J. D. HILLIARD.

ELECTRICAL SWITCH.

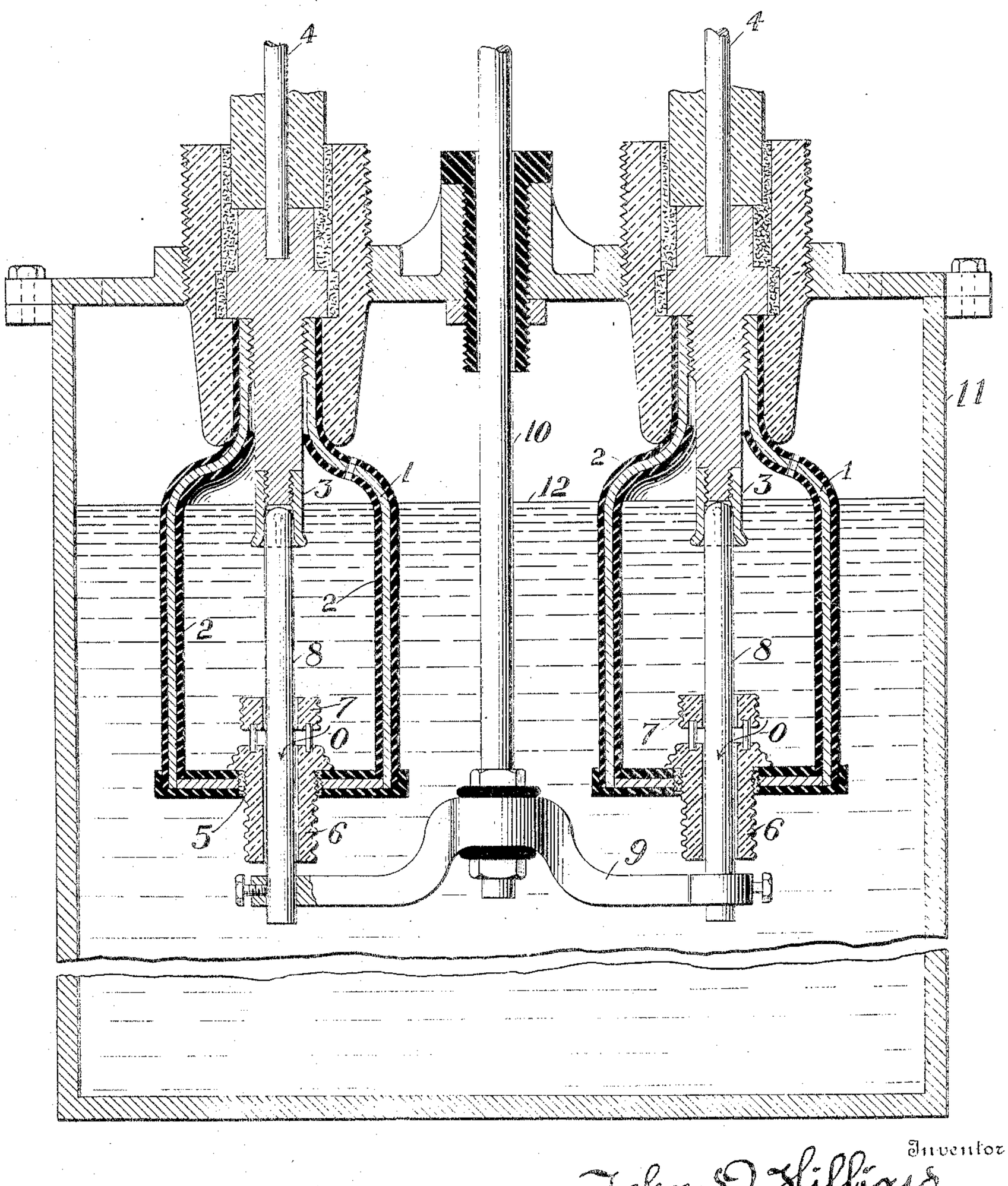
APPLICATION FILED MAR. 19, 1908.

949,033.

