

E. M. HEWLETT.  
EXPULSION SWITCH.

APPLICATION FILED MAY 21, 1906. RENEWED MAR. 30, 1912.

1,039,395.

Patented Sept. 24, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

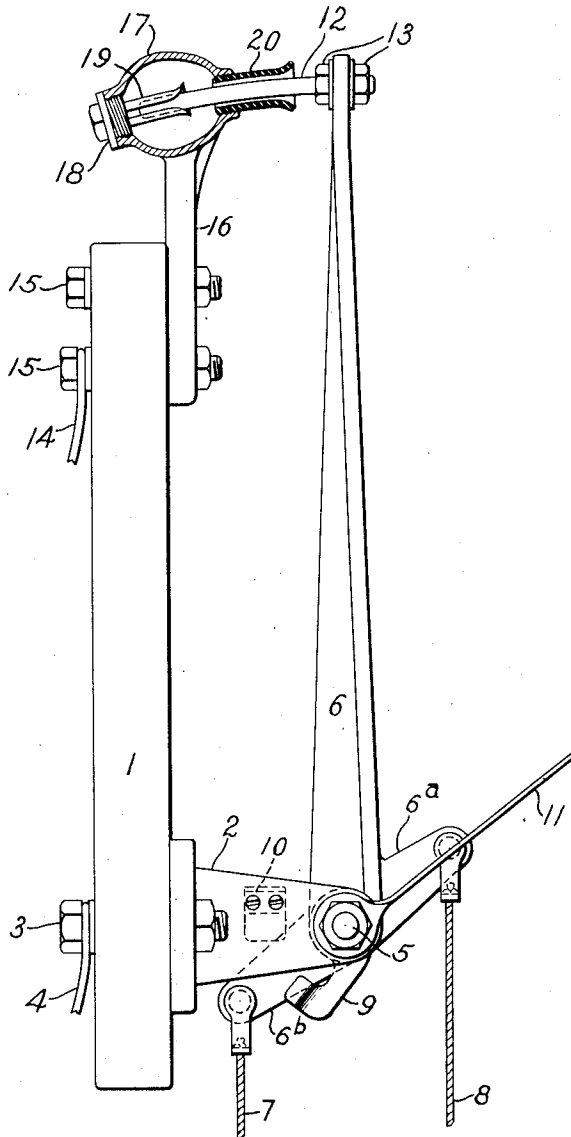
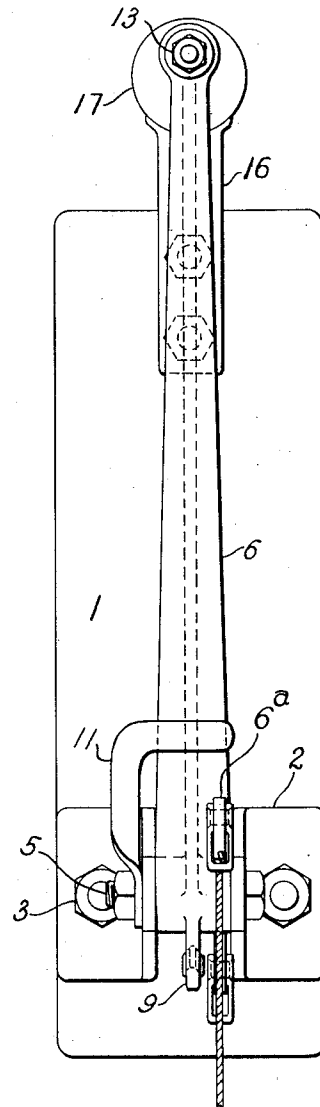


Fig. 2.



