967,633.

A. GOLDSTEIN.

CIRCUIT MAINTENANCE SYSTEM.

APPLICATION FILED JAN. 22, 1906.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.

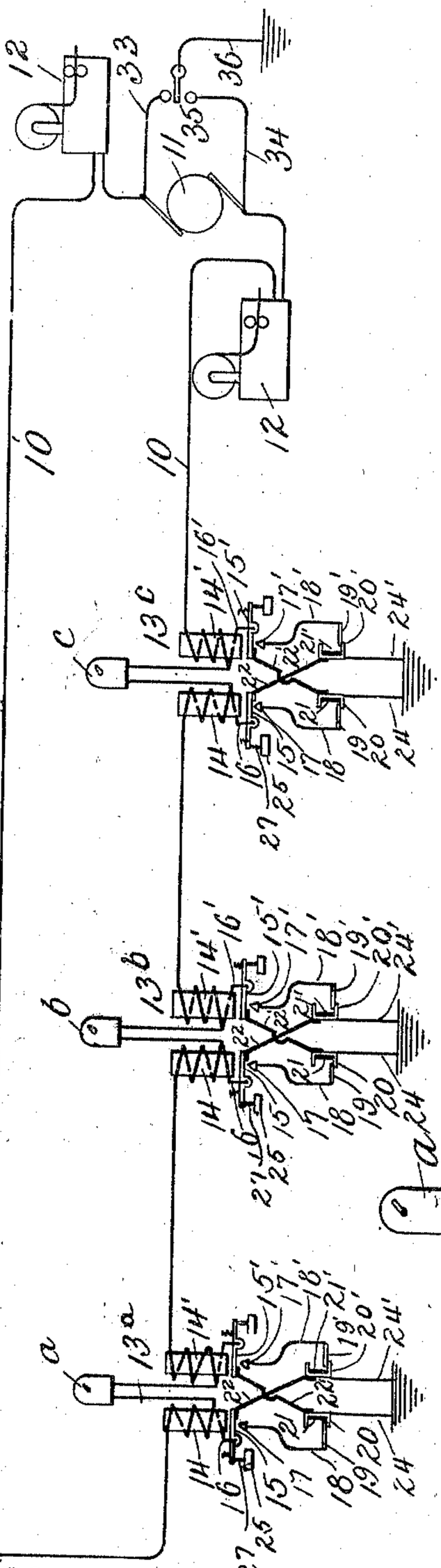

