E. B. MERRIAM.

ELECTRIC SWITCH.

APPLICATION FILED FEB. 11, 1915.

1,156,542. Patented Oct. 12, 1915.

Fig. 1.

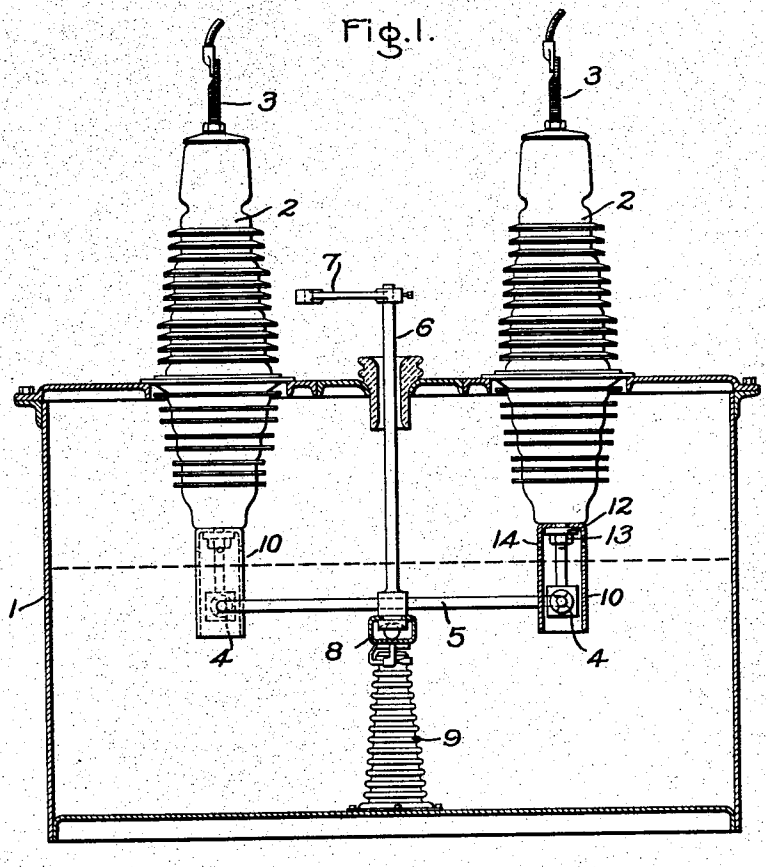
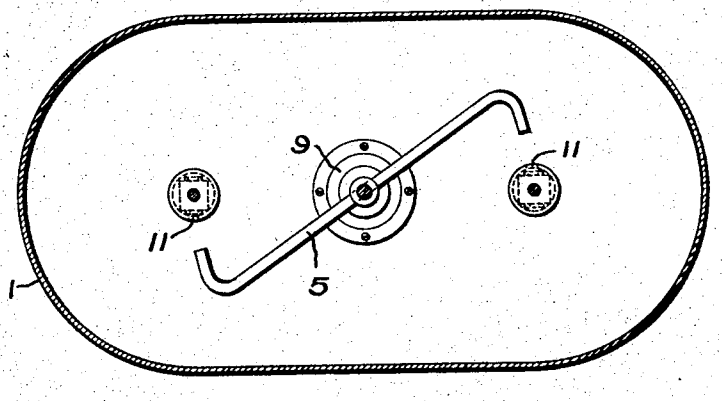


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

1,156,542. Specification of Letters Patent. Patented Oct. 12, 1915.

Application filed February 11, 1915. Serial No. 7,598.

To all whom it may concern:

Be it known that I, EZRA B. MERRIAM, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches for opening circuits carrying large amounts of energy, and more especially to horizontal break oil switches.

The object of my invention is to increase the rupturing capacity of horizontal break oil switches, and in general to improve switches of this type, as hereinafter more particularly pointed out. To this end I provide a horizontal break oil switch with means by which the arc is prevented from rising above the surface of the oil and is subjected to forces which tend to distort it downward and in a direction transverse to its length, so that the continuity of the arc stream is quickly broken and the circuit opened. I prefer to attain this result by an arc restraining chamber open beneath the surface of the oil and substantially closed above the oil. This chamber is so placed that the horizontal arc drawn through the chamber is restrained by the walls of the chamber and any movement of the contents of the chamber must be in a direction transverse to the arc, thereby tending to break it and extinguish it.

My invention will best be understood in connection with the accompanying drawings, in which merely for purposes of illustration I have shown one of the various forms in which my invention may be embodied, and in which—

Figure 1 is a longitudinal section of one form of oil switch embodying my invention; and Fig. 2 is a horizontal section at about the surface of the oil, as shown by the dotted line in Fig. 1.

