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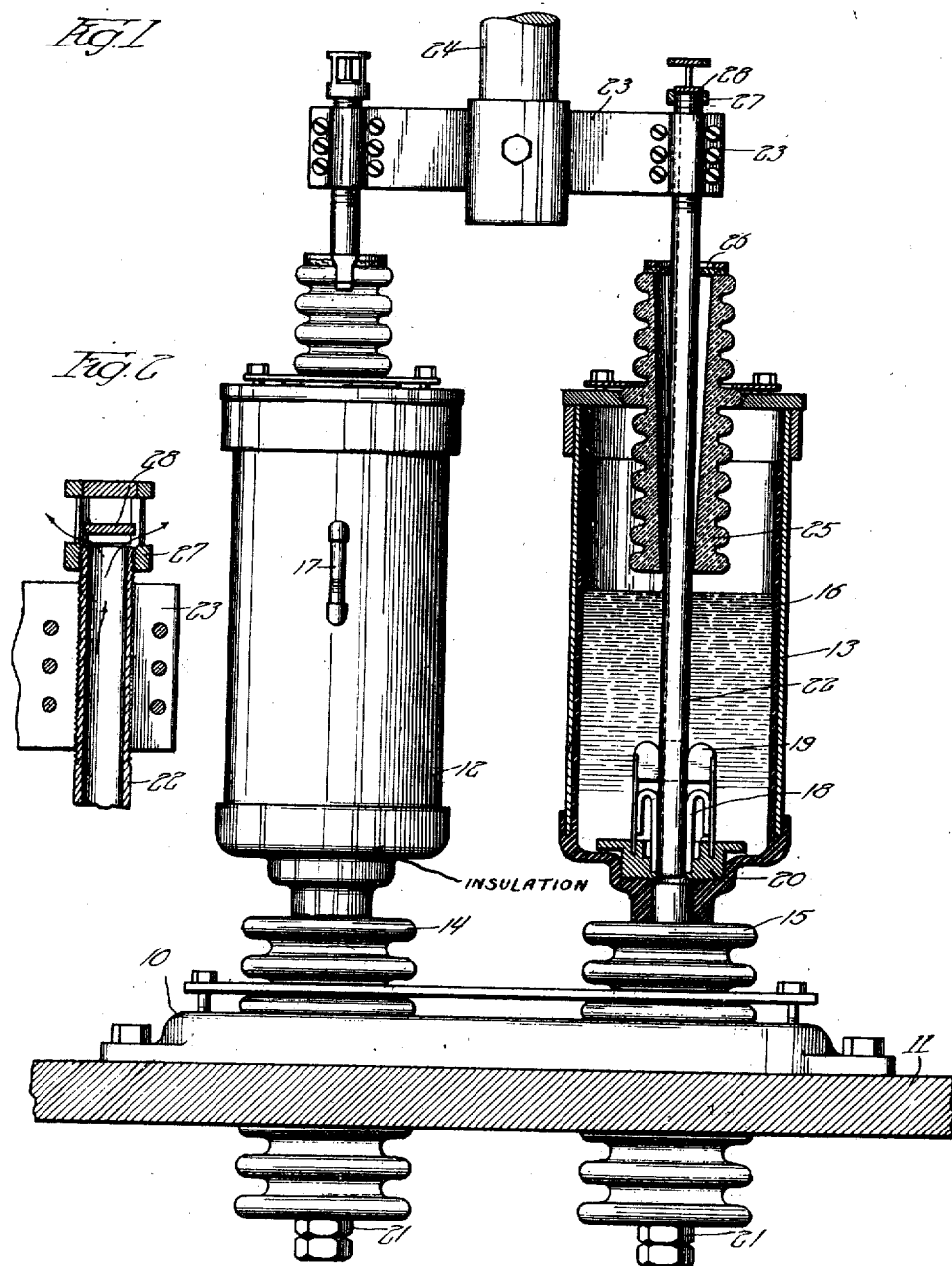
N. J. CONRAD

1,469,381

SWITCH

Filed Feb. 24, 1920

5 Sheets-Sheet 1



Inventor
Nicholas J Conrad
by Gabriel Mueller atty

Oct. 2, 1923.

