B. PRICE.

OIL SWITCH.

APPLICATION FILED OCT. 13, 1920.

1,415,114.

Patented May 9, 1922.

5 SHEETS—SHEET 1.

Fig. 1.

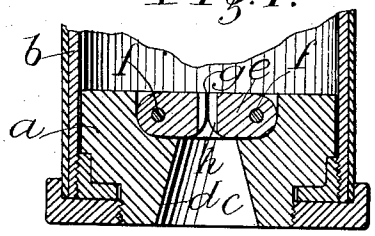


Fig. 2.

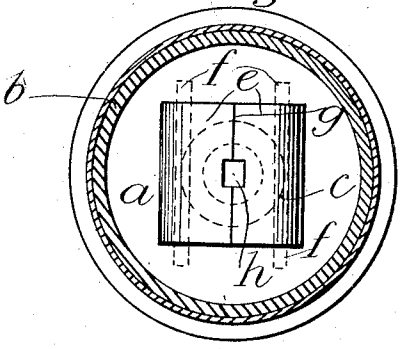


Fig. 4.

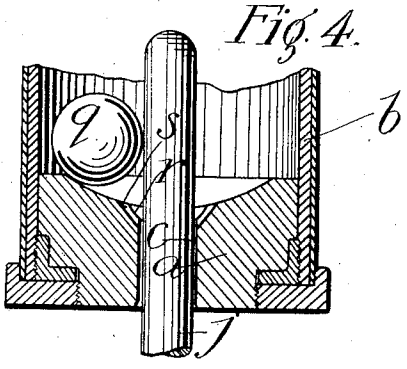
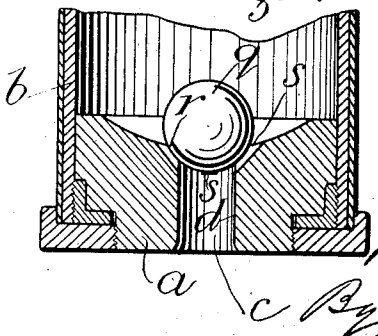


Fig. 5.



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5 SHEETS—SHEET 2.

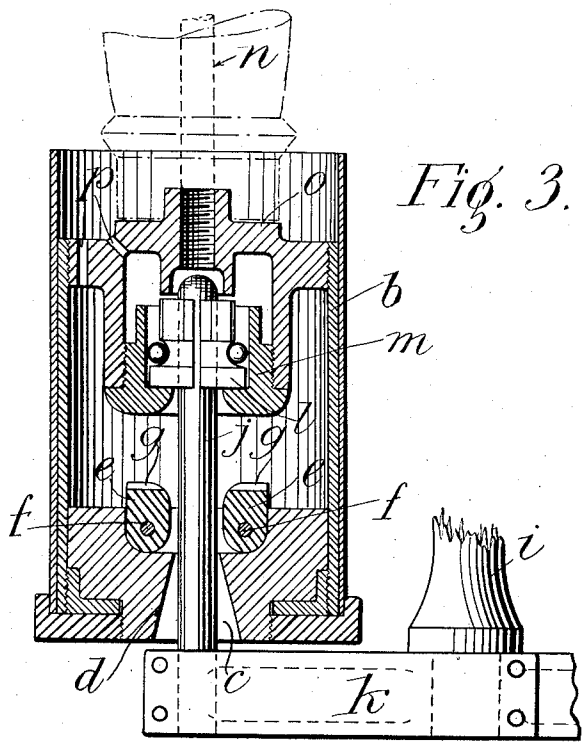
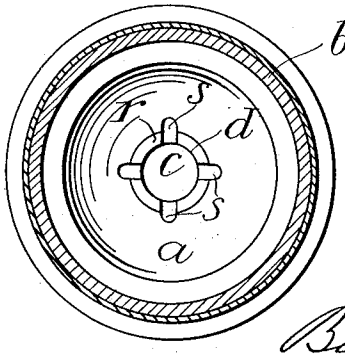


Fig. 3.

Fig. 6.



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5 SHEETS—SHEET 3.

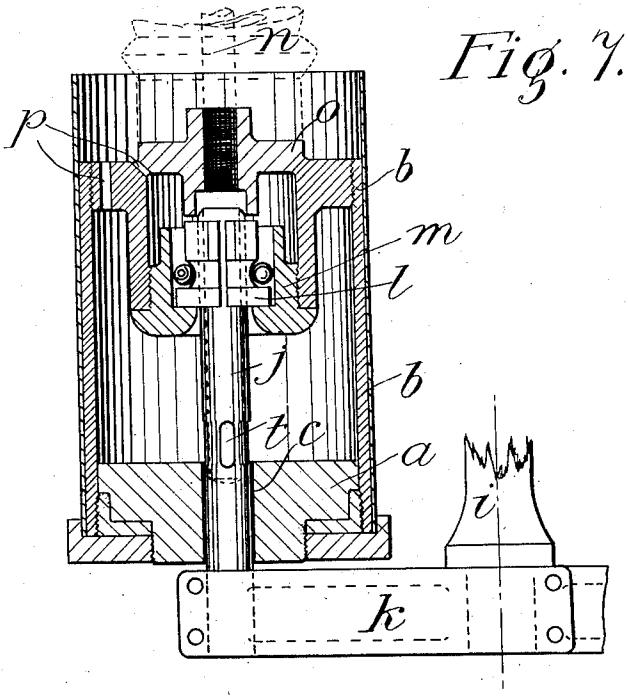


Fig. 7.

