

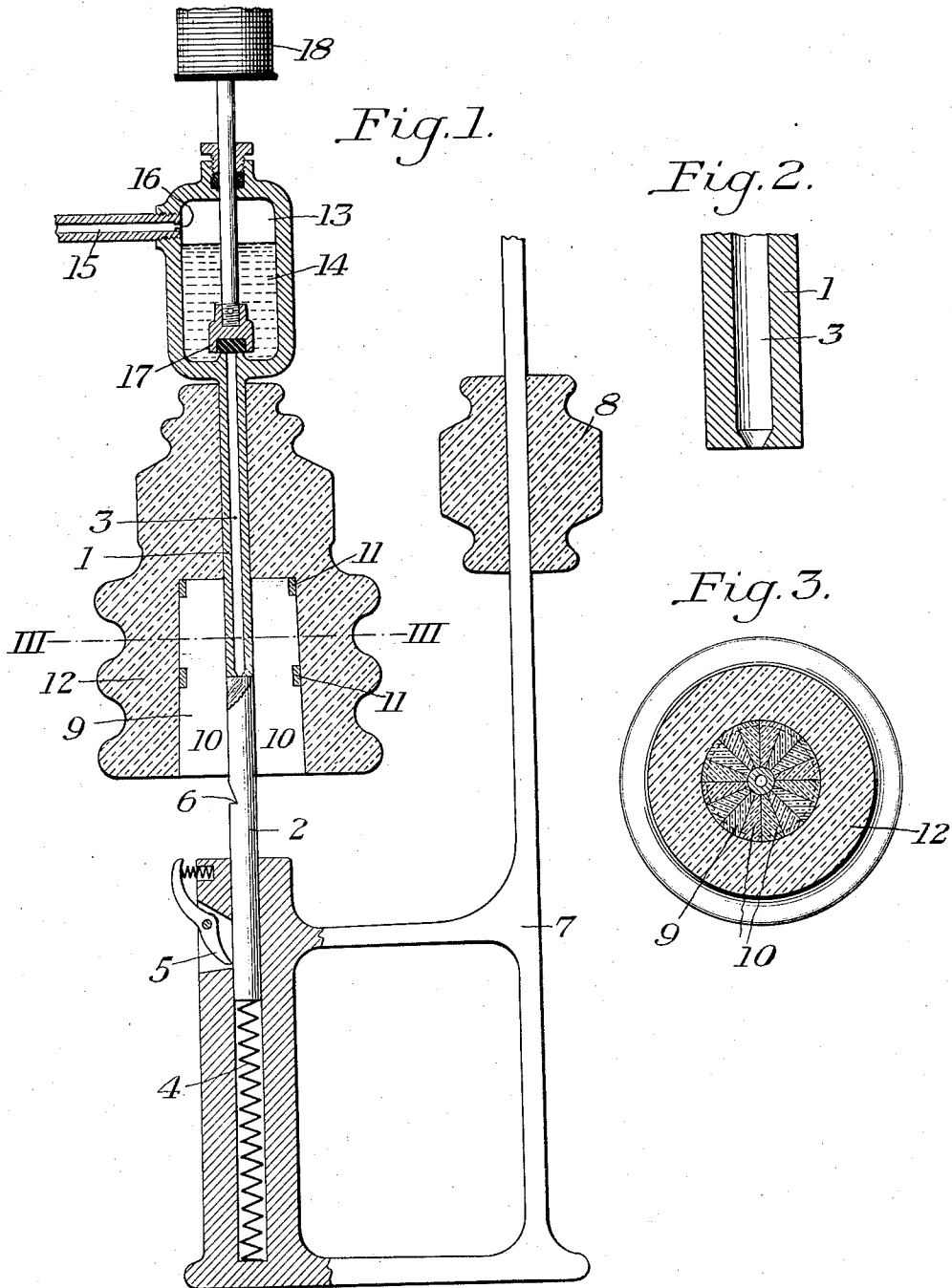
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C. L. JONES

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ELECTRIC SWITCH

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INVENTOR

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## UNITED STATES PATENT OFFICE

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## ELECTRIC SWITCH

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The present invention relates to electric switches, and more especially to means for prevention of arcing at the switch contacts.

A non-flammable liquid or gas, preferably carbon dioxide, is introduced under pressure between the contacts. The contacts are separated by the pressure thus supplied. The expanding gas or gasified liquid also serves to blow out the arc.

10 In the drawings:—

Figure 1 is a vertical section through the switch illustrating one embodiment of the invention;

15 Figure 2 is a detail section through the lower end of the hollow contact, and

Figure 3 is a horizontal section along the line III—III of Figure 1.

Referring to the illustrated embodiment of the invention the switch comprises two separable contacts 1 and 2. The upper contact 1, which is shown as the fixed contact, is hollow, having a passage 3 extending through it to the contact faces of the contacts 1 and 2. The lower contact 2 is a solid movable contact normally held against the contact 1 by means of a spring 4. A latch 5 engaging a tooth 6 in the contact 2 is provided for removably holding the contacts separated. The contact 2 is carried on a frame 7 which is connected to the line in which the switch is interposed, and which is carried by any suitable insulating means 8 to insulate it from the contact 1 and its operating parts.

35 The contacting ends of the contacts 1 and 2 are enclosed in a tube 9 of an insulating material which is resistant to thermal shock. This tube 9 is preferably made up of a plurality of fused silica or quartz segments 10 shown in section in Figure 3. These are bound together by suitable metal bands 11 for structural strength. The quartz tube 9 is inserted in a recess in the insulator 12, which may be made of porcelain or any other suitable insulating material.

