F. J. CLEAVER.

CIRCUIT BREAKER.

APPLICATION FILED NOV. 1, 1915.

1,228,408. Patented June 5, 1917

FIG. 1.

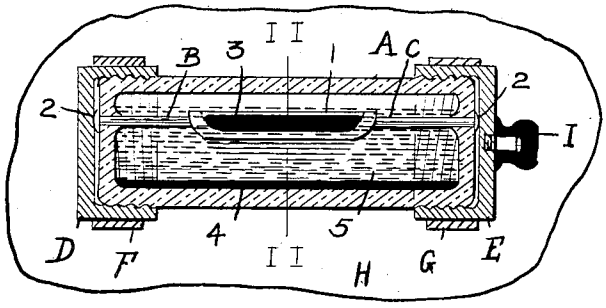
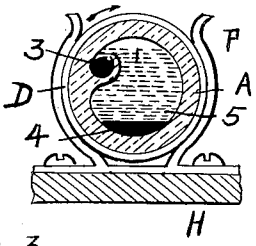


FIG. 2.



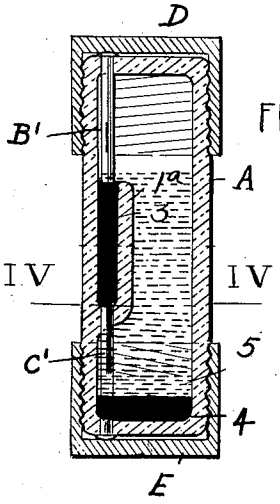


FIG. 3.

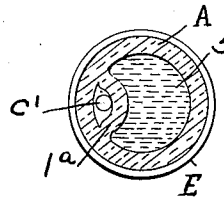


FIG. 4.

WITNESS:

R. F. Dilworth

Fremont J. Cleaver, INVENTOR.

by Edward A. Lawrence,

Lis ATTORNEY

UNITED STATES PATENT OFFICE.

FREMONT J. CLEAVER, OF CARNEGIE BOROUGH, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO HERBERT W. HODGDON, OF PITTSBURGH, PENNSYLVANIA.

CIRCUIT-BREAKER.

1,228,408. Specification of Letters Patent. Patented June 5, 1917.

Application filed November 1, 1915. Serial No. 58,947.

To all whom it may concern:

Be it known that I, FREMONT J. CLEAVER, a citizen of the United States, and residing in Carnegie Borough, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Circuit-Breakers, of which the following is a specification.

My invention consists in a new and improved breaker for electric circuits.

The object in view is the provision of a circuit breaker which will automatically interrupt the circuit when an abnormal rise in current occurs without destroying any portion or element of the breaker, and through which the circuit may be quickly restored without the introduction or substitution of any new element or portion.

I accomplish these purposes by providing an air-tight receptacle of glass or other suitable material of non-conductive character, having, preferably integral therewith, an internal open top reservoir or cut into which extend the terminals of the electric circuit to be protected. The reservoir is normally filled with an unstable fluid conductor, preferably mercury, which electrically connects said terminals and completes the circuit between the same. The quantity of such fluid conductor is regulated to safely carry the normal current, but when an abnormal rise in current occurs, said fluid conductor expands or vaporizes so as to flow over the open top of the reservoir and thus destroy the electrical connection for the passage of the normal current, owing to the lack of sufficient fluid conductor remaining in the reservoir to carry the normal current from one terminal to the other.

The circuit may be instantaneously restored by rotating or inverting the receptacle to refill the reservoir and electrically reconnecting the terminals. I show an improved mounting of the breaker whereby the latter may be rotated or inverted for refilling without its removal from the switch board or displacement from the circuit in which it is interposed.

In the accompanying drawings, Figure 1 is a longitudinal section of my improved circuit breaker, showing the same mounted rotatively in spring contact clamps; Fig. 2 is a cross sectional view of the same along the line II—II in Fig. 1; Fig. 3 is a vertical section of a modified form of said breaker, and Fig. 4 is a sectional view of the same along the line IV—IV in Fig. 3.

The following is a detailed description of the drawings.

