C. D. HASKINS.

OIL SWITCH.

APPLICATION FILED NOV. 19, 1906.

Patented June 13, 1911.

995,000.

Fig. 1

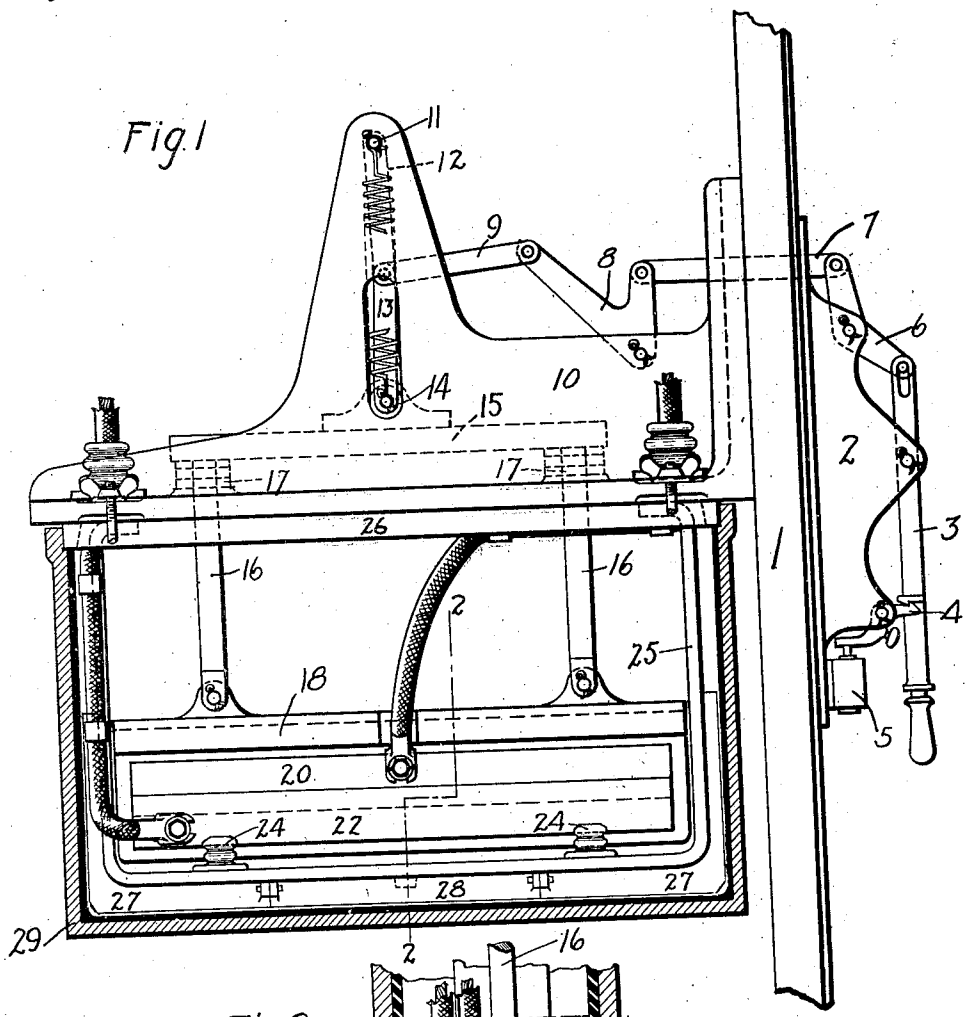
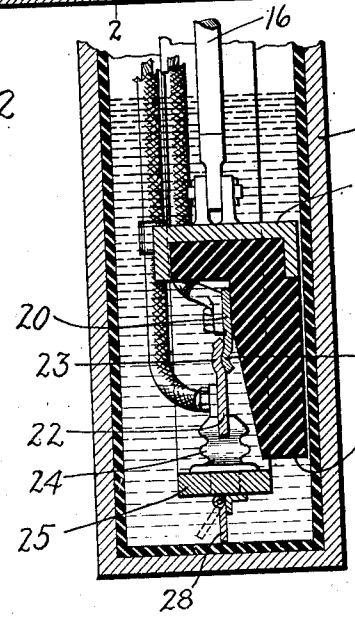


Fig. 2



Witnesses:
Lloyd C. Bush
J. Ellis Glen.

Inventor:
Caryl D. Haskins,
By Albert G. Davis
Atty.

UNITED STATES PATENT OFFICE.

CARYL D. HASKINS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

OIL-SWITCH.

995,000. Specification of Letters Patent. Patented June 13, 1911.

Application filed November 19, 1906. Serial No. 343,973.