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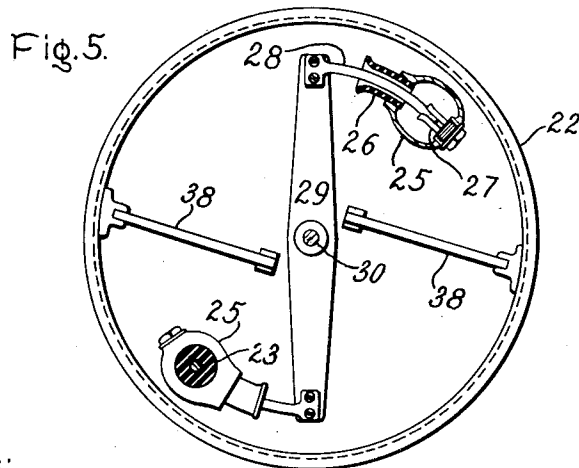
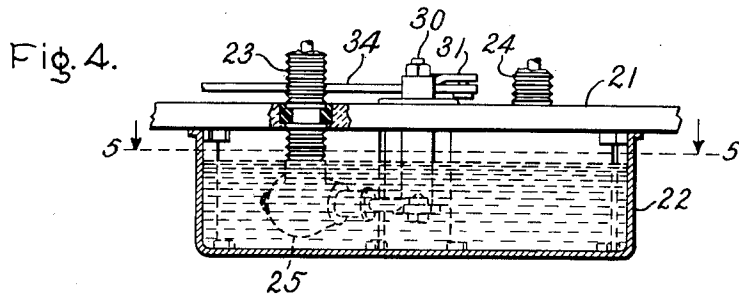
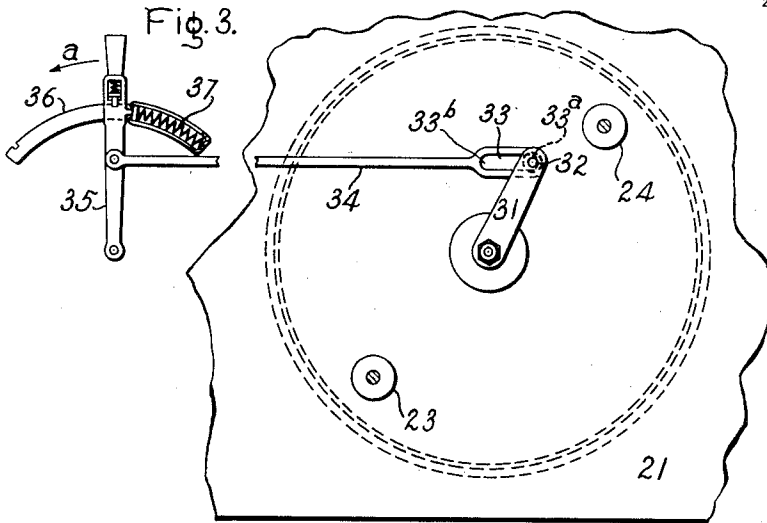
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

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## EXPULSION-SWITCH.

1,039,395.

Specification of Letters Patent.

Patented Sept. 24, 1912.

Application filed May 21, 1906, Serial No. 317,924. Renewed March 30, 1912. Serial No. 687,528.

*To all whom it may concern:*

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Expulsion-Switches, of which the following is a specification.

This invention relates to switches for opening high-tension circuits, and more particularly to switches of a type heretofore used, in which the fixed contact is mounted in a chamber having but one opening through the walls thereof, the movable contact passing through this opening and engaging the fixed contact.

In a switch of this type, when the arc is formed the gases generated by the arc are confined by the walls of the chamber and escape through the opening in the wall of the chamber in a well defined jet and at high velocity.

In switches heretofore used the movable contact recedes from the fixed contact in substantially the same line as that followed by the arc gases when they escape from the chamber, and the arc gases tend to follow the movable contact and make a conducting connection between the movable contact and the fixed contact in the chamber, whereby the arc is prolonged.

This invention consists in so arranging the parts of a switch of the type above described that the movable contact is moved out of the path of the arc gases issuing from the closed chamber, thereby making it difficult for the arc gases to remain in contact with the movable contact and prolong the arc.

The object of the invention is to produce a switch having moving parts of light and simple construction, which will safely and quickly open a high-tension circuit and extinguish the arc formed on opening said circuit, and in general to improve the construction and operation of switches for this purpose, as more specifically described hereinafter and pointed out in the claims.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 is an end view partly in section of one form of switch; Fig. 2 a plan view of the switch shown in Fig. 1; Fig. 3 a plan view of a modified form of a switch in which oil is used; Fig. 4 a view of the switch shown in Fig. 3, the oil can being shown in section,

and the support being partly broken away; and Fig. 5 a sectional view on the line 5—5 of Fig. 4.

The switch shown in Fig. 1 is designed to be mounted upon a wall or similar support. As shown in Fig. 1, a panel or support 1, preferably of slate or other insulating material, is provided, to which a standard 2 is firmly secured by means of bolts 3. A lead 4 of the circuit to be controlled is connected to the bolt 3, thereby establishing an electrical connection between the lead 4 and the standard 2. The standard 2 has mounted therein a pin 5, upon which is loosely mounted an operating lever 6, having arms 6<sup>a</sup> and 6<sup>b</sup>. A cord 7 is connected to the arm 6<sup>b</sup>, and another cord 8 is connected to the arm 6<sup>a</sup>. By means of these cords the operating lever 6 can be moved about the pin 5 as a pivot. The operating lever 6 also carries a projection 9, which is arranged to engage a buffer 10 mounted upon the standard 2. The standard also carries a spring-stop 11, which is engaged by the operating lever 6 when the switch is open. On the free end of the operating lever is mounted a movable contact 12 held in position by means of nuts 13. The other lead 14 of the circuit to be controlled is connected to one of a number of bolts 15, by means of which a bracket 16 is secured to the panel 1. The bracket 16 carries an arc chamber 17, into one wall of which a screw plug 18 carrying a fixed contact 19 is inserted. A tube 20, preferably of insulating material, is mounted in another opening of the wall of the arc chamber 17 in such position that the axis of the tube is in line with the fixed contact 19. The interior of the tube 20 is slightly greater in diameter than the diameter of the movable contact 12, and the parts are so arranged that the movable contact 12 passes through the tube 20 into the interior of the chamber 17 and into engagement with the fixed contact 19. The only means of escape for the arc gases from the arc chamber 17 is through the tube 20, which causes the gases to issue in the form of a jet, moving at high velocity and in a straight line.