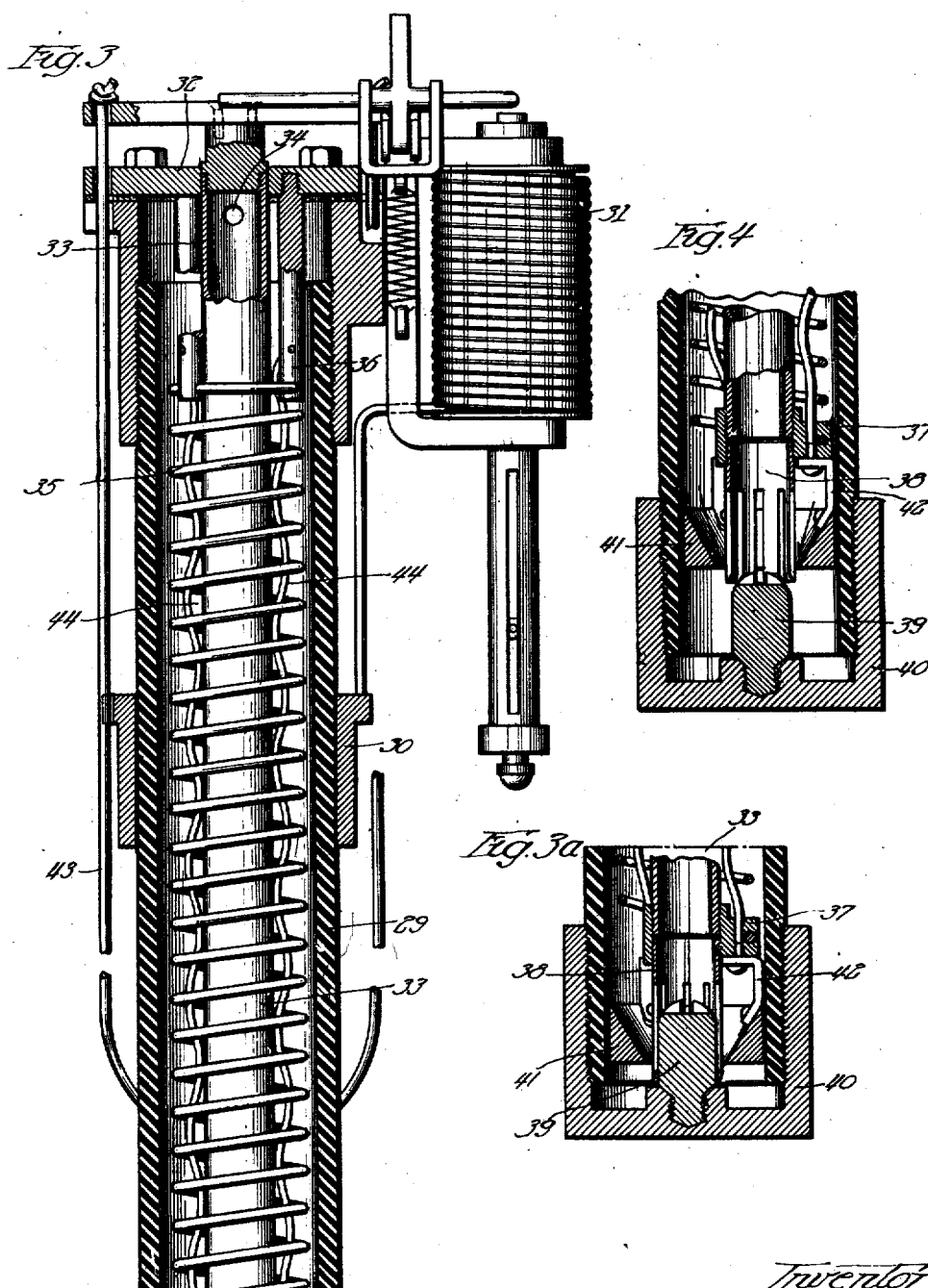
N. J. CONRAD

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SWITCH

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5 Sheets-Sheet 2



Inventor
 Nicholas J. Conrad
 by *Gabel & Mueller attys*

Oct. 2, 1923.

