

E. B. WEDMORE.
LEAKAGE INDICATOR AND CONNECTIONS.
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1,085,309.

Patented Jan. 27, 1914.

Fig.1.

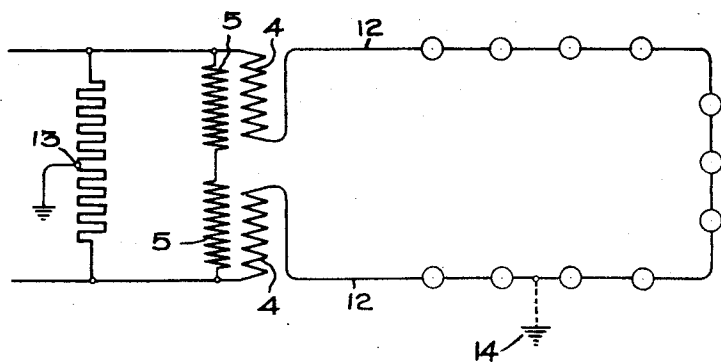
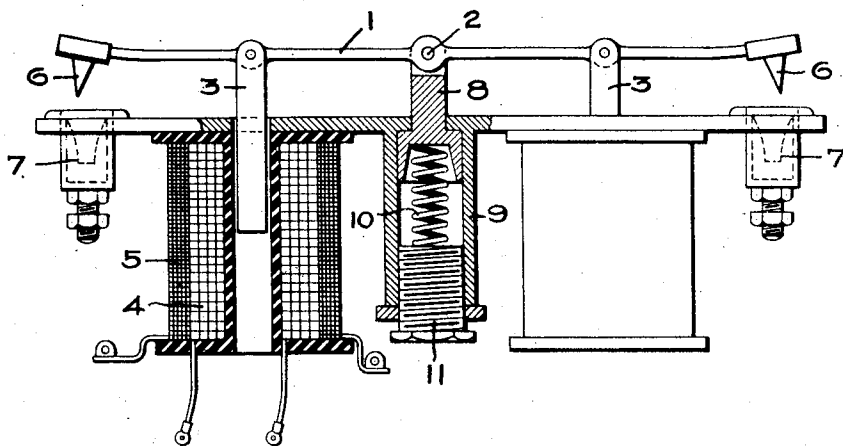


Fig.2.



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UNITED STATES PATENT OFFICE.

EDMUND B. WEDMORE, OF RUGBY, ENGLAND, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LEAKAGE INDICATOR AND CONNECTIONS.

1,085,309.

Specification of Letters Patent.

Patented Jan. 27, 1914.

Application filed March 8, 1911. Serial No. 613,143.

To all whom it may concern:

Be it known that I, EDMUND B. WEDMORE, a subject of the King of Great Britain, residing at Rugby, England, have invented certain new and useful Improvements in Leakage Indicators and Connections, of which the following is a specification.

My invention relates to a relay or indicator and its connections in a system of distribution.

It is common to use a relay or indicator having coils in series with the transmission lines where these coils act on a balanced beam in such a way that under normal conditions the pull of the coils balance and oppose each other. When, however, one side of the transmission line develops a fault, one of the coils will take more or less current and hence exert a more or less pull, thereby unbalancing the beam and indicating the trouble. These devices operate in proportion to the difference between the pulls on the different parts of the beam, which difference is a function of the difference between the ampere-turns on the various coils. Now, as is well known, the permeability varies with the flux density, though not directly. In order to make the device as sensitive as possible, it is necessary that the permeability be large, and the device small. On any distribution system, the device must have a large number of series turns in order to operate on a small value of leakage current to ground which causes a great number of ampere turns for the normal series current, and hence with a small device a great flux density and small permeability due to saturation of the iron core. A large device is therefore necessary to secure a large value for permeability. To overcome this undesirable feature I employ another coil acting in opposition to each series coil and therefore tending to bring the flux density of each armature to a more desirable value; this second coil may be energized in various ways to secure the desired result and I have shown here the connecting of the auxiliary coils in series across the line.

In the drawings which form a part of this specification similar reference characters refer to the same parts.

Figure 1 is a diagrammatic view of a part of a system of distribution showing the connection of my protective device in the

system. Fig. 2 is an elevation partly in section of one form of the device.

