April 26, 1927. 1,626,528

R. W. GREGORY

ELECTRIC CIRCUIT BREAKER

Filed July 22, 1925 2 Sheets-Sheet 1

Fig. 1.

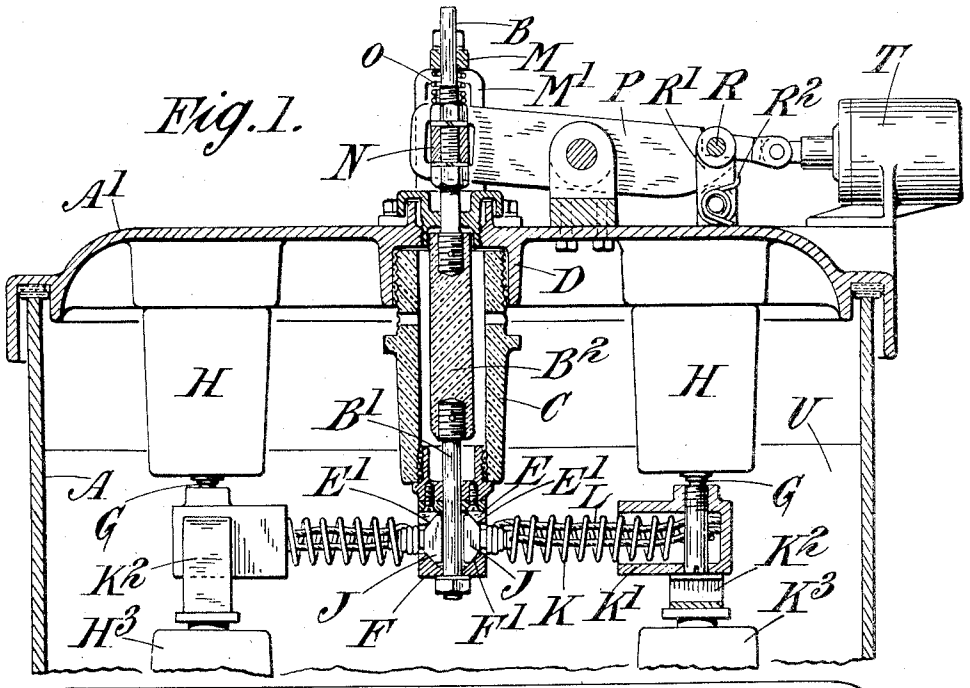
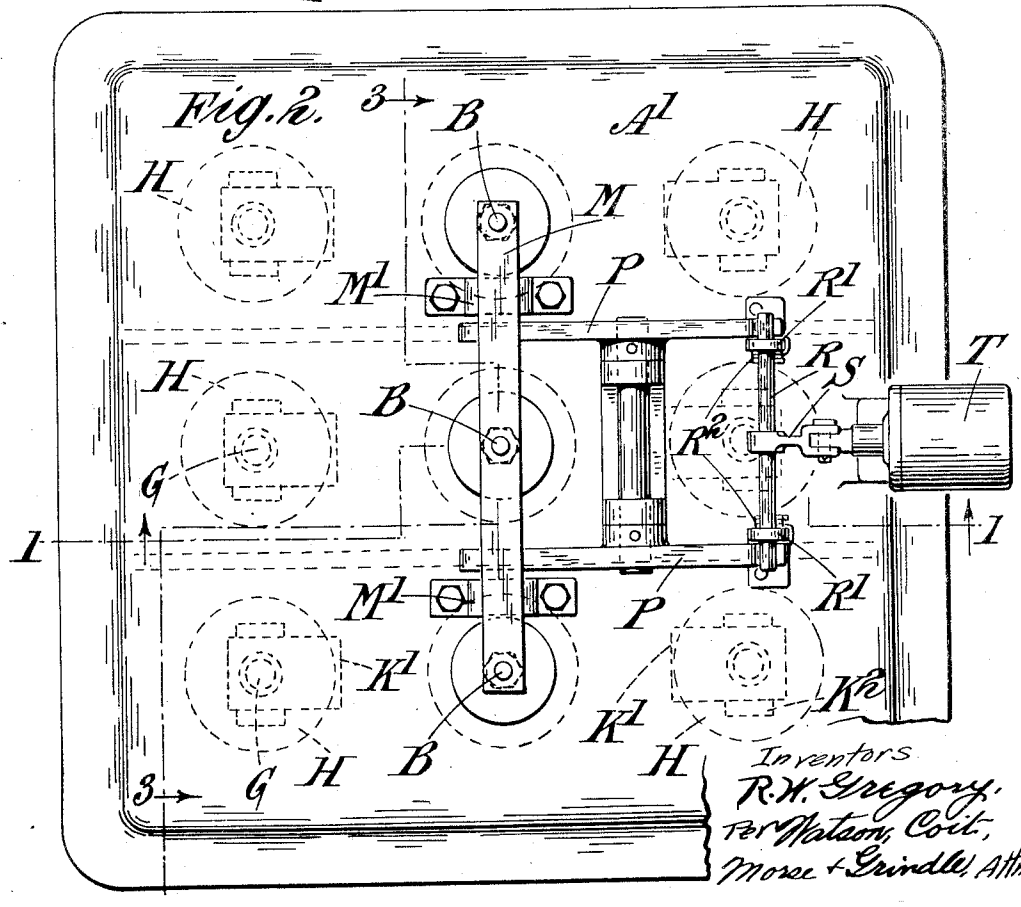


