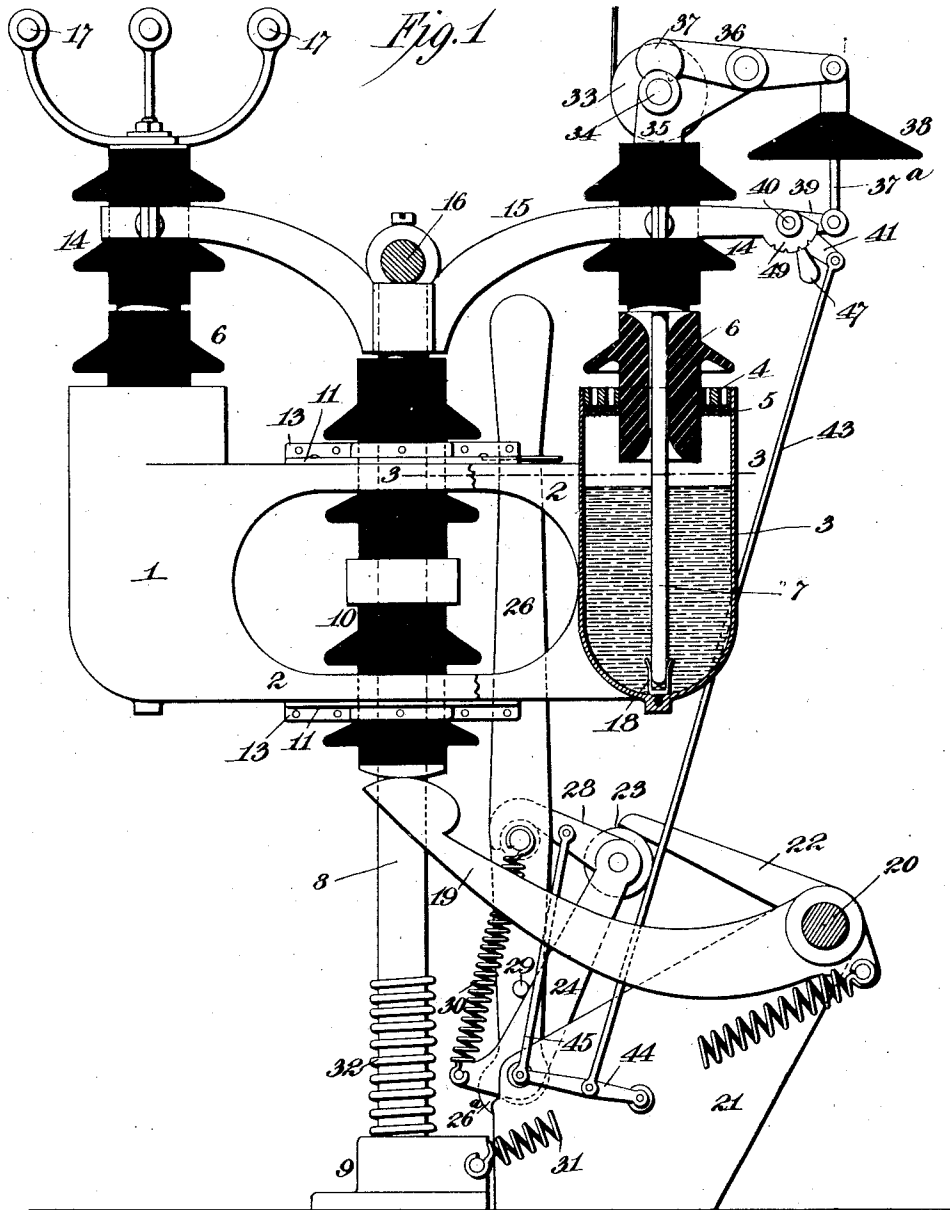


C. C. BADEAU.
 SWITCH OR CIRCUIT OPENER FOR HIGH POTENTIAL CIRCUITS.
 APPLICATION FILED JUNE 16, 1906.

1,041,570.

Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.



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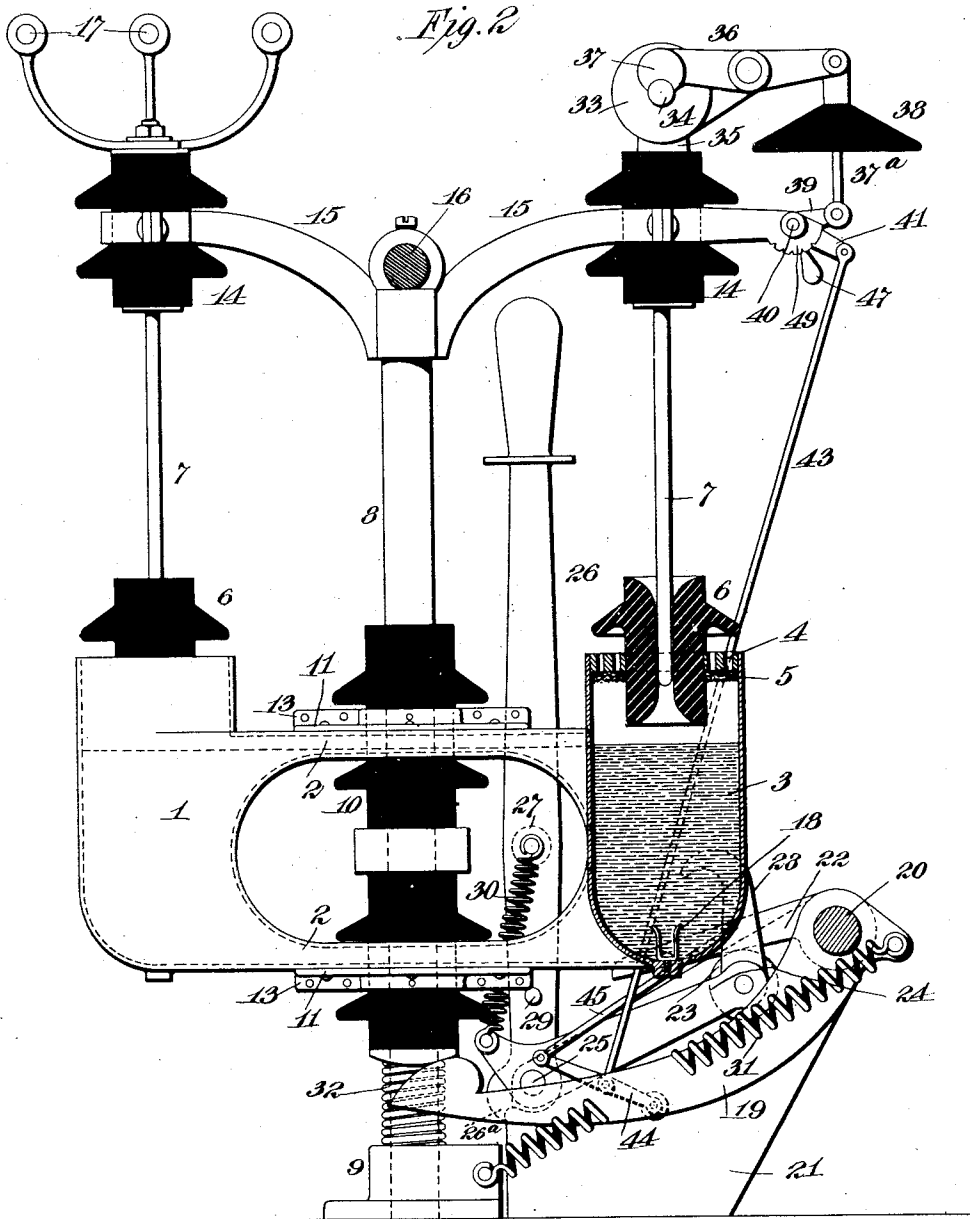
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4 SHEETS—SHEET 2.



