

No. 663,612.

Patented Dec. 11, 1900.

E. OXLEY.  
CIRCUIT CHANGER.

(Application filed May 29, 1899.)

(No Model.)

Fig. 1.

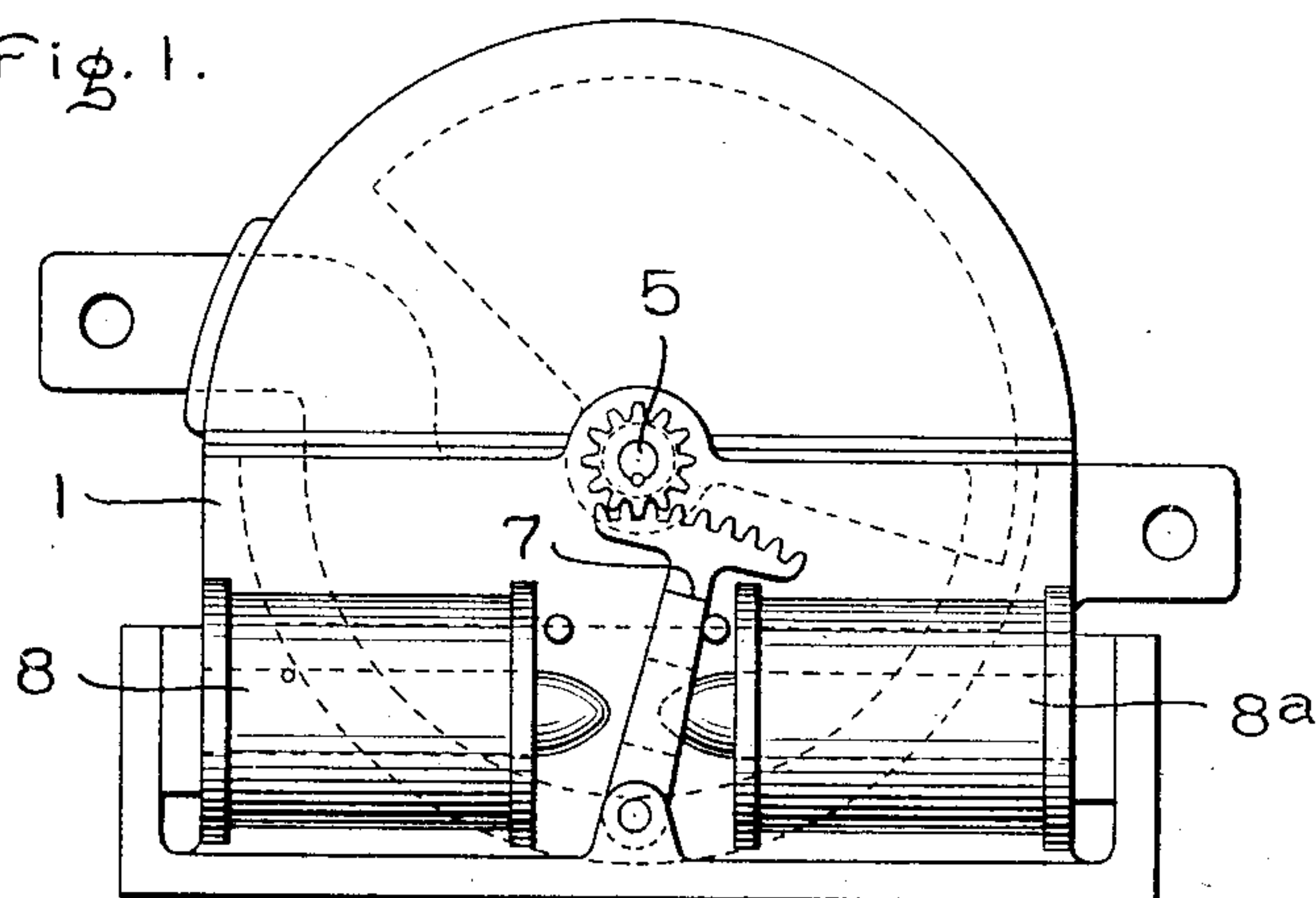
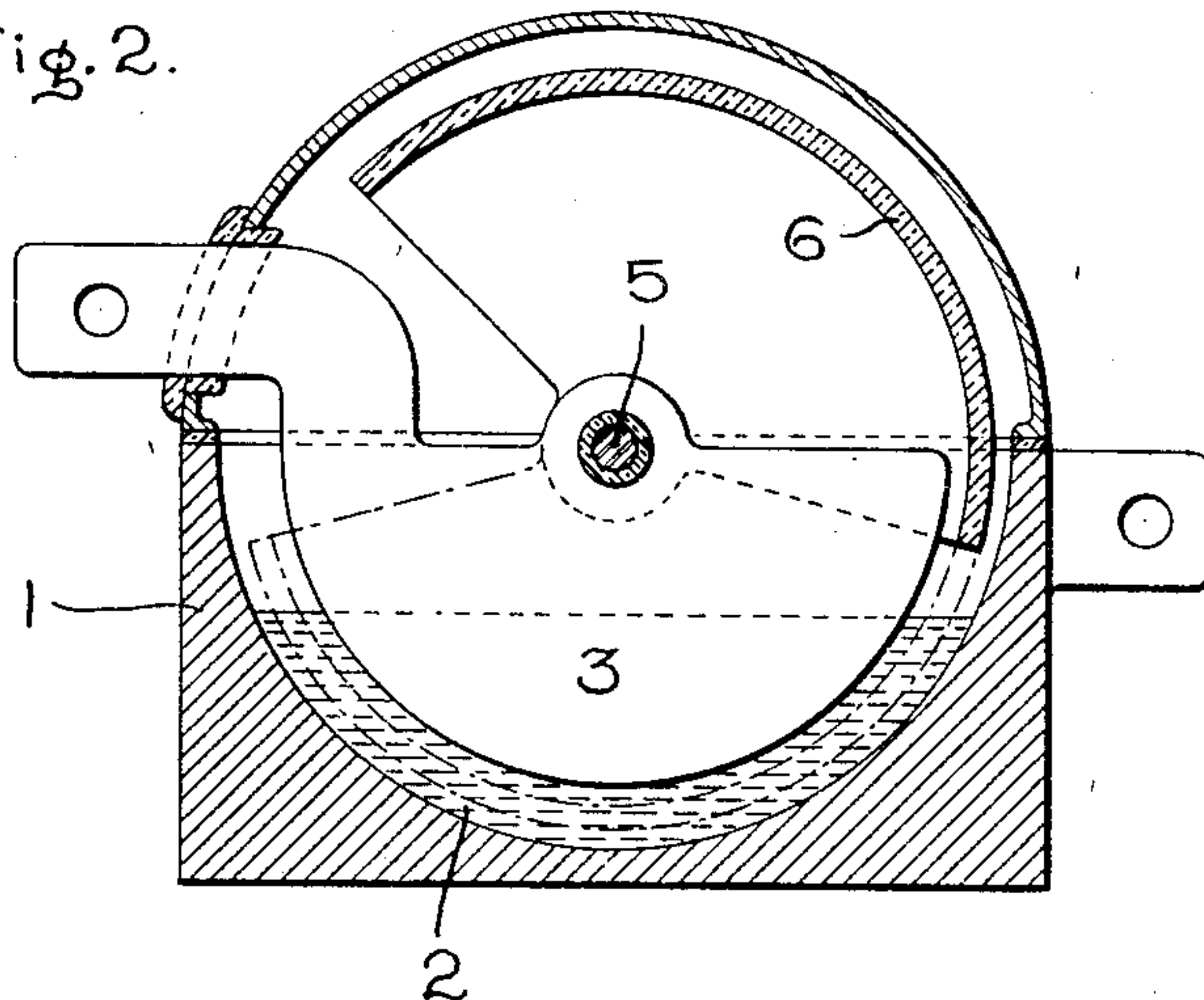