Patented Feb. 15, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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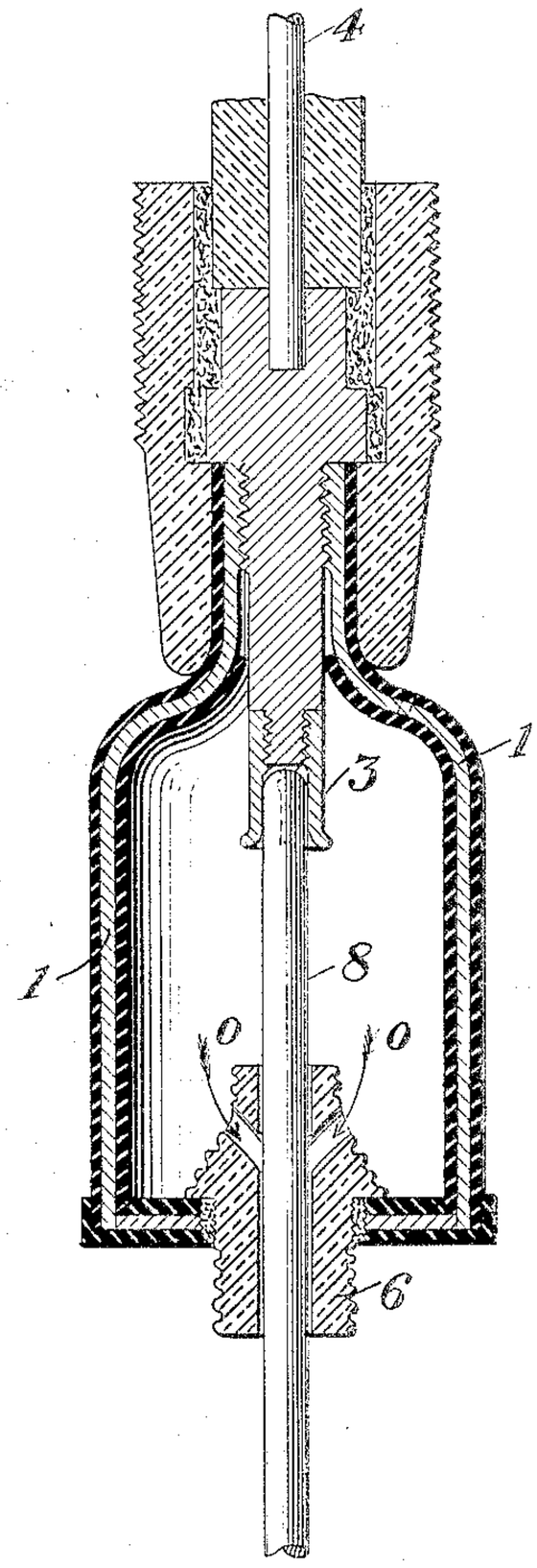
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN D. HILLIARD, OF ALBANY, NEW YORK.

ELECTRICAL SWITCH.

949,033. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed March 19, 1908. Serial No. 422,124.

To all whom it may concern:

Be it known that I, JOHN D. HILLIARD, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Electrical Switches, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electrical switches, and has for its object the production of a switch by means of which high potential circuits carrying considerable amounts of energy can be broken quickly and easily, without the formation of a destructive arc.

My invention may be very briefly stated as follows: A pot of drawn steel or similar material which will resist high pressures, is insulated and carries within it the fixed contact. The movable contact passes into the pot by way of an opening bushed with insulation, through which the arc is drawn out of the pot in breaking. In the upper part of this bushing and below the end thereof are openings through which a blast of insulating fluid is forced into the path of the arc by the pressure created in the pot by the arc itself. The movable contacts are actuated preferably by quick-acting mechanism. When used with oil as the insulating fluid, a suitable reservoir is provided to maintain the oil normally at a proper level in the pot.

My invention is illustrated in the accompanying drawing in which—

Figure 1 is a sectional view of an oil switch, showing one pole or two elements thereof, and Fig. 2 is a similar view of a single element of modified form.

Referring to the drawing, 1 indicates an oil pot, whose surface is covered inside and out with insulation 2. This pot is shown for convenience in the shape of a bottle, in the neck of which is secured the stationary contact 3. In the bottom of the bottle there is an opening 5, provided with an insulating bushing 6—7 of peculiar construction. The movable contact 8 passes through this bushing in making and breaking, and the circuit connections are completed through a pair of the elements by means of the yoke 9. The movement of the contacts 8 is produced through this yoke and its operating rod 10 by means of any suitable mechanism, which may be either mechanical or electrical, but should preferably be adapted to withdraw the contacts 8 from the bottles 1 in a small fraction of a second. A switch of this type is usually arranged for automatic operation, especially on the occurrence of a short circuit, and it is therefore highly desirable for it to break within such a small period of time as to prevent synchronous apparatus on the system from being thrown out of step.

The outer oil vessel or reservoir is indicated at 11 and the oil level therein at 12.

The bushing 6—7 is shown as formed of two separate pieces, the body 6 and the ring 7, with short supports or spacing rods between them. The central openings through both are alined for the passage of the movable contact 8, and the arc formed on breaking is intended to be drawn through them both, being restricted by the ring 7 before it passes into the bushing 6. It is not necessary that these two elements should be separate from each other, however, as the same function would be performed in substantially the same way by enlarging the head of the bushing 6 and forming lateral openings therein as shown in Fig. 2.