Fig. 1

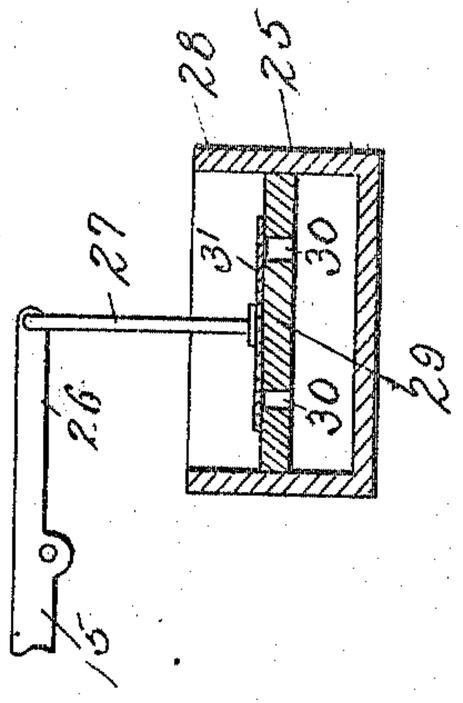

Fig. 3

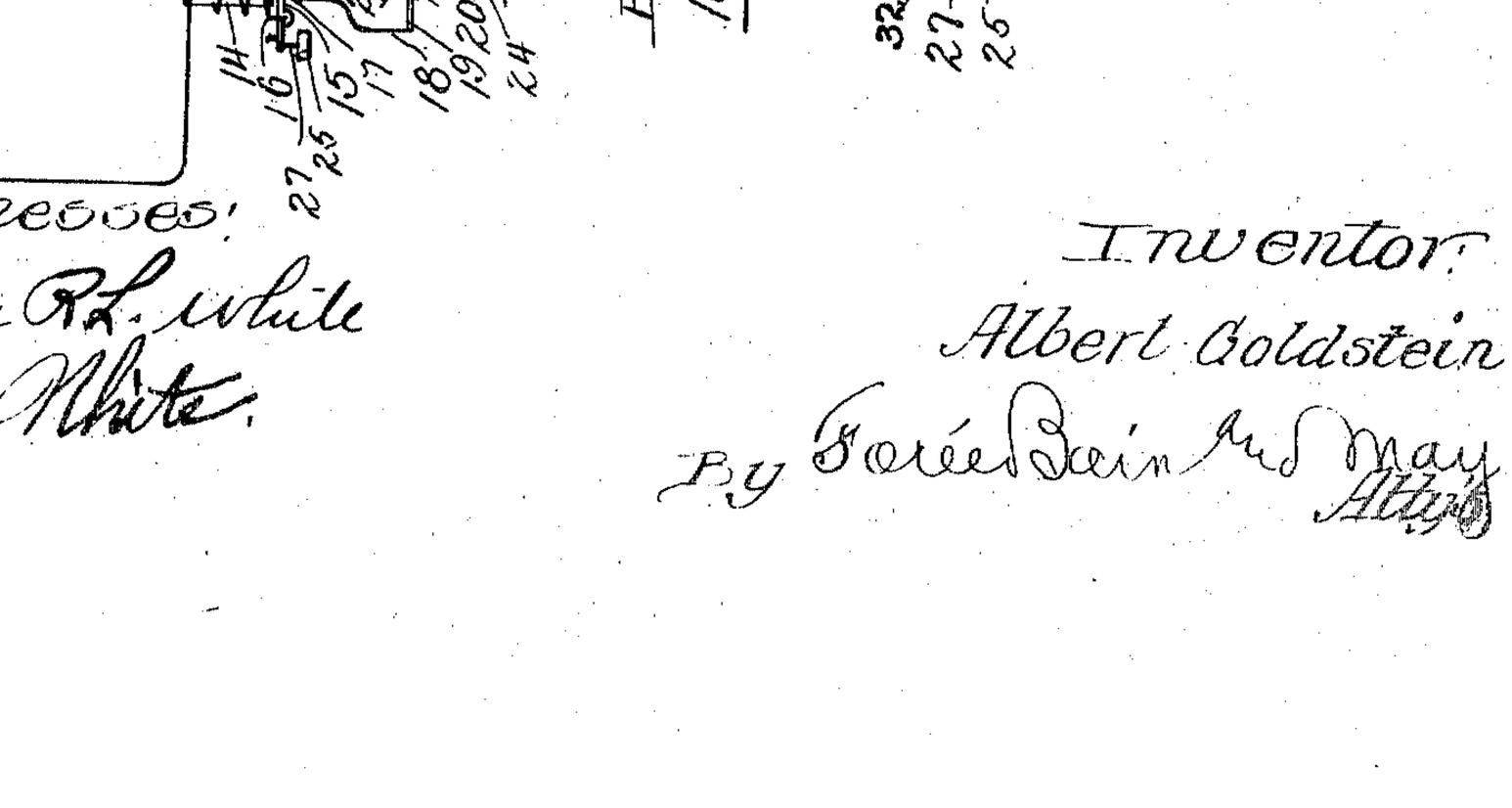

Fig. 2

Witnesses:

Harry R. L. White

Ray White.

Inventor:

Albert Goldstein

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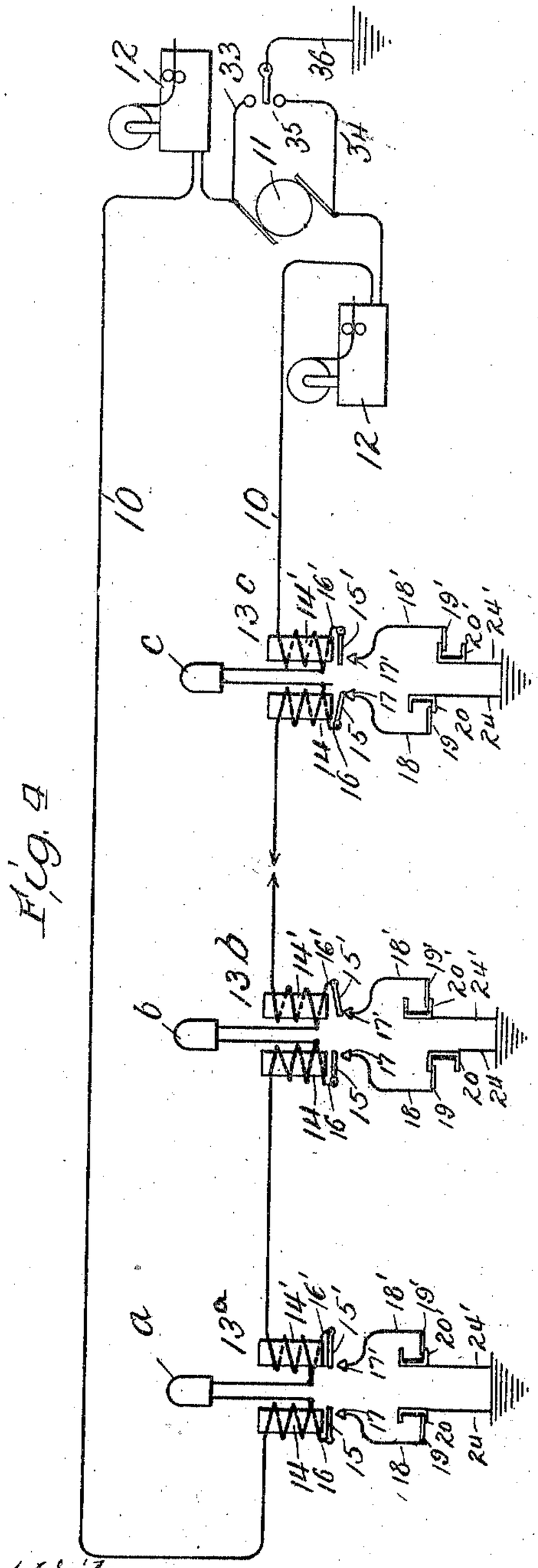

Fig. 4

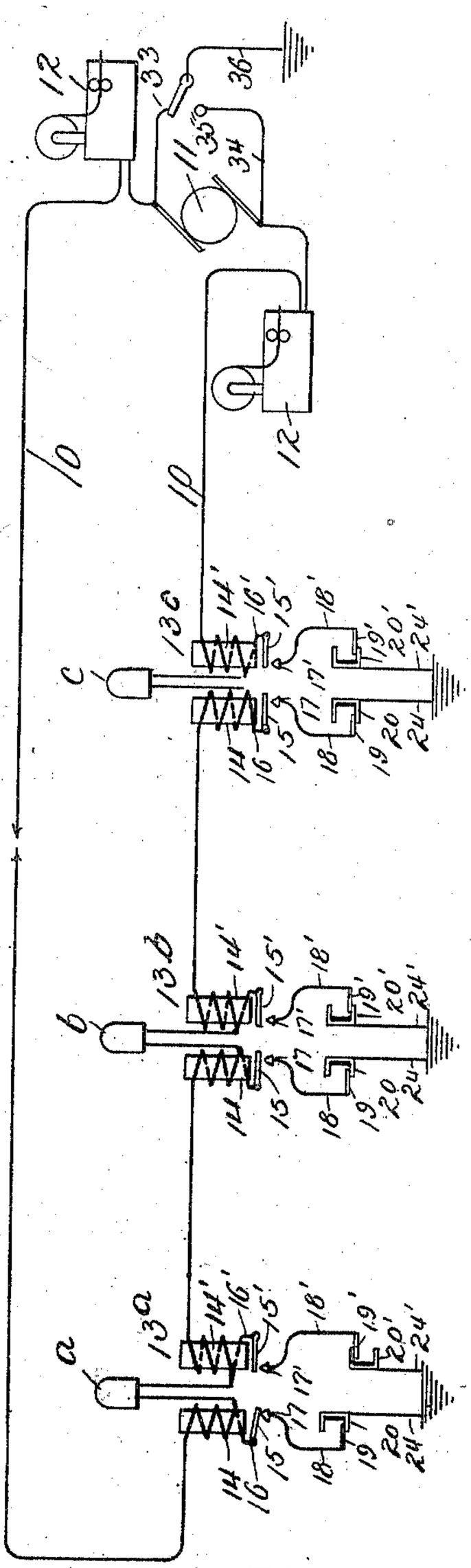

Fig. 5

Witnesses.