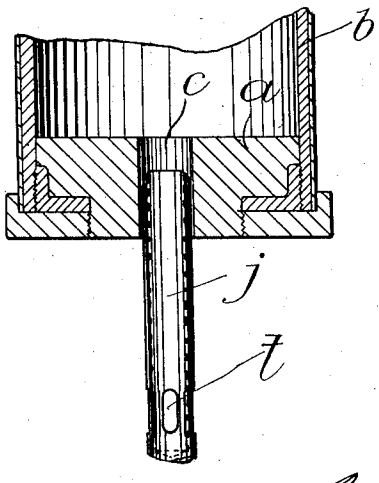


Fig. 8.

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B. PRICE.

OIL SWITCH.

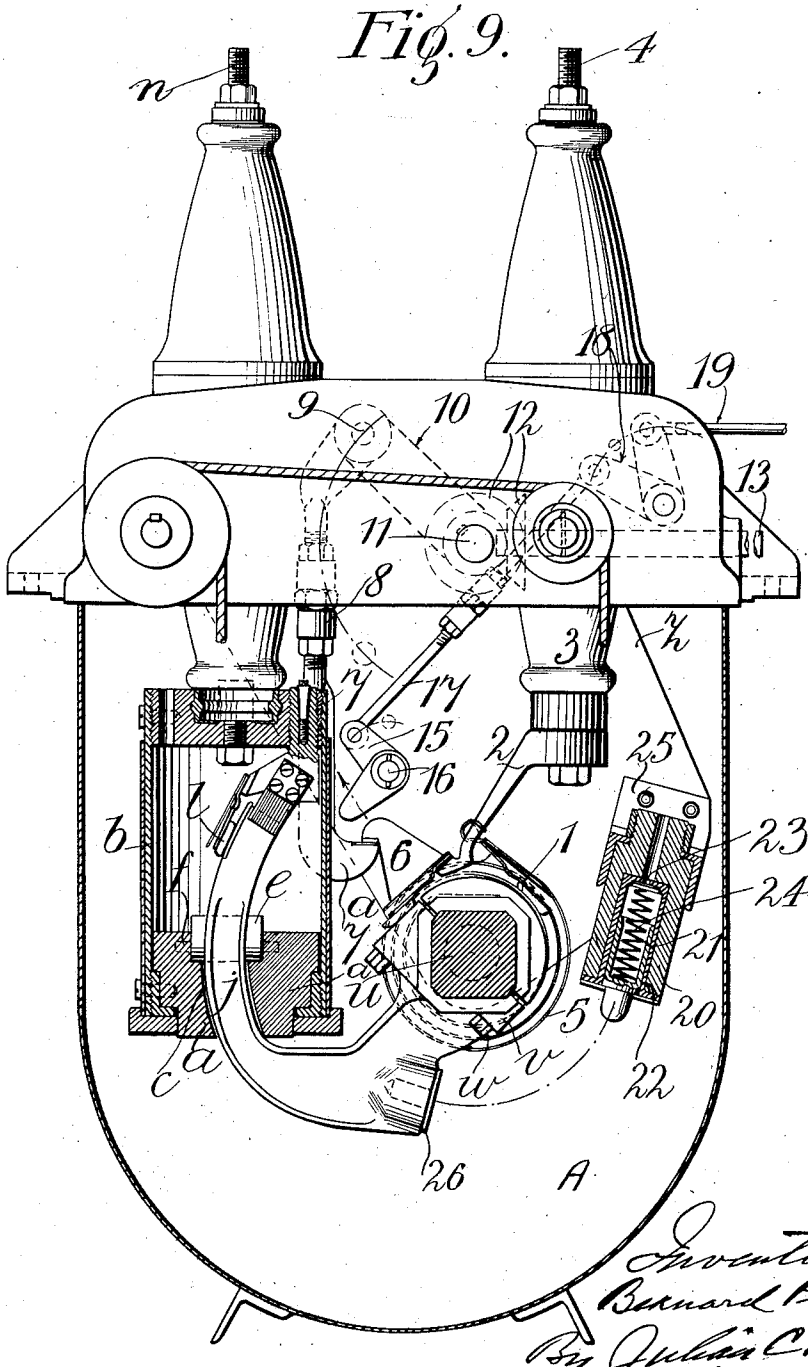
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5 SHEETS—SHEET 4.

Fig. 9.



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5 SHEETS—SHEET 5.