The operation of this form of switch is as follows: Assuming the circuit terminals 4—4 to be connected through the contacts 3—8 and the yoke 9, the circuit is broken by moving contacts 8 quickly away from the stationary contacts 3. In each case an arc is formed within the bottle 1, and above the ring 7. Pressure is immediately generated in the bottle due to the arc heat and gases, this pressure being of course cushioned to some extent, owing to the air space over the oil, but tending to force the latter out of the bottle. As the contact 8 passes down beyond the ring 7, and especially after it passes the tip of the bushing 6, oil will be forced through the openings between the ring and the bushing, as indicated by the arrows marked O, the rush becoming pronounced as the movable contact leaves the bushing and the passageway is entirely open.

I have shown the contact rods 8 solid, but they may be made hollow so as to permit an immediate outrush of oil upon the open end of each contact passing the inner face of the bushing 6. This and other changes which will readily occur to the skilled engineer are optional in practice, and need not be further referred to.

In experimental work heretofore done with oil switches intended to break high potential circuits, it has been found in many cases that the oil blew out, and the extin-

guishment of the arc depended upon the gas blast alone. In some types of switches, even where oil in ample quantity is provided, the formation of a gas sphere between the contacts and in the vicinity of the opening to the oil pot, tends to produce a gas blast and force the oil back in the inner vessel rather than out of the opening therein. It has been found very difficult to produce steady and reliable oil blast action. The present invention, however, removes all difficulties heretofore encountered. As the arc is sprung above the ring and is drawn down within it, the gases cannot reach the opening beneath the ring without forcing the oil therethrough. It will be observed, moreover, that the oil being introduced laterally in this way and then passing in a stream longitudinally of the arc, produces its greatest effect at the weakest point, since the highest initial pressures have already been created before the arc is drawn below the ring. The extinguishment of the arc by a positive oil blast and consequent high efficiency of the switch are thus insured.

In Fig. 2 I have shown a single element, which may be used as gas or oil blast device, the form of the insulator 6 being also somewhat modified by having its head enlarged and the lateral openings formed directly in it as heretofore mentioned. Used as a gas blast switch, the action is very similar to that of the oil blast, a stream of un-ionized insulating fluid being directed through the lateral channels as indicated by the arrows *o*, into the weakest part of the arc as it is drawn out.

I am aware that many non-essential changes may be made in details, materials or form, without departing from the spirit of my invention or the scope of the appended claims. All such changes are contemplated by me, and it should be understood therefore, that the specific type of switch described herein is presented for purposes of definition and not of limitation.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. An electrical switch comprising a pot containing insulating fluid, a stationary contact therein, a movable contact coöperating therewith through an insulated opening in the pot, and means within the pot alined with but spaced away from said opening and adapted to restrict the arc formed upon breaking, above the opening, and to direct a blast due to the arc pressure laterally into the opening and so into the path of the arc, to extinguish the same.

2. An electrical switch comprising a pot containing oil, a stationary contact seated therein, an opening in the pot opposite said contact, tubular insulating means extending through said opening and into the pot, with lateral inlets for oil spaced away from the inner end thereof, and a movable contact passing through said tubular insulating means in making and breaking the circuit, substantially as described.

3. An electrical switch comprising an inner and an outer oil vessel, both partially filled with oil, a pressure chamber in the inner vessel and a stationary contact seated therein, an opening in said inner vessel bushed with an insulating bushing, a movable contact passing through said bushing to make and break within the inner vessel and means constituting an extension of the bushing within said vessel above the opening adapted to restrict the arc formed upon breaking and to direct oil transversely into the path of the same to extinguish it.

4. An electrical switch comprising the following instrumentalities: an oil pot or reservoir, a body of oil therein, a supplemental pot forming a pressure chamber supported in the oil and containing a portion thereof, a fixed contact within the pressure chamber, an opening in the wall of said chamber opposite said fixed contact, an insulator in said opening extending into the chamber and provided with intersecting axial and transverse channels both communicating with the chamber and a movable contact adapted to pass into and out of the pressure chamber through the axial channel in said insulator, whereby when the circuit is broken an arc is drawn out through the insulator, while oil under arc-created pressure is forced through the transverse channel into the axial channel to extinguish the arc.

5. An electrical switch comprising the following instrumentalities: a pressure vessel, a fixed contact therein, a movable contact adapted to pass into and out of the pressure vessel in making and breaking the circuit, and a perforated insulator through which the same passes, said insulator having a plurality of openings within the pressure vessel, whereby in breaking the circuit the arc is sprung within the vessel and is drawn out through one of the openings in the insulator, while a blast due to the arc-created pressure is directed into one or more other openings and so into the path of the arc to extinguish it.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN D. HILLIARD.

Witnesses:
M. L. STEVER,
H. J. HUNSICKER.