Harry R. L. White

Ray White

Inventor

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By Foree Bain and May

Attys

UNITED STATES PATENT OFFICE.

ALBERT GOLDSTEIN, OF NEW YORK, N. Y., ASSIGNOR TO AUTOMATIC FIRE PROTECTION COMPANY, A CORPORATION OF MAINE.

CIRCUIT-MAINTENANCE SYSTEM.

967,633. Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed January 22, 1906. Serial No. 297,141.

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 borough of Manhattan, State of New York, have invented certain new and useful Improvements in Circuit-Maintenance Systems, of which the following is a specification.

My invention has for its object to provide a circuit maintenance system, wherein means are provided for automatically establishing the circuit around any break that may occur within the circuit area protected.

Other and further objects of my invention will become apparent to those skilled in the art from the following description.

In the drawings, wherein I have indicated a system embodying my inveption, showing for convenience very simple mechanism for effecting the results; Figure 1 is a diagram of the system showing the arrangement of parts when the circuit is intact. Fig. 2 is a detail of a set of line grounding mechanism. Fig. 3 is a detail of a dash pot such as I may conveniently employ in connection with such mechanism. Fig. 4 is a diagrammatic view showing the condition of the system after a break in the line within the area protected. Fig. 5 is a similar diagram showing the conditions that may be caused to prevail upon the occurrence of a break without the circuit-area automatically protected.

Throughout the drawings like numerals of reference refer always to like parts.

While my invention is of very wide application and may be used to advantage under many different conditions in connection with various applications of electricity, it may be considered for purposes of illustration as applied to a supervisory signal system for automatic fire extinguisher systems. It is customary to maintain supervision over a number of buildings by means of instruments included in a single circuit, and it is obviously of utmost importance to provide against disabling of such a system by the rupture of a line wire between two of the areas to be protected—that is to say, between two of the buildings under supervision. By my invention I provide for the constant maintenance of a circuit through those areas of the normal circuit which it is desirable to protect—that is to say, through the portions of the normal circuit which are included in the buildings being supervised, and which includes the supervisory instruments for giving fire alarms and other alarms—even when the main line of the circuit is broken between two of the buildings equipped with the signaling apparatus, or between such a building and the central station. The specific manner of the accomplishment of this desideratum may best be gathered from the following description.

In the drawings 10 indicates in general a closed metallic circuit including a source of current supply, such as the generator 11, and preferably having therein means for indicating a cessation of current flow through the line, such for instance as the automatic signal registers 12—12, or any equivalent device, arranged on each side of the generator with respect to the circuit.

13ª, 13ᵇ and 13ᶜ indicate generally the circuit maintenance sets of any suitable number, which may be provided within the circuit area to be protected. The set 13ª, as best shown in Fig. 2, comprises a pair of electromagnets 14—14′, arranged in series in the circuit 10, on opposite sides of the signal transmitting device *a* and respectively provided with the armatures 15—15′, connected as by wires 16 and 16′ with the line wire 10 between the magnet coils 14, 14′. The back contact stops 17, 17′, of the respective armatures, are arranged in ground connections adapted to be made and broken, the ground connection for the contact of each armature being controlled by the opposite armature of the pair, and the parts being preferably so arranged that each armature when in raised or lowered position closes the ground connection of the back contact stop of the opposite armature, but during movement from unattracted to attracted position breaks the ground connection of the back contact of the opposite armature.

In the construction herein shown by way of illustration in a simple apparatus, 18 18′ indicate wires extending from the contacts 17, 17′ to the contact springs 19, 19′ respectively.

20, 20′ indicate forked contact members having their upper and lower points projecting respectively above and below the springs 19, 19′, so as to be capable of mak-

ing electrical contact therewith, and between said points insulated as shown at 21, 21′ to prevent contact of the fork with the coacting contact-spring during vertical movement of the fork. The fork 20′ is connected for movement with the armature 15, as by the insulated rod 22 and the fork 20 is oppositely connected, as by the insulated rod 22′ with the armature 15′. Permanent ground connections 24, 24′ are made from the forks 20, 20′.