The particular form of switch shown in the drawing comprises an oil vessel or tank 1 partially filled with oil or other insulating liquid to about the level indicated by the dotted line. The top of the tank carries two insulators 2 by means of which insulated circuit terminals 3 are led into the tank 1. The lower ends of these terminals are preferably provided with some suitable form of fixed contact 4 which may well be the type of fixed contact shown in patent to Rice, #812,880, February 20, 1906, particularly in Figs. 7, 8, and 9 of said patent. A bridging contact 5 coöperates with the fixed contacts 4 and is mounted to move away from the fixed contacts in a horizontal direction. In the particular arrangement shown, the bridging contact 5 is rotated by means of a vertical axle 6 provided at the upper end with an operating crank 7 connected to any suitable actuating mechanism and steadied at the lower end by a bearing 8 which is mounted on an insulator 9 secured to the bottom of the oil tank. As the bridging contact 5 is moved about its vertical axis of rotation, its ends are brought into and out of operative engagement with the fixed contacts 4. As clearly appears from the drawing, both the fixed and movable contacts are submerged in the oil.

In order to increase the rupturing capacity of the switch and to facilitate extinguishing the arc formed when the contacts separate, I provide suitable arc restraining chambers or bells 10 so disposed in the oil tank that the arc is drawn transversely of the bells 10 and in such a manner that the only direction in which insulating fluid in the arc restraining chambers can move is in a direction across the arc. These arc restraining chambers are preferably made as shown in the drawing in the form of bells closed at the upper end and with the open lower end submerged in the oil. An opening 11 in the wall of the bell permits a movable contact to traverse the bell in a direction transverse to the longitudinal axis of the bell.

In the preferred construction as shown in the drawings, an arc restraining bell or chamber is mounted on each terminal in such a position that it incloses the fixed contact 4, with the opening 11 in alinement with the fixed contact. The bridging contact enters and leaves the arc restraining chamber through the opening 11. The arc restraining chamber may be made of any suitable material, but is preferably made of metal so as to form a strong vessel which will resist any pressure generated within it by the arc gases. The walls of the chamber or inner vessel 10 should be of insulation, or else insulated from the terminal. The chamber or vessel 10 may be mounted in various ways, as, for example, by clamping

it to the insulator 2 by means of an insulating washer 12 firmly held in position by a lock nut 13 threaded on the lower end of the terminal 3. In order to prevent the development of excessive pressures in the inner vessel 10, small vents 14 may be provided above the surface of the oil. These vents permit the gradual escape of arc gases, but are too small to release the pressure generated in the chamber by the arc until after the arc is extinguished.

When the circuit is opened the bridging contact is rotated about its vertical axis 6, and as its ends separate from a fixed contact 4 an arc is formed. As the bridging contact continues to move, its ends retreat from the fixed contacts and eventually pass out through the openings 11 in the wall of the arc restraining chamber 10 and out into the oil tank 1. As a result of this movement, the arc is drawn substantially horizontal. The heated arc gases have great difficulty in following the end of the bridging contact through the opening 11, and at the same time the pressure generated in the chamber 10 by the arc gases can be relieved only by movement of the fluids in the chamber or bell 10 in the downward direction. This movement tends to sweep the arc gases downward and to break the arc. All tendency of the arc gases to rise to the surface of the oil is effectually eliminated by the closed upper end of the chamber or bell 10, while the open lower end offers a path of escape for the gases in a downward direction into the body of oil in the tank.

My invention may be embodied in many other forms than that disclosed, and I therefore do not limit my invention to the precise construction described except in so far as it is limited by the scope of the annexed claims.

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

1. An electric switch comprising an outer vessel partially filled with oil, an inner arc restraining vessel closed at one end and open at the other end and mounted in said outer vessel with its open end submerged in the oil, and relatively movable coöperating contacts mounted to separate under the oil and draw an arc transverse to the longitudinal axis of said inner vessel.

2. An electric switch comprising a vessel partially filled with oil, an arc restraining bell having an opening in one side and mounted in said vessel with its open end submerged in the oil, a fixed contact in said bell, and a coöperating movable contact of a size to pass through said opening with slight clearance and mounted to move horizontally into and out of said bell through the opening in the side thereof to coöperate with said stationary contact.

3. An electric switch comprising a vessel partially filled with oil, two insulated terminals extending into said vessel to a point beneath the surface of the oil, an arc restraining bell mounted on but insulated from each terminal, each of said bells having an opening in one side and mounted with its open end submerged in the oil in said vessel, and a horizontal bridging contact mounted to rotate about a vertical axis with its ends of a size to pass through said opening with slight clearance, and in position to pass into and out of the arc restraining bells through the openings in the sides thereof to coöperate with the terminals in said bells.

4. An electric switch comprising a vessel partially filled with oil and having therein a vertical arc restraining chamber with a restricted opening in one wall, said chamber having its upper end closed and its lower end open and normally submerged in the oil in said vessel, and relatively movable coöperating contacts mounted to separate in said vessel and draw a substantially horizontal arc in said chamber, one of said contacts being mounted to move into and out of said chamber through the opening in the wall thereof with slight clearance between said contact and the walls of said opening.

5. An electric switch comprising a vessel partially filled with oil, a plurality of arc restraining bells, each having an opening in one wall thereof and mounted in said vessel with their open ends submerged in the oil and their closed ends above the surface of the oil, and relatively movable coöperating contacts mounted to separate in said vessel beneath the oil and draw a substantially horizontal arc, one of said contacts being mounted to traverse said arc restraining bells through the openings in the sides thereof.

In witness whereof, I have hereunto set my hand this 10th day of February, 1915.

EZRA B. MERRIAM.

Witnesses:
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