

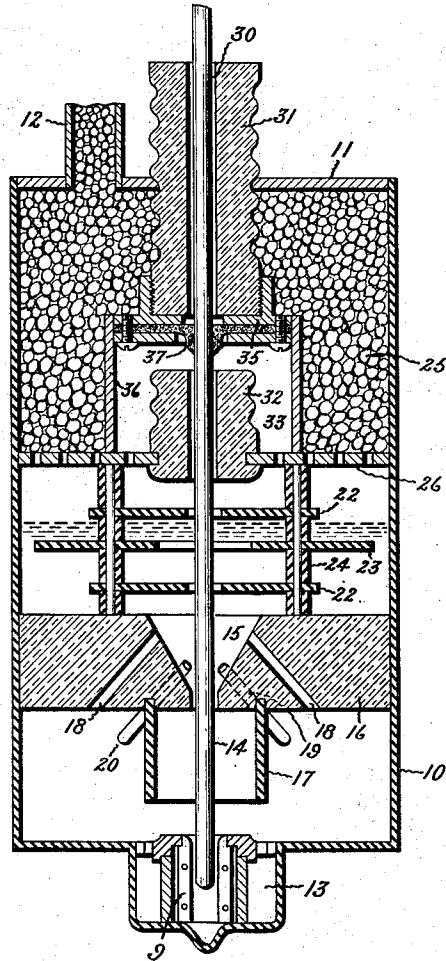
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J. D. HILLIARD

ELECTRIC SWITCH

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Inventor:
John D. Hilliard,
by *Albert H. Davis*
His Attorney.

UNITED STATES PATENT OFFICE.

JOHN D. HILLIARD, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

Application filed August 10, 1921. Serial No. 491,128.

To all whom it may concern:

Be it known that I, JOHN D. HILLIARD, 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, and particularly to those in which the contacts are separable in an insulating fluid. In switches of this type heretofore employed, use has been made of means whereby the pressure created by the arc at the opening of the switch is utilized to create a blast of oil which is directed into the path of the arc and serves to extinguish the same.

According to my present invention which is a continuation in part of my copending application Serial No. 443,440, filed February 8, 1921, I seek to improve the circuit-interrupting capacity of switches of this character by causing portions of the arc to be formed in two separate chambers which communicate with one another by passages other than that through which the arc stream passes. These passages are so arranged that insulating fluid under pressure created by the portion of the arc in one chamber is forced as a cool blast unmixed with arc gases into the arc stream in the other chamber.

In the form here illustrated, I have shown my invention as applied to a switch for opening high power circuits wherein means is provided to prevent ejection of oil from the switch vessel and whereby the gases resulting from the dissociation and vaporization of oil may be cooled to a point at which they may be safely expelled from the apparatus.

Other advantages and objects will appear from the following description, taken in connection with the accompanying drawing, which represents in section a switch embodying my invention and in which 10 indicates a vessel adapted to contain an insulating fluid to the level indicated, and which is constructed to withstand high internal pressure. This vessel is provided with a cover 11 through which passes an outlet tube 12 designed to conduct away the gases formed by the arc. A lower stationary electrode 9 located within a recess 13

formed in the bottom of the vessel 10 is adapted to cooperate with a movable electrode 14 which passes upwardly through the top of the vessel and in the position shown extends through a funnel-shaped opening or passage 15 formed in an insulating partition 16. This partition divides the vessel into a lower and upper chamber which I will respectively term a compression chamber and discharge chamber. Surrounding the electrode and depending from the partition 16 is a cylindrical shield 17 of insulating material and connecting the space outside of the shield with the funnel-shaped opening are passages or outlets 18 and 19. Passages 18 are merely openings formed in the partition 16, while passages 19 are formed not only by openings but have tubular extensions 20 therethrough which are designed to project into the body of oil surrounding the shield 17. It is to be noted that passages 18 and 19 are arranged about and inclined to the axis of passage 15. Either passages 18 or passages 19 may be omitted if desired. Above the partition 16 and surrounding the movable electrode are baffles 22 and 23 which are supported upon insulating rods 24 and are so arranged as to impede the upward movement of the material ejected from the vicinity of the arc at the opening of the switch. As a means for further impeding the movement of the material and for cooling the same, in order that the vapors may be condensed and the gases cooled to a temperature at which they may safely be expelled from the apparatus, I fill the upper portion of the vessel 10 with gravel 25. This is preferably composed of quartz pebbles having a diameter of from $\frac{1}{2}$ to $\frac{3}{4}$ inch. As a means for supporting the gravel, I provide a perforated plate 26, which rests upon the rods 24 and may be secured if desired to the walls of the vessel 10. I may provide the vessel with an inner lining of insulating material to prevent arcing to the metallic walls of the vessel, in which case the plate 26 would be partially supported on the top of the lining. The gravel 25, as shown, extends upwardly into the tube, although if desired it may terminate at the top of the vessel 10.

