E. M. HEWLETT.

ELECTRIC SWITCH.

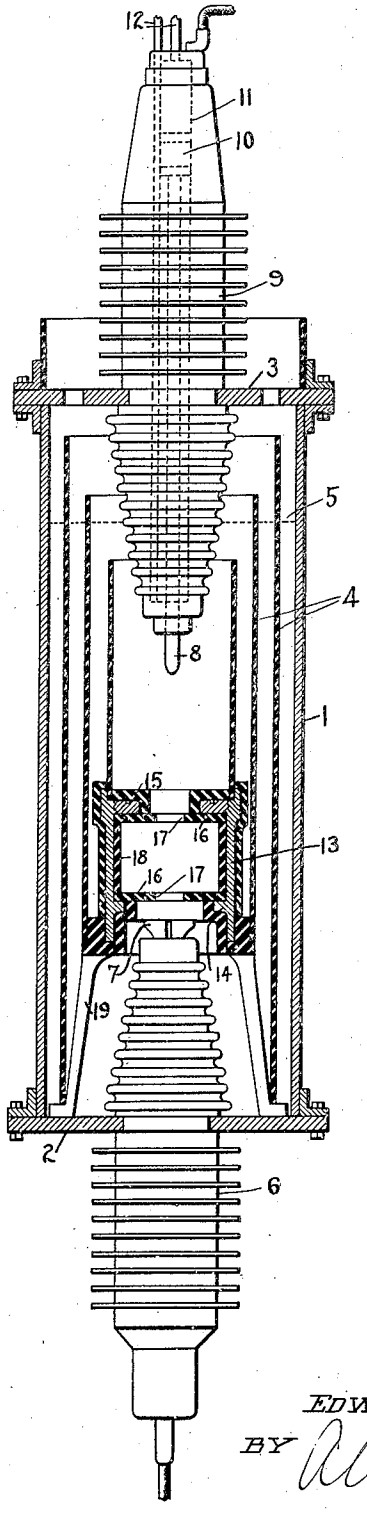
APPLICATION FILED JULY 15, 1910.

1,067,735.

Patented July 15, 1913.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Irving E. Steers

J. Ellis Glen

INVENTOR

EDWARD M. HEWLETT.

BY Albert G. Davis

HIS ATTORNEY.

E. M. HEWLETT.

ELECTRIC SWITCH.

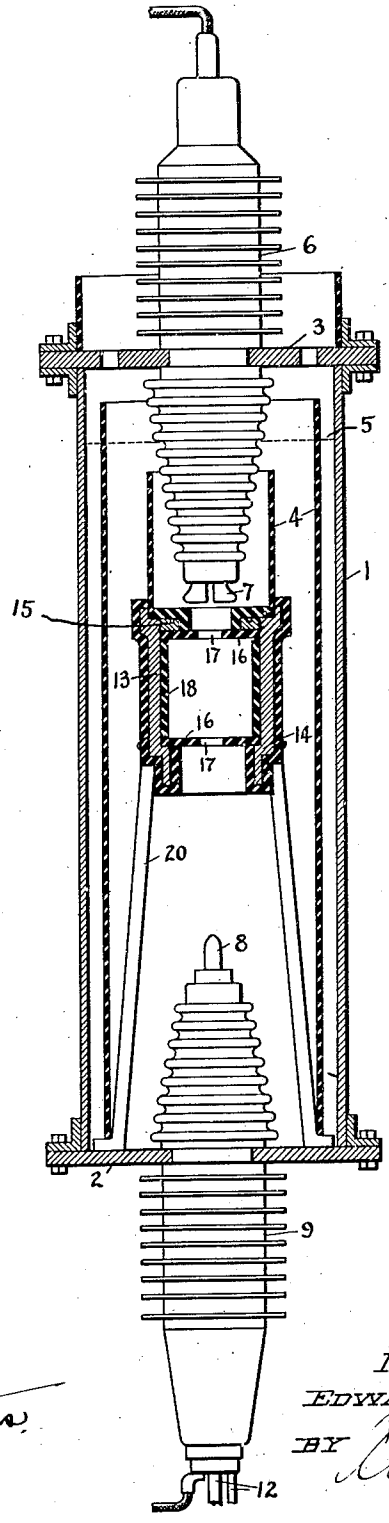
APPLICATION FILED JULY 15, 1910.

1,067,735.

Patented July 15, 1913.

6 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

Irving E. Steers.

J. Ellis Glen

INVENTOR

EDWARD M. HEWLETT.

BY Albert G. Davis

HIS ATTORNEY.

E. M. HEWLETT.

ELECTRIC SWITCH.

