E. M. HEWLETT.

OIL SWITCH.

APPLICATION FILED NOV. 14, 1904

1,023,310. Patented Apr. 16, 1912.

Fig. 1

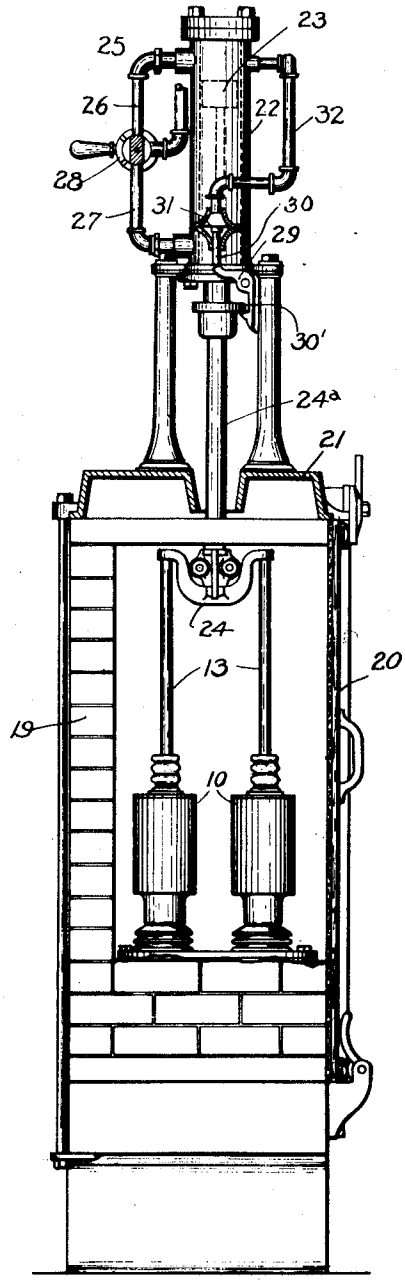
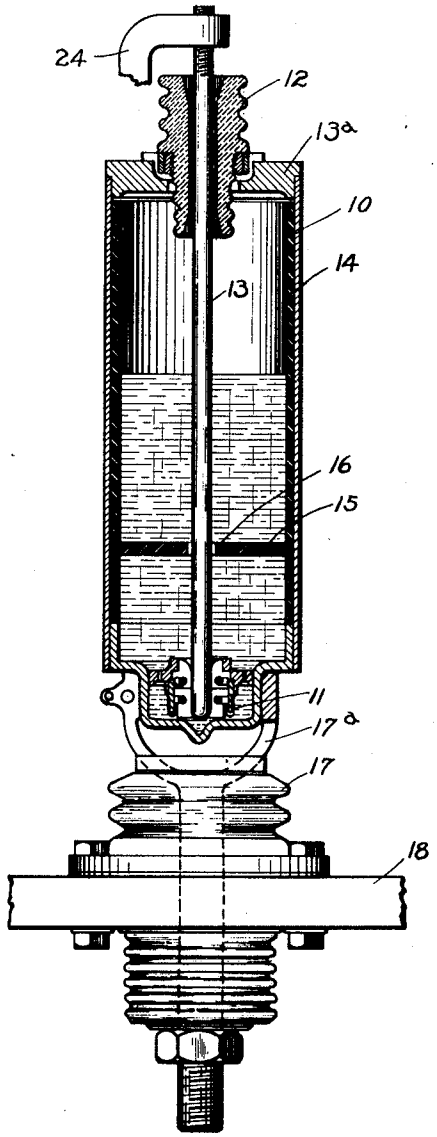


Fig. 2



Witnesses

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UNITED STATES PATENT OFFICE.

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OIL-SWITCH.

1,023,310. Specification of Letters Patent. Patented Apr. 16, 1912.

Application filed November 14, 1904. Serial No. 232,603.

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 Oil-Switches, of which the following is a specification.

The present invention relates to electric switches of the oil break type such as used in installations handling currents of high potential and large amperage, and has particular reference to the construction of the oil pot or inclosure in which the arc is drawn.

The principal object of the invention is to improve the effectiveness of this type of switch by providing a novel oil pot construction by which the pressure created by the arc is utilized in extinguishing the arc.