The arrangement of parts is such that if the armature 15 be in either raised or lowered position the corresponding lower or upper tongue of the fork 20′ will make contact with the spring 19′ completing the ground connection of the back contact 17′ of the opposite armature 15′. During movement of the armature 15 from open to closed position, or vice versa, the insulation 21′ is drawn past the spring 19′ and the ground connection of contact stop 17′ is momentarily broken. The connection of contact 17 with the ground is similarly controlled by armature 15′.

Associated with each armature I preferably provide means tending to restrain the movement of the armature to a suitable extent in its opening movement only, such as the dash pot herein indicated generally by the numeral 25. Specifically referring to Fig. 3, wherein the dash pot is best shown, 26 indicates a convenient extension from the armature 15, beyond the pivot thereof.

27 indicates a dash pot stem, 28 the casing and 29 a piston within the casing secured to the stem 27 and provided with apertures 30 adapted to be closed by a valve 31.

The construction shown is obviously such that as the arm 26 is raised by the customary armature retracting spring, illustrated as 32, its movement is opposed to the full resistance of the dash pot, the valve 31 closing the aperture 30, but such that the closing movement of the armature under the influence of its magnet is not materially resisted, the depression of the dash pot plunger being accompanied by the raising of the valve member 31 and the opening of the ports 30, to permit free circulation of the air or other fluid employed in the dash pot.

It will be understood that each set of devices 13^b, 13^c, etc., is similar in all respects to that described.

Where the circuit area to be protected is less than the entire circuit, so that there is liability to rupture of the circuit outside of the area automatically protected, I prefer to provide means for grounding the source of current supply on either side thereof, and to this end I provide the wires 33 and 34 connected with opposite terminals of the generator 11, and leading to contact points of the single pole double throw switch 35 whose pole is grounded as by wire 36.

The operation of a system constructed and arranged as above described will be as follows: Normally the circuit stands in the condition shown in Fig. 1, no ground being upon the generator and the circuit being intact throughout. Accordingly all of the magnets 14 and 14′ are energized and their armatures lifted so that no armature is grounded. Assuming, however, that a break should occur within the area protected, as shown in Fig. 4, the operation will be as follows; As soon as the break occurs, current being simultaneously cut off from all of the magnets of the general numeral 14, all of them become deënergized and their armatures 15 fall in unison. During this movement the ground connections of all of the back contacts are broken, but when the armatures are clear down and in contact with their back contacts 17, the ground connections of said back contacts are reëstablished through the wires 17, the upper fingers of the forks 20 and the wires 24. Consequently current from the generator finds its way through the circuit 10 to the nearest ground path afforded through the coil of the magnet 14, shown to the extreme left in the drawing, the wire 16 and armature 15, contacts 17, wire 18, spring 19, fork 20, and wire 24, returning through the path 24′, 20′, 19′, 18′, 17′, 15′, 16′, of the grounded connection at 13^c on the opposite side of the break in the line wire. The circuit established, however, including as it does the coil of the magnet 14, causes the armature 15 of said magnet to be attracted. In its responsive upward movement the said magnet, as heretofore described, through its connection with the part 20′ momentarily breaks the ground connection of the opposite armature 15′. Consequently its own ground connection being broken as it leaves the contact 17, the current is compelled to seek ground through some connection nearer the break, and, in the showing of Fig. 4, such connection being provided through the middle set of ground connections at 13^b, the magnet 14′ of set 13^a becomes energized and the armature is accordingly raised, breaking the ground connection at the contact point 17′. This action continues with each pair of magnets until the set nearest the break on the opposite side of the generator is reached when the first magnet 14 only, having its ground connections on the far side of its magnet windings, with reference to the generator, will be energized, as heretofore described, causing the momentary breaking of the ground connection of the opposite armature of the couple, but there being no further ground connections between said point and the break in the line, the armature of said magnet 14′ nearest the break is not energized and its armature is not lifted, so that when the armature

of the left hand magnet 14 of the pair gets home and reëstablishes the ground connection between the back contact 17′ and the ground, the grounded condition of the magnet armature nearest the break is permanently established, the ground being removed from all armatures between said points and the generator on the opposite side. On the opposite side of the break, it will be apparent that the same result will have ensued, all of the magnets being energized save the one nearest the break and its armature alone remaining down, and making a ground connection.