Fig. 10

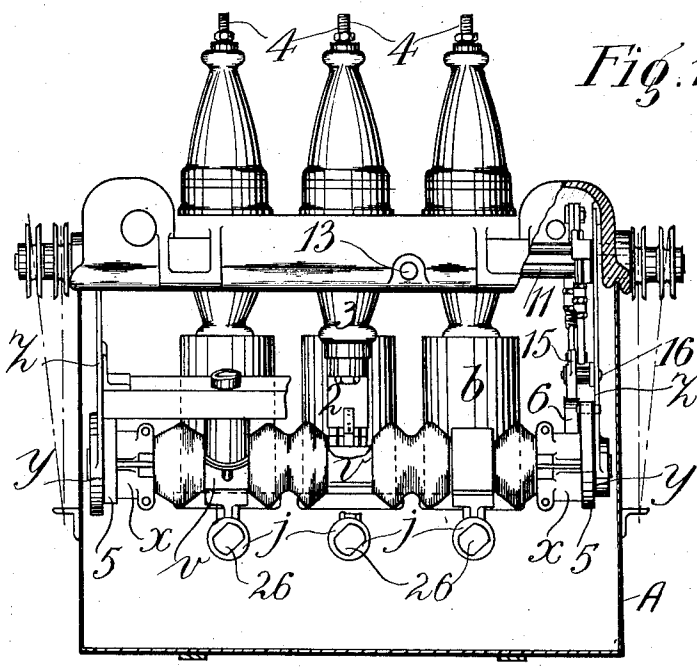
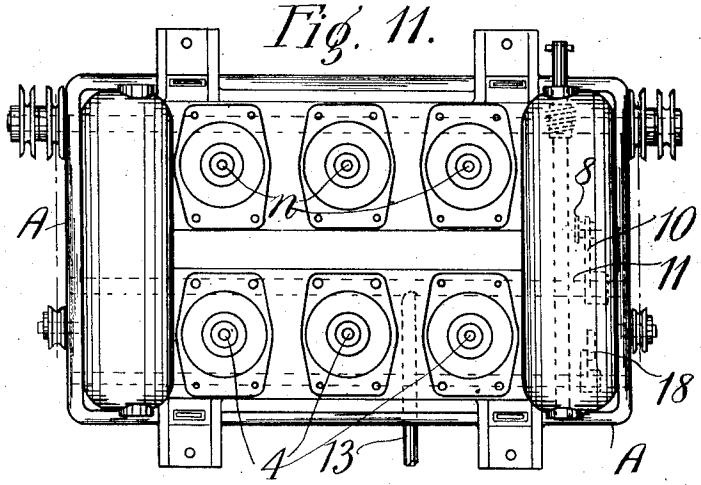
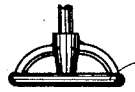


Fig. 11.





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UNITED STATES PATENT OFFICE.

BERNARD PRICE, OF JOHANNESBURG, SOUTH AFRICA, ASSIGNOR TO HIMSELF AND THE VICTORIA FALLS AND TRANSVAAL POWER COMPANY, LIMITED, OF LONDON, ENGLAND.

OIL SWITCH.

1 415,114. Specification of Letters Patent. Patented May 9, 1922.

Application filed October 13, 1920. Serial No. 416,723.

To all whom it may concern:

Be it known that I, BERNARD PRICE, a subject of the King of Great Britain and Ireland, residing at Johannesburg, South Africa, have invented Improvements in or Relating to Oil Switches, of which the following is a specification.

This invention has reference to oil switches and more particularly those of high rupturing capacity.

In such switches the fixed and moving contacts are sometimes arranged within a vessel, commonly called an explosion pot, which is immersed in the oil in the switch tank, is closed at the end where the stationary contact or contacts is or are located, and is provided at the other end with an aperture through which the movable contact or contacts can freely pass on closing and opening the switch. When the movable contact or contacts is or are arranged to travel downwards in opening the switch, the explosion pot is provided with a small vent in its upper end through which the gases formed by the arc can gradually escape.

In some instances two separate sets of stationary and moving contacts are provided, one set comprising main contacts designed to carry the working current when the switch is in the closed position, and the other set comprising breaking or arcing contacts designed not to part contact with the corresponding stationary contacts until after the said main contacts have parted from their stationary contacts.

In switches of the above mentioned type, the pressure created inside the pot by the energy dissipated at the arc when the switch opens, accelerates the motion of the moving contact and operating gear connected thereto, and when the arcing contact attached to the extremity of the moving member is passing through and out of the aperture of the pot, the oil in the pot is forced to follow in the wake of the said member and to converge into a stream through the said aperture, and therefore into and along the path of the arc.

With such arrangements, the pressure of the oil passing through the aperture of the pot is fully transmitted to the oil in the surrounding tank with the result that the latter is sometimes ruptured owing to the pressure to which it is suddenly subjected.

It has been proposed to provide the explosion pots with a valve device independent of the movable contact, adapted to be dislodged by the latter in the act of closing the switch and automatically to act to close the aperture in the pot when the switch is opened, whereby the insulating liquid is imprisoned and caused to compress the arc with a view to rupturing it.

Now the present invention has for its object, inter alia to enable the energy dissipated at the arc to be utilized in a more effective manner than heretofore to increase the arc rupturing capacity of the switch whilst at the same time avoiding undue pressure being transmitted to the oil in the tank by the oil issuing from the pot through the aperture therein.

For the present purpose, according to this invention, means are provided whereby the arc and a rapidly moving stream of the oil or other insulating liquid used in the pot and issuing from the latter when the switch is opened, are confined automatically and suddenly to an aperture having a cross sectional area much less than that of the aperture in the pot through which the movable contact member works, thus ensuring that the energy dissipated at the arc and the kinetic energy stored in the insulating liquid during its acceleration, are utilized in the most effective manner for projecting the insulating liquid into, along or across the path of the arc whilst simultaneously reducing the pressure of the issuing liquid and relieving the outer structure and tank of the switch from any undue mechanical strain which might otherwise be imposed upon them by the sudden release of liquid under pressure from the pot. Such means constitute in effect a combined arc constricting and pressure reducing device. If desired, the moving contact member may be designed and arranged to move independently of its operating gear during the opening of the switch, thus enabling the said member to attain a very high velocity under the influence of the pressure created in the pot by the energy dissipated at the arc.