Fig. 2.



Inventors
R. W. Gregory,
Per Watson, Coit,
Mosse & Grindell, Attys.

April 26, 1927. 1,626,528

R. W. GREGORY

ELECTRIC CIRCUIT BREAKER

Filed July 22, 1925 2 Sheets-Sheet 2

Fig. 3.

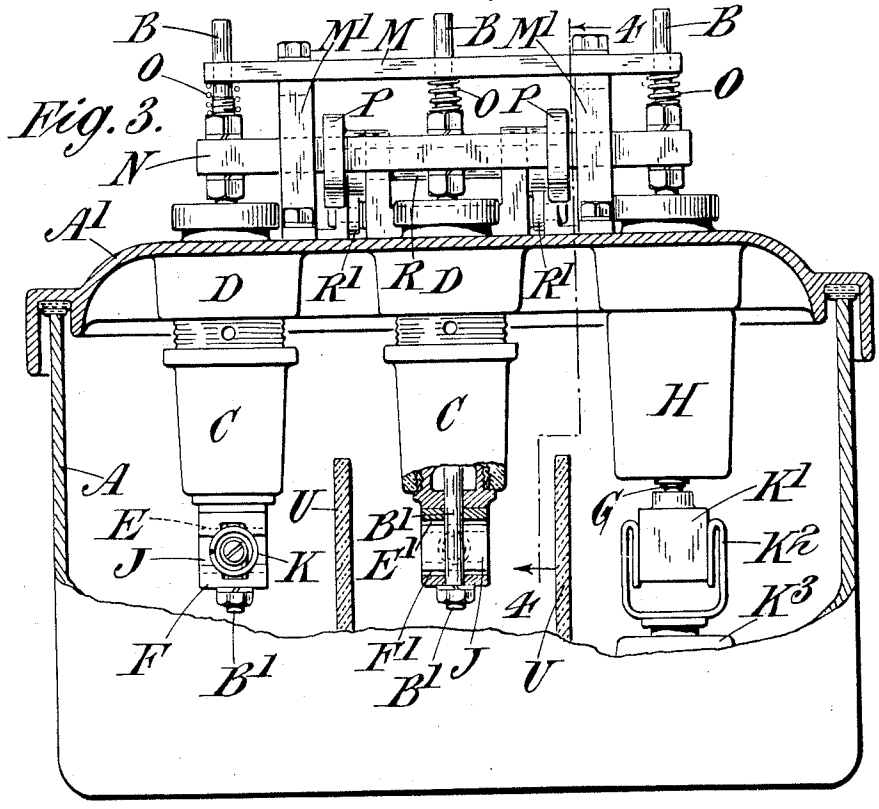
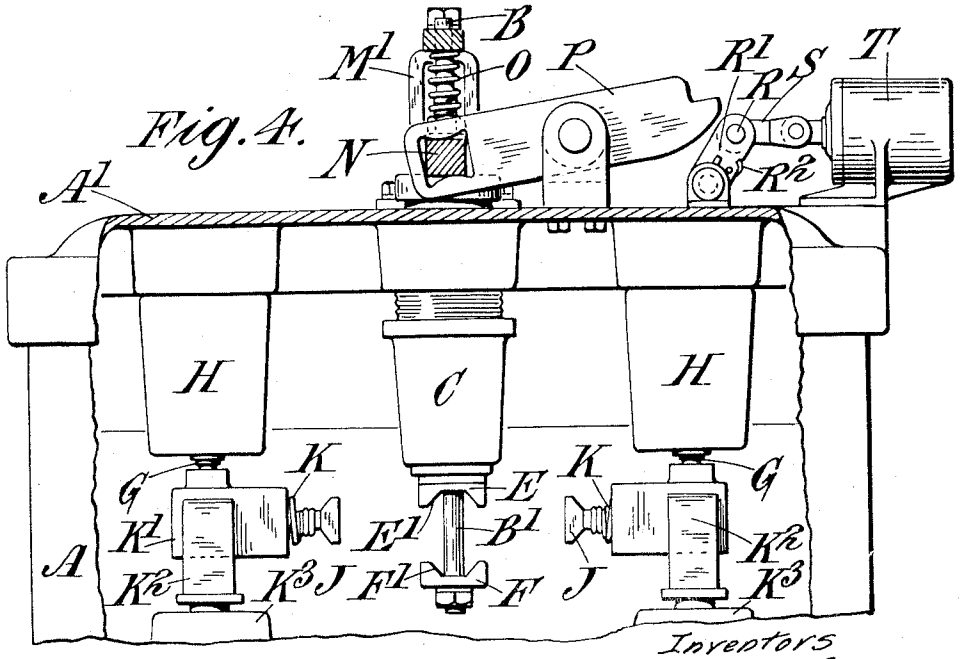


Fig. 4.



Inventors
R. W. Gregory.
Per Watson, Coit,
Morse & Grindle Attys.

Patented Apr. 26, 1927. 1,626,528

UNITED STATES PATENT OFFICE.

RICHARD WALTER GREGORY, OF HEXHAM-ON-TYNE, ENGLAND, ASSIGNOR TO ELECTRICAL IMPROVEMENTS LIMITED, OF NEWCASTLE-UPON-TYNE, ENGLAND.

ELECTRIC CIRCUIT BREAKER.

Application filed July 22, 1925, Serial No. 45,373, and in Great Britain September 24, 1924.

This invention relates to electric circuit-breakers and has particular reference to oil-immersed circuit-breakers suitable for use on high voltage systems where a quick break with a long gap is desirable.

A circuit-breaker according to this invention has a spring or gravity-controlled spindle carrying what may be termed retaining contacts cooperating, when the breaker is closed, with one or more spring-operated contacts which are released by the retaining contacts when the spindle is tripped by trigger or like mechanism to effect a sudden and long break in the circuit.

The circuit-breaker is intended to be immersed in oil and the contact making and breaking parts thereof are conveniently mounted on the under side of the lid of a box or tank whilst the tripping mechanism may be placed on top of the lid.

In one convenient construction the spindle is housed in a hollow or tubular support screwed into a threaded boss in the inside of the lid, the top of the spindle passing through an opening in the lid. To the lower end of the support is detachably fixed a contact having two surfaces, which are adjacent to the spindle, inclined or sloped. Near the lower end of the spindle is mounted a contact block also formed with inclined surfaces.