To all whom it may concern:

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

This invention relates to switches for controlling electric circuits of high potential and carrying large amounts of energy. It is customary to make the contacts of the switches controlling such circuits as small as possible consistent with carrying the current without undue heating, and as a result, when the circuit is opened an arc of high temperature forms on a comparatively small area of metal; volatilizing the metal and being exceedingly difficult to extinguish. If, however, the arc should form between parallel surfaces or along parallel edges of comparatively great extent, the arc would be diffused over such surfaces or along such edges, the temperature of the arc gases would be comparatively low, and the arc could be extinguished with comparative ease.

The object of my invention is to provide a switch in which the arc formed on opening the circuit is diffused over an area sufficiently great so that the arc is thin, of low current density, and easily extinguished; which when mounted on a switchboard, requires a minimum amount of space thereon, so that a switchboard shorter than would otherwise be required may be used, and in which the insulating liquid is caused to flow across the contacts for the purpose of breaking and extinguishing the diffuse arc formed between said contacts.

In carrying out my invention I prefer to use contacts of such area, or, where the contacts are in the form of a long, thin blade, of such length that the arc formed between them upon opening the circuit will be diffuse and of low current density, and to separate these contacts in such a way that the engaging surfaces of the contacts are always parallel, so that every point of the surface of one contact leaves the surface of the other contact at the same instant. By suitable means the contacts are interlocked when the switch is closed in a manner to insure the separation of the contacts with a quick-break, every point of the engaging surface of one contact leaving the engaging surface of the other contact at the same instant. I also provide means for causing a flow of insulating liquid across the contacts to extinguish the diffuse arc, as well as other details and improvements hereinafter pointed out.

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

Figure 1 shows a hand-operated oil switch embodying my invention, the switch being shown partly in section; and Fig. 2 is a sectional view along the line 2, 2, of Fig. 1.

The switch shown in the drawings is a hand-operated oil switch intended to be mounted upon a switchboard, but the form shown is for the purpose of illustration only, and my invention may be embodied in switches of many different forms and types, as I may operate the switch by a motor, and may dispense with the body of insulating liquid submerging the contacts. The switch is mounted upon a panel 1, the front of which carries a framework 2, in which the operating handle 3 is pivoted. A latch 4 controlled by an electro-responsive device 5, holds the handle 3 in the position shown in Fig. 1 when the switch is in the closed position. In case an abnormal current is flowing in the circuit, the latch 4 releases the handle 3 and permits the switch to open. The handle 3 is connected by means of a bell-crank lever 6, a link 7, bell-crank 8, and link 9 to the movable element of the switch. On the rear of the panel 1 a frame 10 is mounted which forms a support for the contacts of the switch, and in which the bell-crank 8 is pivotally mounted. The frame 10 is formed with two side plates, each of which has an upwardly extending projection, the projections being connected at the upper end by the pin 11. A link 12, mounted upon the pin 11, swings between the side plates of the frame 10. Another link 13 is pivoted to the link 12 at one end, and has a pin in the other end carrying rollers 14, operating in slots in the side plates of the frame 10, the slots forming a guide to cause the rollers 14 to move in a straight line. The pin 11

and the pin upon which the rollers 14 are mounted are connected by means of springs which are put under strain when the switch is closed. The link 9 is connected to the pin which joins the links 12 and 13; these links forming a toggle actuated by means of the link 9 and moving the rollers 14 up and down in the guiding slots. The pin on which the rollers 14 are mounted passes through a projection on a yoke 15, which carries at each end thereof a rod 16; these rods passing through guides 17 in the frame 10, and being connected at their lower ends to a metal plate 18 to which is securely attached a block 19 preferably made of soapstone or similar insulating material. The block 19 carries a contact 20, which is made with an engaging surface of such comparatively great area that the arc caused by opening the circuit for which the switch is designed is very diffuse and easily extinguished. The form of contact shown is a long thin blade, the length of which varies with the amount of energy transmitted through the circuit to be opened, but is always great enough so that the arc is exceedingly diffuse and of low current density at any particular point on the contact because of the long line of separating metallic surfaces; moreover the extended line of contact permits the adjacent metal to carry away the heat and thus reduce the volume of arc gases permitting easy extinguishment of the arc. If the circuit carries a large amount of energy the contacts may be as much as five feet long, in which case the switch will be operated by means of a motor or similar source of power. A switch having contacts of this form is long and narrow, and when mounted with one end secured to suitable supporting means, such as a switchboard, and its length at right angles to the switchboard, requires much less room upon the switchboard than other switches of equal capacity, so that my invention renders possible the control of circuits carrying a given amount of energy from a switchboard much shorter and cheaper than would be required if other switches were used.