According to one arrangement for obtaining the result described, means are provided whereby at the moment when the arcing contact is passing through the aperture of the explosion pot, the cross sectional area of the said aperture is automatically and suddenly reduced whilst a free exit into the tank of the switch is provided for the insulating

liquid simultaneously discharged through the said constricted aperture, thus confining the arc and the stream of insulating liquid to the said constricted aperture and rendering the difference of pressure inside and outside the pot fully effective in accelerating the velocity of the said stream of insulating liquid and in projecting that stream into and along the path of the arc, whilst at the same time relieving the tank of undue pressure.

For example, there may be fitted at the inner entrance of the aperture of the explosion pot, hinged flaps, composed of solid non-inflammable insulating material, designed and arranged so that they will be lifted into the open position by the moving contact member when closing the switch and be forced into the closed position by the flow of insulating liquid as it follows the moving member, under the influence of the pressure created in the pot, when the switch is opening, the arrangement being such that the closing of the hinged flaps reduces the size of the aperture to any desired extent and forces both the arc and the stream of insulating liquid to pass through this reduced aperture.

Alternatively, a loose solid sphere of non-inflammable insulating material may be placed in the explosion pot and the inner entrance of the aperture of the pot may be so designed that when the arcing end of the moving contact is leaving the pot, the said sphere will be drawn by the flow of insulating liquid and caused to rest upon a suitable seating at the inner entrance of the aperture, thus constricting the aperture and forcing both the arc and the stream of insulating liquid to pass through one or more passages of any desired size situated between the said sphere and the seating against which it rests.

In each case the moving contact member and the arcing contact, together with the aperture through which they pass, are so relatively constructed and arranged that immediately beyond the part where the aperture has been constricted, a free or enlarged exit is provided for the insulating liquid to pass from the constricted aperture into the outer tank of the switch.

In an alternative method of carrying out this invention, the moving member of the switch is provided with an internal passage the entrance to which is situated in the centre of, or closely adjacent to, the arcing contact, and the exit aperture of which is of much less cross sectional area than that of the aperture or of the said internal passage and is situated at a point in the length of the moving member such that the said exit aperture in the tubular moving member passes out of the aperture of the pot and therefore becomes opened to the tank of the switch at a predetermined point in the travel of the moving member. From the moment, during the opening of the switch, when the said passage in the moving member is opened to the switch tank, the difference of pressure inside and outside the pot is rendered fully effective in forcing the insulating liquid at high velocity and reduced pressure through the said passage and into the tank, and, inasmuch as the entrance to this passage is partially or wholly surrounded by the arcing contact, the said stream of insulating liquid will be compelled to flow across the arc at every point where the said arc extends from the arcing contact. If desired, arc constricting and pressure reducing means such as one or other of those hereinbefore described may also be provided further to constrict, automatically and suddenly, the aperture of the pot at the moment when the arcing contact leaves the pot, thus ensuring that, if the arc has not been quenched by the stream of insulating liquid entering and leaving the said passage during the earlier portion of the travel of the moving member, then the arc will be effectually quenched before the moving member has reached the end of its travel.

In the above mentioned alternative methods of carrying out the invention, the constriction of the exit aperture of the explosion pot is also beneficial in relieving the outer structure and tank of the switch from any undue mechanical strain which might otherwise be imposed upon them by the sudden release of pressure from the pot at the moment when the moving member becomes wholly withdrawn from the aperture of the pot. In cases where means such as hinged flaps or a sphere are not provided for automatically constricting the aperture of the pot, but the moving contact member is provided with an internal passage having a constricted outlet as described, such moving member, together with the operating gear with which it is connected, may be so designed and associated with an elongated aperture of the pot, as to prevent the entire withdrawal of the moving member from the said aperture at the end of the travel of such member, thus ensuring that the cross sectional area of the exit for insulating liquid and for the release of pressure from the pot, is always less than the cross sectional area of the passage in the moving member.

Inasmuch as the effectiveness of the above mentioned methods of carrying out the invention does not depend directly upon the velocity of the moving member of the switch, the said methods are suitable for use in combination with switches as heretofore commonly constructed in which the moving member is directly connected to and unable to move independently of the operating gear actuating the said member when closing and opening the switch.

If desired, the kinetic energy stored in the moving member, and in the operating mechanism connected thereto, during their ac-

celeration, may be utilized to assist the rapid movement of the stream of insulating liquid into and along the path of the arc. For this purpose, instead of providing a free exit for the insulating liquid discharged from the valve constricted aperture of the pot into the switch tank at the moment when the arcing contact leaves the constricted aperture, the moving member and the aperture of the pot may be so relatively constructed and arranged that the moving member produces a suction upon the stream of insulating liquid discharged through the constricted aperture, thus increasing the velocity of the said stream and retarding the velocity of the moving member.

