E. B. MERRIAM.

ELECTRIC SWITCH.

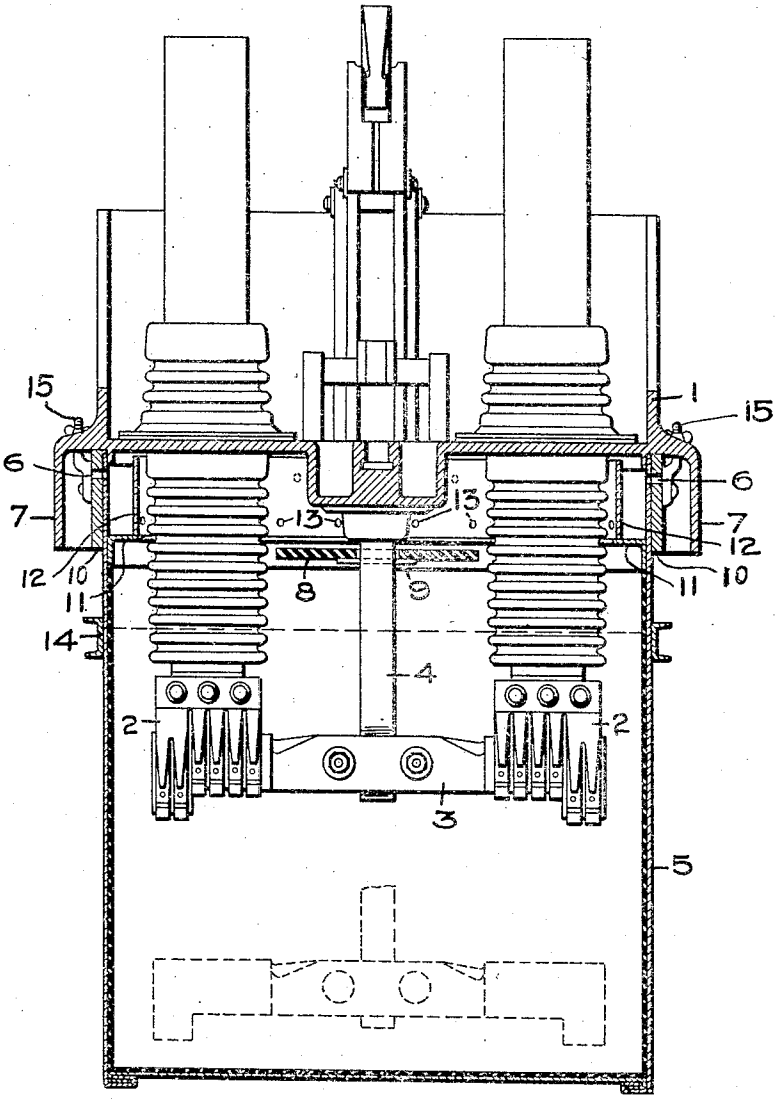
APPLICATION FILED JUNE 23, 1911.

1,161,716.

Patented Nov. 23, 1915

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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J. Earl Ryan

Inventor

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by Albert G. Davis

His Attorney

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2 SHEETS—SHEET 2.

Fig. 2.

