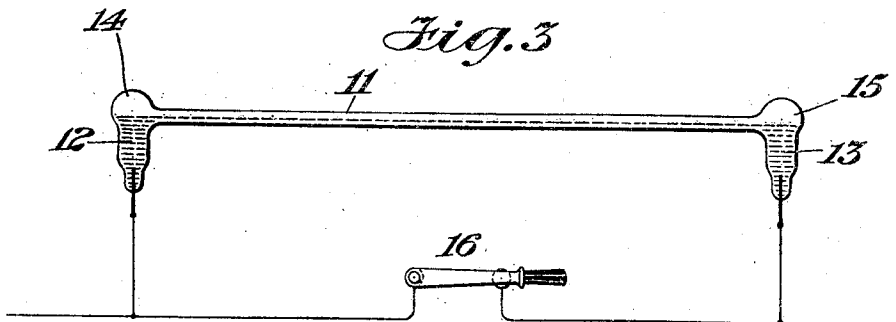
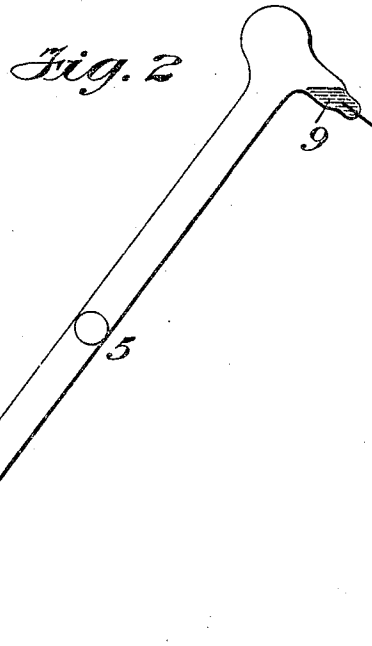
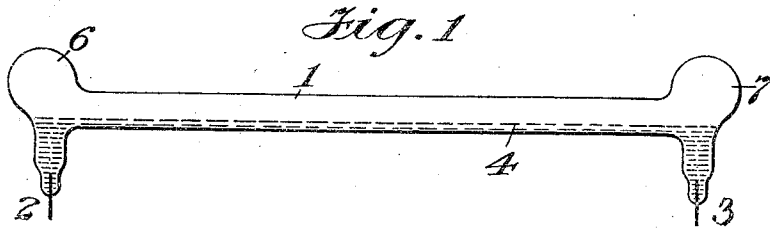


P. H. THOMAS.
CIRCUIT BREAKER.

APPLICATION FILED DEC. 10, 1903. RENEWED FEB. 19, 1907.

952,153.

Patented Mar. 15, 1910.



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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER.

952,153.

Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed December 10, 1903, Serial No. 184,540. Renewed February 19, 1907. Serial No. 353,217.

To all whom it may concern:

Be it known that I, PERCY H. THOMAS, a citizen of the United States, and resident of Pittsburg, county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Circuit-Breakers, of which the following is a specification.

In an application for Letters Patent of the United States filed by me on the 27th day of June, 1903; Serial Number 163,307, I have shown and described a form of circuit-breaker especially adapted for use in connection with alternating current circuits, the significant feature being that the circuit is broken between surfaces inclosed in an exhausted chamber. When such a circuit-breaker is included in an alternating current circuit, the rupture of the arc takes place when the current momentarily ceases at the zero point of the wave, and cannot start again, this being accomplished without any injurious rise of potential in the external circuit. The described circuit-breaker may also be applied to circuits conveying currents naturally varying, provided the lower limit of variation is below the carrying limit of the circuit-breaker.

In this application I disclose a circuit-breaker which may also be utilized in connection with alternating current circuit, but which is more particularly adapted to be used in connection with direct current circuits.

In the present instance, the interruption of the circuit is accomplished by the gradual introduction of a resistance to the flow of current through increasing the pressure within the exhausted chamber. In gas or vapor apparatus of this character, the resistance to the flow of current, or, in other words, the voltage necessary to pass current, is greatly increased as the pressure of the vapor within the exhausted chamber rises. Apparatus of this class will not pass current below a certain definite limit of electro-motive-force, and when the chamber is made of a proper heat radiating and heat absorbing capacity, this limit may be so fixed that while a normal current will flow through the apparatus, an abnormal current will be prohibited from passing through and the current will cease. In this connection it is to be remembered that the pressure in the exhausted chamber is determined by the temperature of the vaporizable material

within the chamber—usually mercury—which is heated by the passage of current. It becomes, then, a question of properly proportioning the dimensions of the chamber so as to give it a definite heat radiating and heat absorbing capacity. This done, a vapor circuit-breaker may be made to operate with certainty within such limits as may be predetermined.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a circuit-breaker constructed in accordance with my invention; Fig. 2 shows the same circuit-breaker in its open position; and Fig. 3 illustrates a modification.

