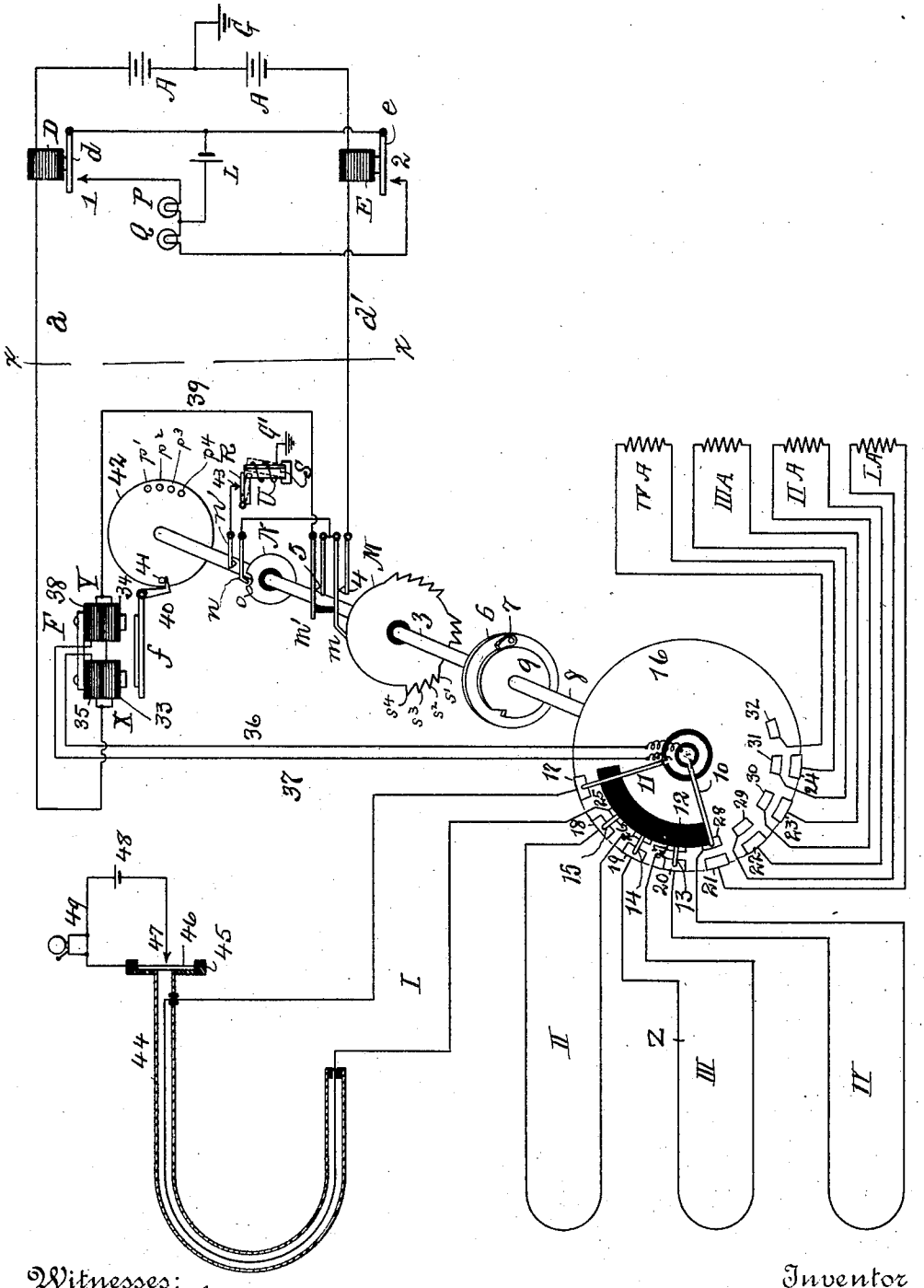
C. H. POOL.

ELECTRICAL SIGNALING SYSTEM.

APPLICATION FILED MAY 2, 1910.

977,219. Patented Nov. 29, 1910.



Witnesses:
May T. McGarry
Gertrude T. Potter.

Inventor
Clark H. Pool
By his Attorney
Paul Benjamin

UNITED STATES PATENT OFFICE.

CLARK H. POOL, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL ELECTRIC PROTECTION COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL SIGNALING SYSTEM.

977,219. Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed May 2, 1910. Serial No. 558,828.

To all whom it may concern:

Be it known that I, CLARK H. POOL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Electrical Signaling Systems, of which the following is a specification.

The invention relates to an electrical signaling system, and consists in the construction whereby a break or a ground occurring in any one of a plurality of loops in a circuit, cuts out the loop in which the trouble has taken place, substitutes for said loop a compensating resistance, and causes a transmitter, common to all of said loops, to send a predetermined number of impulses over the line to a translating device at the receiving station.

The accompanying drawing is an electrical diagram, showing my system.