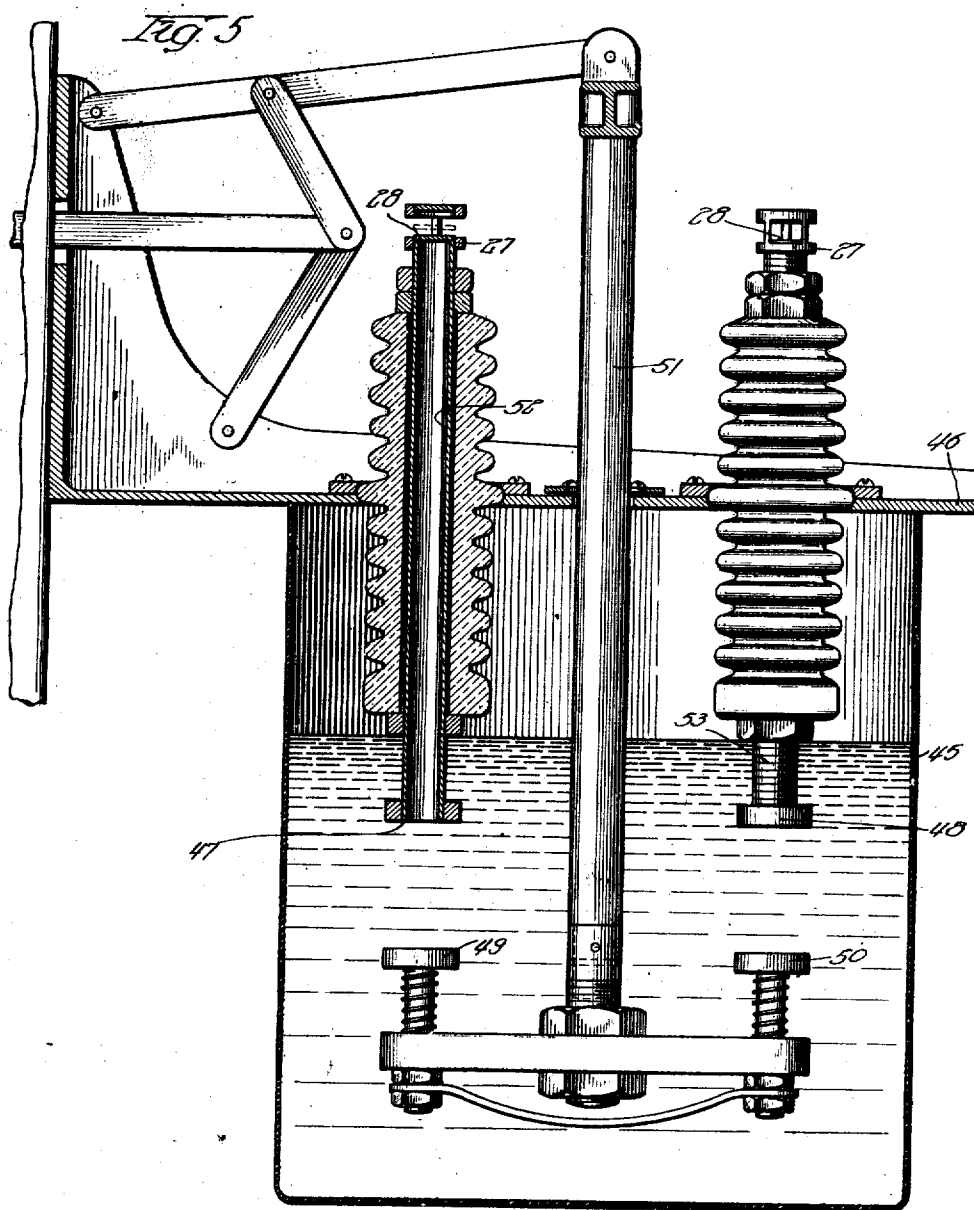
N. J. CONRAD

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SWITCH

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5 Sheets-Sheet 3



Inventor
Nicholas J. Conrad
by Jabel & Mueller
attys.

