No. 848,915. PATENTED APR. 2, 1907.

E. B. MERRIAM.

TRIP COIL FOR CIRCUIT BREAKERS.

APPLICATION FILED FEB. 15, 1905.

Fig. 1.

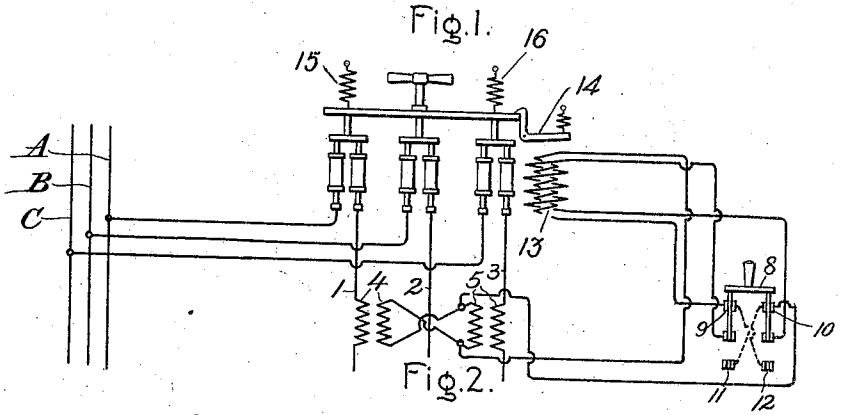
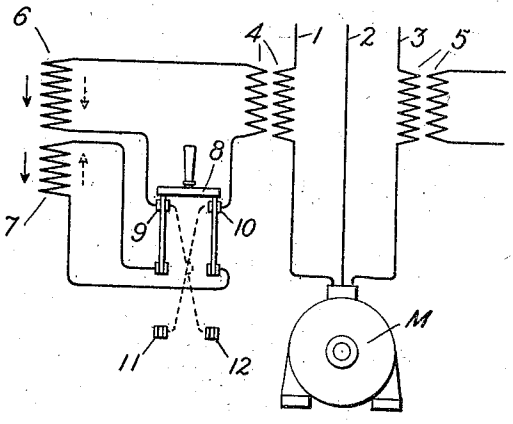


Fig. 2.



Witnesses.

Harry D. Tilden

Helen Alford

Inventor.

Ezra B. Merriam

by Albert G. Davis

Atty

UNITED STATES PATENT OFFICE.

EZRA B. MERRIAM, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TRIP-COIL FOR CIRCUIT-BREAKERS.

No. 848,915. Specification of Letters Patent. Patented April 2, 1907.

Application filed February 15, 1905. Serial No. 245,648.

To all whom it may concern:

Be it known that I, EZRA B. MERRIAM, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Trip-Coils for Circuit-Breakers, of which the following is a specification.

This invention relates to automatic circuit-interrupting means, and has for its object the provision of improved means for varying at will the load under which the trip device will be automatically operated to break the circuit.

In the starting of electric motors considerable annoyance is often caused by the tripping of the circuit-breaker at the first rush of current upon the closing of the circuit. This is most particularly annoying in the case of induction-motors, where an excessive alternating current flows in starting and an oil-switch is set to normally trip at a certain overload. In this case the excessive starting-current will immediately trip the circuit-breaker. This is undesirable, since the armature of the motor will usually stand heavy current for such a time as is necessary for it to reach normal speed.

It has been the standard practice when the tripping-coil is excited from a current-transformer to short-circuit the coil. This overcomes the objectionable feature of the circuit-breaker tripping out; but it does not protect the apparatus until the shunt or short circuit is removed.

In carrying out my invention I make use of a special feature for the tripping mechanism by providing means whereby a change in the calibration of the mechanism may be effected temporarily and at the will of the operator. I am aware that it has been proposed to change the calibration by varying the tension of the tripping-spring, and likewise by providing two springs of different tensions, together with means for shifting them so that the tension of the trip may be instantaneously changed. These devices, while to a certain extent overcoming the difficulties above noted, are still open to objections. They necessitate the use of a circuit-breaker in which the trip is spring-pressed and will not be capable of use where a gravity-operated trip is employed. Moreover, in many forms of circuit-breakers the construction is such that where a spring-trip is used it is not accessible, and considerable modification in structure would be necessary to bring about a change of calibration in this way. In addition to this it is necessary in devices of this character that the change in calibration be effected at the circuit-breaker instead of at a remote point, as is often desirable.