On each side of the spindle and its support is an insulator fixed beneath the lid and terminating at its lower end in a hollow member or housing for a more or less horizontal coiled spring. Electrical connections are made in any convenient way to these hollow members or housings. The free end of each of the springs bears a contact block preferably wedge-shaped or having inclined surfaces corresponding to the surfaces on the fixed and spindle-carried contacts previously mentioned. The springs are so mounted and arranged as to be capable of being extended and moved sideways sufficiently to allow the wedge-shaped blocks to be slid into the space between the adjacent fixed contact and the spindle-carried contact and when the wedge-shaped block is in this position the spring is in fairly strong tension. A flexible connection is preferably provided between the conductor and the wedge-shaped block at the end of the spring.

The upper end of the spindle is operatively engaged by a trigger or other retaining and releasing device.

Whilst this trigger is in its retaining position the spindle cannot move downwards and consequently the spring-operated contacts are retained and the circuit remains closed.

When the trigger or other trip mechanism is operated the lever is released, the spindle moves downwards under the action of gravity or a spring and carries with it the contacts fixed to its lower end. This action is assisted by the pull of the springs on the wedge-shaped contact blocks which are pulled quickly through the spaces between the fixed and spindle-carried blocks and a quick long distance break is obtained.

To reset the circuit-breaker the spindle is raised and the trip mechanism latched or engaged so as to hold it, the springs operating the wedge-shaped blocks are extended and the blocks slid into position. The trip mechanism may be such that the act of raising the spindle automatically latches or sets the breaker. When, as is preferred, the parts are mounted as described on the lid of an oil tank it is necessary to swing the lid back on its hinges for the resetting operation.

All the contacts are preferably made so that they may be readily detached and fresh contacts substituted if that is necessary.

The trip mechanism may be hand-operated or operated electromagnetically for instance, through a relay actuated by some known balanced or other protective system.

In the accompanying drawings which illustrate by way of example one construction of oil-immersed circuit-breaker according to this invention:

Figure 1 is a section on the line 1—1 of Figure 2.

Figure 2 is a plan.

Figure 3 is a section mainly on the line 3—3 of Figure 2, and

Figure 4 is a section on the line 4—4 of Figure 3 showing the movable contacts released and in their separated positions.

In these figures A is a box or tank adapted to contain oil and having a lid A^1 which may be attached to the box and secured in any desired way. The particular example illustrated is a three phase circuit-breaker and is described as such but it is to be understood that the main features of the inven-

tion are applicable to single phase circuit-breakers and Figure 1 shows the principal cooperating parts for one phase. These parts comprise a spindle formed of two rods B B^1 joined by insulating material B^2 and housed within a tubular member C screwed into a hollow boss D on the inside of the lid A^1. The lower rod B^1 of the spindle passes through a gland in the end of the tubular member C which is provided with a contact E having inclined surfaces E^1. At the end of the rod B^1 is mounted a similar contact F with inclined surfaces F^1.

On each side of the tank are conductors G supported in insulators H and connected respectively to wedge-shaped contacts J mounted on the ends of springs K in boxes or housings K^1. Electrical connection is made from each box or housing K^1 to its contact J through flexible conductors L so that the current does not necessarily pass through the springs. Electrical connections from outside are made to the housings K^1 through clips K^2 supported on insulators K^3 fixed on the bottom of the tank, the housings K^1 being withdrawn from the clips K^2 when the lid A^1 is opened.

When the circuit-breaker is set the spindle in its raised position retains the contacts J as shown in Figure 1 and electrical connection is established between the two conductors G. The downward movement of the spindle and contact F F^1 allows the movable contacts J to fly apart under the action of their springs K and assume the positions shown in Figure 4.

In the construction illustrated there are three sets of parts such as have been described one set for each phase and the rods B of each spindle pass through a bar M mounted on brackets M^1 on the lid A^1. The rods B are attached to a cross bar N and springs O tend to force the cross bar N and the spindles downwards to open simultaneously the contacts in all three phases.