In carrying out my invention I provide the oil pot with means for confining the pressure created by the arc within the neighborhood of the arc and subsequently directing it against the arc so as to extinguish it. It is obvious that oil pots of various forms may be employed to accomplish this result, and I have disclosed jointly with Charles E. Eveleth another form in an application No. 232,466 filed Nov. 12, 1904, in which the oil pot is provided with an interior cylindrical chamber in which the arc is drawn. In the present case I shall disclose an embodiment of the invention in which the oil pot is provided with a partition or baffle-plate having an opening through which one of the contacts is drawn. The arc being first drawn at one side of this partition puts the oil under pressure in that portion of the pot and forces it through the opening in the baffle-plate. At the instant of separation of the contacts the action of the arc on the oil begins and the flow of oil through the opening in the baffle-plate continues until the pressure subsides after the arc is ruptured. Since the point of initial separation of the contacts is some distance from the opening in the baffle-plate, and since it is at this point of separation that the pressure is applied to the oil, it follows that there will be a current of oil from the neighborhood of the arc along the movable contact and out through the opening. This current is instrumental in carrying away the conducting gases and vapors from their effective position between the contacts and thereby in increasing the resistance of the arc path. In addition to being subjected to this current of oil, the arc is also subjected to pressure. This is brought about by making the clearance between the movable contact and the wall of the opening in the baffle-plate such that the oil cannot escape rapidly enough to keep down the pressure in the neighborhood of the arc. This pressure forces the oil to close in upon the arc, or rather prevents the latter from materially increasing in cross-section. At the same time the oil rapidly absorbs the heat of the arc and assists in chilling the vapor. In case the arc persists until the terminal of the movable contact passes through the opening in the baffle-plate, the plate will act to mechanically restrict the cross-section of the arc and thereby assist in extinguishing it. Thus it will be seen that the arc is subjected first to the mechanical action of the current of the oil along the movable contact and, if this is insufficient to extinguish it, then to the mechanical action of the baffle-plate together with the strong current of oil through the opening. This construction has been found very effective in extinguishing the arc.

A further understanding of the invention will be best obtained upon reference to the following detailed description taken in connection with the accompanying drawing which illustrates the preferred construction.

The various features and aspects of the invention will be particularly set forth in the appended claims.

Figure 1 of said drawing is an elevation of an oil switch having an oil-pot constructed in accordance with the present invention; and Fig. 2 is a sectional elevation of the oil pot drawn to an enlarged scale.

Referring in detail to said drawing, 10 designates the oil pot which is here shown as a closed cylinder provided with a yielding contact 11 at its lower end and an insulating guide 12 at its upper end through which the contact rod 13 is adapted to be moved into and out of engagement with the contact 11. The oil-pot is provided with a suitable cover 13ª and interior insulating lining 14. In the present instance a plurality of oil pots is employed for each circuit. These oil-pots are arranged in pairs located within fire-proof cells formed by the brick walls 19 and the fire-proof doors 20. Each pot is mounted directly upon a ter-

minal 17ª which extends down through a porcelain or glass insulator 17 carried upon a slab 18 of slate or other suitable insulating material located within the fire-proof cell. The upper ends of the contact rods 13 are mechanically and electrically connected by means of a yoke 24 secured to the lower end of a wooden or other insulating rod 24ª, which extends upward through the cap 21 of the cell structure. When the switch is in the closed position circuit is completed between the terminals 17ª by way of the contacts 11 and 13 and the yoke 24. The construction thus far described constitutes no part of the present invention but is one which has been largely employed heretofore.

It will be apparent that in a switch construction such as the above, when the arc is drawn between the contacts, considerable gas is evolved at the lower end of the pot and this, when rupturing a large amount of energy, has the effect of throwing the oil upward very much like a piston, and sometimes with sufficient force to spill the oil from the pot, thus forcing the oil away from the arc where it should be retained in order to extinguish it. By the present invention, this pressure is utilized for this purpose. In pursuance of this object I divide the oil pot 10 into two compartments by means of a baffle-plate or partition 15, which is located near the lower end of the pot in a position to pocket a certain portion of the oil in the neighborhood of the lower contact. The baffle-plate 15 is provided with a central opening through which the contact rod 13 moves. This opening is somewhat larger in diameter than the contact 13 so that there is a clearance through which the oil may pass. Preferably the oil fills completely the lower compartment and a portion of the upper compartment as shown, but obviously the amount of oil may be varied within wide limits or in some instances entirely omitted.