A is a hermetically sealed receptacle of glass or other non-conducting material, preferably in the form of a cylinder with closed ends, and having its exterior ends threaded, as shown. Within said receptacle is the open top reservoir 1, preferably formed integrally on the wall of the receptacle, as shown. B and C are stout copper circuit terminals extending through the walls of the receptacle and protruding into the ends of the reservoir 1. The outer ends of said terminals are provided with enlarged contact plates 2 which are brought into close electrical contact with the inner faces of the heads of the brass end caps D and E which are screwed onto the threaded ends of the receptacle A, as shown. The circuit breaker is mounted in the circuit to be protected by interposing the brass caps D and E between the spring contact clamps F and G of the switch board or other support, H. An insulated handle or knob I is mounted on one end of the breaker, so that the latter may be rotated without removing it from the contact clamps.

3 represents a quantity of fluid conductor of unstable character, such as mercury, filling the reservoir 1 and electrically connecting the terminals B and C under normal current. When an abnormal rise in current occurs, the mercury expands or vaporizes, thus causing the same to flow over the open top of the reservoir and prevent the resumption of the flow of normal current between the terminals, owing to an insufficient quantity of mercury remaining in the reservoir. The electrical connection between the terminals is thus interrupted and the circuit broken.

By rotating the receptacle in the direction of the arrow in Fig. 2, the empty reservoir is turned, mouth first, down through the mercury in the lowest portion of the receptacle and rises into its normal position on the other side refilled with mercury, thus re-establishing the circuit between the terminals B and C.

The receptacle may be rotated to refill the reservoir without removing the breaker from the spring contact clamps of the switch board, by grasping the knob I.

The excess 4 of mercury facilitates the refilling of the reservoir, as above described.

The interior of the reservoir is preferably a vacuum or a vacuum combined with a supply of arc-absorbing oil 5.

In the Figs. 3 and 4 I show the receptacle in the form of an upright cylinder, hermetically sealed, and provided with an integral open top cup or reservoir 1^a formed on the interior vertical wall of the receptacle thereof and filled with mercury 3. One of the terminals, B′, is led down through the top of the receptacle into the open top of the cup and into contact with the mercury therein, while the other terminal, C′, is led up through the bottom of the receptacle and through the bottom of the cup into contact with the mercury therein contained.

When an excess of current occurs, the mercury 3 is thrown out over the open top of the cup 1^a, breaking the connection between the two terminals. By first turning the receptacle upside down and then right side up again, the cup may be refilled, and the circuit through the terminals reëstablished.

The terminals should be of sufficient strength and stiffness to prevent their being bent or thrown out of their proper position, to contact with the mercury, when the receptacle is being rotated or turned end for end.

The capacity of the reservoir or cup in my breaker is regulated to accommodate a unit or quantity of mercury sufficient to carry the normal current in the circuit.

It is evident from the foregoing that my improved circuit breaker is an inexpensive, convenient and practically indestructible device, which will adequately protect the circuit, and through which the circuit may be restored almost instantaneously, without having to supply any new element or portion, and even without removing the device from its place in the circuit.

What I desire to claim is—

1. An electric circuit breaker comprising a hermetically sealed receptacle, a reservoir contained in said receptacle and having an open top elevated above the bottom of the latter, a pair of line terminals leading through the walls of said receptacle and into the ends of said reservoir, and a filling of fluid conductor for said reservoir normally electrically connecting said line terminals but in the presence of an abnormal rise in current being expelled over the open top of said reservoir into the bottom of said receptacle, thus breaking the electrical connection between said line terminals.

2. An electric circuit breaker comprising a hermetically sealed receptacle, a reservoir contained in said receptacle and having an open top normally elevated above the bottom of said receptacle, a pair of line terminals leading through the walls of said receptacle and extending into the ends of said reservoir, and a supply of fluid conductor in said receptacle whereby said reservoir may be filled with said conductor and the terminals electrically connected by inverting said receptacle and allowing said fluid conductor to flow into the reservoir over the open top thereof, and in case of an abnormal rise in current said fluid conductor is expelled from said reservoir and falls to the bottom of said receptacle, thus breaking said electrical connection.

3. In combination with contact members interposed in an electric circuit, a circuit breaker having its extremities mounted in said members and rotatable therein, said circuit breaker consisting of a hermetically closed receptacle provided with an open top reservoir in the interior thereof, terminals connected to said members and leading through the walls of said receptacle into the ends of said reservoir, and a filling of fluid conductor for said reservoir normally connecting said terminals electrically together but adapted to be expelled from said reservoir to break said connection when an abnormal rise of current occurs, said reservoir being refilled and said electrical connection of said terminals being restored by rotating said receptacle, substantially as described.

Signed at Pittsburgh, Pennsylvania, this 30th day of October, 1915.

FREMONT J. CLEAVER.