I have shown my protective device as a relay which may close a circuit to another device at any place which will there indicate that trouble has occurred, or may close a circuit to operate a circuit breaker to open the main system. It is obvious that the device illustrated may be used to itself indicate that trouble has occurred and not act as a relay at all. I have shown my device as applied to a two wire direct current circuit, but its use is of course not limited to such a system. The relay I have shown has a lever 1 pivoted at 2. At equal distances from the pivot 2 are armatures 3, each of which is controlled by a solenoid. Each solenoid has two coils 4 and 5 of an appropriate number of turns. At the ends of the lever I have shown the contacts 6 which, when trouble has occurred, contact with either or both of the contacts 7, which may be mercury cups as shown or any other common form of contact. Of course, when the device is to be used as an indicator directly and merely, it is not necessary that these contacts be used. The pivot 2 is supported by a longitudinally movable member 8 which operates in the guide 9, and is supported in turn by the spring 10. At the bottom of the guide 9 is inserted the screw 11 which by being moved into or from the guide 9 may increase or decrease the tension on the spring 10 and thus determine at what overload the device will operate; this overload operation will be later described. Although I have described this specific form of relay and indicator, it will be understood that this specific form is not necessary, but that this specific form is shown as one which includes the necessary features of my device.

One coil of each pair is connected in series with a main of the distribution system. The other coils are to be supplied with energy in such quantities that their pull on the armatures 3 will be equal and balance each other, and they are preferably wound so that for the average load on the system they will neutralize the effect of the series coils. In Fig. 1 I have shown the coils 4 connected in series with the mains 12. To supply the coils 5, which as connected should have the same number of turns, I have connected them in series between the mains 12. In order that one of the series coils may take an increase of current on the grounding

of a single one of the mains, it is necessary that there be some grounded point in the system; there is in most systems some point connected to ground which may be located
 5 as I have shown at 13, the mid point of very high resistance connected between the mains; this resistance is so high that practically no current is taken under normal conditions.

The operation is as follows: When a
 10 ground occurs, for instance, on one main as at 14, the lower series coil will carry more current than the other. Under normal conditions the two coils 5 exactly balance each other and the coils 4 exactly balance each
 15 other and hence the lever 1 stands in the mid-position as illustrated in Fig. 2. During the continuation of the ground at 14, since one series coil has more current flowing through it than is flowing through the
 20 other, the lever 1 is unbalanced, and that end of the lever which is controlled by the first coil is pulled down. Although there is a ground at 14, nevertheless it will be apparent from the drawing that the coils 5 still bal-
 25 ance each other. Suppose for another example that instead of there being a ground the two mains 12 are short circuited at some point. The coils 4 although taking a much greater current than under normal condi-
 30 tions still balance each other, the coils 5 still balance each other and neither end of the lever 1 experiences a greater pull than the other, but if the combined pull of the two is greater than the pressure exerted by
 35 the spring 10 the lever 1 is bodily moved laterally downward, thus indicating the short circuit. The screw 11 thus becomes of use to regulate the amount of overload allowable. Although I have shown this spe-
 40 cific form of relay and shown it connected in this specific system of distribution, it will be understood of course that my invention is not limited to exactly what is shown but that the scope of my invention is defined in
 45 the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is—

1. In a system of distribution, mains and a relay or indicator, said relay or indicator
 50 including a movable member, a single solenoid connected to receive current proportional to the current in each main and controlling said member, and an opposing coil adjacent each solenoid.
 55 2. In a system of distribution, mains and

a relay or indicator, said relay or indicator including a movable member, a solenoid connected to each main and opposing the action on the movable member of each of the remainder of the solenoids, and a constantly
 60 opposing coil adjacent each solenoid.

3. In a system of distribution, mains and a relay or indicator, said relay or indicator including a movable member, a solenoid in series with the load in each of the mains and
 65 acting on the movable member and constantly opposing coils adjacent the solenoids and connected in shunt to the load.

4. In a system of distribution, mains and a relay or indicator, said relay or indicator
 70 including a movable member, a solenoid for each main connected to receive current proportional to the current therein and acting on the movable member, and opposing coils adjacent the solenoids and connected in
 75 shunt to the load.

5. In a system of distribution, mains and a relay or indicator, said relay or indicator including solenoids connected to the mains, a beam responsive to the unbalanced action
 80 of the solenoids, a fulcrum for the beam, and a yielding means for the fulcrum.

6. In a system of distribution, mains and a relay or indicator, said relay or indicator including solenoids connected to the mains,
 85 a beam responsive to the unbalanced action of the solenoids, a fulcrum for the beam, and an adjustable yielding means for the fulcrum.

7. An indicator including a balanced
 90 beam, solenoids controlling said beam at different sides of the fulcrum and yielding means supporting said beam.

8. A relay including a balanced beam, coils controlling said beam at different sides
 95 of the fulcrum, contacts on said beam, contacts to be engaged by said contacts on the beam and yielding means supporting the beam.

9. An indicator including a balanced
 100 beam, solenoids controlling said beam at different sides of the fulcrum, yielding means supporting said beam and means for adjusting the tension of said yielding means.

In witness whereof, I hereunto set my hand this 20th day of February, 1911.

EDMUND B. WEDMORE.

Witnesses:

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 ERNEST M. WARD.