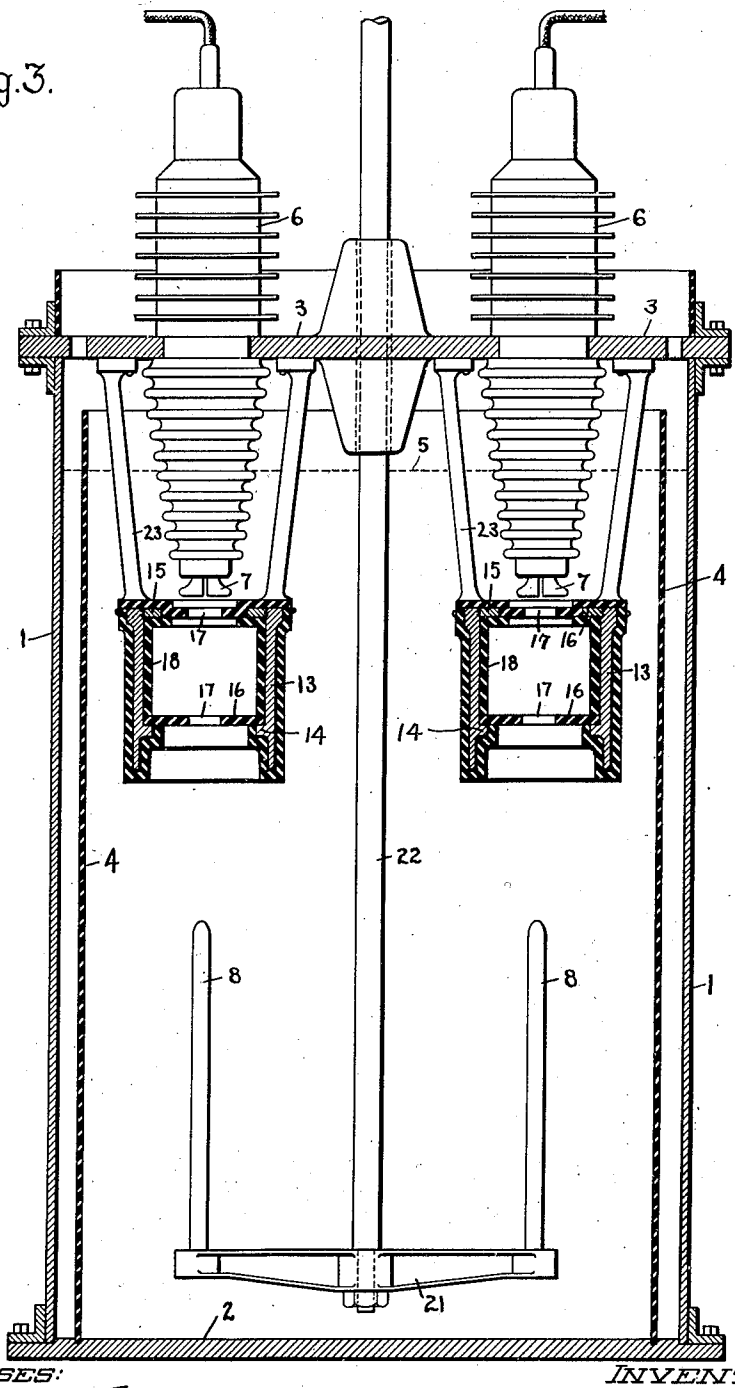
APPLICATION FILED JULY 15, 1910.

1,067,735.

Patented July 15, 1913.

6 SHEETS—SHEET 3.

Fig.3.



WITNESSES:

Irving E. Steers

J. Ellis Glen

INVENTOR

EDWARD M. HEWLETT.

BY Albert G. Davis

HIS ATTORNEY.

E. M. HEWLETT.

ELECTRIC SWITCH.

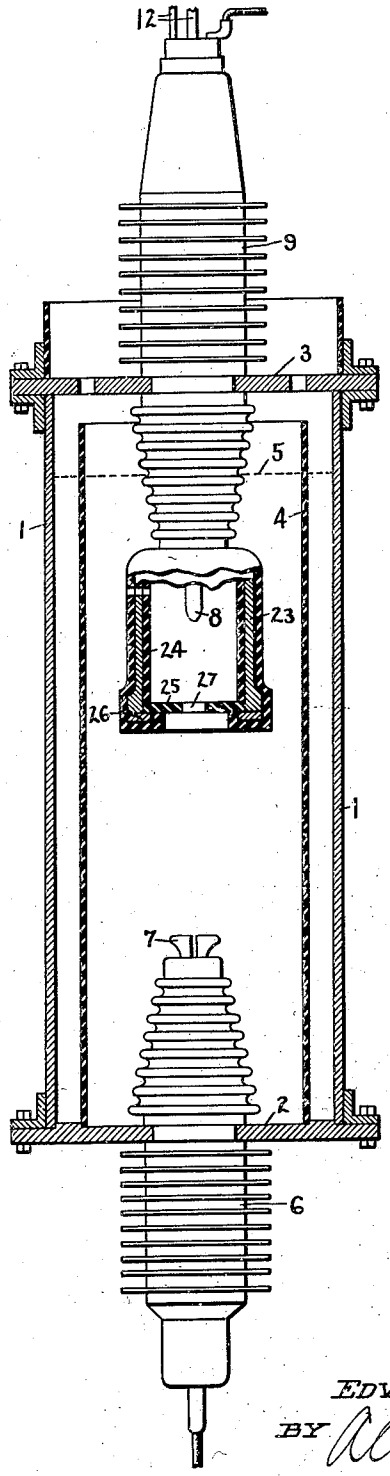
APPLICATION FILED JULY 15, 1910.

