(No Model.)

W. J. HAMMER.

INDICATOR FOR ELECTRIC LIGHTING SYSTEMS.

No. 363,333. Patented May 17, 1887.

FIG. 1.

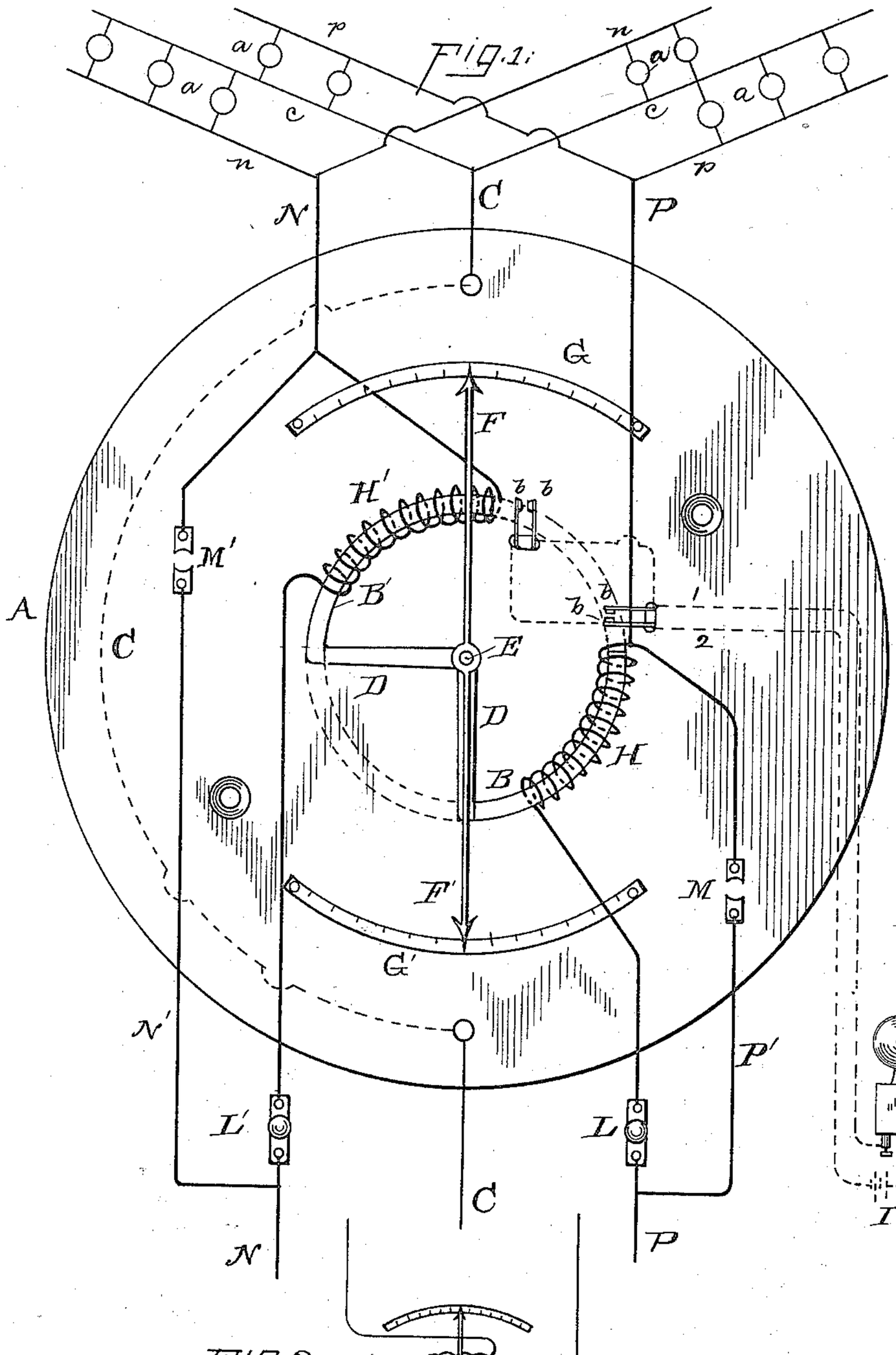
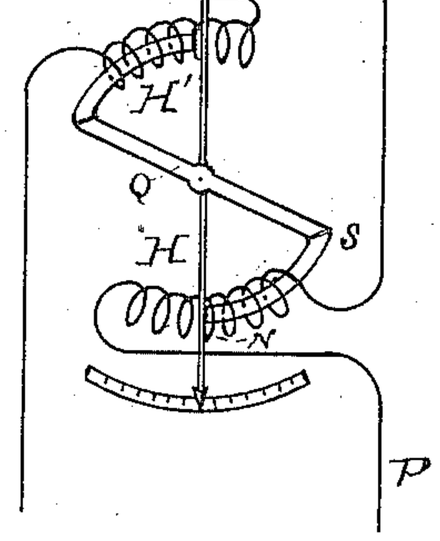