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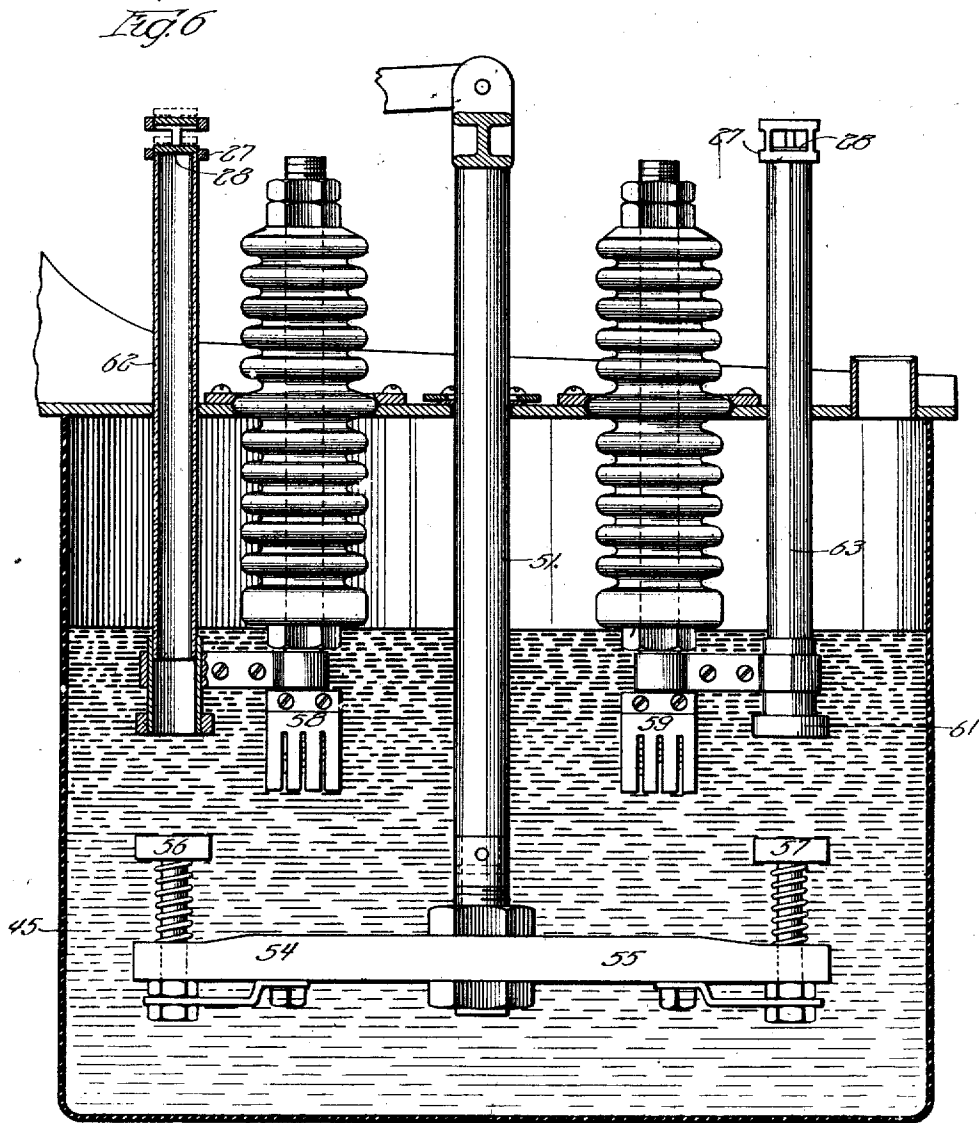
N. J. CONRAD

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SWITCH

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Inventor
Nicholas J. Conrad
by Gabriel & Mueller Atty

Oct. 2, 1923.