Referring to Figs. 1 and 2, 1 is a container of insulating material having lead wires, 2 and 3, sealed into its ends, the said lead wires being connected inside the container by a mass of mercury, 4. This connection by means of mercury or some equivalent conducting liquid exists when the circuit-breaker occupies its closed position, as illustrated in Fig. 1. The circuit-breaker, thus horizontally located, may be assumed to constitute part of an electric circuit, and under such circumstances to convey the normal current after the manner of any ordinary circuit controller, in its closed position. When it is desired to open the circuit, the circuit-breaker is turned into the position illustrated in Fig. 2, whereby the mercury or other conducting liquid is separated into two distinct masses or bodies, 8 and 9, located at the opposite ends of the circuit-breaker and constituting electrodes. To enable the circuit-breaker to be manipulated in the manner indicated, the same may be mounted upon trunnions, one of which is shown at 5.

In order to tip the circuit-breaker to cause the rupture of the circuit by the gradual introduction of resistance, as indicated in the statement of the invention, the container 1 and the condensing chambers, 6 and 7, if such chambers are used, should be so proportioned that the current which may traverse the apparatus after the tilting of the circuit-breaker will heat one or both of the electrodes sufficiently to produce an increased vapor pressure such as will reduce the current strength below the operating minimum. It is obvious that by tipping the circuit-breaker more or less, as the case may

be, the vapor pressure within the apparatus may be varied at will within wide limits.

In Fig. 3, the circuit-breaker is arranged in shunt to a switch of comparatively low resistance which carries the normal current of the circuit. In this type of circuit-breaker the container 11 is made of comparatively small cross section and contains in the major portion of its length a small amount of mercury bridging the electrodes 12 and 13 at the opposite ends of the circuit-breaker. I may provide small condensing chambers, 14 and 15, above the respective electrodes.

The switch which carries the normal current is shown at 16, and when this switch is opened, the entire normal current is diverted through the circuit-breaker, whereupon a portion of the mercury in the container 11 is vaporized, creating a high vapor pressure for the purposes already set forth.

The circuit-breaker shown in Fig. 3 does not require to be provided with pivots, inasmuch as it retains its horizontal position under all circumstances, depending upon the vaporization of a portion of the thin layer of mercury in the main portion of the tube to secure the results indicated.

It is found that in both types of circuit-breaker illustrated herein, the development of high vapor pressure is gradual; that is to say, the point of actual rupture of the circuit is reached through comparatively small gradations. Accordingly, all tendency to create an injurious rise of potential in the external circuit is avoided.

The structure illustrated in Fig. 3 is not specifically claimed herein, but is claimed in applicant's Patent #876,918, dated January 14, 1908.

I claim as my invention:

1. The combination with an electric circuit, of a vapor circuit-breaker included

therein, and means whereby the circuit-breaker may be moved for opening the circuit within the circuit-breaker, the proportions of the circuit-breaker being such that when it is moved to open position the vapor is gradually heated beyond its carrying capacity for the normal current.

2. The combination with an electric circuit, of a gas or vapor electric circuit breaker included therein, said circuit breaker being adapted to heat up beyond the conducting point on the passage of normal current through the vapor path, and means within the container for short circuiting said vapor path together with trunnions permitting motion of said circuit breaker to discontinue the short circuiting means.

3. A gas or vapor electric circuit breaker adapted to heat up beyond the conducting point on the passage of normal current through the vapor path comprising means for short circuiting said vapor path within the container and means for tilting the container to interrupt said short circuit.

4. In a vapor electric device, the combination with two electrodes spaced apart and adapted to contact with each other of a hermetically sealed and completely exhausted container inclosing the same, said container being so proportioned as to cause a rise of temperature and corresponding rise in pressure above the conducting point when current passes through the exhausted space between the electrodes.

Signed at New York, in the county of New York and State of New York, this 7th day of December, A. D. 1903.

PERCY H. THOMAS.

Witnesses:

WM. H. CAPEL,
GEORGE H. STOCKBRIDGE.