In order to prevent gas in the vessel from escaping around the electrode 14, there is

formed in the passage 30 which extends through insulators 31 and 32, and through which the electrode 14 passes, a stuffing box 33. This preferably comprises a leather disk 5 37 which surrounds the electrode 14 and a metal cap 35 against which the disk is adapted to be forced by pressure of the gas within the vessel 10. A shield 36 separates the stuffing box 33 from the gravel 25.

- 10 In operation the electrode 14 being normally in contact with the electrode 9, the switch is opened by raising the former by any suitable mechanism, not shown. An arc is at first formed between the electrodes be-
 15 neath the partition 16 and as the electrode 14 continues to rise is drawn up into the funnel-shaped opening 15. The pressure created by the arc or that portion of the arc beneath the partition 16 acts throughout the body of
 20 oil in the pressure chamber with the result that oil is violently forced through the passages 18 and 19 into the arc stream within and above the funnel-shaped opening 15, and serves quickly to extinguish the arc. The
 25 material forced upwardly by the arc passes around the baffles 22 and 23 and through the gravel 35 which function in the manner here-
 tofore described.

What I claim as new and desire to secure 30 by Letters Patent of the United States, is:—

1. In a switch, a vessel adapted to contain an insulating fluid and provided with a partition forming two chambers and having a restricted opening therein, electrodes sepa-
 35 rable within said fluid to form an arc which extends into each of said chambers, and means whereby the pressure caused by the portion of the arc in one chamber forces insulating fluid around said opening into the
 40 arc stream in the other of said chambers.

2. In a switch, a vessel adapted to contain an insulating fluid and provided with a partition forming an upper and lower chamber and having a restricted opening therein, elec-
 45 trodes separable within said fluid to form an arc which extends into each of said chambers and through said restricted opening and means whereby the pressure caused by the portion of the arc in the lower chamber
 50 forces insulating fluid from said lower chamber around said opening into the arc stream in the upper chamber.

3. In a switch, a vessel adapted to contain an insulating fluid and formed with a com-
 55 pression chamber and a discharge chamber, electrodes separable within said insulating fluid to form an arc which extends from a point within said compression chamber through a restricted passage and into said
 60 discharge chamber, means whereby the pressure created by the portion of the arc within the compression chamber forces a blast of insulating fluid from a point within said compression chamber into the arc stream in
 65 said discharge chamber, and a shield between

said passage and the point within said compression chamber from which said insulating fluid is forced.

4. In a switch, a vessel adapted to contain an insulating fluid, a partition therein forming upper and lower chambers and having a restricted opening therein, and relatively movable electrodes in said lower chamber, one of said electrodes being movable through said restricted opening to draw an arc ex-
 70 tending in each of said chambers, said partition having openings displaced from said restricted opening through which the pressure created by the portion of the arc in
 75 said lower chamber may force a blast of oil into that part of the arc in said upper chamber.

5. In a switch, a vessel adapted to contain an insulating fluid and provided with a compression chamber and a discharge chamber, electrodes adapted to form an arc within
 80 each of said chambers, said compression chamber being provided with an outlet communicating with said discharge chamber whereby upon the formation of the arc an insulating fluid will be projected from the
 85 pressure chamber into the path of the arc in said discharge chamber, and a shield located within said pressure chamber so as to prevent gases formed by the arc within said
 90 pressure chamber from entering said outlet.

6. In a switch of the fluid break type, a chamber adapted to contain insulating fluid, stationary and movable contact members separable to form an arc in said chamber, the upper wall of said chamber having an opening therein for said movable contact member, said wall having a plurality of inclined passages therein for conveying fluid from said chamber into said opening and means forming a gas collecting space around
 95 said movable contact member for preventing the gas liberated by said arc from reaching said passages.

7. In a switch of the fluid break type, a vessel adapted to contain insulating fluid, a partition extending across said vessel forming a plurality of chambers and having an opening therein, a stationary contact member carried at one end of said vessel, a movable contact member adapted to extend through the opening in said partition and to engage said stationary contact and a shield extending from said partition into the chamber adjacent said stationary contact, said shield surrounding but spaced from said movable contact member and said partition having inclined openings connecting the said opening therein with said chamber at points without said shield.

8. In a switch, a vessel adapted to contain an insulating fluid, a partition dividing said vessel into lower and upper chambers and formed with a funnel-shaped passage there-
 through, a stationary electrode within said

lower chamber, a movable electrode adapted to form contact with said stationary electrode and withdrawable upon the opening of said switch through said passage, said
5 partition being provided with other passages arranged about the axis of said funnel-shaped passage and extending from points within said lower chamber removed from
10 said funnel-shaped passage to points within said funnel-shaped passage.

9. In a switch of the fluid break type, a vessel adapted to contain insulating fluid, a transverse partition therein forming upper and lower chambers, and having a central

opening therein, a movable contact rod ex- 15
tending through said opening, a stationary contact at the bottom of said lower chamber, an annular shield depending from said partition and surrounding said contact rod, said shield being spaced from said rod and adapt- 20
ed to form a gas collecting space, said partition having passages formed therein to convey fluid from without said shield to said central opening.

In witness whereof, I have hereunto set 25
my hand this 8th day of August, 1921.

JOHN D. HILLIARD.