N. J. CONRAD

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SWITCH

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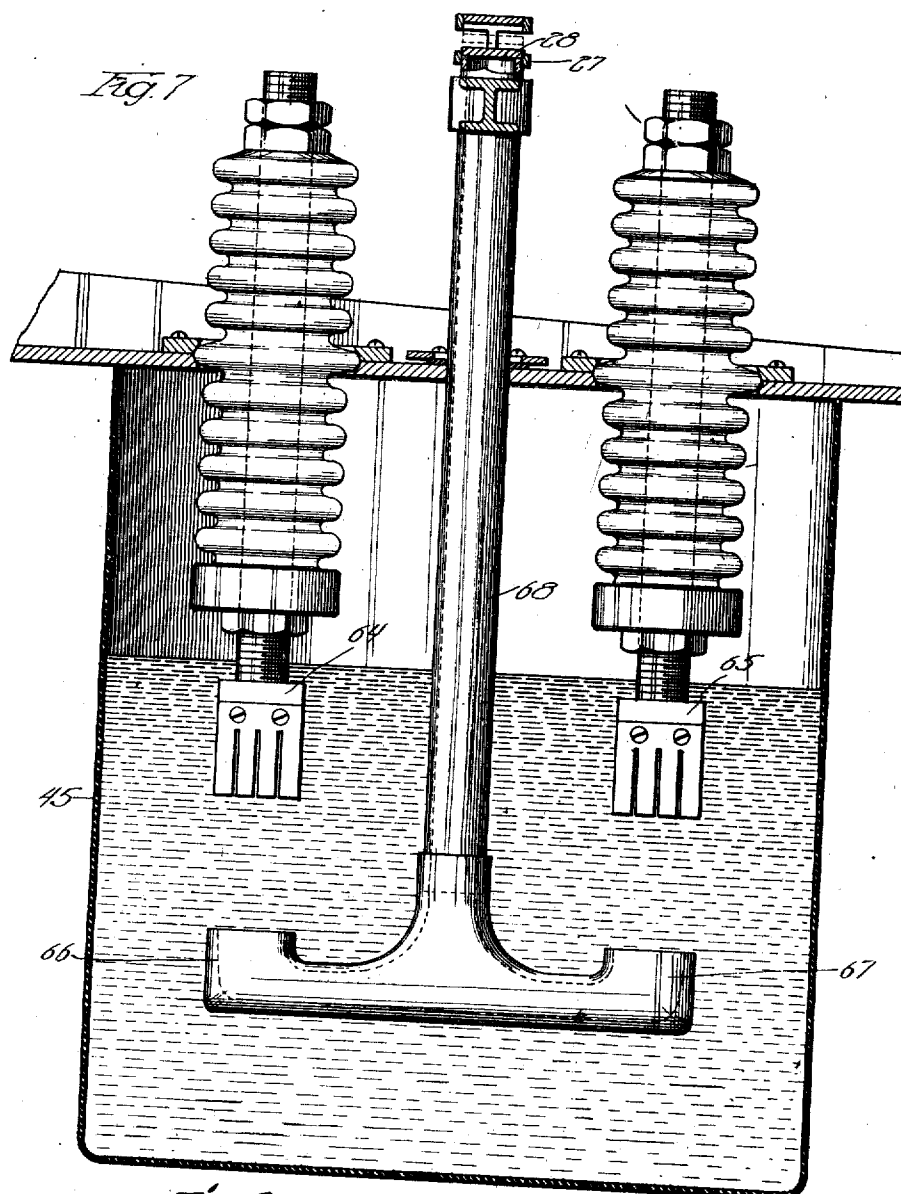
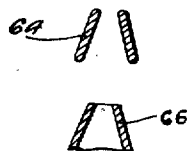


Fig. 8.



Inventor
Nicholas J Conrad
by Gabel & Mueller
Atty's.