With this improved construction it will be seen that in operation as the terminal 13 is drawn upward the arc will be drawn in the lower compartment and the oil in said compartment will be put under pressure and forced through the opening into the upper compartment. This movement of the oil will take place almost immediately upon the formation of the arc, and as the contacts separate it will tend to carry the conducting vapors and gases produced by the arc upward along the contact 13 and out into the upper compartment. At the same time the pressure exerted upon the oil will react to compress the arc stream. If the arc is not broken by the combined action of the current of oil and the pressure in the lower compartment but persists it will be drawn through the opening 16 into the upper compartment. In passing through the opening the arc will be mechanically contracted by the baffle-plate 15 and will be torn apart by the current of oil flowing upward through the opening. Where oil is omitted, the air within the pot will be subjected to similar action.

The rupturing of circuits carrying large amounts of energy produces an enormous pressure in the lower compartment of the oil-pot. This pressure is counteracted by the oil-pot structure which must be sufficiently strong to withstand it. It is obvious that this strain on the pot may be relieved and the capacity of the switch thereby increased either by increasing the size of the opening 16 or by decreasing the amount of oil in the pot sufficiently to bring its level below the baffle-plate and leave an air cushion between its surface and the baffle-plate. It will be apparent to those skilled in the art that the position of the baffle-plate may also be varied to suit certain conditions of service.

In the operation of switches of this type some power-actuated mechanism is usually employed. For the purpose therefore of illustrating a completely operative device, I have shown in the present instance pneumatic means for reciprocating the movable contacts of the switch. The means illustrated is substantially the same as that disclosed in my prior application, Serial Number 4314, filed February 17, 1900. It is of course obvious that other motor mechanisms might be employed equally as well and in fact the pneumatic mechanism described and shown herein has been practically superseded in practice by electric actuating mechanism but I have desired to illustrate pneumatic means because of its simplicity. This pneumatic mechanism is mounted on the cap 21 of the cell structure of the switch and comprises a cylinder 22 which is provided with a piston 23 having its rod connected to the upper end of the wooden rod 24ª. Movement is given to the piston 23 by admitting compressed air or other fluid through the supply pipes 25, 26 and 27 to either side of the piston. The supply of fluid to the cylinder is controlled by a valve 28 provided with suitable supply and exhaust ports. It is obvious that the piping may be arranged in any desired manner and that the controlling valve 28 may be located at a point some distance from the main switch in order to insure safety to the operator. From the above it will be apparent that when air is admitted through the pipes 25 and 27 to the under side of the piston it will be forced upward and at the same time the contacts 11 and 13 in each of the oil-pots will be separated and the circuit broken in the manner previously described. On the other hand, if air is admitted through the pipe 26 to the

upper side of the piston, it will be forced downward and the circuit thereby closed. In order to retain the switch in its open position, that is with its piston up, without maintaining air pressure in the lower end of the cylinder, I provide a latch 29 which engages a collar 30′ at the upper end of the wooden rod 24ª. This latch is normally drawn into engagement with the collar by gravity. In order to release the latch, a releasing pin 30 is provided. This pin at its lower end engages the latch 29 and at its upper end is secured to a diaphragm located in a chamber 31 and in communication at its upper side through the piping 32 with the upper end of the cylinder. With this organization, when air is admitted to the upper end of the cylinder it will also be admitted to the upper side of the diaphragm and will force the pin 30 downward against the latch 29 thereby releasing it and allowing the air on the upper side of the piston to forcibly close the switch.

It will be obvious to those skilled in the art that many alterations and modifications may be made in the specific construction herein disclosed without departing from the spirit and scope of my invention. I therefore do not wish to be limited to the specific matter disclosed but aim to cover by the terms of the appended claims all such alterations and modifications.

