

P. C. HEWITT.  
VAPOR CIRCUIT BREAKER.  
APPLICATION FILED MAR. 20, 1903.

Fig. 1

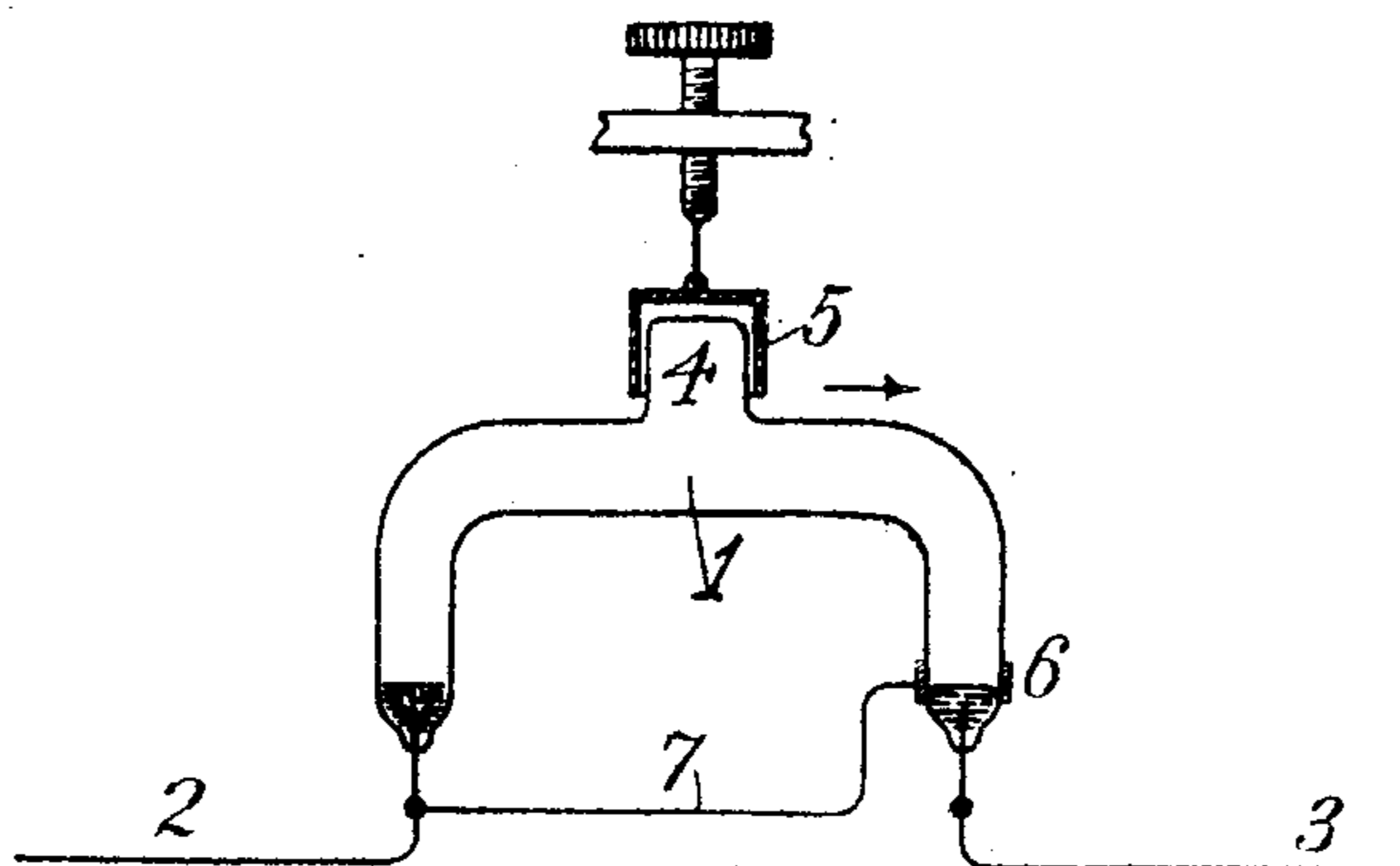
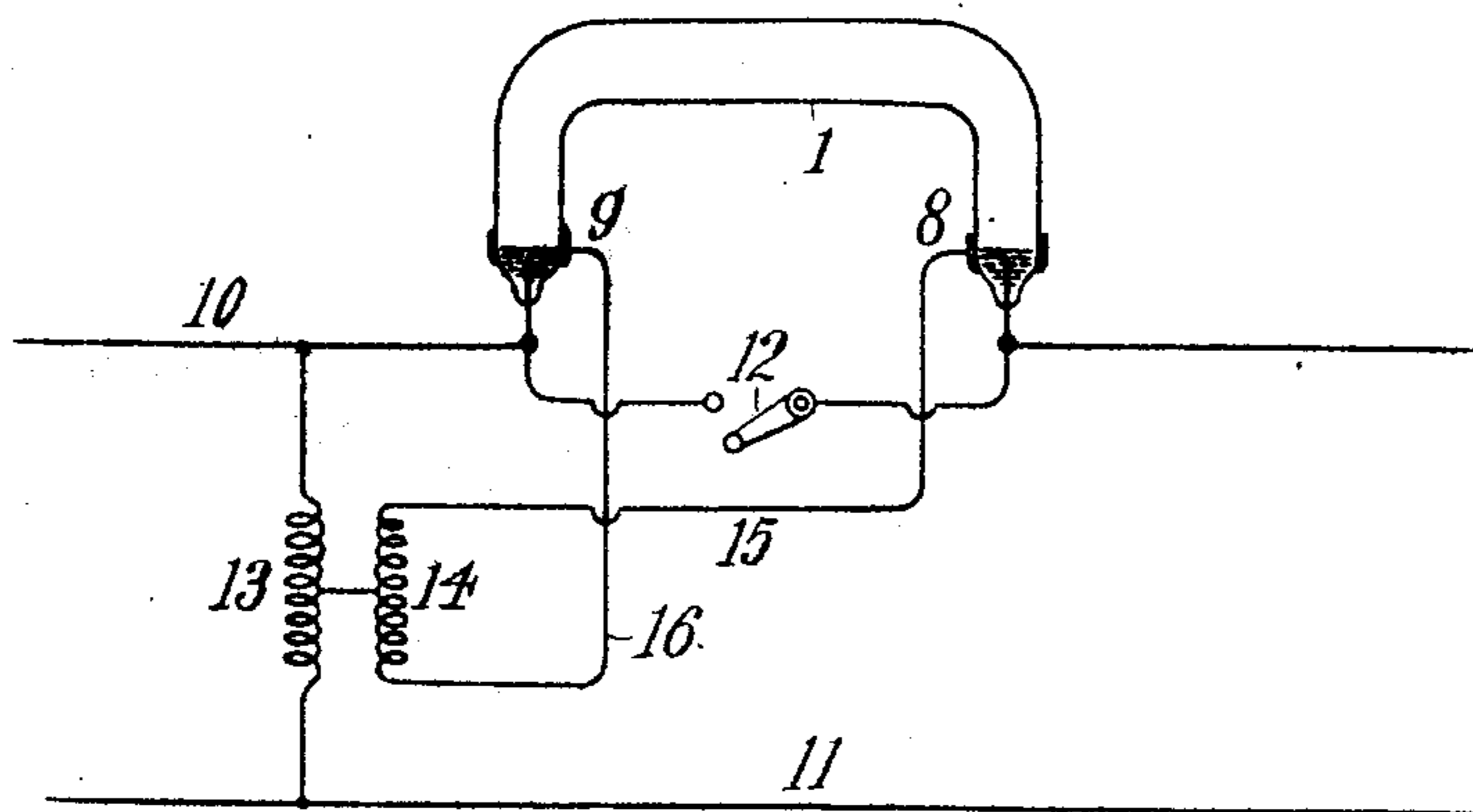