UNITED STATES PATENT OFFICE.

NICHOLAS J. CONRAD, OF CHICAGO, ILLINOIS, ASSIGNOR TO SCHWEITZER & CONRAD,
OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SWITCH.

Application filed February 24, 1920. Serial No. 360,809.

To all whom it may concern:

Be it known that I, NICHOLAS J. CONRAD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to switches and has for its object the provision of suitable means utilized in connection with switches or other circuit controlling or changing elements whereby to cause a rapid extinguishment of the arc that may be formed during the actuation of such switches or elements or to eliminate the arc entirely under certain conditions.

My invention is of more particular utility in connection with such switches or elements as are used in connection with high potential circuits or apparatus.

My invention contemplates the use of a suitable fluid having the necessary properties whereby it can be used satisfactorily in connection with my improved device to bring about the objects and functions heretofore outlined.

My invention is of use in connection with all of those liquids or fluids which are of value in this connection, such as for instance oil or the various other liquids as are set forth in Patent No. 1,319,907, issued Oct. 28, 1919, to E. O. Schweitzer and myself. In general my invention contemplates the provision of means whereby the fluid is directed in a path across the arc to thereby assist in the extinguishment of such arc. I will explain certain forms which my invention may take more in detail by referring to the accompanying drawings, in which—

Fig. 1 is a fragmentary view of a switch constructed in accordance with my invention, certain portions being shown in sections more clearly to reveal features of construction;

Fig. 2 is an enlarged longitudinal sectional view of certain vent mechanism shown in Fig. 1;

Fig. 3 is a fragmentary longitudinal sectional view of a modified form of the device shown in connection with a circuit breaker;

Fig. 3^a is a continuance of the lower portion of Fig. 3;

Fig. 4 is a view similar to Fig. 3^a showing the movable parts in an intermediate position;

Fig. 5 is a fragmentary longitudinal sectional view of a modified form of switch mechanism;

Figs. 6 and 7 are similar views of modified forms of switches constructed in accordance with my invention;

Fig. 8 is a fragmentary vertical sectional view of the cooperating contact members of the switch mechanism shown in Fig. 7.

Referring more particularly to Fig. 1 I show a switch whose parts are suitably mounted upon a base plate 10 which base plate is rigidly secured to a suitable shelf or similar support 11. The switch comprises the two cups 12 and 13, which are suitably held in place upon the insulators 14, 15, these insulators being carried by and supported upon the base plate 10. These cups may be of customary design and are provided with suitable arc extinguishing liquid 16 whose level can readily be ascertained by an inspection of the liquid level indicator 17. Within the lower portions of the cup there are provided suitable main contacts 18 and auxiliary break contacts 19. These are in electrical connection with the metallic plate 20 which in turn is in electrical connection with the binding post or connectors 21. The movable element of the switch consists of the hollow rod 22. This hollow rod as readily apparent from an inspection of Fig. 1 is in its circuit closing position. Whenever it is desired to interrupt the circuit then the tube 22 is pulled upwardly through the agency of the support or bridge 23 controllable by the link 24. It will of course be understood that the bridge 23 supports two rods 22 so that the switch as herein disclosed breaks both sides of the metallic circuit. The tube 22 passes outwardly from the cup 13 through the insulating sleeve 25, a suitable gasket 26 being provided so that the cup is always in

a closed condition. The upper extremity of the tube is surmounted by a cap structure 27 within which a disc 28 is loosely mounted. This disc 28 is permanently held in place within the cap structure and normally closes the upper extremity of the tube 22. Upon a predetermined increase of the pressure within the cup 13 the vent 28 is lifted so as to permit escape of the gases which have been formed after the switch has been opened.

From what has been thus described it will be apparent that the liquid within the cup 13 has no means of escape nor have excess gases any means of escape from the said cup except through the tube 22 which in this instance is shown as being part of the main switch elements.