The means which I employ to vary the calibration is very simple and consists merely in providing a trip-coil with differential windings, which may be joined or opposed by means of a switch to vary the pull of the magnet-coil.

I have illustrated my invention in connection with a particular type of circuit-breaker—*i. e.*, the oil-switch type for alternating currents; but it is to be understood that I do not limit myself as to the type of switch or the nature of the current used beyond the scope of the claims appended to and forming a part of this specification.

Referring to the drawings, Figure 1 shows a circuit-breaker provided with my improved trip-coil, and Fig. 2 shows a diagram of the circuits.

Referring to Fig. 2, 1, 2, and 3 represent the leads of a three-phase circuit, two legs of which are provided with the current-transformers 4 5. The circuit extends from the generator-leads A, B, and C through the oil-switch and the leads 1, 2, and 3 to an induction or similar motor M. As the mechanism which these two transformers operate is the same, I shall only describe one of them, although it is to be understood that a similar trip-coil and means for changing its calibration may be used in connection with transformer 5 instead of connecting both transformers to the coil in the manner shown in Fig. 1. 6 and 7 represent two companion windings of a trip coil which are simply shown diagrammatically in this figure, but which in practice will both be wound on one spool and provided with a core. 8 is a double-pole double-throw switch, the middle contacts of which are connected with the terminals of coil 7. The coil 6 is in series with the secondary of transformer 4 and has one terminal connected to the upper contact 9 of the switch, while the terminal of the secondary is connected with contact 10. Contacts 9 and 10 are cross-connected, as shown in dotted lines, with the lower contacts 11 and

12. From this it will be seen that when the switch-blades are in the position shown the current from the transformer will pass through the coils 6 and 7 in the direction shown by the heavy arrows, while when the switch is thrown so as to make contacts at 11 and 12 the direction of the current through these coils is indicated by the dotted arrows. Thus when the switch is in its upper position the windings, and therefore the fluxes of the coils 6 and 7, will be joined, while with the switch in the lower position they are opposed. For instance, suppose the coil 6 has sixty turns and the coil 7 has forty. Then when the switch is so set that the current flows in the same direction through both coils there will be one hundred effective turns; but when the current through coil 7 is reversed by throwing the switch to the lower position there will be only twenty effective turns, giving a ratio of five to one, or when three amperes is the normal tripping-current it would require fifteen amperes to trip the same device when the switch is reversed and the ratio changed.

In Fig. 1 I have shown conventionally an oil-switch for three-phase current provided with a tripping mechanism which includes the differential trip-coil above described. As my invention does not relate to the specific switch mechanism, and, moreover, as switches of this character are old and well known, a description thereof is unnecessary. Let it therefore suffice to say that when the differential coil 13 is energized the trip 14 is drawn down, and the springs 15 and 16 operate to break the circuit in a well-known manner. It will be understood that the trip-coil will be arranged to trip at a certain overload-current; but upon starting in order to prevent the circuit-breaker from tripping out, due to the first rush of current which the motor can stand for a short time, the switch 8 is thrown into engagement with the contacts 11 and 12, connecting the windings of the trip-coil in opposition to each other, so that a current greater than normal will be required to cause the trip-coil to actuate the circuit-breaker.

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

1. The combination with an automatic circuit-breaker, of mechanism for tripping the same comprising a trip-lever, an electromagnet having differential windings for actuating the same, and a circuit-changer for varying at will the relative directions of a current through said windings.

2. The combination with an automatic circuit-breaker, of mechanism for tripping the same comprising a trip-lever, an electromagnet having differential windings for actuating the same, and means whereby the fluxes due to a current through the windings may be joined or opposed at will.

In witness whereof I have hereunto set my hand this 13th day of February, 1905.

EZRA B. MERRIAM.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.