Fig. 2



Witnesses:  
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Inventor  
Peter Cooper Hewitt  
by Charles A. Tamm, Atty

# UNITED STATES PATENT OFFICE.

PETER COOPER HEWITT, OF NEW YORK, N. Y., ASSIGNOR TO COOPER HEWITT ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## VAPOR CIRCUIT-BREAKER.

No. 799,051.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed March 20, 1903. Serial No. 148,690.

*To all whom it may concern:*

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and a resident of New York, county of New York, State of New York, have invented a certain new and useful Vapor Circuit-Breaker, of which the following is a specification.

Various applications have been made and proposed in the useful arts of the properties of the gas or vapor electric apparatus invented by me and patented to me under certain of these forms on the 17th day of September, 1901. These applications have for the most part been based upon the action of such apparatus when provided with suitable cooling or heat-dissipating devices whereby the radiation of heat from the apparatus has been made equal to the absorption of the heat in the natural operation of the vapor apparatus.

The present invention contemplates the use of a form of vapor apparatus in which a volatilizable fluid is inclosed within a suitable container and is vaporized by the action of the current. The invention depends for its utility upon the characteristic possessed by apparatus of this kind of not continuing to carry current when the density of the vapor becomes excessive—that is to say, when the dissipation of heat is not rapid enough to carry off the heat absorbed under the influence of current of definite value. This capacity of the apparatus for heat dissipation may reside in the special construction of the container inclosing the gas or vapor or it may be partly due to the employment of external devices calculated to assist or oppose the normal rate of dissipation.

In the present instance I propose using apparatus of the character described as a circuit-breaker or safety-switch for preventing the flow of an abnormal or dangerous current in the electric circuit.

The drawings, Figures 1 and 2, illustrate uses of apparatus of this class, the former showing a direct-current circuit and the latter an alternating-current circuit supplied with safety-switches of the class described.

In Fig. 1 vapor apparatus 1 is introduced into a conductor 2 3 and is adapted to permit a flow of current through it in the direction of the arrow, provided the current remains at a definite predetermined normal value. The apparatus is provided with a small cooling-chamber 4 for assisting in the con-

densation of the vapors developed in the operation of the devices, and I may surround this cooling-chamber with an adjustable damping-shield 5, of metal, adapted to regulate the amount of heat dissipation at the cooling-chamber. By the action of the shield the device can be adapted to carry normal currents of different values without the development of excessive density in the inclosed gas or vapor. We may assume that the apparatus shown in Fig. 1 is capable of transmitting the normal current on the line 2 3. Should a current of abnormal or dangerous value be thrown upon the line, however, the excess of vapor thereby developed inside the container 1 would suddenly cause too great a vapor density and the current would cease to flow. In other words, the device acts as a safety-switch and may take the place of an ordinary safety-fuse in the electrical arts. Instead of actually breaking the circuit and interrupting the flow the apparatus may be used to interpose an increased resistance for various purposes. I have not thought it necessary to illustrate any mode of starting the apparatus in the first instance, but have shown the usual starting-band at 6 and a wire 7 connecting the starting-band with the opposite side of the circuit. The starting may be accomplished through an auxiliary positive electrode, as is well understood, or by automatically or mechanically breaking contact between two electrode-surfaces inside the container.

In Fig. 2 the vapor apparatus 1 is provided with two starting-bands 8 and 9, one near each electrode. The apparatus is here included in one of the mains 10 of an alternating-current-distribution system, the other main being shown at 11. The vapor apparatus is here shown in shunt to a switch 12. The function of the vapor apparatus in this case is to prevent excessive sparking or an injurious rise of voltage in the circuit when the switch 12 is opened. It will be seen that I place between the mains 10 and 11 the primary 13 of a transformer having a secondary 14, the opposite terminals of which I join by suitable wires 15 and 16 to the starting-bands 8 and 9, respectively. By this arrangement of devices the vapor apparatus 1, which is short-circuited when the switch 12 is closed, will when the said switch is opened have impressed upon it not only the full voltage of the current at its

electrodes, but also a secondary voltage at the starting-bands. These combined effects are sufficient to start the vapor apparatus and permit a temporary flow of current through it, thus relieving the sparking at the terminals of the switch 12. Any tendency to maintain an alternating flow of current through the vapor device will, however, be defeated by the development of too great density of vapor in the apparatus, which is designed in this instance for suppressing the flow after the first passage of current has performed its function of relieving the hand-switch. Intermediate points upon the primary 13 and the secondary 14 are shown as being cross-connected. The object is to apply the starting voltage as between each of the several starting-bands 8 and 9 and its neighboring electrode. Without such a cross connection between the primary and the secondary the secondary voltage would be applied to the starting-bands alone, and the object of applying such secondary voltage would not be attained. It is evident that the self-starting feature might be applied to the device illustrated in Fig. 1, in which case the switch would restore itself to the normal working condition after the cessation of the abnormal or dangerous current.