Moreover, if desired, the moving member and arcing contact of the switch used in any of the arrangements hereinbefore described for constricting the arc and reducing the pressure of the liquid issuing from the explosion pot, may, in addition be caused to attain a very high velocity under the influence of the pressure created in the explosion pot by the energy dissipated at the arc.

For this purpose the moving member with arcing contact and the switch operating gear are so relatively constructed and connected together that whilst the gear can act positively to move the movable contact into its closed position to cause it to engage the fixed contact inside the explosion pot and can afterwards act to disengage it from the fixed contact, the movable contact will thereafter be left free to be rapidly accelerated and moved into its full open position under the influence of the pressure created in the pot independently of the switch operating gear.

The very high velocity attained by the moving member when so designed, is beneficial, not only in increasing the speed of elongation of the arc, but also in increasing the velocity of the insulating liquid which follows in the wake of the arcing contact in its motion towards the aperture of the pot, thereby increasing the kinetic energy stored in the said insulating liquid and causing the said liquid to discharge suddenly and rapidly through the valve constricted aperture at the moment when the said constriction takes place.

Switches embodying the invention can be constructed in various forms.

In the accompanying illustrative drawings, Figs. 1 and 2 are respectively a sectional elevation and a sectional plan showing part of an explosion pot with exit aperture and means for automatically and suddenly reducing the size of the aperture at the moment, during the opening of the switch, when the arcing contact leaves the pot, the arrangement being such as to provide a free exit for the insulating liquid discharged from the reduced aperture into the outer tank of the switch not shown in these figures.

Fig. 3 is a sectional elevation of an explosion pot with fixed and moving contacts and with means for reducing the size of the aperture of the pot, similar to those illustrated in Figs. 1 and 2.

Figs. 4 and 5 are sectional elevations of part of an explosion pot with exit aperture, showing alternative means to those illustrated in Figs. 1 and 2, for reducing the size of the aperture, and Fig 6 is a sectional plan view of the same arrangement.

Figs. 7 and 8 are sectional elevations of an explosion pot together with fixed and moving contacts and embodying means whereby the pressure created in the pot is enabled to force a stream of insulating liquid from inside the pot into the outer tank of the switch through a passage and restricted exit aperture in the moving member, Fig. 7 showing the moving member in the closed position and Fig. 8 showing it at a point in its travel during the opening of the switch when its free end is within the exit passage.

Figs. 9 and 10 are sectional elevations at right angles to one another and Fig. 11 is a plan view, showing a three phase switch embodying means whereby the moving member carrying the arcing contact is free to move independently of the movement of the operating gear, during the opening of the switch, the exit aperture of the explosion pot being provided with means similar to those illustrated in Figs. 1, 2 and 3 for reducing the size of the aperture but the arrangement being such that it is adapted for utilizing the kinetic energy stored in the moving member to assist the flow of insulating liquid through the said reduced aperture.

Referring to Figs. 1 and 2, the disc a of insulating material, forming the end of the cylindrical explosion pot b, is provided at its centre with a conical aperture c its sloping side d being arranged to form an outwardly flaring exit passage. The moving contact member of the switch, which is not shown in these figures, moves without friction but with a small clearance, through the upper and smaller end of the said aperture and, inasmuch as the sides of the aperture are not parallel, the clearance between the moving member and the sides of the aperture gradually increases towards the outside of the explosion pot.

At the upper end of the said aperture c are two hinged flaps e of non-inflammable insulating material, arranged to fit into suitable recesses in the disc a each of the said flaps being attached to a spindle f the ends of which extend in holes in the sides of the said recesses, the arrangement being such as to enable the said flaps to rotate about the axes of the said spindles through an angle of 90 degrees from the horizontal to the vertical position and vice versa, but not beyond these positions. The said flaps e

with their spindles *f*, and the recesses into which they are placed, are, as shown, so shaped and relatively associated together that, when the moving contact member of the switch enters the explosion pot, on closing the switch, the said flaps are pressed upwards by the end of the said moving member, and are thus caused to rotate into the vertical position, thereby permitting the said moving member to pass into the pot.

It will be apparent that during the initial portion of the travel of the moving member on opening the switch, a clearance will exist between the flat sides of the flaps and the circular surface of the moving member, thus enabling the pressure inside the pot to act on both sides of the said flaps and prevent any tendency of the flaps to press unduly against the surface of the moving member. When, however, the end of the moving member is passing into the aperture *c* on opening the switch, the said flaps will be caused to follow the flow of insulating liquid in the wake of the moving member and to rotate into the horizontal position where they are brought to rest by abutting against the bottom of the recesses in the disc *a*. The said flaps are so designed and arranged that when they reach the horizontal position their edges meet on the line *g* thus closing the entrance to the aperture *c*, except at the centre where the edges of the flaps are recessed to form a reduced aperture *h*, which may have any desired size and shape. As the end of the moving member continues to pass through the aperture *c*, the clearance between it and the side *d* of the said aperture increases, thus providing a path of increasing cross sectional area for the insulating liquid which is discharged through the aperture *h* into the outer tank of the switch.

It will be apparent that, from the moment when the said flaps close behind the moving member, the arc drawn between the arcing contact at the end of the moving member and the fixed contact inside the pot, will be forced to pass through the aperture *h* in the flaps where it is subjected to the quenching effect of the stream of insulating liquid discharged at high velocity through the said aperture by the pressure created in the pot. Moreover, the reduction in the size of the exit aperture of the pot effectually prevents the sudden release of pressure from the pot which would otherwise occur, thus relieving the outer structure and tank of the switch from any undue mechanical strain.