If we now assume that the switch is being opened and that the tube 22 is being moved upwardly then a rupture of the circuit occurs which under normal conditions is followed by an arc which arc extends from the extremity of the tube 22 to either the main or auxiliary switch contacts 18 and 19. The opening of the circuit brings about an increase of pressure within the cup 13 and as this pressure must find egress somewhere it flows along the path of least resistance which is upwardly through the tube 22 and outwardly past the disc 28. The only way in which fluid may pass into the tube 22 is naturally around its lower mouth or edge and by virtue of this, the flow of this fluid or liquid is directly across the path of the arc (if any exists) extending from the lower edge of the tube. The efficacy of the means thus disclosed in providing a direct path of extinguishing material across the arc will be apparent. Unless the fluid is forced directly across the path of the arc it would tend initially to flow away from the arcing area by reason of developing of excess pressure within this area.

In Fig. 3 I show my invention as applied more particularly to a commercial form of circuit breaker consisting of the container 29 suitably held in place by the support 30 and in turn supporting the controlling coil 31 with its associated catch and operating parts. The container is closed by the cap plate 32 through which projects the tube 33. This tube 33 again serves as one of the main switch elements. The tube 33 has preferably three holes 34, which are so arranged that when the tube 33 is drawn upwardly under the influence of the spring 35 these holes eventually provide an outlet for the excess pressure within the tube, as these holes after a short movement of the tube 33 will be found outside of and above the cap plate 32. The spring 35 is securely fastened at its upper extremity to the block 36 and is fixedly secured to the block 37 at its lower extremity. This block 37 is fixedly mounted upon the

lower extremity of the tube 33. The tube 33 also carries fixedly mounted contact fingers or elements 38 as shown more clearly in Figs. 3^a and 4. These contact fingers co-operate with a stationary contact 39 rigidly secured within the container 29. The contact 39 is in engagement with the metallic cap 40 through the agency of which contact may be established with the circuit which it is desired to protect. As the container 29 is closed it will be noted that the formation of excess pressure must again find its outlet through the tube 33 and through the vent holes 34 after these vent holes have risen above the cap plate 32. The vent holes rise above the cap plate before complete separation of contacts.

In order to more thoroughly direct the flow of the liquid within the tube across the path of the arc, I provide a deflector element 41 rigidly held in place upon the lower extremity of the tube 33 by the bracket 42. This deflector moves upwardly with the tube and by reason of its inclined inner face serves to direct the liquid through which it is passing across the lower extremities of the contact fingers 38. A suitable cord 43 as well understood is used to restore the circuit breaker to its circuit closing position. Flexible conductors 44 may be employed to extend the circuit upwardly from the contact element 38.

In Fig. 5 I show a device somewhat similar to that disclosed in Fig. 1. In the structure of Fig. 5 however I provide one container or tank 45 which carries the arc extinguishing liquid and which also supports through the agency of its cover plate 46 two stationary contact elements 47 and 48. The contact elements 47 and 48 co-operate with the contact elements 49 and 50 respectively, which latter contact elements are movable with the controlling link 51. The contact elements 47 and 48 are at the lower extremities of tubes 52, 53, which extend outwardly from the tank or container 45 and which at their upper extremities are provided with cap plates 27 and discs 28 similar to that shown in connection with Fig. 1. It will be noted that as the switch is being opened that the excess pressure must again find egress against the tubes 52 and 53 so that the arc extinguishing liquid or fluid travels across the path of the arc.

In Fig. 6 I show a somewhat modified form of structure in which the link 51 is again movable to control the movable contacts which in this instance include main contacts 54 and 55 and auxiliary contacts 56 and 57. Co-operating main contacts are shown at 58 and 59 respectively and co-operating auxiliary or arcing contacts are shown at 60 and 61 respectively. It will be noted that the co-operating auxiliary contacts are carried by non-conducting tubes 62 and 63

which again are provided with the cap structure 27 and disc 28 for venting purposes. In this particular structure it will be noted that the arc which is formed after the complete rupture of the circuit will be found between the contacts 56 and 60 or the contacts 57 and 61. By reason of the fact that the container is again closed and that egress for excess pressure must be through the tubes 62 and 63, it will be seen that the arc extinguishing liquid or fluid is again forced in a path across the arc.