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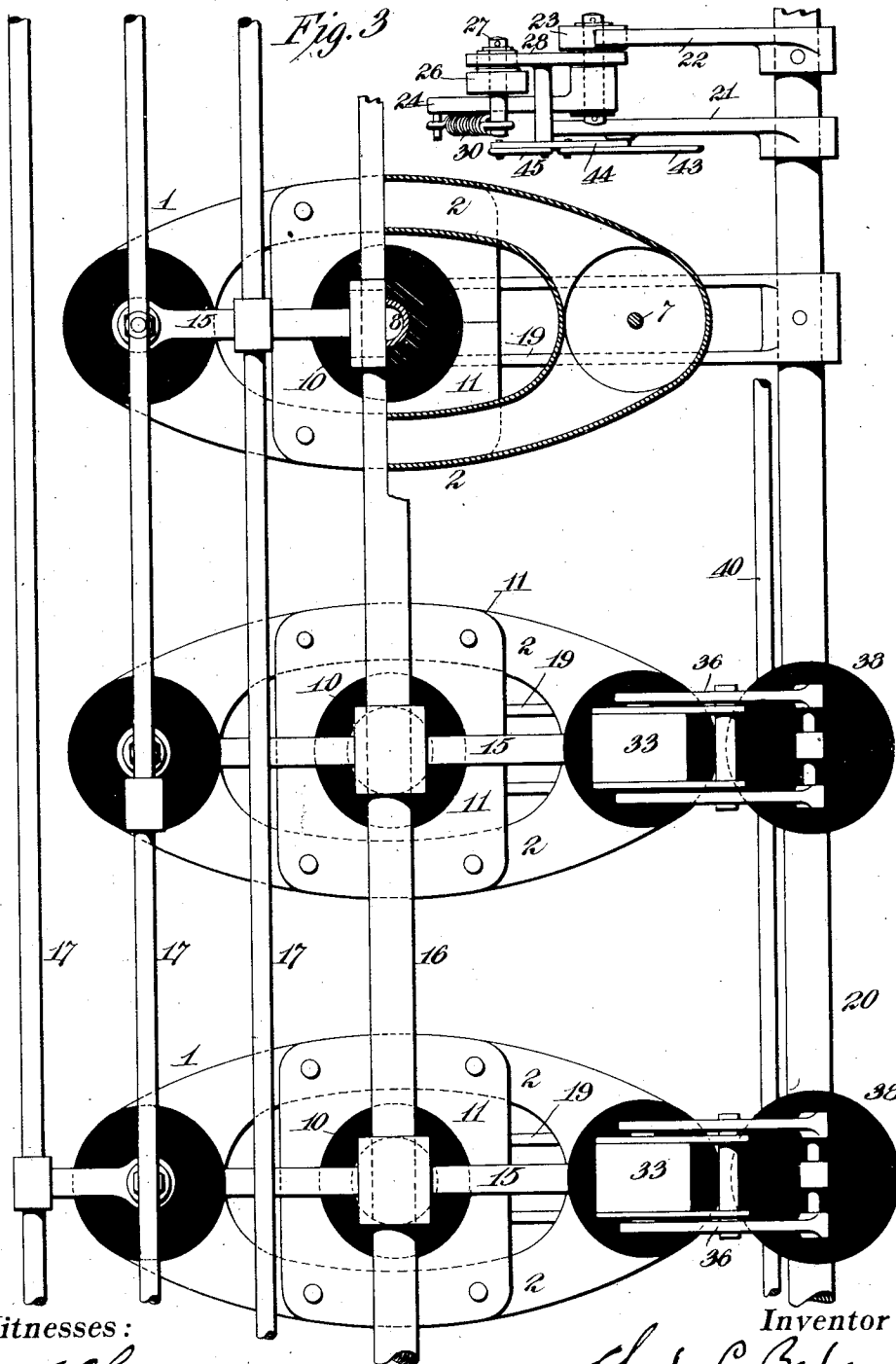
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4 SHEETS-SHEET 3.



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UNITED STATES PATENT OFFICE.