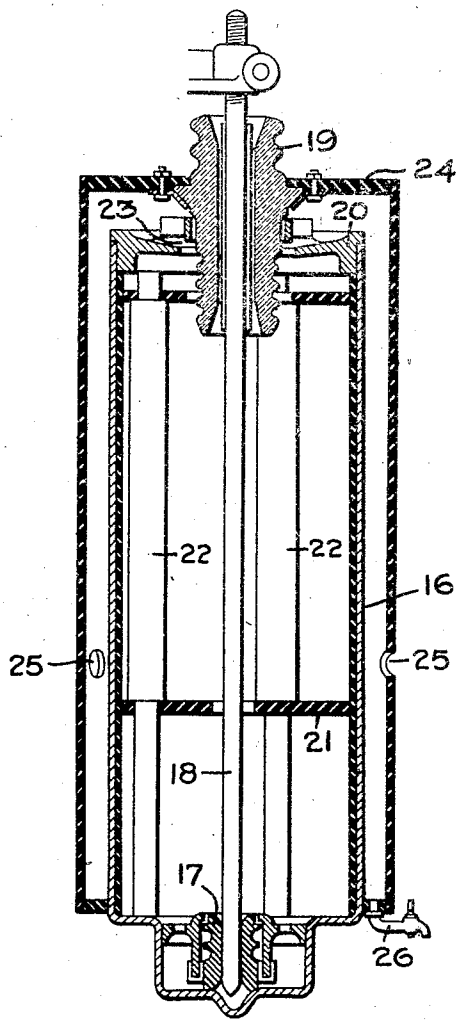
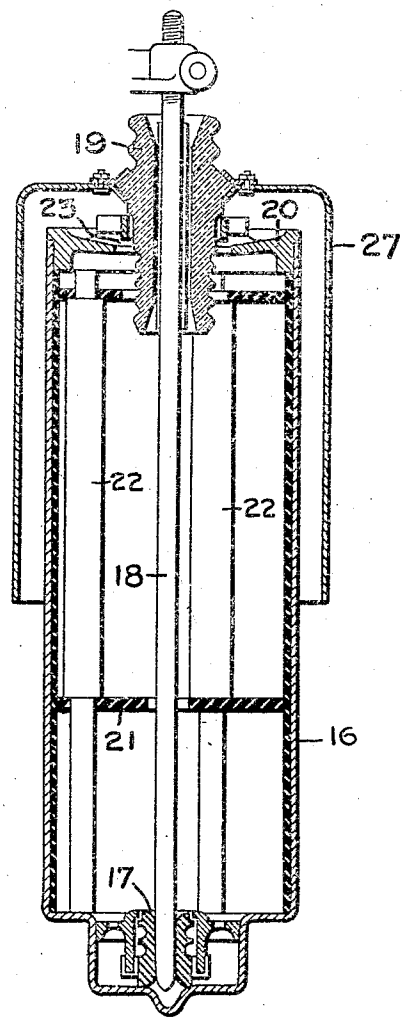


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

1,161,716. Specification of Letters Patent. Patented Nov. 23, 1915.

Application filed June 23, 1911. Serial No. 634,951.

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, particularly switches in which the circuit is opened by means of contacts which separate in oil or other suitable insulating fluid, and its object is to provide an electric switch which will open the circuit in a suitable insulating fluid, such as oil, without scattering oil over the surroundings or permitting gases, at a temperature high enough to be conductive, or to ignite, to come into dangerous proximity to live parts of the system; in which gases generated from the insulating fluid by the arc are cooled and partially condensed before escaping to the open air; in which the fluids ejected from the switch are diverted from a dangerous direction of flow and compelled to flow to a point where they can do no damage; in which oil set in motion by the opening of the switch is trapped and directed in such a manner that it does no harm to the surroundings of the switch; in which the oil pot is strengthened in a desirable and efficient way; in which the oil pot is thoroughly insulated and accidental contact with live parts of it rendered impossible; and which is improved in the many details hereinafter set forth more at length.

My invention will best be understood in connection with the accompanying drawings which show, merely for purposes of illustration, some of the various forms in which my invention is embodied and in which—

Figure 1 is a cross section of a form of switch embodying my invention; and Figs. 2 and 3 are cross-sections of a slightly different form of switch also embodying my invention.

The particular form of switch shown in Fig. 1 comprises a frame 1 secured to a switchboard, or other suitable support, in any suitable manner, and carrying stationary contacts 2 suitably insulated from the frame and connected to the leads of the circuit to be controlled. The circuit is opened and closed by means of a metal bridging contact 3 carried by an insulating rod 4. By means of any suitable operating mechanism, the bridging contact 3 is lifted into engagement with the stationary contacts 2 to close the circuit and is dropped out of engagement with them to open the circuit. When the bridging contact 3 separates from the stationary contacts 2, an arc is formed, and, to extinguish it, the contacts are submerged in oil or other suitable insulating fluid contained in an oil vessel 5 secured to the framework 1, with its upper edge fitting closely against the framework and partially filled with oil to a level above the contacts, as indicated by the dotted line. The arc produced by the separation of the contacts beneath the oil when a large amount of energy is flowing through the circuit, produces a violent disturbance in the oil, develops inflammable gases, and puts the air and gases above the level of the oil under very considerable pressure. To prevent distortion of the oil vessel by the pressures developed by the arc, the oil vessel is provided with suitable vents 6 above the surface of the oil through which the gases may escape when put under pressure. The inflammable gases, mingled with air and drops of oil, escape through the vents 6 at a very considerable velocity and at a temperature high enough to render them partially conductive and easily ignited. These gases tend to rise, and may come in contact with live parts of the system and cause short circuits, or may ignite and thereby cause serious damage in the station. In accordance with my invention, scattering of oil from the switch and discharge of gases which are hot enough to be dangerous may be prevented by means of some suitable diverter, such as the diverter 7, secured in any suitable way in such a relation to the vents 6 that oil and gases ejected from the vents will be intercepted and diverted downward. The diverter 7 not only changes the direction of flow of the gases and oil ejected from the switch but also acts to cool the gases to such an extent that when they escape into the atmosphere they will not readily ignite and are no longer partially conductive. The oil ejected from the switch is caught and diverted downward along the walls of the oil vessel 5 and is deposited where it cannot disfigure the surroundings of the switch. The diverter 7 may be mounted in any suitable