Referring to Fig. 3, the device illustrated in Figs. 1 and 2, is shown applied to one pole of a double pole switch of common type, the various parts being lettered, as far as they apply, in the same way as in Figs. 1 and 2. A wooden rod *i* forming part of the operating gear of the switch, actuates the moving member *j* through a cross bar *k*. The upper end of the moving member *j* constitutes the arcing contact and engages with a fixed contact *l* that is situated in the upper portion of the explosion pot *b* and carried by an insulator *m*. Into the end *o* of the explosion pot, which end is also of insulating material, extends a conductor *n* that connects the fixed contact *l* to one of the main terminals of the switch. Small vent holes *p* are provided in the said end *o* of the explosion pot, through which the gases, formed inside the pot may gradually escape after the switch has interrupted the flow of energy in the electrical circuit.

If it be desired to utilize the kinetic energy stored in the moving member and in the operating gear for assisting the flow of insulating liquid through the reduced aperture *h* in the flaps *e* when opening the switch, the aperture *c* in the disc *a* may be so shaped as to fit closely, but not tightly, round the moving member *j*, throughout the axial length of the said aperture, and the cross sectional area of the moving member *j* relative to the cross sectional area of the smaller aperture *h* in the flaps *e*, may be such as to cause the movement of the said member along the aperture *c* to produce a suction effect upon the insulating liquid passing through the said smaller aperture *h*. The axial length of the aperture *c*, if desired, may also be increased so as to prolong the action of the moving member in the manner just described.

Referring to Figs. 4, 5 and 6, the cylindrical explosion pot *b* is provided with an end disc *a* of insulating material having an aperture *c* so shaped and arranged as to fit closely, but not tightly, round the moving member *j*. A loose sphere *q* of noninflammable insulating material, having a diameter greater than that of the aperture *c*, is placed inside the pot, and the inner surface of the disc *a* is made slightly concave so as to cause the said sphere to tend to roll towards the aperture *c* when not prevented from so doing by the interposition of the moving member *j*. The inner entrance to the aperture *c* is countersunk to form a seating *r* for the sphere *q* and any desired number of radial grooves *s* are provided in the said seating to form intercommunicating passages between the inside of the pot and the exit aperture *c* thereof.

It will be apparent that when the moving member *j* passes into the pot, on closing the switch, the end of the said member will move the sphere *q* to one side, thus permitting the said member to engage with the fixed contact at the upper end of the pot, and when the arcing contact attached to the end of the moving member enters the aperture *c* on opening the switch, the sphere *q* will be caused to follow in the wake of the said mem-

ber and to rest upon the seating r, thus reducing the cross sectional area of the aperture c and causing the insulating liquid and the arc to pass through the passages s. If desired, the aperture c may be designed and arranged as shown in Fig. 1, to provide a free or flaring exit for the insulating liquid after it leaves the passages s or, alternatively, the aperture c may be arranged to fit closely, but not tightly, round the moving member as shown in Figure 4, and the cross sectional area of the aperture c and moving member j may be so proportioned in relation to the cross sectional area of the passages s, as to enable the movement of the end of the member j through the aperture c to cause a suction effect upon the insulating liquid flowing through the passages s.

Referring to Figs. 7 and 8, an alternative method in accordance with the invention is shown applied to one pole of a double pole switch of common type, generally similar to that illustrated in Fig. 3, the various parts being lettered, as far as they apply, in the same way as in Fig. 3. Fig. 7 shows the switch in the closed position, and Fig. 8 shows the moving member at a point in its travel, during the opening of the switch, when the arcing contact has entered the aperture c. The moving member j fits closely but not tightly, in the aperture c of the disc a. The upper portion of the said moving member is constructed in tubular form, an exit aperture or hole t being formed through its side at the bottom of the said tubular portion, so as to provide an internal passage through the moving member. The exit aperture t is of much less cross sectional area than that of the interior of the tubular portion of the member, as and for the purpose hereinbefore described. The length of the said passage and the position of the hole t are such that when, during the opening of the switch, the hole t passes out of the lower end of the aperture c, the tubular extremity of the moving member, which constitutes the arcing contact, will have reached any desired predetermined position in its travel relative to the fixed contact inside the pot.

It will be apparent that when the arcing contact disengages from the fixed contact, on opening the switch, the pressure created inside the pot by the energy dissipated at the arc will act upon the insulating liquid contained in the pot, but so long as the hole t is within the aperture c of the disc n, the insulating liquid inside the pot will be unable to discharge freely through the passage in the moving member. Immediately the said exit hole t immerges from the said aperture c, however, a restricted exit will be provided for the said insulating liquid to discharge into the outer tank of the switch, thereby causing the said liquid to converge into a stream that will enter the tubular end of the moving member and pass through the arc at the part thereof where it extends from the circular edge of the tubular end of the moving member. Inasmuch as the entrance to the said passage in the moving member is surrounded by the arcing contact, the said stream of insulating liquid is forced to cross the path of the arc at all points, and consequently the arc is effectively subjected to the quenching power of the said stream. If desired, and as hereinbefore stated, the exit passage c from the pot through the disc a may be elongated and the operating gear of the switch may be so designed as to prevent the entire withdrawal of the arcing contact from the said exit passage at the end of the travel of the said contact, thus further preventing sudden release of the pressure from the pot, which might impose undue mechanical strain upon the outer structure and tank of the switch.