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SWITCH OR CIRCUIT-OPENER FOR HIGH-POTENTIAL CIRCUITS.

1,041,570.

Specification of Letters Patent.

Patented Oct. 15, 1912.

Application filed June 16, 1906. Serial No. 321,996.

To all whom it may concern:

Be it known that I, CHARLES C. BADEAU, a citizen of the United States, residing in Swissvale, county of Allegheny, State of Pennsylvania, have invented a certain new and useful Improvement in Switches or Circuit-Openers for High-Potential Circuits, of which the following is a specification.

The object of my invention is the production of a switch for opening and closing circuits carrying currents of high potential and large amperage.

Further objects will appear in the following specification and accompanying drawings, considered together or separately.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end view, partly in section, of a switch embodying my invention and shown in the closed position. Fig. 2 is a similar view showing the circuit open. Fig. 3 is a plan view partly in section, the section being taken on the line 3—3 of Fig. 1, and showing the invention embodied in a switch for triphase circuits. Fig. 4 is an enlarged view in section of the one form of overload tripping device used in connection with my invention; and Fig. 5 is a section taken on the line 5—5 of Fig. 4.

In all of the several views like parts are designated by the same reference characters.

In carrying out my invention, I provide a double pole break for each leg of the circuit. In connection with a triphase circuit, I provide three of such double pole breaks. Each of such double pole breaks is preferably alike, and the description of one will be a description of all.

The invention comprehends the use of chambers containing an insulating liquid, such as oil, in which the break occurs, and which serves to squeeze out and rupture the arc.

Referring to Figs. 1 and 2, the numeral 1 represents the inclosing chamber for the rupture points. This chamber is preferably in the form of a metallic vessel, which may be a single casting, having cylindrical end parts connected together by horizontal communicating passages or cross-members 2. Four of such passages are shown, but the number may vary. They connect the cylindrical end portions of the chamber at the bottom of each and at the top about on a level with the top of the liquid. These com-

municating passages are sufficiently large to permit free circulation of the liquid from one extremity to the other of the chamber, and permit immediate equalization of pressure from one end to the other of the chamber. The walls of the passages constitute means for the passage of current from one end to the other of the oil chamber. They should be of sufficient size to properly carry whatever current is needed. Within the chamber is a body of insulating liquid, such as oil, indicated by the numeral 3. The chamber is not closed at the top, but each end portion is provided with a cover of foraminous material, such as that shown in my Patent No. 752,192, dated February 16th, 1905. This foraminous cover permits the ready escape of gas, but prevents the escape of the oil. As shown in the drawings, it comprises a plate 4, provided with openings as shown. Below the plate are a number of layers of wire gauze 5.

Within the cover 4, and supported thereby, is an insulator 6 through which the rod 7 freely passes. This rod 7, is one element of one pole break.

The chamber is supported upon a rod or standard 8, which is shown as supported upon a foundation 9, there being one standard for each chamber. An insulating sleeve 10, slides upon the rod, and supports the chamber. The sleeve and chamber are connected together by plates 11, which are secured to the cross-members 2 of the chamber by screws or bolts, as shown. The plates 11 are made in halves connected together by flanges 13, so that they may be applied to the insulating sleeve 10.

Each pair of rods 7 is carried upon a yoke 15, supported upon a standard 8; the rods being connected to the yoke by insulators 14. The horizontal rod 16, connects the standards together and imparts the necessary rigidity to the entire structure.

The rods 7, on the left-hand side of Figs. 1 and 2 are connected to bus-bars 17, in the well-known manner. The rods on the right-hand side of the figure are electrically connected to an over-load tripping device, one of which is carried upon each of the yokes 15. The lower extremity of each of the rods 7, is arranged to mechanically and electrically engage with clips 18, each located within the bottom of the chamber 1, at such a point as to be engaged by the free end of the rod 7. The rods 7, are made of suitable

material possessing good electric conductivity.

