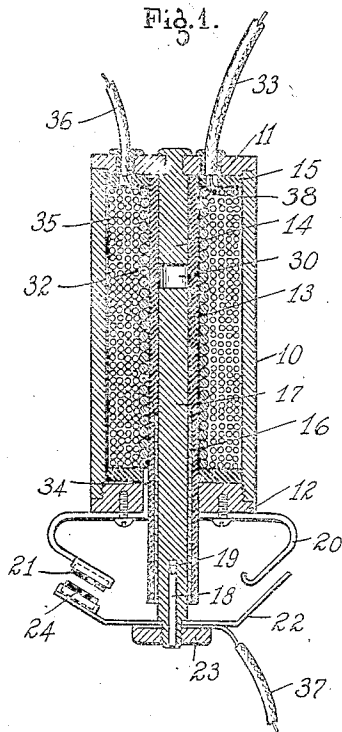
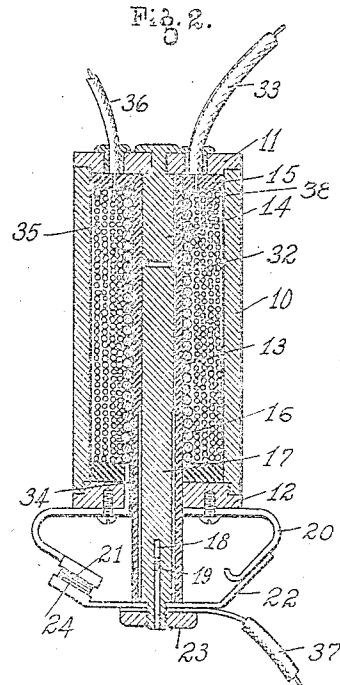
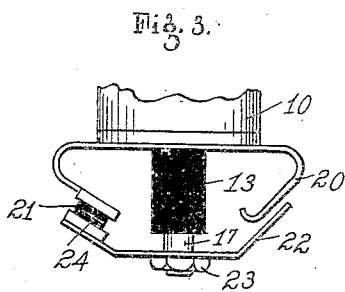
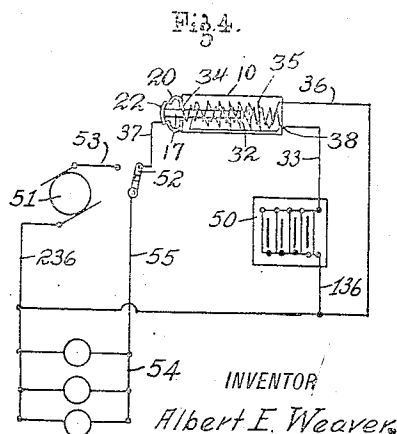


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 REVERSE CURRENT AND LOW VOLTAGE CIRCUIT BREAKER.
 APPLICATION FILED JULY 20, 1914.

1,293,587.

Patented Feb. 4, 1919.



WITNESSES:
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UNITED STATES PATENT OFFICE.

ALBERT E. WEAVER, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO SWARTZ ELECTRIC CO., OF INDIANAPOLIS, INDIANA, A CORPORATION.

REVERSE-CURRENT AND LOW-VOLTAGE CIRCUIT-BREAKER.

1,293,587.

Specification of Letters Patent.

Patented Feb. 4, 1919.

Application filed July 20, 1914. Serial No. 852,015.

To all whom it may concern:

Be it known that I, ALBERT E. WEAVER, a citizen of the United States, and a resident of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Reverse-Current and Low-Voltage Circuit-Breakers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters refer to like parts.

This invention has been designed for particular use in connection with an individual electric lighting plant wherein a storage battery is employed which is charged from a generator driven by an internal combustion engine and the generator serves both the function of the generator for generating electricity and charging the battery and supplying the lamps, and the generator serves also as a motor, taking its current from the storage battery for starting the engine.

The object of the invention is to protect the storage battery from overdischarge and to prevent the current from reversing and the battery from discharging through the generator as a motor, during the charging operation, and to accomplish said objects by a simple means which is iron clad and does not arc.

The full nature of the invention will be understood from the accompanying drawings and the following description and claim.

In the drawings, Figure 1 is a central vertical section through such circuit breaker in normal position. Fig. 2 is the same in actuated position. Fig. 3 shows the lower part of Fig. 1 with the device partially actuated midway between the positions shown in Figs. 1 and 2. Fig. 4 is a diagram of the wiring.