In the modified form of the switch shown in Figs. 3, 4 and 5 a horizontal base 21 is provided, to which is secured an oil-can 22, containing oil or similar insulating liquid. The base 21 carries insulators 23 and 24, to

which are attached arc chambers 25. The insulator 23 carries one lead of the circuit and the insulator 24 carries the other lead. The arc chambers 25 are substantially the same in construction as the arc chambers shown in Fig. 1. In the only opening through the walls of the chamber 25 a tube 26 is mounted the axis of which is in line with a fixed contact 27 mounted in the interior of the arc chamber. A movable contact 28, the diameter of which is slightly less than the interior diameter of the tube 26, passes through said tube into engagement with the fixed contact 27. The movable contacts 28 are mounted on a cross-bar 29 of conducting material mounted to swing in a horizontal plane, the cross-bar being carried by a vertical shaft 30, which passes through, and is supported by the horizontal base 21. On the upper end of the shaft 30 is mounted an operating arm 31 having a pin 32 in the end thereof. This pin passes through a slot 33 in the end of a rod 34, the rod being connected to an operating lever 35 pivoted in any suitable manner near the switch. The operating lever 35 is provided with a quadrant 36, in one end of which a spiral spring 37 is mounted. The lever 35 is shown in its normal position when the switch is closed in Fig. 3, and the spring 37 permits the operating lever to be moved to the right of the position shown in Fig. 3; although no means are provided for holding it in such extreme position. If it be desired to open the switch, the operating lever 35 is moved in the direction of the arrow *a*, and the end 33<sup>a</sup> of the slot 33 engages the pin 32, thereby rotating the shaft 30 and opening the switch. As a result of the pin-and-slot connection of the operating lever 35 and the crank 31, the crank may move more rapidly than the operating lever when the switch is being opened, since the pin may travel from the end 33<sup>a</sup> to the end 33<sup>b</sup> of the slot 33. When it is desired to close the switch, the operating lever 35 is moved in a direction opposite to the arrow *a*, and this movement brings the end 33<sup>b</sup> into engagement with the pin 32. The operating lever 35 is then moved to the right, beyond the position shown in Fig. 3, compressing the spring 37 until eventually the contacts 28 are forced into engagement with the fixed contacts 27. When this occurs, the operating lever 35 is released, and the spring 37 moves it back to the position shown in Fig. 3, in which position the contacts are in engagement and the end 33<sup>a</sup> of the slot 33 is in engagement with the pin 32.

Barriers 38, as shown in Fig. 5, are provided between the arc chambers 25 for the purpose of preventing any tendency of the arcs formed on opening the switch to pass from one arc chamber 25 to the other. These barriers also prevent displacement and movement of the oil, and thereby increase

the efficiency of the oil as a means of extinguishing the arcs.

The operation of the switch is as follows: When it is desired to open the switch shown in Fig. 1, the operator pulls upon the cord 8, thereby rotating the operating lever 6 about the pin 5, and causing the movable contact 12 to move out of engagement with the fixed contact 19. An arc is thereby formed, and the arc gases and heated air instantaneously fill the chamber 17 under high pressure and tend to escape through the tube 20. Since the operating lever 6 is of a light construction, the movable contact 12 is projected violently away from the fixed contact 19; this movement being aided by the pressure of the gases confined in the chamber 13, since the contact 12 acts as a loosely fitting piston in the tube 20. The contact 12 is therefore moved away from the fixed contact 19 very rapidly, and in so moving describes an arc of a circle with the pin 5 as the center. The arc gases and the heated air, however, confined in the chamber 17 rush out through the tube 20 in the form of a solid jet, which is directed against the arc, tending to break and extinguish it, while the tube 20 also acts to direct the stream of gases in a straight line, substantially tangent to the circle described by the movable contact 12, which is swinging about the pin 5 as a center. As a result, the movable contact 12 passes farther and farther away from the stream of arc gases as it moves away from the fixed contact 19; and the velocity of the expulsion jet is such as to draw in its wake the surrounding air and thus prevent the arc from holding after the contact in its circular sweep leaves the trajectory of the gases and thus the arc is quickly broken and extinguished. In the form shown in Fig. 5 the separation of the contacts in the arc chamber 25 causes the oil in the said chamber to be projected through the tube 26 in a jet which surrounds and cools the contact 28 and also tends to close the tube 26 and hold the arc gases in the chamber 27, since to escape therefrom the gases would have to force their way through the oil in the tube, which is under great pressure. When the arc reaches the tube 26 it is compressed and disrupted by the jet of oil, and is also cooled and extinguished by the walls of the tube and the surrounding oil. The arc cannot follow the circular path of the contact 28, as the jet of oil from the tube 26 moves in a straight line across that path. The barriers 38 retain the oil in the most advantageous position and prevent movements and disturbances in the body of the oil, which might tend to prolong the arc.