In a triphase switch, such as is illustrated, the three oil chambers are separated a sufficient distance to prevent short circuits between the adjoining chambers, without the need of partitions. The movability of the oil chambers insures the fixture of the electrical connections. The bus bars are at the top where they are accessible, and the overload tripping devices are also very accessible.

The circuit is made and broken by elevating or depressing the oil chambers, the rods 7 being fixed. These rods dip into the oil when the chambers are elevated but do not displace any oil from the chambers in which the amount of liquid remains constant. The oil chambers are shown as capable of being elevated by manually operated means. They may be lowered by such means, and also by an electrical automatic overload tripping device.

The manually operated means comprises means operated by a single lever and by means of which all of the oil chambers may be simultaneously raised or lowered. This means consists of a lever 19, for each chamber, such lever being bifurcated and having the free extremity curved on the upper side which engages with the lower extremity of the sleeve 10, the two forks of the lever straddling the standard 8. The levers 19 are connected to and operated by an operating shaft 20, which is mounted in suitable bearings, one of such bearings being carried by a standard 21. The levers 19, all being rigidly connected to the operating shaft 20, by partly rotating the latter, these levers will be moved together and the oil chambers simultaneously elevated or depressed. For the purpose of imparting rotation to the operating shaft 20, a lever 22 is provided which engages with a roller 23 carried by a lever 24. This lever 24 is pivoted at 25. A hand lever 26 having its pivot in the same center as the pivot 25 is provided with a pin 27 with which a hook 28 engages. This hook 28 is pivoted to the lever 24. A pin 29 carried by the hand lever 26 engages with the lever 24 when the hook 28 is in engagement with the pin 27. A spring 30 connects the lever 24 at a point beyond its point of pivoting to the lever 26. The connection of the spring 30 to the lever 26 is shown to be a continuation of the pin 27. The spring 30 tends to cause the hook 28 to constantly remain in engagement with the pin 27 and exerts a stress upon the lever 24 in the direction away from the lever 26. This pin and hook arrangement is for the purpose of permitting the attachment of the overload tripping device, by means of which the circuit will be automatically opened. When the lever 26 is in a vertical position, as shown in

Figs. 1 and 2, and the hook 28 is in engagement with the pin 27, the roller 23 will support the lever 22 and with it the levers 19, holding all of the oil chambers in an elevated position with the circuits closed. The engagement of the lever 22 with the roller 23 will, through the agency of the lever 24 and pin 29, keep the lever 26 vertical, with the claw 26^a at the lower end thereof in engagement with the standard 21, preventing the lever 26 from falling to the left. By swinging the end of the lever 26 outward and away from the standard 8, the pin 29 engaging with the lever 24 will swing the latter, causing the roller 23 to roll under the lower face of the lever 22, permitting the latter to descend, partially rotating the shaft 20 and lowering the levers 19 and oil chambers 1. By raising the lever 26, the oil chambers will be simultaneously elevated. A spring 31 may be provided for counterbalancing to some extent the weight of the moving parts, so that the labor of closing the switch will be reduced. A spring 32 may be provided, surrounding each of the standards 8 for reducing the shock when the switch is opened and an oil chamber drops.

An automatic tripping device which is operated by overload, is carried upon each of the yokes 15. There is provided one device for each oil chamber and two pole break. Each of these devices is electrically in series with the two poles of the switch. The overload tripping devices, each comprises a coil 33, formed of a strip of material of good conductivity, and coiled around the poles 34 of a magnet, the convolutions being separated by strips of insulation as illustrated in my Patent 752,192, dated February 16, 1904.

The circuit continues from the coil 33, into the frame 35, and to the rod 7. The frame carries, pivoted upon it, two arms 36, the interior extremities of which are enlarged to form armatures 37. Upon the other extremity of the arms 36, is pivoted a link 37^a, a strain insulator 38 being interposed between the link and the arms 36. The link 37^a is connected to a lever 39, which is pivoted to the outer extremity of the yoke 15, by being connected to a tripping shaft 40. To the end of the shaft is also secured a lever 41. Adjacent to each lever 39 is a lever 42 which carries a pin, which engages with the upper side of the lever 39. The lever 41 is connected through a rod 43, to a lever 44 of the third class, which is shown as pivoted to the standard 21. The free end of this lever is connected by means of a link 45 to the hook 28.