In a divisional application filed by me August 10, 1903, Serial No. 168,984, claims are made upon the method herein described.

I claim as my invention—

1. The combination with an electric circuit requiring protection from currents of abnormal or dangerous value, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor having a density suited to the said current of definite value, and means for automatically increasing the density to a limit prohibiting current-flow when an abnormal or dangerous current is thrown upon the circuit.

2 The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor, suitable electrodes, and an attachment for regulating the heat-dissipating capacity of the circuit-breaking device.

3. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor, suitable electrodes, and means for regulating the density of the gas or vapor.

4. The combination with an electric circuit requiring protection from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of suitable inclosed gas or vapor, electrodes therefor, and means

for limiting the heat-dissipating capacity of the inclosure.

5. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor having a density suited to transmit the normal current, means for adjusting the heat-dissipating capacity of the circuit-breaker, and means whereby an abnormal or dangerous current in the circuit develops a vapor density in the circuit-breaker which prohibits the flow of such current.

6. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor having a density suited to transmit the normal current, and means for limiting the heat-dissipating capacity of the circuit-breaker whereby the normal density of the vapor will be increased by an abnormal or dangerous current to a point where it will oppose a prohibitive resistance to such current.

7. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit being adapted to carry a current of definite value, of a circuit-breaker consisting of an inclosed gas or vapor having a density suited to transmit the normal current, means for causing an abnormal or dangerous current to develop a density which prohibits the passage of such current, and automatic means for restoring the transmission when the current again becomes normal.

8. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit having a variable load, of an inclosing chamber, a gas or vapor contained therein, connected in series in the circuit, and means for varying the pressure of the gas or vapor by variations in the quantity of the current traversing the same.

9. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit having a variable load, of an inclosed gas or vapor both connected in series therewith, and means for increasing the pressure of the inclosed gas or vapor whenever an abnormal or dangerous current is applied to the circuit, whereby the flow of current through the gas or vapor may be controlled.

10. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit having a variable load, of a device for controlling the flow of current through the circuit, and means for varying the gas or vapor pressure thereof.

11. The combination with an electric circuit requiring to be protected from abnormal or dangerous currents, the said circuit having a variable load, of an inclosed gas or vapor, and means for causing variations in the pressure within the inclosure such that the difference of potential across the terminals when carrying current may be of any desired value.

12. The combination with an electric circuit requiring protection from currents of abnormal or dangerous value, the said circuit being adapted to carry a current of definite value, of a conductor in said circuit adapted to conduct current of determinate potential between certain limits of temperature and to become a non-conductor of said current on an increase of the temperature of the conductor beyond the upper limit.

13. The combination with an electric circuit containing a switch, of a circuit-breaker in shunt to the said switch, the said circuit-breaker consisting of an inclosed gas or vapor and electrodes therefor, whereby on the breaking of the circuit at the switch, the vapor device will receive the full potential of the current and relieve the effects of sparking at the switch-terminals.

14. In an electric circuit containing a switch, a circuit-breaker in shunt thereto consisting of an inclosed gas or vapor and suitable elec-

trodes, in combination with means for regulating the density of the gas or vapor.

15. The combination with an electric circuit containing a switch, of a circuit-breaker in shunt thereto, the said circuit-breaker consisting of a suitable inclosed gas or vapor and electrodes therefor.

16. In an electric circuit carrying alternating current, of a switch in the said circuit and a circuit-breaker in shunt to the said switch, the said circuit-breaker consisting of an inclosed gas or vapor and electrodes therefor, in combination with starting-bands near the electrodes of the vapor device and a transformer energized by the alternating-current circuit, the terminals of the transformer-secondary being joined to the said starting-band, whereby on the opening of the switch the vapor apparatus will have impressed upon it the full voltage of the current at its electrodes and also the secondary voltage at the starting-band.

Signed at New York, in the county of New York and State of New York, this 17th day of March, A. D. 1903.

PETER COOPER HEWITT.

Witnesses:

WM. H. CAPEL,

GEORGE H. STOCKBRIDGE.