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

1. An electric switch comprising separable contacts, a closed chamber therefor containing insulating fluid, and immovable means located therein for confining the insulating fluid when put under pressure by the arc and directing the insulating fluid against the arc so as to extinguish it.

2. An electric switch comprising a closed chamber, separable contacts arranged to break therein, and an immovable partition therein located above the break point and provided with an opening for the passage of the movable contact.

3. An electric switch comprising separable contacts arranged to break under oil, a closed chamber for the oil, and immovable means located therein for confining the oil when put under pressure by the arc and directing it against the arc so as to extinguish it.

4. An electric switch comprising separable contacts arranged to break under oil, a closed chamber for the oil, and an immovable apertured partition therein through which one of said contacts passes in drawing the arc.

5. An electric switch comprising a closed chamber containing oil, separable contacts arranged to break therein, and communicating means between different portions of said chamber arranged to cause the pressure produced by the arc to direct oil against the arc so as to extinguish it.

6. An electric switch comprising an oil pot, separable contacts arranged to break therein under oil, and communicating means between different portions of said pot arranged to conduct the oil displaced by the arc against the arc so as to extinguish it.

7. An electric switch comprising a two compartment chamber containing oil, separable contacts arranged to break in one of said compartments, and communicating means therebetween arranged to direct oil put under pressure produced by the arc against the arc so as to extinguish it.

8. An electric switch comprising a two compartment oil pot, separable contacts arranged to break in one of said compartments under oil, and communicating means therebetween arranged to conduct the oil displaced by the arc gases against the arc so as to extinguish it.

9. An electric switch comprising a two compartment oil pot, separable contacts arranged to break in one of said compartments, and an oil conducting passage therebetween arranged to conduct the oil displaced by the arc gases against the arc so as to extinguish it.

10. An electric switch comprising a two compartment oil pot, one of which compartments is filled with oil, separable contacts arranged to break in the filled compartment, and communicating means between the compartments for directing the oil put under pressure by the arc gases against the arc so as to extinguish it.

11. An electric switch comprising a two compartment oil pot, one of which compartments is filled with oil, separable contacts arranged to break in the filled compartment, and the oil conducting passage between said compartments arranged to conduct the oil displaced by the arc gases against the arc so as to extinguish it.

12. An electric switch comprising a two compartment oil pot, a communicating passage therebetween, and separable contacts arranged to break under oil in one compartment and to draw the arc through the communicating passage into the other compartment, whereby the oil put under pressure in one compartment prior to the other escapes through the communicating passage thereby compressing and extinguishing the arc.

13. An electric switch comprising a two compartment oil pot one of which compartments is filled with oil, a communicating passage therebetween, and separable contacts arranged to break in the filled compartment and draw the arc through the communicating passage to the other compartment whereby the oil put under pressure in one compartment prior to the other, escapes through the communicating passage thereby compressing and extinguishing the arc.

14. An electric switch comprising an oil

chamber, separable contacts arranged to break therein under oil, one of said contacts movable into and out of the oil, and means in the path of movement whereby the oil put under pressure by the arc is utilized in extinguishing the arc.

15. An electric switch comprising an oil compartment, separable contacts arranged to break therein under oil, and an escape opening permanently open to the oil displaced by the arc gases arranged so as to direct the escaping oil against the arc and to conduct the oil to said compartment after the arc is extinguished.

16. An electric switch comprising an oil pot partially filled with oil, a contact at the lower end of the pot, a coöperating movable contact extending into the pot through its upper end, and an immovable partition therein located below the oil level and provided with an opening for the passage of the movable contact.

17. An electric switch comprising an oil pot, separable contacts therein arranged to break under oil, a partition in said pot located adjacent to the break point and extending transversely of the path of contact movement, and an escape opening therein for the passage of the oil put under pressure.

18. In an oil switch, an oil pot having a transverse flat partition extending from wall to wall, and dividing the interior of the pot into two compartments, said partition provided with a relatively small central communicating opening, a fixed contact seated in one compartment, and a movable contact passing through the other compartment and through said opening into engagement with the fixed contact, together with oil in both compartments.

In witness whereof I have hereunto set my hand this 12th day of November, 1904.

EDWARD M. HEWLETT.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.