If desired, the arrangement illustrated in Figs. 7 and 8, may be used in combination with the arrangement illustrated in Figs. 1 and 2, or Fig. 3, or in Figs. 4, 5 and 6 as additional means, for suddenly reducing the size of the aperture through which the moving member passes on opening the switch, thus ensuring that, if during the initial portion of the outward travel of the moving member, when the arcing contact is inside the pot, the stream of insulating liquid entering the internal passage of the moving member and issuing through the constricted exit hole t should not be effective in quenching the arc, then the sudden further constriction of the aperture of the pot when the arcing contact is passing through the disc a, and the consequent subjection of the arc to the quenching power of the stream of insulating liquid through such constricted aperture, shall effectively rupture the electrical circuit.

Figs. 9, 10 and 11 show a three phase switch, each pole of which has a single break in a single explosion pot b, the several pots being enclosed in a tank A. Each explosion pot is provided with an end disk a having a rectangular shaped aperture fitting closely, but not tightly, round the corresponding rectangular shaped moving member j and carrying the flaps e, the arrangement of the said flaps being generally similar to that illustrated in Figs. 1, 2 and 3. The moving member j however is designed and arranged for rotary motion, being rigidly attached to a wooden shaft u to which all the moving members j are clamped by metal clamping pieces v and nuts w. To each end of the wooden shaft u is rigidly attached a metal extension piece x provided with a trunnion piece supported in a bearing y in a bracket z. The two brackets are supported rigidly from the outer structure of the switch, thus

enabling the shaft u and the moving members j attached to it, to rotate about the axis of the said shaft.

The moving members j, where they are clamped to the shaft u, are designed to form cylindrical surfaces concentric with the centre of the said shaft, spring contacts 1 attached to brackets 2 being arranged to press upon the said cylindrical surfaces. The brackets 2 are rigidly fixed to the ends of insulators 3 and electrically connected to rods 4 which pass through the said insulators and form, at their upper extremities, one set of main terminals of the switch.

A spiral spring 5 extends round the extension piece x at each end of the shaft u, the outer end of the said spring being attached to the bracket z and the inner end of the said spring being attached to the said extension piece. The arrangement is such that the two springs 5 exert a force tending to rotate the said shaft in the direction which will withdraw the moving members j from their respective pots.

At the front end of the switch, shown on the right hand side of Fig. 10 and at the bottom of Fig. 11, the extension piece x is rigidly attached to a crank lever 6 so shaped (see Fig. 9) as to form a catch or jaw with which can be engaged a similar catch or jaw 7^a on the lower end of a link 7. This link, which is adjustable in length by means of an internally screw threaded sleeve 8, works, at its upper end, on a pin 9 on a crank lever 10, which is keyed to a shaft 11. The said shaft 11 is capable of being partly rotated by means of bevelled gearing 12 operated by a shaft 13, to which the operating hand wheel 14 (Fig. 11) of the switch is attached. A bell crank 15 mounted to turn on a pin 16 attached to the bracket z, at the front end of the switch, is connected by an adjustable link 17 and bell crank 18 to a link 19 which is connected to the tripping mechanism of the switch.

It will be apparent that the various parts of the mechanism above described are so relatively constructed and associated together that when the moving members j are in the full open position, the link 7 may be lowered by rotation of the shaft 13 attached to the hand wheel 14 of the switch until the jaw 7^a, at its lower extremity, engages with the jaw on the lever 6. By reversing the rotation of the said hand wheel, link 7 will be raised, thus lifting the lever 6 and rotating the shaft u together with the moving members j until the arcing contacts engage with the fixed contacts l in the explosion pots and close the switch, thereby completing the electrical circuit from the main terminals 4 through the brackets 2, sliding contacts 1, moving members j and fixed contacts l to the other set of main terminals n.

When opening the switch, the tripping mechanism, operating through links 19 and 17 and bell crank 18, will rotate the bell crank 15 in the direction of the arrow, thus forcing link 7 to one side and releasing the jaw on lever 6. The tension of the springs 5 will then cause the shaft u to rotate, thus disengaging the arcing contacts from the fixed contacts in the explosion pots and causing arcs to pass between the said contacts. The pressures created in the explosion pots by the energy dissipated at the arcs, will then rapidly accelerate the motion of the moving members j, which latter, together with the shaft u, are then free to move independently of the operating mechanism of the switch.

Dash-pots, comprising outer cylinders of insulating material 20, pistons 21 working in internal metal cylinders 22 having orifices 23 and containing springs 24, are attached to a channel iron 25 rigidly supported from the brackets z. The said dash-pots are so situated and designed as to absorb the kinetic energy retained by the moving members j and shaft u, when these latter are approaching the end of their outward travel, the pistons 21 of the said dash-pots being forced into their cylinders by shoulders 26 on the said moving members, thus bringing the said moving members to rest without undue shock.

