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ELECTRICAL SIGNALING SYSTEM.

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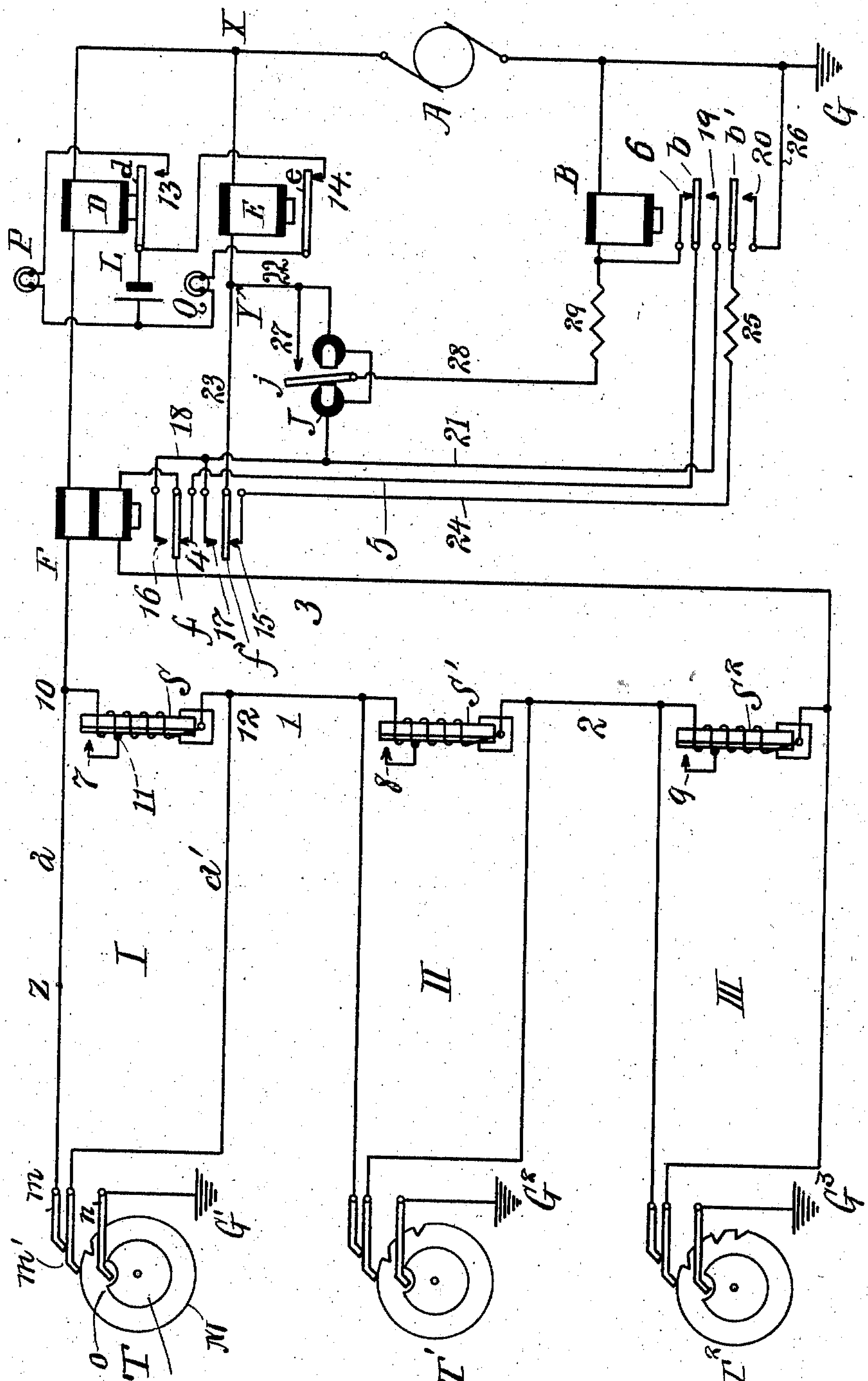
966,902. Patented Aug. 9, 1910.



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UNITED STATES PATENT OFFICE.

ALBERT GOLDSTEIN, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL ELECTRIC PROTECTION COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL SIGNALING SYSTEM.

966,902. Specification of Letters Patent. Patented Aug. 9, 1910.