There is shown herein an iron shell which is tubular in form with an iron cap at one end and an iron screw cap at the other end. Centrally within said shell a fiber tube 13 is secured, one end surrounding a central, inwardly extending stationary iron rod 14 which is secured to the cap 11, and the other end of the tube 13 extends through and beyond the cap 12. At each end of the shell on the inside of each cap there is also a fiber disk 15. Within the outer portion of the tube 13 there is a thin brass tube 16 which serves as a guide for a

plunger 17. The outer end of the plunger 17 projects beyond the sleeve and is slotted at 18 and through said slot a cotter pin 19 extends from the tube 13 so as to limit the outward movement of the plunger and also guide actuate it.

On the end cap 12 there is shown secured a phosphor bronze contact spring 20 which has a transverse portion secured to the cap and the ends thereof are turned outward and inward and on one end there is secured a removable high resistance carbon contact 21. On the outer end of the plunger there is secured a phosphor bronze contact spring 22 by a nut 23 and its ends are bent at an inclination inward so as to be substantially parallel with the outer ends of the contact spring 20 and on one end of said spring 22 there is a removable high resistance carbon contact 24 adapted to engage the contact 21 on the spring 20, upon the inward movement of the plunger 17 before the other ends of the springs 20 and 22 act and thus prevent arcing between said contact springs. The end of the tube 13 limits the inward movement of the plunger 17 when the spring 22 comes in contact with such tube. There is an air gap 30 between the rod 14 and the plunger 17 at all times and it is about one-sixteenth of an inch wide when the circuit breaker is closed.

There is a primary winding 32 surrounding the tube 13 with one end 33 thereof leading to a storage battery 50, and the other end 34 connected with the contact spring 20. There is a secondary winding 35 surrounding the primary winding and connected with the battery 50 and a generator 51 through wires 36, 136 and 236, and a wire 37 leads from a switch 52 in position to connect it either with the generator 51 through a wire 53 or with lamps 54 through wire 55. The primary and secondary windings are connected at the point 38.

The nature and operation of the invention will be understood when considered in connection with the mechanism with which it is designed to be used, as illustrated in Fig. 4. Thus during the charging of the storage battery, the secondary winding is thrown across the generator terminals by the switch 52, which pulls up the plunger 17 and then the secondary winding is across the battery and generator in parallel, and from this it is obvious that the circuit to the battery

would not be closed until the generator is generating electricity. Then as soon as the current passes through the primary winding in the same direction as in the secondary winding, it assists in pulling up the plunger with a great force which increases the spring pressure between the contact springs 20 and 22, and further as the air gap between the plunger 17 and rod 14 diminishes, the force of their mutual attraction is increased. This is important because if for some reason the prime mover of the generator, such as the engine, becomes disabled, the generator circuit gradually comes to zero, and when the battery circuit starts to pull up in the opposite direction, it induces in the secondary winding a counter electromotive force to that already in the secondary winding, when the windings are properly calculated, as when the primary winding is made of 32 turns of No. 9 wire and the secondary winding of 6,000 turns of No. 28 wire. Then the current in the secondary wire is opposed by an equal and opposite current set up by this counter electromotive force and consequently it is reduced to zero and the plunger drops, thus opening the circuit breaker.

Also when the lamps 54 are thrown on the storage battery by the switch 52 in such device, the secondary circuit is closed across the battery terminals. If the voltage of the battery is high enough, the plunger 17 will rise, closing the circuit breaker which closes the battery and light circuit. When the voltage of the battery falls to the minimum voltage allowable, the circuit breaker automatically opens the circuit and protects the battery from overdischarge.

The high resistance carbons 21 and 24 and the shape of the contacts 20 and 22 prevent any arcing at the metal contacts.

The invention is not limited to the particular use here referred to or the particular

diagram shown, as the latter is merely for the purpose of explaining the general nature of the invention. In the diagram in Fig. 4, the lamps are connected with a battery through part of the line 36 and the same line connects the battery with the generator. Nor is the invention limited to the particular switch 52 shown, and in fact the arrangement may be in practice arranged so that the lights will draw current from both the generator and battery, but that constitutes no part of this invention.

The invention claimed is:

A circuit breaker comprising a metallic casing, a tube of insulated material located centrally within said casing, a fixed core of magnetic material within said tube at the upper end thereof, a conducting plunger mounted to reciprocate in the tube and projecting through the other end thereof, and constantly separated by an air gap from the lower end of the core of magnetic material, primary and secondary windings surrounding said tube, a spring contact member mounted on the casing adjacent said plunger and having a metal contact and having a high resistance contact, a corresponding contact member carried by the movable plunger and having corresponding contacts, and means whereby in the upward movement of the plunger the high resistance contacts engage before the other contacts, and means carried by the plunger and adapted to contact with the lower end of the tube for limiting the upward movement of the plunger and preventing the closing of the air gap.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

ALBERT E. WEAVER.

Witnesses:

J. H. WELLS,

R. G. LOCKWOOD.