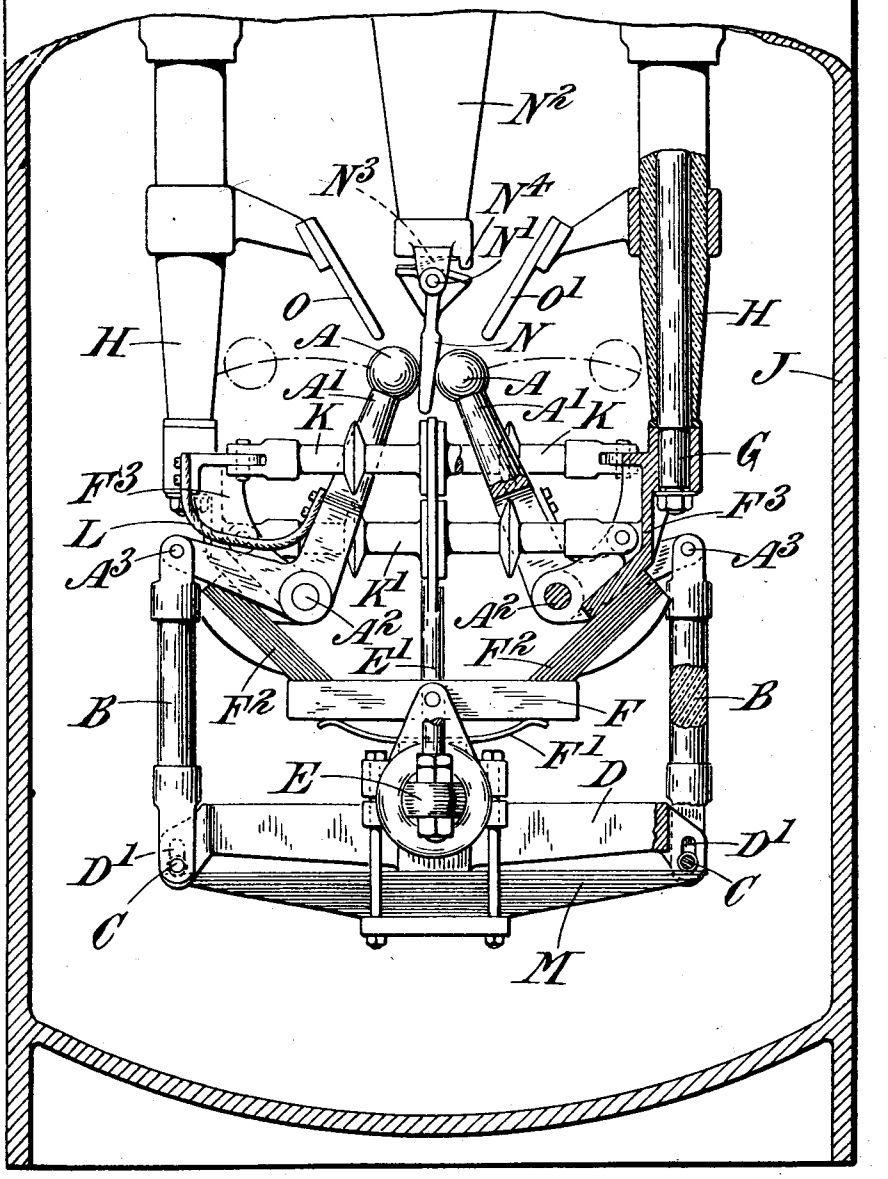
Oct. 18, 1927. 1,645,905

R. W. GREGORY ET AL

ELECTRIC SWITCH OR CIRCUIT BREAKER

Filed Dec. 21, 1926 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

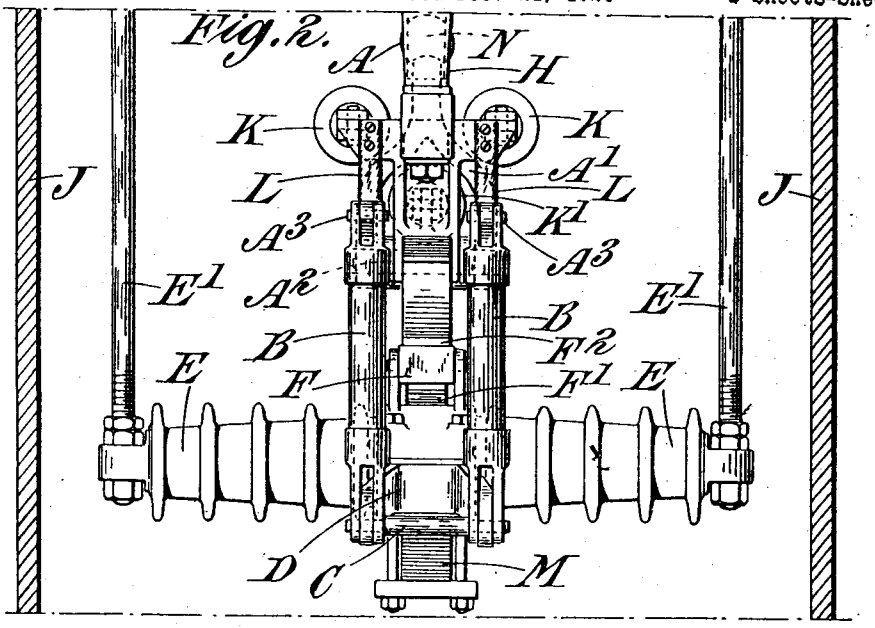
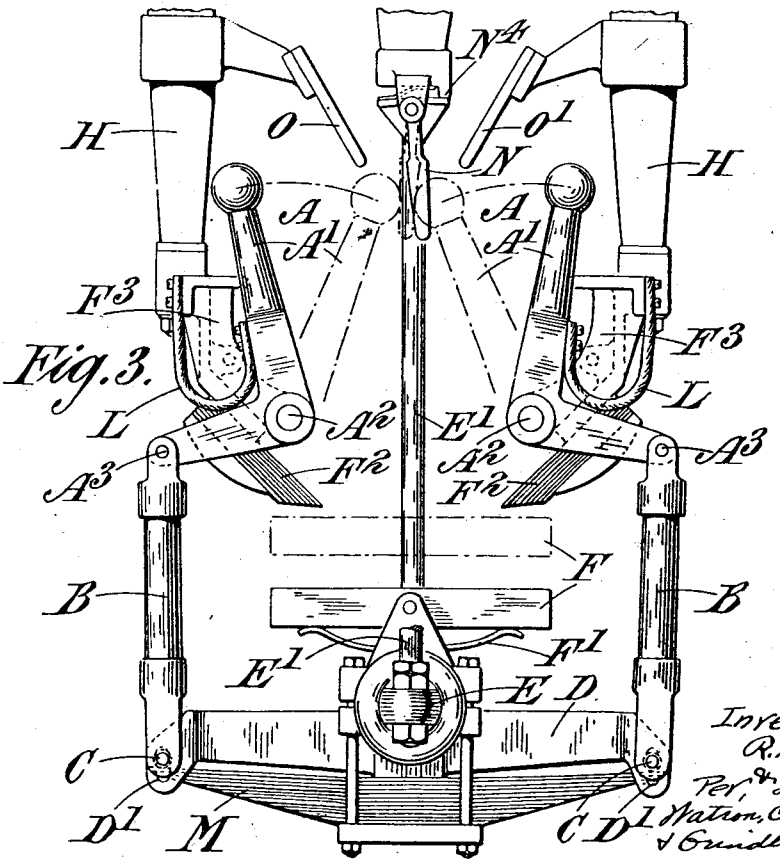


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH OR CIRCUIT BREAKER.

Application filed December 21, 1926, Serial No. 156,194, and in Great Britain March 3, 1926.

This invention relates to electric switches or circuit-breakers and particularly to the contacts, whether main or auxiliary, where arcing takes place when the switch is broken.

In switches or circuit-breakers dealing with heavy loads this arcing is a serious factor and many suggestions have been made to reduce the size of the arc and its duration.

An electric switch or circuit-breaker according to the present invention has contacts which, when the switch is opened, move away in opposite directions from an insulated metal body against which they both rest when the switch is closed.

This body is preferably in the form of a metal plate or block mounted centrally so that the contacts close on to it one from each side. The body serves to "anchor" the arc, for example to prevent it from travelling along the pivoted arms bearing the contacts when such arms are employed. Further, it acts to cool the arc and divides it into two arcs, i. e. one between the body and one contact and the other between the body and the other contact. These arcs are thus in series with each other.