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To all whom it may concern:

Be it known that I, Albert Goldstein, 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 is an electrical signaling system, and consists in the construction hereinafter set forth, whereby a break occurring in one or more loops of a plurality of loops connected in series in the circuit will not prevent signals being transmitted to a receiving station from any transmitter in any of said loops.

The accompanying drawing is an electrical diagram showing the invention by conventional symbols.

Three loops I, II, III are here shown in series circuit with the source A of current which is grounded at G. In each loop is a transmitter T, T′, T², each comprising a code wheel M, on the shaft of which is a cam N, having a notch *o* in its rim. Bearing on the cam is a switch arm *n* which is connected to ground—as at G′, G² or G³. When the code wheel M is at rest, the downwardly bent end of arm *n* enters notch *o* in cam N and so opens the ground connection. Each wheel M is rotated by any suitable means, released or otherwise controlled by the operator when a signal is to be sent, and, in rotating, said wheel makes and breaks circuit between the spring arms *m*, *m′* in the usual way. The magnets D and E respectively control their switches *d*, *e* to make and break local circuit at 13 and 14. The magnet F has two coils, and when one over-balances the other, controls its switches *f*, *f′* to make and break circuit at 4, 15, 16, 17. The magnet B controls its switch *b* to make and break circuit at 6 and 19, and its switch *b′* to make and break circuit at 20.

The metallic circuit proceeds as follows: From non-grounded pole of source A, to magnet D, one coil of the neutral magnet F, member *a* of loop I, arm *m*, arm *m′*, member *a′* of loop I, by wire 1 to loop II and transmitter T′ therein, by wire 2 to loop III and transmitter T² therein, wire 3 to other coil of magnet F, switch arm *f*, contact 4, wire 5, switch arm *b*, contact 6, magnet B, to grounded pole of source A.

Across each loop—as from junction 10 to junction 12 in loop I—is a shunt which includes a thermostatic circuit closer. Each of said circuit closers consists of a high resistance heating coil inclosing a thermostatic bar S, S′, S². Said bar may be made of two metals, as steel and brass, and supported at one end. The resistance of the coils on said bars is to be made so high as that said coils are practically short-circuited by the loops I, II, III. Hence said bars are not heated, and hence they normally open circuit at the contacts 7, 8, 9. Each of said contacts is connected to the heat coil associated therewith, so that when said coil is heated, thus causing the bar to bend and establish circuit at the contact, the greater part of the coil on said bar and hence the greater part of the resistance offered thereby is cut out—the shunt then proceeding—in loop I, for example—from junction 10 to junction 11, contact 7, bar S to junction 12.

D and E are magnets which respectively control their switches *d*, *e*, which make and break circuit at contacts 13 and 14. In circuit with switches *d*, *e* and contacts 13, 14 is a local battery L and glow lamps P, Q, the whole located at the receiving station and constituting a translating device for signals coming over the line from transmitters T, T′, T².

The normal operation of the system is as follows: When signals are sent, say from transmitter T, there is constant connection to ground G′, thus energizing differential magnet F which moves its switches *f*, *f′* to open circuit at contacts 4 and 15 and to close circuit at contacts 16 and 17. By reason of the opening of circuit at 4, magnet B normally energized is caused to fail, so that its switches *b*, *b′* open circuit at contact 6 and close circuit at contacts 19 and 20. Two leads from the non-grounded pole of source A now exist as follows: (1) From source A to magnet D, one coil of magnet F, member *a* of loop I, through transmitter T to ground G′. (2) From source A to junction X, magnet E, switch *f′*, contact 17, wire 18, contact 16, switch *f*, other coil of magnet F, wire 3 to loop III, by wire 2 to loop II, by wire 1 to member *a′* of loop I, transmitter T and ground G′. Consequently both magnets D and E are actuated by the current impulses sent by transmitter T, and both lamps P, Q translate the signals visually.