1,067,735.

Patented July 15, 1913.

6 SHEETS—SHEET 4.

Fig. 4.



WITNESSES:

Irving E. Steers

J. Ellis Glen

INVENTOR

EDWARD M. HEWLETT.

BY Albert G. Davis

HIS ATTORNEY.

E. M. HEWLETT.

ELECTRIC SWITCH.

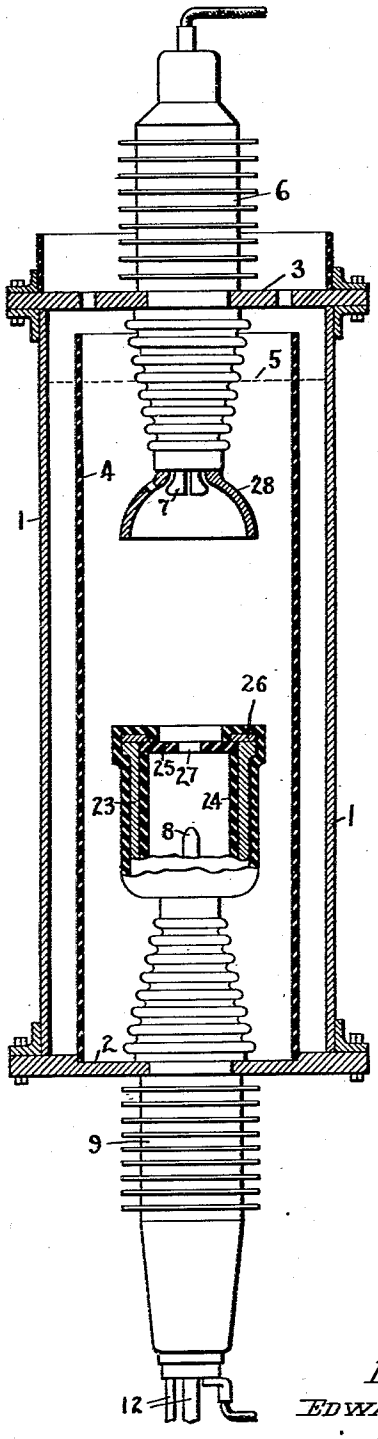
APPLICATION FILED JULY 15, 1910.

1,067,735.

Patented July 15, 1913.

6 SHEETS—SHEET 5.

Fig. 5.



WITNESSES:

Irving E. Steers

J. Ellis Glen

INVENTOR.

EDWARD M. HEWLETT.

BY

HIS ATTORNEY.

E. M. HEWLETT.

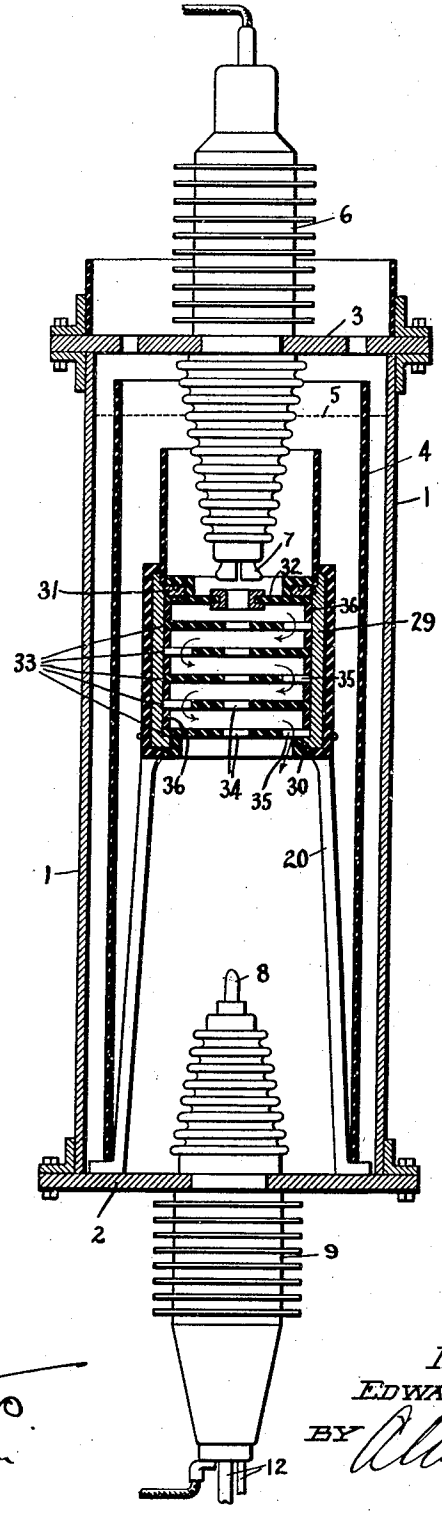
ELECTRIC SWITCH.