Another feature which may be provided in a switch or circuit-breaker according to this invention is a conductor placed out of direct connection with the moving contact but adjacent to its path of motion. There are preferably two of such conductors disposed at equal or unequal distances from the central metal body or plate. Their action is to cool the arc still further when, as in the case of a heavy and strong arc, it extends from the central body to the moving contact as such contact passes the conductor. In such circumstances the arc will be established momentarily between the plate on the one hand and the conductor and moving contact on the other hand. The arc will be cooled and will almost immediately be extinguished as the moving contact passes further on its path away from the conductor. Momentarily there will, in such a case, be three or four arcs in series, for instance, two on one side and one or two on the other.

The plate, the moving contacts and the conductors when such are provided, are all preferably made with smooth rounded surfaces to avoid edges or points, and thus keep the arc cool by preventing it from raising unduly the local temperature of any part of the contact.

The invention is more particularly applicable to oil-immersed switches of the kind described in the specification of United States Letters Patent No. 1,366,791 granted to R. W. Gregory, one of the present applicants, wherein the moving contacts are at the end of upwardly extending pivoted arms arranged so as to draw out the arc more or less horizontally so that the vapours can rise freely through the oil in which the switch is immersed to a vent.

When the invention is so applied the metal body or plate is fixed so as to be between the contacts when they are closed on to it, and its presence not only cools the arc but effectually prevents any tendency for it to travel downwards. The intermediate conductors, if used, are preferably placed slightly above the substantially horizontal paths through which the contacts move.

When the contacts carried by the pivoted arms are primarily only arcing contacts, the main contacts may be in the form of fixed brushes bridged by a contact bar which is moved away from them by appropriate mechanism immediately before the arcing contacts are opened.

In the accompanying drawings,

Figure 1 is an elevation partly in section of one construction of switch according to this invention;

Figure 2 is a portion of a sectional elevation taken at right angles to Figure 1, and

Figure 3 shows the principal parts of the switch as illustrated in Figure 1 but in different positions.

In these figures A are arcing contacts mounted on bell crank levers A^1 pivoted at A^2 and having their short arms pivotally connected as at A^3 to the upper ends of insulating rods B. The lower extremities of these rods, or caps borne by them, have pins C passing through them and through slots D^1 in the ends of a bar D. This bar D is clamped to an insulating cross bar E attached at its ends to operating rods E^1. Centrally above the cross bar E a main contact F is pivoted and is supported by a spring F^1. This main contact F cooperates

with two fixed main contacts brushes F^2 supported on brackets F^3 secured to the main conductors G which pass down through hollow insulators H from the top of the tank J. The brackets F^3 and the dependent conductors G are braced by a pair of insulators K and by a central insulator K^1 which passes through the forked lower portions of the contact-bearing arms of the crank levers A^1. Flexible conductors L join these contact-bearing arms with the adjacent brackets F^3, i. e. with the conductors G. Below the bar D is a leaf spring M whose ends bear against the pins C.

It will be seen that when the switch is closed, as in the position shown in Figure 1, the arcing contacts A do not bear directly against each other but against a metal body or tongue N pivotally supported as at N^1 from an insulator N^2. This tongue N in the construction illustrated is provided with a spring N^3 which tends to deflect it when free to the right-hand side of the centre line of Figure 1. In this position, which is made definite by the provision of a stop N^4, the tongue N is shown in full lines in Figure 3.

As will be apparent from the drawings, when the operating rods E^1 are pushed down by some suitable mechanism, not shown but of any usual and known construction, the main contact F is moved downwards. For the first part of that movement the arcing contacts A are not separated but remain pressing on the two sides of the tongue N. Shortly after the beginning of its downward movement the main contact F separates from the fixed brushes F^2 and assumes say the position shown in chain lines in Figure 3. Further downward opening movement of the switch then begins to swing the bell crank levers A^1 outwards to separate the arcing contacts A. The left-hand arcing contact will then at once separate from the tongue N but the right-hand arcing contact will not separate from the tongue N quite simultaneously as the tongue will follow up the motion of the arcing contact under the influence of the spring N^3 until stopped by the projection N^4. Continued opening movement swings both the arcing contacts outwards until they reach their final positions as indicated in full lines in Figure 3.