As will be seen from Fig. 9, the aperture c of disc a of each explosion pot, is so designed as to enable the kinetic energy stored in the moving members j and the shaft u, together with all parts which are rigidly attached thereto, to produce a suction action upon the insulating liquid discharged through the smaller aperture in the flaps e during the opening of the switch, but the arrangement of operating gear and moving members illustrated in Figs. 9, 10 and 11 may be used in combination with any of the constructions illustrated in previously described figures.

The means and methods illustrated and hereinbefore described may be applied in cases where two separate sets of stationary and moving contacts are provided in the explosion pots, or in each explosion pot, one set comprising main contacts designed to carry the working current when the switch is in the closed position, and the other set comprising breaking or arcing contacts designed not to part contact with the corresponding stationary contacts until after the said main contacts have parted from their stationary contacts, and in such cases the means and methods herein described may be applied to the said breaking or arcing contacts only.

It will be understood that the devices shown in the drawings and described above are merely illustrative of the manner or method by which the invention can be carried into practice.

What I claim is:—

1. An electric oil switch of the type herein referred to, comprising an oil tank, an explosion pot having a stationary contact member therein and an aperture through which oil can pass from said pot to said tank, a movable contact member which, when in the closed position, extends through and practically closes the aperture through which it works and means under the control of said movable contact, adapted during the opening of the switch, automatically to constrict the cross sectional area of the arc and of the stream of oil issuing from said pot into said tank to an extent much less than that of the cross sectional area of said aperture, substantially as described for the purposes set forth.

2. An electric oil switch of the type herein referred to, comprising an oil tank, an explosion pot arranged within said tank and adapted to communicate therewith through an exit aperture in the wall of said pot, a stationary contact in said pot, a movable contact arranged to work through and practically close said aperture and means under the control of said movable contact adapted during the opening of the switch partly to throttle the arc and stream of oil issuing from the pot into the tank through said aperture, substantially as hereinbefore described for the purposes set forth.

3. An electric oil switch of the type herein referred to, comprising an oil tank, an explosion pot having an exit aperture or passage through which oil can pass from said pot to said tank, a stationary contact in said pot, a movable contact member, and valve means whereby the exit aperture or passage of the said pot through which the movable contact member passes, will automatically and suddenly be reduced in cross sectional area when, on the opening of the switch, the free end of the said contact member leaves the interior of the pot, so as thereby to constrict the cross sectional area of the issuing arc and oil and reduce the pressure of the issuing oil, substantially as described for the purpose set forth.

4. An electric switch of the type herein referred to, comprising an oil tank and an explosion pot having an aperture or passage through which oil can pass from said pot to said tank, a stationary contact in said pot and a movable contact member, wherein the exit aperture or passage in the pot through which the movable contact member passes, is controlled by valve means constituted by hinged flap members adapted, when moved into the closed and operative position, to form between them a passage of less cross sectional area than the said exit aperture or passage, substantially as described for the purpose set forth.

5. An electric oil switch comprising an oil tank, an explosion pot having a passage in its wall through which oil can pass from said pot to said tank, a stationary contact in said pot, a movable contact co-operating with said stationary contact and adapted to work through said passage, means under the control of said movable contact member adapted, during the opening of the switch, automatically to partly throttle the arc and stream of oil issuing from the pot into the tank through said passage, a support for said movable contact, spring means adapted when freed to move said support and movable contact member into the open position, means for moving said movable contact member into the closed position against the action of the said spring means and trip mechanism adapted to disconnect said switch closing means from said spring means and leave the movable contact member free to be moved rapidly into the open position independently of the switch closing means.

6. An electric oil switch comprising an oil tank, an explosion pot, a stationary contact therein, a movable contact in the form of a curved switch arm cooperating with said stationary contact, a member closing the bottom of the pot having an oil outlet passage through which the movable switch arm extends, when the switch is closed and through which oil can pass from the pot to the tank during the opening of the switch, a pivotal support for said switch arm, means for advancing the switch arm to engage the stationary contact, means for automatically holding the switch arm in closed position, trip gear for releasing the switch arm leaving it free to turn independently, and hinged flaps within the explosion pot at the entrance to such outlet passage adapted to be moved into an inoperative position by the movable contact member when closing the switch and to automatically and suddenly move into a position to reduce the cross sectional dimensions of the passage when the switch is opened and the movable contact member leaves the interior of the pot, substantially as described.

7. An electric oil switch comprising an oil tank, an explosion pot, a stationary contact therein, a movable contact in the form of a curved switch arm cooperating with said stationary contact, a member closing the bottom of the pot having an oil outlet passage for connecting the explosion pot to the tank during the opening of the switch and through which the movable switch arm works plungerwise in order to produce a suction effect upon the oil in the pot during the opening of the switch, a pivotal support for said switch arm, means for advancing the switch arm to engage the stationary contact, means for automatically holding the switch arm in closed position, trip gear for releasing the switch arm leaving it free to turn

independently and hinged flaps within the explosion pot at the entrance to such outlet passage adapted to be moved into an inoperative position by the movable contact member when closing the switch and to automatically and suddenly move into a position to reduce the cross sectional dimensions of the passage when the switch is opened and the movable contact member leaves the interior of the pot, substantially as described.

Signed at Johannesburg, Province of the Transvaal, Union of South Africa, this 30th day of August, 1920.

BERNARD PRICE.