In Fig. 7 I show a further modified form of structure in which suitable switch contacts 64 and 65 are provided which co-operate with contacts 66 and 67 respectively. The contacts 66 and 67 are carried by a non-conducting tube 68 which tube again is provided with the cap structure 27 and venting disc 28. The bore of the tube 68 is continued in the form of a Y as shown by the dotted lines to the extremities of the movable contacts 66 and 67. As the container 65 is again closed the excess pressure must find its egress through the tube 68 and the arc extinguishing liquid or fluid must pass inwardly to the openings within the switch elements 66 and 67 so that this fluid again follows a path transversely of the arc.

From what has thus been described the nature of my invention will be readily clear to those skilled in the art and it will be readily clear that many modifications may be made within the scope of my invention without departing from its salient features. Having however thus described several forms which my invention may take what I claim as new and desire to secure by Letters Patent is:

1. A device of the character described comprising a normally closed container having arc interrupting fluid therein, a normally closed vent tube extending into said container having an open end submerged in said fluid, providing the only means of communication between the interior of said container and tube, means for opening said vent to relieve excess pressure upon circuit rupture, and a pair of co-operating switch contacts, one of said switch contacts being mounted on said tube at the submerged open end thereof.

2. A device of the character described comprising a normally closed container having arc interrupting fluid therein, a vent tube extending into said container having an open end submerged in said fluid, providing the only means of communication between the interior of said container and tube, and a pair of co-operating switch contacts, one of said switch contacts being mounted on said tube at the submerged open end thereof.

3. A device of the character described comprising a container having arc inter-

rupting fluid therein, a pair of switch contacts within said container, a movable open ended tube communicating with the exterior of said container carrying one of said switch contacts at the open end thereof, and a deflector carried by said tube adjacent said end for directing the currents of said fluid set up at circuit rupture across the face of said switch contact.

4. A device of the character described comprising a container having arc interrupting fluid therein, a pair of switch contacts within said container, a movable tube extending outside and communicating with the exterior of said container carrying one of said switch contacts, the switch contact carried by said tube being exteriorly of the other switch contact when said switch contacts are in their circuit closing position, and a deflector carried by said tube and surrounding the same for directing the stream of fluid moving toward the open end of said tube at circuit rupture across the face of said switch contact.

5. A device of the character described comprising a container having arc interrupting fluid therein, a pair of switch contacts within said container, a movable tube extending outside and communicating with the exterior of said container carrying one of said switch contacts, a deflector carried by said tube for directing currents of said fluid across the face of said switch contact, and means for controlling the egress of fluid from said tube.

6. A device of the character described comprising a container having arc interrupting fluid therein, a pair of switch contacts within said container, a movable open ended tube communicating with the exterior of said container carrying one of said switch contacts at the open end thereof, the switch contact carried by said tube being exteriorly of the other switch contact when said switch contacts are in their circuit closing position, a deflector carried by said tube for directing currents of said fluid set up at circuit rupture across the face of said switch contact, and means for controlling the egress of fluid from said tube.

7. In a device of the character described, a container having arc interrupting fluid therein, a tubular member mounted for movement within said container, and a stationary contact, said tubular member being open at the lower end thereof and having means adjacent said open end cooperating with said stationary contact to close the circuit, said tubular member having means operated by the movement thereof to open said member to the outer air prior to separation of said contacts.

8. In a device of the character described, a container having arc interrupting fluid therein, a tubular member mounted for

movement within said container, and a stationary contact, said tubular member being open at the lower end thereof and having means adjacent said open end cooperating with said stationary contact to close the circuit, said tubular member having means operated by the movement thereof to open

said member to the outer air prior to separation of said contacts, and means for directing the currents in said fluid set up by circuit rupture across said contacts. 10

In witness whereof, I hereunto subscribe my name this 13th day of Feb. A. D., 1920.

NICHOLAS J. CONRAD.