All of the mechanism on the left of the line x, x, is at the transmitting station, and all on the right of said line is at the receiving station. The two stations are connected by the members a, a' of the line circuit.

At the receiving station is a source of current A, here shown as a split battery, grounded at G, also the translating devices, these being here the magnets D and E, which respectively control through their switch levers d, e, local circuits, which include the battery L and lamps P, Q. When switch lever d of magnet D closes circuit at 1, the lamp P is lighted. When switch lever e of magnet E closes circuit at 2, the lamp Q is lighted.

At the transmitting end of the line are a plurality of loops I, II, III, IV, each one of which may be regarded as representing a separate building or a separate section or floor of a single building. It is the function of the apparatus to cause an alarm automatically to be given by the lamps at the receiving station whenever any one of the aforesaid loops is broken or grounded; and also to indicate the particular loop affected.

The transmitting device is common to all the loops, and comprises a code wheel M supported on shaft 3 and insulated therefrom. Said shaft is rotated by any suitable clockwork or other mechanism (not shown). The bent end of switch arm m bears upon the periphery of code wheel M. On the rim of the code wheel are suitable projections for causing the switches m, m' to break circuit at the contacts 4 and 5, and thus to transmit some definite signal. As here shown, the wheel M sends a signal 5—3 followed by 1, 2, 3 or 4 taps in accordance with the conditions hereafter described. On the end of code wheel shaft 3 is a disk 6 which carries a pawl 7. In line with shaft 3 is a shaft 8 having at its end and facing the disk 6, a notched disk 9. Hence when the pawl 7 engages with the notch in disk 9, motion will be transmitted from shaft 3 to shaft 8. On the end of shaft 8 are two arms 10 and 11, insulated from one another and from said shaft. Said arms carry an arc-shaped block 12 of insulating material, on which are radial metal contact strips 13, 14, 15.

The shaft 8 passes through the disk-shaped block 16, upon which are secured an outer row of metal contacts 17, 18, 19, 20, 21, 22, 23, 24, and an inner row of metal contacts 25, 26, 27, 28, 29, 30, 31, 32, the contacts of the inner row being respectively disposed opposite to contacts 18, 19, 20, 21, 22, 23 and 24 of the outer row. The arm 11 sweeps over contacts 17 to 21 of the outer row. The arm 10 sweeps over contacts 28 to 32 of the inner row. The contact strips 13, 14, 15 bridge the pairs of contacts—as 18—25—over which they may be placed. Connected between the pair of contact plates 24—32 is a loop IV^A containing a resistance equaling that of loop IV, and respectively between the pairs 23, 31—22, 30—21, 29 are loops III^A, II^A and I^A containing resistances equaling those in loops III, II and I. Also on the shaft 3, but insulated therefrom, is a cam N, having a notch o in its periphery. Upon said cam bears the bent end of a switch arm n which establishes circuit with a switch n' while the cam is rotating. When the cam is at rest, the end of arm n enters the notch o and so breaks circuit.

The normal metallic circuit from battery A proceeds as follows: from one pole of said battery to magnet D and line member a, to junction point X where the circuit divides into two branches, the main or line branch proceeding through two coils 33, 34 of a four coil differential relay F to junction Y. The other local or house branch proceeds from junction X, through coil 35 of said relay F, by wire 36, to arm 10 on shaft 8.

thence to fixed contact 28, loop IV, contact 20, bridge strip 13, contact 27, loop III, contact 19, bridge strip 14, contact 26, loop II, contact 18, bridge strip 15, contact 25, loop I, contact 17, arm 11, wire 37, to coil 38 of relay F to junction Y. From junction Y—where the branches of the circuit unite—the circuit proceeds by wire 39, to switch m', contact 5, switch m, contact 4, line member a', magnet E, to other pole of battery A. The relay F is normally balanced, so that its pivoted bell-crank armature f is, therefore, not attracted, and engages by means of a hook detent on its arm 40, a pin 41 on a disk 42 which is fast on shaft 3. By reason of this engagement, the shaft 3 and hence the code wheel M is prevented from rotating, until the magnet F attracts its said armature and so releases the detent from the pin 41.