It is apparent that many changes and alterations may be made in the form in which my invention is embodied, and I, 130

therefore, do not desire to be restricted to the exact form shown and described; but intend to cover by the terms of the appended claims all changes and modifications within the spirit and scope of my invention.

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

1. In an electric switch, the combination with an oil vessel containing relatively movable coöperating contacts immersed in oil, of a pressure retaining vessel for inclosing said contacts when said contacts are in engagement, said vessel having a tubular vent which nearly surrounds one of said contacts and extends along the path of movement thereof to a considerable distance and directs the oil put under pressure by the arc against the arc to extinguish it, and operating mechanism for moving one of said contacts out of said pressure retaining vessel through said tubular vent in a horizontal plane beneath the surface of the oil in an arc to which a stream of fluid from said tubular vent is tangential.

2. In an electric switch, the combination of an oil vessel containing fixed and movable contacts immersed in oil, said movable contact being mounted to move in a curved path in a horizontal plane, of a pressure retaining vessel surrounding said fixed contact and provided with a curved tubular vent which extends along a considerable portion of the path of said movable contact and provides comparatively small clearance around said contact, said tubular vent having an outlet which projects a stream of fluid from said outlet in a horizontal path tangential to the curved path of said contact.

3. In an electric switch, the combination with an oil vessel containing oil, a stationary contact mounted in said vessel, a pressure retaining vessel mounted beneath the oil to surround said stationary contact and provided with a tubular outlet which forms a nozzle of considerable length, a movable coöperating contact mounted to swing in a curved path in a horizontal plane beneath the oil through said tubular vent and into and out of engagement with the fixed contact, and operating means for carrying said movable contact out of said pressure retaining vessel through said tubular vent and out of alinement with the outlet of said tubular vent as the switch opens, said operating mechanism comprising means for permitting said movable contact to move independently of said operating mechanism when said contacts separate.

4. In an electric switch, the combination of an oil vessel containing oil, a pressure re-

taining chamber mounted in said vessel beneath the oil and provided with a tubular vent which forms a nozzle of considerable length, a stationary contact mounted in said pressure retaining chamber in alinement with said vent, a movable contact mounted to move into said chamber through said tubular vent with small clearance and to engage said stationary contact and an arm pivoted to swing in a horizontal plane and to carry said movable contact through said tubular vent and out of alinement with it.

5. In an electric switch, the combination with an oil vessel containing relatively movable coöperating contacts mounted to move in a horizontal plane beneath the oil, of a pivoted operating rod for one of said contacts, operating means, connections between said operating means and said rod permitting said rod to move independently of said operating means, and pressure retaining walls about the point of engagement of said contacts closely surrounding said rod throughout a portion of the path of said rod to direct the oil put under pressure by the arc against the arc at an angle to the path of the movable contacts.

6. In an electric switch, the combination of an oil vessel, a closed chamber mounted beneath the oil in said vessel containing a fixed terminal, a tube extending from the chamber, an arm pivoted to swing in a horizontal plane beneath the oil, and a movable terminal carried by said arm out of line with said tube when the switch opens and passing through the tube into the chamber to engage the fixed terminal, said movable terminal being free to take an accelerated motion under gaseous pressure due to the arc.

7. In an electric switch, the combination with an oil vessel, two pairs of coöperating contacts mounted beneath the oil to separate in a horizontal plane, operating means for said contacts comprising a vertical operating shaft, and radial barriers mounted between said pair of contacts with their inner ends adjacent said shaft.

8. In an electric switch, the combination with an oil vessel, of two fixed contacts, a coöperating bridging contact mounted on a vertical operating shaft and radial barriers mounted between said fixed contacts with their inner ends adjacent said shaft.

In witness whereof, I have hereunto set my hand this 19th day of May, 1906.

EDWARD M. HEWLETT.

Witnesses:

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HELEN ORFORD.