way, but I prefer to secure it directly to the framework 1, preferably by making the diverter in the form of a member which depends from the framework and encircles the outer edge of the oil vessel 5. One advantage of this construction is that the diverter will act to catch and hold the edge of the oil vessel, if for any reason the upper part of the oil vessel is blown outward by pressures developed in it. The action of the switch is improved and throwing of oil and inflammable gases from the vents 6 is further prevented by some suitable means which acts on the air and gases in the space above the oil. One particular form of device for accomplishing this result is shown in the drawings in the form of a plate 8 loosely mounted on the rod 4 and large enough to extend across the greater portion of the space between the insulators in which the fixed contacts 2 are mounted. The plate 8 is prevented from moving downward along the rod 4 by a pin 9 extending through the rod 4 and forming a stop or support for the plate. In order that the presence of the plate may not increase the tendency of the switch to arc over between the fixed contacts, the plate is preferably made of some suitable insulating material, such as fiber, or any other suitable material which has the necessary mechanical strength. As the switch contacts separate, the plate 8 is free to drop along the rod 4 to the surface of the oil. The pressures developed in the oil vessel 5 are sufficient to distort the vessel unless the walls are stiffened by some suitable braces. The weakest part of the oil vessel is near the upper edge and I strengthen and reinforce the oil vessel by a rim 10 and also by means of a stiffening rib 11 secured to the interior of the vessel near the upper edge thereof and shaped to form an inwardly projecting rib or ledge. This construction not only stiffens the edge of the vessel against distortion by pressures due to the arc but the rib 11 also acts as a deflector or baffle to hinder escape of oil through the vents 6. The oil is still further restrained by an internal baffle 12 mounted on the inner edge of the rib 11 in front of the vents 6 and provided with holes 13 some distance below the vents 6 and out of alinement with the vents. As a result of this construction, the gases can escape quite freely but the oil cannot escape unless it follows a tortuous path through the holes 13 and the vents 6, whereupon it is caught and directed downward by the diverter 7. The oil vessel is further strengthened where distortion is most likely to occur by means of a rib 14 secured to the oil vessel near the surface of the oil and preferably made in the form shown in the drawing so as to secure maximum resistance to distortion. The oil vessel may be held in place against the framework by any suitable support, but merely for purposes of illustration I have shown bolts 15 for holding the oil vessel in place on the framework.

In the form of switch shown in Fig. 2, the oil vessel comprises a strong metallic vessel 16 partially filled with oil and having near the bottom a fixed contact 17 which coöperates with a movable contact rod 18 moved into and out of engagement with the fixed contact 17 by any suitable operating mechanism and guided through the top of the oil vessel 16 by a hollow insulator 19 which is secured in any suitable manner to the top 20 of the oil vessel. When the circuit opens, the oil is retained in the oil vessel by means of a perforated baffle or partition 21 having a central opening, through which the movable contact rod 18 passes, and held in position a short distance above the fixed contact 17 by supporting rods 22 of wood or other suitable insulating material. In order that the pressures in the vessel may not rise too high when the circuit is being opened, the top 20 is provided with vents 23 immediately adjacent the hollow insulator 19, and, in order to intercept and deflect any gases and oil which may escape from the vents 23, I provide some suitable form of diverter, such as the diverter 24 mounted in a position to intercept fluid flowing from the vents 23 and to direct the fluid downwardly along the external walls of the oil vessel 16. The particular form of diverter shown in Fig. 2 is made in the form of an insulating shell or casing which completely incloses the walls of the oil vessel 16 and which is provided near the bottom with escape openings 25, through which the gases ejected from the oil vessel 16 may escape after they have been diverted and directed along the walls of the oil vessel. The insulating diverter 24 also protects the operator from accidental contact with the oil pot 16 which is alive at the potential of the fixed contact 17. If the circuit is carrying a large amount of energy when the contacts 17 and 18 separate, the arc which is formed will put the oil in the oil vessel 16 under pressure and some of the oil, mingled with air and with the gases generated by the action of the arc on the oil, will be ejected through the vents 23 with considerable velocity, but will be caught by the diverter 24 and directed downward where the oil is caught and retained in the bottom of the diverter. At the same time the hot gases escaping through the vent will be caught and held by the diverter and will be cooled to a very considerable extent, so that, when they finally escape through the openings 25, they will be cooled to such an extent that they will not easily ignite. By collecting in the diverter the oil ejected from the switch, the operator can determine very closely the amount of oil left in the oil