As soon as the transmitter T stops—say, having completed its rotation—the ground G′ is removed from the system, and differential magnet F becomes deënergized, causing its switches f, f' to open circuit at 16 and 17 and to close circuit at 4 and 15. Two circuits are now established from junction X: (1) by magnet E to junction Y, (2) by magnet D, one coil of magnet F, through loops I, II, III successively, by wire 3 to other coil of magnet F, switch f, contact 4, wire 5, switch b, contact 19, wire 21, polarized magnet J, wire 22 to junction Y. Then from junction Y by wire 23, switch f', contact 15, wire 24, resistance 25, switch b', contact 20, wire 26 to grounded pole of source A. Magnet J now being energized by a reverse current, swings its switch j to close circuit at contact 27—when the circuit is established from source A, to junction X, magnet E, junction Y, wire 22, contact 27, switch j, wire 28, resistance 29, magnet B, to grounded pole of source A: thus energizing magnet B and restoring the metallic circuit as originally described. Magnet B is given sufficient lag so that it will not be caused to fail by the momentary interruptions due to the operation of the transmitters; nor until after its circuit has been opened for some predetermined period of time.

I will now describe the operation of the system under abnormal condition of a break occurring in any one of the loops—say, for example, at Z in member a of loop I. It has already been stated that each loop practically forms a short-circuit around its thermostatic switch. Hence the advent of the break in loop I removes that short-circuit, and the winding of bar S receives sufficient current to heat that bar, which accordingly closes circuit at contact 7. As already explained, most of the resistance of the heating coil of bar S is thus cut out, so that a low resistance shunt becomes established across loop I, over which shunt transmitters T′, T^2 can continue to send their signals. Or, in other words, so far as transmitters T′ and T^2 are concerned, loop I is cut out of circuit. But signals can still be sent from transmitter T, because the circuit can still be closed to ground G′ by said transmitter through member a' of loop I, as already described, despite the fact that circuit is broken at Z in member a, and both magnets D, E will still continue to be operated because the two leads proceeding from the non-grounded pole of source A and through said magnets D, E are tied together by the low resistance shunt established across loop I, also as already described. It is immaterial whether the break occurs in member a or a' of any loop I, II or III, and immaterial whether it occurs in one or more of the loops. The result is simply by the establishment of the low resistance shunt to short-circuit the loop in which the break occurs so far as the other loops are concerned, while leaving the transmitter in the impaired loop still operative to control the translating device at the receiving station.

It is, of course, to be understood that in cutting out parts of the heat coils of the thermostatic switches, enough of said coil is still to be left operating to heat the bars sufficiently to keep the contacts at 7, 8 9 closed.

I claim:

1. The combination of a source of current, a ground connection at one pole thereof, a metallic circuit including a plurality of loops in series, a ground connection from each of said loops, a transmitter in each of said loop ground connections, translating means in said circuit actuated by each of said transmitters, and means operating upon the occurrence of a break in either member of any loop for cutting said loop out of the series and establishing a current lead from the non-grounded pole of said source through the other member of said loop to the transmitter therein.

2. The combination of a source of current, a ground connection at one pole thereof, a metallic circuit including a plurality of loops in series, a ground connection from each of said loops, a transmitter in each of said loop ground connections, two translating devices in said circuit both actuated by each of said transmitters, and means operating upon the occurrence of a break in either member of any loop for cutting said loop out of the series and establishing a current lead including one of said translating devices from the non-grounded pole of said source and through the other member of said loop to the transmitter therein.

3. The combination of a source of current, a ground connection at one pole thereof, a metallic circuit including a plurality of loops in series, a ground connection from each of said loops, a transmitter in each of said loop ground connections, translating means in said circuit actuated by each of said transmitters, and means operating upon the occurrence of a break in any loop for individually short-circuiting said loop.

4. The combination of a source of current, a ground connection at one pole thereof, a metallic circuit including a plurality of loops in series, a ground connection from each of said loops, a transmitter in each of said loop ground connections, translating means in said circuit actuated by each of said transmitters, a shunt across each loop of relatively higher resistance than said loop, and means operating upon the occurrence of a break in any loop for removing the excess resistance in said shunt.

5. The combination of a source of current, a ground connection at one pole thereof, a

metallic circuit including a plurality of loops in series, a ground connection from each of said loops, a transmitter in each of said loop ground connections, translating means in said circuit actuated by each of said transmitters, a heating coil in shunt across each loop of relatively higher resistance than said loop, and a thermostat heated by said coil and operating upon the occurrence of a break in said loop to cut out a fraction of said coil sufficient to remove the excess resistance in said shunt.

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

ALBERT GOLDSTEIN.

Witnesses:

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