The contact 20 has a ridge 21 along the lower edge thereof and coöperates with a similar contact 22 having a similar ridge 23, the ridges being formed by grooving or corrugating the contact-blades. The ridges on the contacts are so proportioned, as shown in Fig. 2, that when the contacts are in engagement the ridge on the contact 20 interlocks with the depression in the contact 22 resulting from the formation of the ridge 23. The contacts are thus interlocked in such a manner that when the switch is opened the contact-blades separate along their entire length at the same instant. Other means for insuring this result may be used, if desired. The contact 22 is supported upon insulators 24 which, in turn, are mounted upon a yoke 25 suspended from the frame 10. One lead of the circuit is connected to the stationary contact 22 while the other lead is connected to the movable contact 20 by means of flexible, stranded cable, which permits the movement of the contact 20. A partition 27 is attached to the yoke 25 and in the middle of the partition a swinging valve 28 is loosely mounted. The contacts are immersed in oil in the removable oil vessel 29, which has an insulating lining. The insulating block 19 fits closely to the wall of the oil vessel 29, as shown in Fig. 2, and the outer edges of the partition 27 are close to the insulating lining of the oil can; the valve 28, however, being free to swing. The result of this arrangement is that the insulating block 19 acts as a piston, the walls of the oil vessel, the partition 27, and the contact 22, forming the cylinder in which the piston acts, so that when said block is drawn up, the valve 28 swings into the position shown in Fig. 2, where it acts as an obstruction to the flow of oil and consequently the oil tends to flow between the contacts as the contacts separate.

The operation of the switch is as follows:—The switch is shown in Figs. 1 and 2 in the closed position, and when it is desired to open it, the handle 3 is moved in the proper direction, thereby permitting the springs, which are under strain when the switch is closed, to contract and open the switch with a quick break. The insulating block 19 and the contact 20 move upward causing the contacts 20 and 22 to separate along the entire length of their engaging edge at the same instant, this result being aided by the interlocking of the edges or corrugations upon the two contacts, as this interlocking overcomes any tendency for the contacts to separate at one end rather than along their entire length. When the contacts separate in the manner described, the arc which results from the rupturing of the circuits is spread over the entire area or along the entire length of the engaging surfaces of the contacts and is therefore, very diffuse and of a low temperature by reason of low current density. When the contacts separate the insulating liquid in the oil vessel 29 tends to flow across the contacts at right angles thereto, and this flow of cool oil is very effective in extinguishing the arc which, on account of being diffused along the engaging surfaces of the contacts 20 and 22, is very easily extinguished. It is apparent that other means for causing the flow of oil across the contacts could be substituted for that disclosed in this application.

It is obvious that my invention may be embodied in many different forms of switches and I therefore, do not wish to be restricted to the precise form shown and described, but intend to cover by the terms

of the appended claims all changes and modifications which are 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 oil, and cooperating contact blades mounted beneath the oil in said vessel to separate along their edges and of a length to extend substantially the whole length of said vessel and great enough to form a diffuse arc when the circuit is opened, of operating means for moving said contacts so that said edges separate at all points simultaneously.

2. An electric switch comprising a narrow oblong vessel containing oil, supporting means at one end of said vessel for supporting it in a horizontal position, coöperating contacts mounted lengthwise of said vessel and beneath the oil to separate along their edges, said contacts being of a length great enough to form a diffuse arc and to extend substantially the entire length of said vessel, and operating means comprising an operating member adjacent said supporting means for moving said contacts to separate them at all points along their edges simultaneously and to maintain said edges parallel.

3. An electric switch comprising a panel, a narrow oblong vessel containing oil, means mounted on said panel for supporting said vessel at right angles to the panel with one end adjacent thereto, operating mechanism comprising an operating handle mounted on said panel, and thin coöperating relatively movable contacts connected to said mechanism and of a length sufficient to extend substantially the entire length of said vessel and to form a diffuse arc when separated, said contacts being mounted lengthwise of said vessel and beneath the oil to maintain their edges parallel during movement and thereby form a long diffuse arc beneath the oil in said vessel.

4. In an electric switch, the combination with an oil vessel containing oil and long thin coöperating contact blades mounted beneath the oil in said vessel to separate along their edges and having interlocking projections thereon parallel to the engaging edges of said blades, of means for causing said blades to move at right-angles to the interlocking projections, whereby said blades separate at all points of engagement simultaneously.

5. In an electric switch, the combination with an oil vessel containing oil and thin cooperating contact blades mounted beneath the oil in said vessel to separate along their edges and of a length great enough to extend substantially the entire length of said vessel and to form a diffuse arc when the circuit is opened, of operating means for separating said contacts, and means carried by one of said contacts for coöperating with the walls of the oil vessel to cause the movement of the oil between the edges of said contact blades when the switch is opened.

In witness whereof, I have hereunto set my hand this 17th day of November, 1906.

CARYL D. HASKINS.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.