It will be apparent that when the first-acting armature of a couple rises to closed position breaking the ground connection of the opposite armature, and no current path is supplied beyond the opposite magnet on account of the presence of the break, the effect will be as of the initial break and all of the armatures will tend to fall. It is for the purpose of preventing this effect that I provide the dash pots, or other retarding devices for the armatures, the retardation of said dash pot to the opening movement only of the armatures preventing their return to open position before the ground is reëstablished at the armature nearest the break. Other means for the same end may obviously be provided however.

Momentum carries the armature 15 of set 13^b to bring part 20 up into upper contacting position, while the retarding devices prevent the other armatures, as of set 13^a back of the one in question, from falling during the instant's break of the circuit. The dash pots are illustrative of any suitable one-way retarding devices.

It will thus be seen that I provide in conjunction with the circuit or circuit-part to be protected, means operable upon the occurrence of a break in the circuit or circuit-part to automatically establish a ground upon each side of the break and thus maintain the circuit in operative condition.

When the circuit area automatically protected is less than the entire circuit, as is herein illustratively shown, and the break occurs between the source of current supply and the circuit part protected, the protected part of the circuit may be maintained in commission by grounding the side of the generator between which and the circuit part to be protected the break has occurred. Such a condition is illustratively represented in Fig. 5. When the break occurs notice thereof is given by the recording instrument at central station, as usual, and from the fact that the circuit does not almost immediately restore itself to permit the flow of current therethrough it is indicated to those at the central station that the break is in the line wire between the area protected and "central". The hand switch 35 is accordingly thrown to one side, and then if necessary to the other. Upon taking position to ground the appropriate brush of the generator, ground connection is established on both sides of the generator and current flows through the circuit area to be protected as far as the magnet nearest the break, all of armatures between said last magnet and the generator, restoring themselves as heretofore described.

While I have herein shown a very simple embodiment of my invention with the protection applied to a portion of a simple single series circuit, it will be apparent that the principles of my invention may be applied to circuits for many diverse purposes, and I do not desire to be understood as limiting myself to the simple circuit arrangement herein shown and described further than as specified in the claims. Further it will be apparent that while for a convenient understanding of my invention I have shown the central station equipped with apparatus for determining the condition of the line and indicating a break therein, such apparatus might be omitted. Further I desire it to be understood that I appreciate that a metallic return might be employed instead of the ground return with generally equivalent results as those described, and I, therefore, desire it to be understood that in employing the term "ground" I use it in its broad sense of an electrically conducting body of such extent and arrangement that the necessary parts may be connected thereto in common whether such body be the earth, a wire or other conductor.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, of the United States, is:

1. In a circuit maintenance system, a circuit to be maintained, a source of current supply therefor, signal transmitting devices associated with said circuit at separate points, a pair of electromagnets associated with each signal transmitting device arranged in the circuit on opposite sides thereof, armatures for said magnets, means for grounding the armatures to said magnets, and circuit breaking means in the ground connection of each armature for preventing the maintenance of the ground connection thereof if, through some other ground connection, a circuit be established from the source of current supply through the magnet with which said armature is connected.

2. In a circuit maintenance system, a circuit to be maintained, a source of current supply therefor, electromagnets arranged in series in said circuit in pairs, an armature for each magnet, the armatures for a pair of magnets being connected with the circuit to be maintained on adjacent sides of their respective magnets, normally open ground connections for the respective armatures and

means actuated by each armature for controlling the ground connection of the opposite armature.

3. In a circuit maintenance system, a circuit to be maintained, a source of current supply therefor, a pair of magnets in said circuit each having an armature, connections from said armatures to the circuit to be maintained on adjacent sides of their respective magnets, a back contact for each armature arranged for connection with the ground, means actuated by each armature for controlling the ground connection of the opposite armature, and means for retarding the movement of each armature toward its back contact.

4. In a circuit maintenance system, a circuit to be maintained, a source of current supply therefor, a pair of magnets in said circuit each having an armature, connections from said armatures to the circuit to be maintained on adjacent sides of their respective magnets, a back contact for each armature arranged for connection with the ground, means actuated by each armature for controlling the ground connection of the opposite armature, means for retarding the movement of each armature toward its back contact, and means for grounding the circuit to be protected on either side of the source of current supply.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

ALBERT GOLDSTEIN.

In the presence of—
A. M. CROOKER,
H. S. BULLOCK.