A spring 46 having one extremity connected to the lever 39, and its other extremity provided with an adjusting handle 47, is coiled around the shaft 40. The adjust-

ing handle 47 is provided with a finger 48 which is adapted to engage in a notch on the sector 49, carried by the yoke 15. The handle is insulated by means of the insulators 14 and 38, so that it may be adjusted without danger. By adjusting the finger 48 in one notch or another of the sector, the tension upon the spring 46 may be adjusted and the amount of overload required to trip the switch determined. The end of the yoke is trifurcated, the lever 39 being mounted between two of the forks, and the spring 46 between one of these forks and the third fork. It is to be noted that the magnets of the tripping devices are in series with the line, and are mechanically connected to, but electrically insulated from the tripping shaft 40.

The operation of the tripping device is as follows:—Current passes through the coil 33 and energizes the core 34, attracting the armature 37. When the current reaches such an amount that the armature is attracted against the tension of the spring 46, the link 37* will be elevated, moving the lever 41 through the agency of the lever 42, partially rotating the tripping shaft 40, elevating the rod 43 by means of the lever 41, which in turn moves the lever 44, and link 45, thus disengaging the hook 28 from the pin 27. This will permit the lever 24 to be moved downward, partially through its own weight, partially through the agency of the spring 30, and partially through the depressive action of the lever 22 upon the roller 23. The hook 28 being released, the operating shaft 20 will be partly oscillated and all of the oil chambers 1, will be lowered. The position of the apparatus is shown in Fig. 2 with the parts thus positioned.

By the arrangement thus described, should any one of the several tripping devices be tripped, the tripping shaft 40 will be partly rotated through the agency of the lever 39 engaging with the pin on the lever 42, thus partially rotating the shaft 40, and the lever 41 will be moved a sufficient distance to disengage the hook 28 from the pin 27. It will thus be seen that there are a plurality of high tension switches independently mounted and operated by one operating shaft and one tripping shaft.

The manually operated means, and the automatic overload trip, will give the desirable quick break and long motion necessary to properly rupture the arc and squeeze the arc products to permit early rupture.

The invention may be modified in many ways. For instance, the manually operating and tripping mechanism disclosed may be used in connection with other forms of switches than that herein described.

In accordance with the provision of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

Having now described my invention, what I claim is:—

1. An electric switch, comprising fixed terminals and movable terminals, the movable terminals being in the form of a multi-part chamber containing insulating liquid.

2. An electric switch having a double pole break in the form of a single multi-part liquid containing chamber, and terminals extending into the chamber the said chamber containing insulating liquid.

3. In an electric switch, the combination with a single multi-part liquid containing chamber of a plurality of fixed terminals, and means for moving the chamber to break contact said chamber containing insulating liquid.

4. In an electric switch, the combination with a single open multi-part liquid containing chamber, of fixed terminals extending into the chamber; and means for moving the chamber the said chamber containing insulating liquid.

5. An electric switch having a fixed terminal and a movable terminal, the movable terminal being in the form of a chamber containing insulating liquid and the fixed terminal being in the form of a rod with means moving with the chamber, and surrounding the rod and which make a close fit therewith.

6. An electric switch comprising a fixed terminal and a movable terminal, the movable terminal being in the form of a chamber containing insulating liquid, and means on the chamber which enshroud the fixed terminal, when in open position.

7. An electric switch having a liquid containing chamber forming part of the electric circuit which has end body portions, and connecting tubular portions forming passageways.

8. In an electric switch, the combination of a supporting standard, and a liquid containing chamber, the said chamber having body portions connected together by tubular portions, one at least on each side of the standard.

This specification signed and witnessed this twelfth day of June, 1906.

CHARLES C. BADEAU.

Witnesses:

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