APPLICATION FILED JULY 15, 1910.

1,067,735. Patented July 15, 1913.

6 SHEETS—SHEET 6.

Fig. 6.



WITNESSES:

Irving E. Steers

J. Ellis Glen

INVENTOR.

EDWARD M. HEWLETT.

BY Albert G. Davis.

HIS ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

1,067,735. Specification of Letters Patent. Patented July 15, 1913.

Application filed July 15, 1910. Serial No. 572,123.

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 Electric Switches, of which the following is a specification.

My invention relates to electric switches, particularly to switches for opening circuits carrying large amounts of energy and its object is to provide an improved switch which will open circuits carrying large amounts of energy, and in which the arc formed on separating the contacts is promptly and effectively extinguished.

When an electric switch is connected to a circuit carrying a large amount of energy and particularly if the voltage of the current is high, a persistent and dangerous arc is formed when the contacts of the switch are separated, even though the contacts separate in a vessel containing some suitable insulating fluid, such as oil. In accordance with my invention, the arc formed on separating the contacts is drawn into some suitable device in which insulating fluid is put under great pressure by the arc and on account of its pressure promptly extinguishes the arc. Various devices may be used which tend to disrupt and extinguish the arc when the arc is drawn into them, but the preferred device is a substantially closed pressure retaining vessel mounted in such a position that, as the contacts separate, the arc is drawn into the pressure retaining vessel, whereupon the oil or other insulating fluid in the pressure retaining vessel is put under pressure by the arc and extinguishes the arc. The chamber may also be made so that the arc is drawn entirely through it as the switch opens and thereby the oil or other insulating fluid in the chamber put under pressure by the arc tends to contract the arc and also to flow in both directions along the arc, thereby extinguishing it. In another form of my invention, the arc is drawn into a device in which the fluid put under pressure by the arc is forced to flow along a sinuous path which intersects the arc at numerous points, the fluid under pressure stretching the arc in different directions and disrupting it as a result of the pressure developed on the insulating fluid by the arc.

My invention will best be understood in connection with the accompanying drawings which show some of the numerous forms in which the invention may be embodied and in which—

Figure 1 is a a longitudinal section of one form of switch in which an upwardly moving contact draws the arc through a pressure retaining chamber; Fig. 2 is a longitudinal section of a similar form of switch in which the movable contact moves downward through a pressure retaining vessel; Fig. 3 is a longitudinal section of a form of switch in which a bridging contact moves downward and draws the arc through two pressure retaining chambers; Fig. 4 is a longitudinal section of a form of switch in which the arc is drawn upward into a pressure retaining vessel where it is extinguished; Fig. 5 is a longitudinal section of a form of switch in which the arc is drawn downward into a pressure retaining vessel in which it is extinguished; and Fig. 6 is a longitudinal section of a form of switch in which the arc is drawn into an arc extinguishing device so arranged that the pressure developed by the arc causes the fluid to flow in a sinuous path, and to stretch and distort the arc until it is extinguished.

Many parts are the same as in the various forms of switches shown in the drawings and these parts are indicated in all the figures by the same reference characters.

In the form of switch shown in Fig. 1, a suitable vessel 1 provided with a bottom 2 and a top 3 contains oil or other suitable insulating fluid preferably divided into concentric layers by concentric barriers 4 of fiber or other insulating material. These barriers may vary in number and in the particular form shown in Fig. 1 three barriers are shown. Where oil is used as the insulating fluid, the tank 1 is filled to bring the level of the oil to the dotted line 5.

In the bottom 2 of the particular form of switch shown in Fig. 1, there is mounted an insulator 6 of any suitable construction which carries on the upper end a fixed contact 7 connected to one lead of the circuit to be controlled and coöperating with a movable contact 8 which is movably mounted in

an insulator 9 carried in the head 3 of the switch. The movable contact 8 is moved into and out of engagement with the fixed contact 7 in any suitable way, preferably by means of a fluid pressure actuating mechanism such as is outlined in dotted lines in the insulator 9, and comprising a piston 10 rigidly connected to the movable contact 8 and slidably mounted in the cylinder 11, which in turn is carried in the insulator 9. The piston 10 and contact 8 are moved up and down to open and close the circuit by means of compressed air admitted to the cylinder 11 through supply pipes 12 which in turn are controlled by any suitable valve mechanism not shown. The cylinder 11 and piston 10 are connected to the other lead of the circuit and current flows through the cylinder 11, piston 10 and contact 8 into the stationary contact 7 and thence through the circuit.