Apart from the initial advantage of having a metallic body or tongue between the arcing contacts for the purpose of anchoring and cooling the arc, it is found an advantage in practice to have the arrangement above described whereby one of the contacts leaves the tongue a fraction of time before the other.

Adjacent to the paths of the arcing contacts as they move outwards are conductors in the form of plates O O^1 carried by the hollow insulators H. These serve as additional anchors for the arc and assist in cooling it. Only one of these plates is shown at each side of the switch but more may be provided. The plates O O^1 may be symmetrical or not with regard to the tongue N or to the closed position of the arcing contacts. In the example illustrated, as the tongue N will have moved slightly to the right as above mentioned under the action of its spring, the plate O^1 will be slightly nearer to the tongue than the plate O will be. This is found to be advantageous in practice.

As shown in the drawings the arcing contacts A, the tongue N and the conducting plates O O^1 are all provided with rounded surfaces. This helps to attain the general object of the invention which is the construction of a switch wherein the arc shall be cooled as much as possible to facilitate its ready extinction.

It is to be understood that the details of construction may be varied without departing from the spirit of the invention. The construction illustrated is given merely by way of example and obviously details such as the mounting and movement of the contacts might be altered considerably within the scope of the appended claims.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In an electric switch the combination of fixed and movable main contacts, means for separating such contacts by a downward movement of the movable contact, arcing contacts, an insulated metal body between said arcing contacts against which body both arcing contacts rest when closed, and an operative connection between said movable main contact and said arcing contacts acting to cause the arcing contacts to move away from the metal body in opposite directions when the main contacts are opened.

2. In an electric switch the combination of fixed and movable main contacts, means for separating such contacts by a downward movement of the movable contact, pivoted arms extending upwardly to give a rapid and long substantially horizontal break, arcing contacts mounted on said arms, an insulated metal body between said arcing contacts against which body both said arcing contacts rest when closed, and an operative connection between said movable main contact and said pivoted arms to cause said arcing contacts to move away in opposite directions from said insulated metal body when the main contacts are opened.

3. In an electric switch the combination of movable contacts, an insulated metal body between said contacts against which body both said contacts rest when closed, and an insulated conductor adjacent to the path of motion of each contact between its closed and open positions.

4. In an electric switch the combination of pivoted arms extending upwardly to give

a rapid and long substantially horizontal break, contacts mounted on said arms, a metal body mounted between said contacts in such a position that they close upon it, an insulating support for said body, and an insulated conductor adjacent to the path of motion of each contact between its closed and open positions.

5. In an electric switch the combination of fixed and movable main contacts, means for separating such contacts by a downward movement of the movable contact, pivoted arms extending upwardly to give a rapid and long substantially horizontal break, arcing contacts mounted on said arms, an insulated metal body between said arcing contacts against which body both said arcing contacts rest when closed, an operative connection between said movable main contact and said pivoted arms to cause said arcing contacts to move away from the metal body in opposite directions when the main contacts are opened, and an insulated conductor adjacent to the path of motion of each arcing contact between its closed and open positions.

6. In an electric switch the combination of fixed and movable main contacts, means for separating such contacts by a downward movement of the movable contact, pivoted arms extending upwardly to give a rapid and long substantially horizontal break, arcing contacts mounted on said arms, a pivoted insulated metal body between said arcing contacts against which body both said arcing contacts rest when closed, a spring tending to move said pivoted metal body to one side, and an operative connection between said movable main contact and said pivoted arms to cause said arcing contacts to move away from said insulated metal body in opposite directions when the main contacts are opened.

7. In an electric oil-immersed switch the combination of two fixed main contacts, a movable main contact cooperating therewith, a support for said movable main contact, operating mechanism for moving said support downwards and upwards to open and close the main contacts, pivoted bell crank levers having arms extending upwardly, arcing contacts mounted on said arms, a pivoted insulated metal body between said arcing contacts against which body both said arcing contacts rest when closed, an insulated conductor adjacent to the path of motion of each arcing contact between its closed and open positions, and operative connections between the support for the movable main contact and the pivoted bell crank levers acting to cause the opening of the arcing contacts immediately after the opening of the main contacts.

In testimony whereof we have signed our names to this specification.

RICHARD WALTER GREGORY.
LEWIS COLIN GRANT.