FIG. 2.



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INDICATOR FOR ELECTRIC-LIGHTING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 363,333, dated May 17, 1887.

Application filed December 16, 1886. Serial No. 221,753. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. HAMMER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Indicators for Electric-Lighting Systems, of which the following is a specification.

My invention relates mainly to the Edison three-wire or compensating system of electrical distribution, in which two or more feeding circuits, each consisting of a positive, negative, and compensating or neutral conductor, extend from the source of current to different parts of the district supplied, where they are connected to a system of connected positive, negative, and neutral mains or lighting-conductors, with which the electric lamps or other translating devices are joined in multiple series, as is now well understood. In such a system it is desirable to maintain the system as nearly at a balance as possible—that is, to supply as nearly as possible the same number of lamps from one side of a feeding-circuit as from the other, so that all the lamps will receive the same current and there will be less breakage of lamps caused by excess of current in those on one side of a feeder.

In practice it is found that the balance on a feeder changes in different ways at different hours of the day, as the various consumers connect and disconnect their lamps. For instance, at one hour the "A" side of a feeder will have more lamps on it than the "B" side, while an hour later the "B" side will have the larger number. At the same hours other feeders may be balanced and others may vary in the opposite way.

The main object of my invention is to provide an indicating device whereby the condition of each feeder as regards the relation between its two sides will be constantly shown. By this means, if note is taken during one day of the variations on each feeder, the next day the connections of different consumers may be changed from one side to the other, so that after a few days the system may be brought to a state of substantial equilibrium in all its parts.

To this end I provide a differentially-operating instrument for each feeder connected with the positive and negative sides thereof, whereby when the current on the positive side preponderates indication in one direction will be produced, while preponderance on the negative side produces an opposite indication.

The indicator which I have devised may be employed also in other situations, when it is desired to show whether or not the current in one circuit exceeds that in another; but it was devised with especial reference to use in the three-wire electric-lighting system, as above described. The indicator may also be used as an ampère meter, to show directly the current on either side of the circuit at any time.

My invention is illustrated in the annexed drawings, in which Figure 1 is a plan view and partial diagram showing the preferred form of my indicator in connection with a three-wire feeder, and Fig. 2 a diagram of a modified form of the instrument.

The instrument is mounted upon a suitable base, A, of insulating material, adapted to be secured upon a wall or in any other convenient position within the central station from which the feeding-circuits extend.

P, C, and N represent, respectively, the positive, neutral or compensating, and negative conductors of a feeding-circuit. These conductors extend to the positive, negative, and compensating main or lighting conductors *p n c*, with which the translating devices—electric lamps, electric motors, &c.—*a a* are connected in multiple series. It will be understood that any suitable number of such feeders may extend from the central station to the same connected system of mains, and each feeder is preferably provided with an indicator such as I shall now describe.

This indicator in its preferred form, as shown in Fig. 1, consists of two curved soft-iron cores, B and B′, each of which is connected by an arm, D, with a central pivot, E, pivoted on the base. I prefer to have extending from the pivot two pointers or needles, F and F′, (though one only may be used,) and the ends of these needles move over suitable graduated scales G and G′ on the base.