When the contacts 7 and 8 are separated, an arc is formed and in accordance with my invention the arc is extinguished by being drawn into operative relation to an arc extinguishing device, such as a supplemental pressure retaining vessel 13 having strong metallic walls which, in the particular arrangement shown in the drawings, are provided with a strong flange 14 near one end and are engaged near the other end by a ring 15 threaded into the walls 13. The pressure retaining vessel is preferably covered with insulation, as shown in the drawing, and is provided with end plates 16, preferably made of insulation, and both perforated by openings 17 to permit the movable contact 8 to pass through the chambers to coöperate with the fixed contact 7. The end plates 16 are separated by a ring or lining 18 of insulation of such a width that when the ring 15 is screwed down the plates 16 and ring 18 are clamped rigidly in place in the metallic chamber 13 and form a strong pressure retaining chamber in which the oil or other insulating fluid in the vessel 1 may be put under high pressure by the arc when the arc is drawn into the chamber as the movable contact 8 separates from the fixed contact 7. The pressure retaining vessel 13 is mounted in but insulated from the vessel 1 by means of a suitable insulating support 19 which holds the pressure retaining vessel 13 with its lower end plate 16 a short distance above the stationary contact 7 so that as the contacts separate the arc is first formed between the contacts in the vessel 1 and is then by the continued movement of the movable contact 8, drawn through the opening 17 in the lower plate 16 into the pressure retaining vessel 13, where the arc immediately puts the oil under great pressure, so that the arc is compressed by the oil under pressure, while at the same time the oil attempting to escape through both openings 17 is directed against the arc at two points to extinguish it.

Disturbance of the oil in the vessel 1 is reduced to a minimum by the concentric barriers 4 and in the particular arrangement shown in Fig. 1 the innermost barrier is mounted on the upper end of the explosion chamber 13 concentric with the movable contact 8 so that the main body of oil in the vessel 1 is not disturbed by the oil ejected from the pressure retaining vessel 13 because the ejected oil is restrained by the innermost barrier 4.

In the particular form of switch shown in Fig. 2, the fixed contact is mounted in the upper end of the switch on the head 3 and the movable contact 8, connected to the same mechanism as that shown in Fig. 1, is drawn downward from the stationary contact through the pressure retaining vessel 13, having openings 17 in each end, the pressure retaining vessel being supported in and insulated from the main vessel 1 by means of a suitable insulating support 20.

In the form of switch shown in Fig. 3, the two leads of the circuit are in electrical connection with two stationary terminals 7 mounted in suitable insulators 6 in the head 3 of the main vessel. The circuit is opened and closed by means of a bridging contact which coöperates with the fixed contacts 7 and comprises movable contacts 8 carried by a conducting yoke 21 which in turn is mounted on and actuated by an insulating rod 22 sliding through a bushing in the cover 3 and actuated by any suitable form of actuating mechanism. The pressure retaining vessel 13, constructed in substantially the same manner as the pressure retaining vessel described in connection with the switch shown in Fig. 1, is suspended beneath each fixed contact by means of a suitable insulating suspension 23 in such a position that the movable contacts 8 pass entirely through the pressure retaining vessel as the switch is operated. The operation of this form of switch is as follows: As the bridging contact is lowered and the movable contacts are separated from the fixed contacts 7, arcs are formed and as the bridging contact continues to move away from the fixed contacts the arcs are drawn through the openings 17 in the upper plates 16 into the pressure retaining vessels, whereupon the insulating fluid in the pressure retaining vessels is put under pressure by the arcs and tends to flow through the openings in the plates 16 and thereby to extinguish the arcs. As the contacts 8 continue to move downward and the arcs persist the movable contacts eventually pass out of the pressure retaining vessels through the openings 17 in the lower plates 16, whereupon the arcs extend entirely through the pressure retaining vessels and put the insulating fluid

therein under great pressure so that the portion of the arc inside the pressure retaining vessel is subjected to great pressure, while at the same time the fluid flowing out through both openings 17 exerts a strong disrupting effect on the arc at two different points, the result being that the arc is promptly extinguished even though the voltage is high and the amount of current is great.

