling system comprising a power circuit, a second circuit deriving current from the power circuit, a signal in the second circuit actuated upon the presence of current in the power circuit, a third circuit deriving current from the power circuit, a relay in the third circuit inoperative until the current in the power circuit reaches a proper operating value serving upon actuation to open the second circuit to prevent further actuation of the signal therein and serving upon subsequent release to reëstablish the second circuit, attendant controlled means governing the initial closure of the third circuit, and a locking circuit for the relay completed upon actuation and opened upon the subsequent release thereof; the locking circuit being maintained until the current in the power circuit falls below its proper operating value, whereby the release of the relay opens the locking circuit and reestablishes the second circuit.

3. A signaling system comprising an alternating current power circuit, a transformer having a plurality of windings and having a portion of the windings bridged across the power circuit, a second circuit including another portion of the transformer windings and deriving its current inductively from the power circuit, a signal in the second circuit actuated upon the presence of current in the power circuit, a third circuit including a portion of the transformer windings and deriving current from the power circuit, an alternating current relay in the third circuit serving upon actuation to open the second circuit, attendant controlled means governing the initial closure of the third circuit, and a locking circuit for the relay completed upon actuation thereof.

4. A signaling system comprising an alternating current power circuit, a transformer having a plurality of windings and having a portion of the windings bridged across the power-circuit, a second circuit including another portion of the transformer windings and deriving its current inductively from the power circuit, a signal in the second circuit actuated upon the presence of current in the power circuit, a third circuit including a portion of the transformer windings and deriving current from the power circuit, an alternating current relay in the third circuit inoperative until the current in the power circuit reaches a proper operating value serving upon actuation to open the second circuit and serving upon subsequent release to reëstablish the second circuit, attendant controlled means governing the initial closure of the third circuit, and a locking circuit for the relay completed upon actuation and opened upon the subsequent release thereof; the locking circuit being maintained until the current in the power circuit falls below its proper operating value whereby the release of the relay opens the locking circuit and reëstablishes the second circuit.

5. A signaling system comprising an alternating current power circuit, a transformer having a plurality of windings and having a portion of the windings bridged across the power circuit, a second circuit including another portion of the transformer windings and deriving its current inductively from the power circuit, a signal in the second circuit actuated upon the presence of current in the power circuit, a third circuit including a portion of the transformer windings included in the second circuit and deriving its current inductively from the power circuit, an alternating current relay in the third circuit inoperative until the current in the power circuit reaches a proper operating value serving upon actuation to open the second circuit and serving upon subsequent release to reëstablish the second circuit, attendant controlled means governing the initial closure of the third circuit, and a locking circuit for the relay completed upon actuation and opened upon subsequent release thereof; the locking circuit being maintained until the current in the power circuit falls below its proper operating value whereby the release of the relay opens the locking circuit and reëstablishes the second circuit.

In witness whereof, I hereunto subscribe my name this 16th day of September A. D., 1918.

ROY D. CONWAY.