pot 16 and the oil drained out of the diverter by the drain cock 26 may be used again in the switch.

In the form of device shown in Fig. 3, the oil vessel and other parts are the same as shown in Fig. 2, but the bell shaped diverter 27 of metal is secured to the hollow insulator 19 and incloses only the upper part of the oil vessel 16. With the metal diverter, the gases are more effectually cooled than with the insulating diverter 24. The diverter 27 is proportioned to cool the escaping gases very effectively and to deflect the jet of gases and oil from the switch toward the ground where no damage will be done.

My invention may be embodied in many other forms than that shown and described and I therefore do not limit my invention to the precise arrangement disclosed but aim to cover all modifications which are within the spirit and scope of my invention as set forth in the appended claims.

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 a substantially closed vessel containing insulating fluid and having a restricted vent in the walls thereof, of relatively movable coöperating contacts separable beneath the surface of said fluid, means between said vent and the point of separation of said contacts for deflecting the fluid discharged and arresting the gases formed as said contacts separate, and means surrounding said restricted vent for conducting the fluid and gases escaping from said vent downwardly along the walls of said vessel and away from the live parts of said switch.

2. In an electric switch, the combination with a substantially closed vessel containing insulating fluid and having a restricted vent in the walls thereof, of relatively movable coöperating contacts separable beneath the surface of said fluid, a baffling member having openings therein mounted near the top of said vessel but below said vent whereby the fluid discharged and the gases formed as said contacts separate are arrested and deflected, and a diverter surrounding said vent for conducting the fluid and gases escaping from said vent downwardly past said vent and along the walls of said vessel.

3. In an electric switch, the combination with a substantially closed vessel containing insulating fluid and having a restricted vent in the walls thereof, of relatively movable coöperating contacts separable beneath the surface of said fluid, means in said vessel for preventing the gases formed and the fluid put under pressure as said contacts separate from escaping directly through said vent, and a diverter forming a hollow ring around the outside of said vessel surrounding and extending below said vent for conducting the gases and fluid escaping through said vent downwardly along the walls of said vessel.

4. In an electric switch, the combination of a substantially closed vessel having a vent in the walls thereof and containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, and an inwardly projecting rib secured to the walls of said vessel above the level of the oil and below said vent to deflect fluid tending to escape through said vent as said contacts separate.

5. In an electric switch, the combination of a substantially closed vessel having a vent in the walls thereof and containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, an inwardly projecting rib above the surface of the oil, and a baffle ring mounted on said rib in front of said vents.

6. In an electric switch, the combination of a substantially closed vessel having a vent in the walls thereof and containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, an inwardly projecting rib above the surface of the oil, and a baffle ring mounted in front of said vents and having holes therein out of alinement with said vents.

7. In an electric switch, the combination of a substantially closed vessel having a vent in the walls thereof and containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, and movable means controlled by said contacts for deflecting to the walls of said vessel the fluid discharged upwardly in said vessel as said contacts separate.

8. In an electric switch, the combination of a substantially closed vessel having a vent in the walls thereof and containing oil, stationary contacts in said vessel, a movable cooperating contact, an operating rod for said movable contact extending into said vessel, and a plate loosely mounted on said rod above the surface of the oil in said vessel.

In witness whereof, I have hereunto set my hand this 21st day of June, 1911.

EZRA B. MERRIAM.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.