In the form of switch shown in Fig. 4 the fixed and movable contacts are arranged as shown in Fig. 1 but the insulator 9 carries on the lower end a strong pressure retaining pot or vessel 23 made of any suitable material, preferably metal covered with insulation and provided with an insulating lining 24. The pot 23 is closed at one end by the insulator 9 on which it is mounted and at the other end by an insulating bottom or plate 25, held in position by a flange 26 and perforated by an opening 27 which is of less diameter than the inner diameter of the pot 23. When the switch is opened the contacts 7 and 8 separate in the outer pot 1 and as the contact 8 is moved upward the arc, if it persists, is drawn into the pressure retaining pot or vessel 23 during the last portion of the movement of the contact 8. As soon as the arc is drawn into the pressure retaining pot 23, the oil or other insulating fluid in the pot is at once put under great pressure by the action of the arc, whereupon the arc is compressed and at the same time the oil which flows out of the pressure retaining pot through the opening 27 in the plate 26 is directed against the arc and extinguishes it.

The switch shown in Fig. 5 is constructed so that the movable contact moves downward and the insulator 9 carrying the movable contact has on the upper end a pressure retaining pot or vessel 23 constructed and operating in the same manner as the pressure retaining pot 23 of the switch shown in Fig. 4. The pressure retaining pot 23 of the switch shown in Fig. 5 is mounted on the upper end of the insulator 9 which carries the movable contact 8, so that the movable contact 8 draws the arc into the pot 23 near the end of the downward movement of that contact. In order to minimize the disturbance of the oil in the main vessel and to assist in extinguishing the arc the upper insulator 6 is provided on the lower end with a bell 28 which surrounds the fixed contact 7 and tends to trap or hold the arc gases generated as the contacts separate so that the arc gases will not spread out through the oil or other insulating fluid and cause an arc to be established between the fixed contact and the walls of the vessel 1. In this form of switch the arc is extinguished by the action of the fluid put under pressure in the pressure retaining pot 23, by the arc, in the same manner as in the switch shown in Fig. 4.

In the particular form of switch shown in Fig. 6 the arc is drawn into a form of arc extinguishing device in which it is subjected to pressure and to insulating fluid flowing under pressure through an aperture or opening occupied by the arc, as in the forms of switch previously described, and in addition is subjected to the action of insulating fluid flowing at a high velocity in a zigzag or sinuous path and tending to stretch the arc to such an extent that the arc is broken. The particular form of device shown comprises a strong shell 29 preferably cylindrical and having near the bottom an inwardly projecting flange 30 and near the top a retaining ring 31 threaded into it. The shell 29 has a perforated top 32 and also contains a plurality of plates or baffles 33 mounted parallel to one another and each having a central aperture 34 and a second aperture 35 which is near the circumference of each plate and which may easily be formed by making a notch or recess in the edge of the plate. These plates are preferably made of insulation and are spaced apart by insulating rings 36 in such relative positions that the central openings 34 are in registry and form a straight channel through which the movable contact passes, as shown in the drawings, while the circumferential openings are out of registry and are preferably diametrically opposite. The top 32, the plates 33, and the rings 36 are clamped rigidly between the flanges 30 and the retaining ring 31, and shell 29 fits tightly against the edges of the plates 32, so that the shell 29 contains a number of chambers, each in communication with the others through a central aperture 34 and also through a circumferential aperture 35, but since the circumferential apertures are not in registry with each other, fluid flowing from one chamber to the other through the circumferential apertures 35 must necessarily follow a sinuous and zigzag path and cross and re-cross the central apertures 34 so that an arc extending through the central openings 32 is subjected to the action of fluid flowing at right angles to it. The operation of this form of switch is as follows: As the contacts separate the arc formed in the outer vessel 1 is drawn through the perforated top 32 into the arc extinguishing device and through the central apertures 34 of the plates 33 until the arc extends through all the chambers in the device. The fluid in each chamber, put under great pressure by the arc, squeezes the arc and escapes by flowing to a small extent through the apertures 34 occupied by the arc and to a much larger extent by flowing from the upper chambers to the lower ones in a zigzag path through the circumferential aperture 35.

As a result of this construction, as soon as the arc is established through the central apertures 34, the insulating fluid is projected with great violence along the sinuous path indicated by the arrows through first one circumferential opening 34 and then over the central opening 34 to the next circumferential aperture 35, and in its course flows at high speed over and through the arc holding through the central apertures 34, consequently in one chamber the flow of fluid tends to stretch the arc in one direction while in the next chamber the flow of fluid tends to stretch the arc in a directly opposite direction. The arc is therefore very much distorted and stretched, while at the same time it is subjected to the extinguishing action of the fluid escaping through the apertures 34 occupied by the arc, so that the arc is quickly extinguished with a minimum disturbance in the circuit regardless of the voltage and of the amount of energy flowing in the circuit.