45 The switch contacts are separated by the pressure caused by introducing liquid carbon dioxide or other fluid between their contacting faces. The liquid carbon dioxide is, of course, under high pressure. The pressure of the carbon dioxide shoots the contact 2 at

high velocity downwardly from the tube 9 somewhat after the manner in which a projectile is discharged from a gun.

The carbon dioxide is introduced between the contacting faces of the contacts 1 and 2 through the passage 3 in the contact 1. A small reservoir 13 is provided at the end of the passage 3 for holding a supply of liquid carbon dioxide 14. The reservoir 13 is supplied through a pipe 15 from a carbon dioxide storage container (not shown). The pipe 15 is preferably provided with an orifice 16 to limit the rate of flow from the carbon dioxide storage container into the reservoir 13. Any suitable valve arrangement may be employed for controlling discharge of the carbon dioxide from the reservoir through the passage 3. For purposes of illustration, I have shown a simple lift valve 17. The valve may be operated by any suitable means. In the drawings a solenoid 18 is shown for raising the valve 17.

The operation of the switch is as follows: The parts are shown in the drawings in their normal current conducting positions. When the switch is to be opened, the valve 17 is raised, admitting a stream of liquid carbon dioxide through the passage 3 between the contacts 1 and 2. The liquid carbon dioxide is, of course, under the high pressure in which it is supplied in the storage containers. When the valve 17 is opened, the pressure of the carbon dioxide drives the contacts 1 and 2 apart. Any heat which may be generated by arcing between the contacts at the moments of separation tends to volatilize or expand the carbon dioxide. At the moment of separation of the contacts, the carbon dioxide between them is under a considerable pressure, which of itself tends to prevent electric discharge taking place. Also the stream of carbon dioxide between the contacts tends to violently blow out or sweep away any arc which may tend to form between the contacts. The cooling effect of the expanding carbon dioxide also tends to produce a condition unfavorable to the formation and maintenance of an electric arc.

When the movable contact 2 is shot down, it is engaged by the latch 5 and held out of

contact with the fixed contact 1 until such time as it may be desired to close the switch.

On account of the extreme temperature conditions produced by the formation of an arc followed immediately by the intense cold of the expanding carbon dioxide, the tube 9 should be made of some insulating material which is resistant to thermal shock, and for this purpose I prefer to use fused silica, although it is to be understood that other materials may be used.

While I prefer to use liquid carbon dioxide as the material to be introduced between the contacts, other non-aqueous fluids, either liquid or gaseous, may be employed. Water is not suitable for this purpose, particularly when high voltages are to be handled. Such fluids should be non-flammable, non-corrosive and non-conducting, and may be compressed inert gas, such as nitrogen or a volatile liquid under pressure, such as carbon tetrachloride or other fluids containing halogenated hydrocarbons.

While the drawing illustrates diagrammatically an embodiment of the invention, it is to be understood that it may be embodied in other forms of switches, in which any of the usual mechanisms may be employed for mounting the contacts and operating them on any desired duty cycle.

The present invention is therefore not limited to its specific and preferred embodiment shown in the drawings and above described in detail, but may be otherwise embodied within the scope of the following claims.

I claim:

1. An electric switch comprising separable contacts, a tube of material resistant to thermal shock surrounding the contacts, and means for supplying a highly compressed non-flammable non-conducting fluid between the contacts so as to separate them by the pressure thus applied.

2. An electric switch comprising separable contacts, a tube of material resistant to thermal shock surrounding the contacts, and means for introducing liquid carbon dioxide between the contacts so as to separate them by the pressure of the carbon dioxide.

3. A tube for withstanding thermal shock comprising a plurality of silica segments, and means for holding them together.

4. A tube for withstanding thermal shock comprising a plurality of silica segments, a band for holding the segments together, and a casing surrounding the silica segments.

5. A tube for withstanding thermal shock comprising a plurality of segments of a material having a low co-efficient of thermal expansion, and means for holding the segments together.

6. An electric switch comprising separable contacts, and means for separating the contacts and blowing out any arc by the injection

of a compressed non-inflammable non-conducting liquid of boiling point below 0° C. between the contacts when the contacts are in closed position.

7. An electric switch comprising separable contacts, a chamber surrounding the contacts and in which at least one of the contacts is movable, and means for introducing into the chamber between the contacts a non-inflammable non-conducting fluid of boiling point below 0° C. under pressure so as to both drive the contacts apart and blow out any arc formed upon their separation.

8. An electric switch comprising separable contacts, a chamber surrounding the contacts and in which at least one of the contacts is movable, and means for introducing into the chamber between the contacts while the contacts are in closed position, carbon dioxide under pressure equal to, or greater than, its vapor pressure so as to both drive the contacts apart and blow out any arc formed upon their separation.

9. An electric switch comprising separable contacts, and means for supplying liquid carbon dioxide between the contacts as they are separated whereby a stream of intensely cold carbon dioxide gas is discharged across the contacts to chill and blow out any incipient arc formed upon their separation.

10. An electric switch comprising separable contacts, and means for discharging highly compressed carbon dioxide between the contacts to separate the contacts and to chill and blow out any incipient arc formed upon their separation.

11. An electric switch having separable contact faces, and means for discharging highly compressed carbon dioxide against one of the contact faces to separate the contacts and chill and blow out any incipient arc formed upon their separation.

In testimony whereof I have hereunto set my hand.

CHAS. L. JONES.