The conductor P is thrown into a coil, H,

which incloses the core B, and conductor N into a coil, H′, inclosing core B′. The conductor C is not connected with the instrument, but may extend under or around the base, as indicated by the dotted line. The coils H and H′ are wound to act normally equally upon their cores.

When more lamps are being supplied by the positive side of the feeder than by the negative, more current flows over conductor P and through coil H than over conductor N through coil H′, and the cores are therefore moved against the influence of coil H′, and the pointer F moves to the left on its scale, whereby the preponderance on the positive side is shown. An excess of current on the conductor N produces an opposite effect on the instrument, the pointer being thereby deflected to the right. Every variation in the balance of the system is thus indicated, and the necessary steps may then be taken to remedy such variations, as already explained.

I may provide in connection with the instrument an alarm for showing when either side of the circuit is broken by the fusing of a safety-catch due to an abnormal or unusually great load on a conductor.

Two contact-springs, *b b*, normally insulated from each other, are placed in proximity to the end of each movable core, and both these pairs of springs control a local circuit, 1 2, containing a battery, I, and electric bell K.

If a safety-catch in one side of the circuit should break, there will be no opposition to the action of the solenoid on the other side, and the excessive movement thus given to the core will cause the same to strike its pair of contact-springs and close the local circuit, whereby the bell is rung and the abnormal state of the system indicated, so that measures to remedy the same may be taken immediately before the safety-catches of other feeders are fused by the additional current thrown on them.

In order that the instrument may be made to indicate directly the current on either side of the system, I employ certain additional features, as follows: A shunt, P′, is formed around coil H and around a plug-switch, L, in conductor P, such shunt being provided with a plug-switch, M; and a similar shunt, N′, with plug-switch M′, is formed around coil H′ and switch L′ in conductor N.

By withdrawing the plug at L and inserting one at M, the coil H is cut out of circuit, and the current will therefore act on the core B′ alone and the pointer will be moved upon the scale, which, the scale being graduated for ampères, will show the current flowing on that conductor in the circuit. The same indication may be produced by cutting out coil H′, so that coil H acts alone on the pointer.

In the modification shown in Fig. 2 the cores B B′ are connected directly by a single pivoted arm, Q. In this case one or both of the cores is polarized, as indicated, so that the coils affect the needle oppositely, as before.

In either form of instrument the curved cores may be connected by non-magnetic extensions, so as to form a complete circle, as indicated by dotted lines in Fig. 1.

What I claim is—

1. The combination, with a three-wire circuit of a compensating system of electrical distribution, of a differential indicating-instrument affected oppositely by the current in the positive and negative conductors of said circuit, substantially as set forth.

2. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of a differential indicating-instrument affected oppositely by the current in the positive and negative conductors of said feeding-circuit, substantially as set forth.

3. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of a coil included in the positive conductor, another coil included in the negative conductor, and an indicating device affected differentially by the magnetizing effect of said coils, substantially as set forth.

4. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of a coil included in the positive conductor, another coil included in the negative conductor, a movable core for each of said coils, and a pointer connected with said cores, so as to be moved in one direction or the other by the differential action of said coils, substantially as set forth.

5. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of a curved coil included in the positive conductor, another curved coil included in the negative conductor, a movable curved core for each of said coils, a pivoted arm joining said cores, and a pointer connected with said arm and moved in one direction or the other by the differential action of said coils, substantially as set forth.

6. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of an electrically-operated alarm in connection with each side of the circuit, affected by abnormal currents therein, substantially as set forth.

7. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of an electro-magnetic device in the positive conductor and another in the negative, and a local circuit including a battery and bell, adapted to be closed by the movements of said electro-magnetic devices due to abnormal currents, substantially as set forth.

8. The combination, with a three-wire feeding-circuit of a compensating system of electrical distribution, of a coil included in the positive conductor, another coil included in the negative conductor, a movable core for

each of said coils, a pointer connected with said cores, so as to be moved in one direction or the other by the differential action of said coils, a switch in each conductor, a shunt around the coil and switch of each conductor, and a switch for each shunt, substantially as set forth.

This specification signed and witnessed this 10th day of December, 1886.

WM. J. HAMMER.

Witnesses:
WM. PELZER,
JOHN F. RANDOLPH.