My invention may be embodied in many other forms than that shown and described and I therefore do not limit myself to the precise arrangement disclosed, since various modifications of my invention will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. An electric switch comprising a vessel containing insulating fluid, an arc extinguishing device in said vessel whereby insulating fluid is put under pressure by an arc in operative relation to said device and the fluid under pressure exerts an extinguishing action on the arc, relatively movable coöperating contacts mounted to separate in said vessel at a point outside of the arc extinguishing device, and means for bringing the arc and said arc extinguishing device into operative relation, as the switch is opened.

2. An electric switch comprising a vessel containing insulating fluid, an arc extinguishing device in said vessel whereby an arc drawn into said device puts insulating fluid under pressure to extinguish the arc, relatively movable coöperating contacts mounted to separate in said vessel at a point outside of said arc extinguishing device, and means for moving said contacts to draw the arc into said arc extinguishing device as the switch is opened.

3. An electric switch comprising a vessel containing insulating fluid, coöperating contacts mounted to separate in said vessel, a pressure retaining vessel filled with insulating fluid and in communication with the first vessel through an opening in one wall of said pressure retaining vessel and operating means for moving one of said contacts to draw the arc through said opening into said pressure retaining vessel as the switch opens.

4. An electric switch comprising an outer vessel containing insulating fluid, an inner vessel mounted in and insulated from said outer vessel and having in one wall thereof an opening smaller than the interior diameter of said pressure retaining vessel, separable contacts mounted to separate in said outer vessel adjacent said opening, and operating means for moving one of said contacts through said opening into said inner pressure retaining vessel whereby the fluid in said inner vessel is put under pressure by the arc and is directed against the arc to extinguish it.

5. An electric switch comprising an oil pot containing oil, a pressure retaining vessel mounted in said pot beneath the oil and having in one wall thereof an opening smaller than the interior diameter of said vessel, and coöperating contacts mounted to separate in said pot beneath the oil, one of said contacts being mounted to move through said opening and into said vessel as the switch opens.

6. An electric switch comprising a vessel containing insulating fluid, relatively movable coöperating contacts mounted to separate therein, a supplemental pressure retaining vessel having openings in opposite walls and mounted with said openings in alinement with the path of movement of one of said contacts, and operating means for moving one of said contacts away from the other and through both of said openings to draw the arc through said pressure retaining vessel as the switch opens.

7. An electric switch comprising an outer vessel containing insulating fluid, an inner supplemental pressure retaining vessel having openings in opposite walls mounted in and insulated from said outer vessel, a stationary contact mounted adjacent one of said openings and outside said supplemental vessel, and a coöperating movable contact mounted to move through both said openings and to draw the arc through said supplemental vessel as the switch opens.

8. An electric switch comprising a vessel containing insulating fluid, a fixed contact insulated from and mounted to project into said outer vessel, a supplemental inner pressure retaining vessel having openings in opposite walls and mounted in said outer vessel with one opening adjacent said stationary contact, and a movable contact insulated from said outer vessel and mounted to move through said openings in the walls of said inner supplemental vessel to coöperate with said stationary contact.

9. An electric switch comprising a vessel containing insulating fluid, an inner supplemental pressure retaining vessel having

openings in opposite walls and mounted in but insulated from said outer vessel, a stationary contact mounted in said outer vessel on one side of said supplemental vessel and in registry with one of said openings, and a movable contact mounted in said outer vessel on the other side of said supplemental vessel to move through both said openings to coöperate with said stationary contact, whereby the arc formed on opening the circuit is drawn through said supplemental vessel.

10. An electric switch comprising a vented vessel containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, a plurality of perforated plates mounted parallel to each other with their perforations in alinement with the path of movement of one of said contacts, whereby the arc is drawn through the perforations in said plates as the contacts separate and pressure resisting walls engaging the edges of said plates to prevent the escape of fluid from between said plates and thereby form a plurality of chambers in which insulating fluid put under pressure by the arc drawn through said chambers is directed against the arc to extinguish it.

11. An electric switch comprising a vessel containing insulating fluid, a strong pressure resisting cylinder mounted in and insulated from said vessel, a plurality of plates mounted in said cylinder parallel to each other and with their edges in fluid tight relation to said cylinder, said plates having perforations in alinement to form a passage through said cylinder, a stationary contact mounted in said outer vessel adjacent one end of said cylinder and in alinement with the openings through said plates, and a cooperating movable contact mounted adjacent the other end of said cylinder to move through said openings and to draw the arc through said openings as the switch opens.

12. An electric switch comprising a vessel containing insulating fluid, a pressure resisting cylinder mounted in but insulated from said vessel, a plurality of insulating partitions in said cylinder each having a central opening and a circumferential opening, the central openings being in alinement and the circumferential openings being diametrically opposite, a stationary contact mounted in said vessel near one end of said cylinder and in alinement with said central openings, and a movable contact mounted to move through said central openings to cooperate with said stationary contact and draw the arc through said central openings as the switch opens.