Engaging with the cross bar N are pivoted levers P notched at their ends to engage with a rod R mounted in pivoted arms R^1. A link S operatively engages this rod R with a tripping electromagnet T which when energized pulls the rod and arms into such a position (Figure 4) as to release the levers P and allow the cross bar N and the spindles to fall under the action of the springs O. Springs R^2 are provided to return the arms R^1 and rod R when the magnet T is deenergized and the spindle can be raised again by depressing the free ends of the levers P which are rounded at their lower edges so that they may press the rod R outwards until it can slip into the notches in the levers P and hold the spindles in their raised positions.

When thus reset and after opening the lid, the movable contacts J may be replaced by extending their springs K and slipping the contacts sideways into the spaces between the contacts E E^1 and F F^1.

Barriers U of insulating material are preferably provided between the three phases when the invention takes the form of a three-phase circuit-breaker as illustrated. These barriers are shown as extending across the tank A.

It is to be understood that the details of construction may be varied without departing from the scope of the invention as claimed. For instance in a three-phase circuit-breaker it is obviously not essential that all three spindles should pass through the lid of the box or tank and be connected and operated in the way that is illustrated in the drawings. The spindle of the centre phase might pass through the lid and be operated and controlled in any convenient way and the lower part of that spindle might be mechanically connected to the other spindles so that the contacts carried at their lower ends move simultaneously with the contacts F F^1 of the centre spindle.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an electric circuit-breaker adapted to give a quick break and a long gap the combination of a movable spindle, a retaining contact mounted on said spindle, a spring-operated contact normally held against the action of its spring by said retaining contact, and means for moving the spindle to release said spring-operated contact.

2. In an electric circuit-breaker adapted to give a quick break and a long gap the combination of a movable spindle, a retaining contact mounted on said spindle, spring-operated contacts normally held against the action of their springs by said retaining contact, and means for moving the spindle to release said spring-operated contacts and trigger mechanism for holding the spindle in the closed contact position and for releasing it.

3. In an electric circuit-breaker the combination of a box adapted to contain oil, a lid for said box, a hollow support dependent from said lid, a spindle slidably mounted in said support, a retaining contact mounted on said spindle, spring-operated contacts normally held against the action of their springs by said retaining contact, a spring tending to move the spindle and the retaining contact to release the spring-operated contacts, pivoted means for preventing the action of said spring, and electromagnetic means for releasing said pivoted means and allowing said spring to act.

4. In an electric circuit-breaker, the combination of a box adapted to contain oil, a lid for said box, a hollow support dependent from said lid, a contact with inclined faces

attached to the bottom of said support, a spindle slidably mounted in said support, a retaining contact mounted on the lower end of said spindle and having faces oppositely inclined to those on the contact attached to the support, insulators dependent from the lid one on each side of the hollow support, housings carried by said insulators, an extensible spring in each of said housings, a wedge-shaped contact on the free end of each of said springs, a spring around the spindle tending to move the spindle and release the wedge-shaped contacts from engagement between the contacts on the support and the spindle, a pivoted lever acting to prevent the spring around the spindle from acting, a catch on said lever and electromagnetic means for engaging said catch and holding the lever and for releasing or tripping said lever.

5. In an electric circuit-breaker the combination of a box adapted to contain oil, a lid for said box, a hollow support dependent from said lid, a contact with inclined faces attached to the bottom of said support, a spindle slidably mounted in said support, a retaining contact mounted on the lower end of said spindle and having faces oppositely inclined to those on the contact attached to the support, insulators dependent from the lid one on each side of the hollow support. housings carried by said insulators, an extensible spring in each of said housings, a wedge-shaped contact on the free end of each of said springs, insulators mounted on the bottom of the box, and clips supported by said insulators and adapted to receive the housings when the lid is closed.

In testimony whereof I have signed my name to this specification.

RICHARD WALTER GREGORY.