The operation of the apparatus is as follows: Assume a break or a ground at the point Z on loop III. The coils 35 and 38 of magnet F no longer neutralize coils 33 and 34. Said magnet then attracts its armature, releasing shaft 3, which rotates the code wheel to send in its signal 5—3. The placing of the pawl 7 on disk 6 is to be such, that said pawl does not engage in the notch of disk 9 until after the wheel M has sent the signal 5—3, and just before it would send in the succeeding taps due to the projections s', s^2, s^3 and s^4. As the projection s' on wheel M moves past the switch m, the arm 11 on shaft 3 moves from contact 17 to contact 18, and the arm 10 and bridge strips 15, 14, 13 all being connected thereto, likewise move ahead to the next fixed contacts in succession. The projection s' on the code wheel now breaks the circuit at m to produce the first tap following 5—3, and in like manner the projections s^2 and s^3 in turn break the circuit to produce the second and third taps: but by this time the arm 11 has moved to close circuit with fixed contact 20, and loops I, II and III have been cut out. At the same time, however, arm 10 has moved to contact 31, and bridge strips 15, 14, 13 are respectively bridging the pairs, 21, 28—22, 29 and 23, 30. Hence in place of loops I, II and III, there have been inserted the electrically equivalent loops I^A, II^A, III^A. The local or house branch circuit from junction X now proceeds to coil 35 of relay F, wire 36, arm 10, contact 31, loop III^A, contact 23, bridge 13, contact 30, loop II^A, contact 22, bridge 14, contact 29, loop I^A, contact 21, bridge 15, contact 28, loop IV, contact 20, arm 11, wire 37, coil 38 of magnet F, to junction Y. The magnet F will now be neutralized and allow its armature f to drop.

On the disk 42 are four pins p', p^2, p^3, p^4, the location of which is such, that the hook 40 engages pin p' just before projection s' has made contact with switch m, pin p^2 just before projection s^2 has made contact with switch m, pin p^3 just before projection s^3 has made contact with switch m, and pin p^4 just before projection s^4 has made contact with switch m. Consequently, if after the projections s', s^2, s^3 have produced their three taps, the armature of magnet F is released, as above described, the hook 40 on said armature will engage with pin p^4, and so prevent further rotation of the code wheel M. Hence under the conditions noted, the signal 5—3—3 from wheel M translated at the receiving station by flashes of the lamps would announce a break or ground in loop III, and in the same way, a signal 5—3—1, 5—3—2 or 5—3—4 would indicate similar trouble on loops I, II or IV.

In order to prevent the line from being permanently grounded after the transmission of the signal, I provide the following device. S is a vertical thermostatic bar made, for example, of parallel united strips of steel and brass. Resting on the upper free end of said bar is the free end of a pivoted arm R which normally touches the contact point 43. The switch n' is connected to contact point 43 and the arm R is connected to ground G′ through a heating coil U which incloses the bar S. When circuit is closed to the ground G′ from the cam N, the bar S being heated moves at its free end (as indicated in dotted lines) from under the arm R, which then drops away from point 43, thus removing the ground G′ from the system. The time interval required for the bar S to operate, as described, is made long enough to enable the maximum number of signal taps to be transmitted.

My system is especially intended for use in connection with temperature alarm devices of the type in which the air in a long metal pipe of small diameter on becoming expanded by reason of an increase in surrounding temperature, acts upon a diaphragm to close a local circuit including a battery and alarm, and I have here shown such a device, which is not a part of my present invention, applied to the conducting wire of loop I. Said wire passes through the closed end and wall of pipe 44. Said pipe opens into a chamber formed in the case 45, below the diaphragm 46. In proximity to said diaphragm is a contact terminal 47 which is in local circuit with said diaphragm, a battery 48 and electric bell 49. When the air in pipe 44 expands, the diaphragm is moved into contact with point 47, thus closing the circuit and sounding the alarm. The application of my system to the pipe 44 serves to give warning at the receiving station of injury to the pipe, since a breakage of the pipe would also involve a

breakage of the loop wire, while a crushing of the pipe, which is normally grounded, would involve a grounding of the wire.

I claim:

1. In combination with a line circuit, a signal translating device, a transmitter constructed to send a succession of current impulses to line, a plurality of loops in circuit, and means automatically operating on a break or ground in any one of said loops for controlling said transmitter to send a predetermined number of impulses, the said number of impulses being different for each of said loops.

2. In combination with a line circuit, a signal translating device, a transmitter constructed to send a succession of current impulses to line, a plurality of loops in circuit, means automatically operating on a break or ground in any one of said loops for cutting said loop out of circuit and substituting therein a resistance equal to that of said loop, and means also automatically operating on said break or ground for controlling said transmitter to send a predetermined number of impulses.

3. In combination with a line circuit, a signal translating device, a transmitter constructed to send a succession of current impulses to line, a plurality of loops in circuit, means automatically operating on a break or ground in any one of said loops for cutting a certain number of said loops out of circuit, and means also automatically operating on said break or ground for controlling said transmitter to send impulses corresponding in number to the loops cut out.

4. In combination with a line circuit, a signal translating device, a transmitter constructed to send a succession of current impulses to line, a plurality of loops in circuit, means automatically operating on a break or ground in any one of said loops for cutting a certain number of said loops out of circuit and substituting a compensating resistance, and means also automatically operating on said break or ground for controlling said transmitter to send impulses corresponding in number to the loops cut out.

In testimony whereof I have affixed my signature in presence of two witnesses.

CLARK H. POOL.

Witnesses:
GERTRUDE T. PORTER,
MAY T. MCGARRY.