13. An electric switch comprising a vessel containing insulating fluid, coöperating contacts mounted in said vessel to separate therein, and means surrounding the path of movement of said contacts whereby insulating fluid is put under pressure by the arc to extinguish the arc and is directed in a sinuous path which intersects the arc at a plurality of points in series along the arc.

14. An electric switch comprising a vessel containing insulating fluid, separable contacts mounted in said vessel to separate therein, a plurality of perforated plates insulated from each other and spaced apart with their perforations concentric with the path of movement of one of said contacts, whereby the arc is drawn through said plates as the contacts separate, and a wall surrounding said plates and cooperating therewith to form chambers which limit the expansion of the insulating fluid put under pressure by the arc and direct the fluid under pressure from one chamber across the path of the arc in the next chamber.

15. An electric switch comprising a vessel containing insulating fluid, coöperating contacts mounted in said vessel to separate therein, a plurality of plates each having two openings, said plates being insulated from each other and spaced apart with one opening in each plate in registry with a corresponding opening in adjacent plates while the other openings are out of registry, and a wall engaging the edges of said plates to limit the expansion of insulating fluid put under pressure by the arc between said plates and to cause the insulating fluid under pressure to flow from one chamber across the path of the arc in the adjacent chamber.

16. An electric switch comprising a vessel containing insulating fluid, separable contacts mounted in said vessel to separate therein, plates mounted in said vessel to extend across the path of movement of one of said contacts and having two openings, one concentric with the path of movement of one of said contacts and the other eccentric to said path, rigid walls engaging the edges of said plates, and an insulating support engaging said walls to maintain said plates in definite relation to said contacts.

17. An electric switch comprising a vessel containing insulating fluid, coöperating contacts mounted in said vessel to separate therein and thereby draw an arc, and means in the path of said arc whereby the insulating fluid is put under pressure by the arc and is directed across adjacent portions of the arc, the fluid flowing across each portion of the arc in a direction opposite the direction of flow across adjacent portions.

18. An electric switch comprising an outer vessel containing insulating fluid, fixed and movable coöperating contacts mounted in said vessel to separate therein, an insulating support in said outer vessel for said fixed contact, a pressure retaining inner vessel mounted in said outer vessel to restrain the

fluid put under pressure by the arc and to direct the fluid under pressure against the arc to extinguish it, and an insulating support in said outer vessel for supporting said inner vessel.

19. An electric switch comprising an outer vessel containing insulating fluid, an insulator extending through the wall of said outer vessel, a stationary contact mounted on said insulator, a movable contact mounted to coöperate with said stationary contact, a pressure retaining vessel for containing the arc formed by the separation of said contacts and directing the fluid put under pressure by the arc against the arc to extinguish it, and an insulating support for maintaining said inner pressure retaining vessel in position in said outer vessel.

20. An electric switch comprising an outer vessel containing insulating fluid, insulators extending through the walls of said vessel, relatively movable coöperating contacts mounted on said insulators, an inner pressure retaining vessel mounted between said insulators to confine the fluid put under pressure by the arc and to direct said fluid against the arc to extinguish it, and an insulating support engaging said inner vessel and the walls of said outer vessel to maintain said inner vessel in position.

21. An electric switch comprising an outer vessel containing insulating fluid, relatively movable coöperating contacts mounted to separate in said vessel, a pressure retaining chamber having openings in opposite walls and mounted with said openings in alinement with the path of movement of said contacts whereby the arc formed by the separation of said contacts is drawn through said pressure retaining vessel, and an insulating support for maintaining said vessel with one opening in juxtaposition to the point of separation of said contacts.

22. An electric switch comprising a vessel containing insulating fluid, an arc extinguishing device mounted in said vessel and comprising insulating plates having two openings and mounted to bring one opening in each plate into registry with corresponding openings in the other plates, coöperating contacts mounted to separate in said vessel and draw an arc through said registering openings, said plates being separately mounted in said device to bring the other opening of each plate diametrically opposite to that of the adjacent plates and thereby guide insulating liquid under pressure across said arc, whereby said liquid follows a sinuous path and exerts an extinguishing effect upon said arc at several points on its length.

23. An electric switch comprising a vessel containing insulating fluid, an open ended chamber mounted in said vessel, insulating plates, each having a central opening and another opening at the edge, said plates being mounted in said chamber to bring the central opening in each plate into registry with the central openings in the other plates, coöperating contacts mounted to separate in said vessel and draw an arc through said central openings, insulating rings in said chamber to separate said plates, and means for clamping said plates between said rings to overlap the adjacent plates with the edge opening of each plate diametrically opposite to that of adjacent plates, and form a sinuous passage for the insulating liquid put under pressure by the arc.

In witness whereof, I have hereunto set my hand this 11th day of July, 1910.

EDWARD M. HEWLETT.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.