Fig. 2.



Witnesses.

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# UNITED STATES PATENT OFFICE.

EUSTACE OXLEY, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

## CIRCUIT-CHANGER.

SPECIFICATION forming part of Letters Patent No. 663,612, dated December 11, 1900.

Application filed May 29, 1899. Serial No. 718,651. (No model.)

*To all whom it may concern:*

Be it known that I, EUSTACE OXLEY, a subject of the Queen of Great Britain, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Circuit-Changers, (Case No. 974,) of which the following is a specification.

My invention relates to switches or circuit-changers for electric circuits, my purpose being to provide a device for opening and closing a circuit without moving either switch-terminal, the current being interrupted by the interposition of a non-conducting wall between two terminals connected by a conducting liquid.

It is also an object of my invention to permit the circuit to be opened or closed by the exertion of a merely nominal power, whereby automatic circuit-breakers and similar devices can be operated automatically by means of great simplicity, which can be manufactured at very low cost.

It is a further object to provide a device simple and cheap in construction which will accomplish these results and which can be operated by controlling devices of small power.

The invention comprises a current-controller in which the terminals are or may be connected by a liquid conductor and means for interposing a non-conducting diaphragm between them. It comprises also a device of this kind having fixed circuit-terminals and a movable diaphragm of insulating material. It also comprises other more specific features, which will be hereinafter described and claimed.

In the drawings, which show a simple organization embodying my invention, Figure 1 is a side elevation of a device embodying my improvements. Fig. 2 is a vertical section on a plane parallel to that on which Fig. 1 is projected.

The reference-numeral 1 in said drawings indicates my preferred form of containing vessel, formed of conducting material—such as iron, aluminium, or other suitable material—although I may use a vessel formed of a non-conducting substance, but provided with a conducting-lining. This containing vessel holds when in use a body of conduct-

ing liquid 2. I prefer to use mercury; but conducting liquids of other character, such as electrolytes, might be employed. Dipping into the mercury and immersed to a suitable depth therein is a circuit terminal or contact 3, preferably of semicircular form, though any other shape is consistent with the purposes of my invention. The contact 3 is rigidly secured in place and remains permanently in the mercury.

Upon suitable supports or bearings a shaft 5 is mounted, upon which is rigidly fixed a semicircular shell or hood 6, having approximately the form of the contact 3, but of such increased dimensions that it can contain or inclose the latter. Said shell is formed of or covered with any suitable insulating or non-conducting substance—such, for example, as hard rubber, glass, porcelain, wood covered with paraffin or varnished, metal having an insulating coating, &c. It is so arranged upon the shaft 5 that as the latter is turned in one direction said hood will enter the mercury and pass around and inclose the contact 3, its edge when movement is arrested rising above the surface of the mercury. A small portion of the latter will also be inclosed by the shell or hood; but the interposition of a non-conducting wall between the main body of mercury and the switch-terminal 3 completely cuts off the current. A reverse movement establishes the circuit by simply withdrawing the wall interposed between the two conducting-bodies—viz., the mercury and the terminal lying therein. I have shown in this instance a single-pole switch only; but it is evident that the application of my invention to a multipole switch involves merely a duplication of the parts already described. Thus I provide a switch which can be operated quickly and requires, practically speaking, only a nominal power for its operation. By counterbalancing the shell or hood 6 upon the shaft 5 a slight force upon the shaft will turn the hood. As the latter can be made of thin material, it is light, causes no sensible rise and fall of the mercury by displacement, and produces no flash or agitation of the same upon entering or leaving said mercury. As the shaft is the only part on which any action is exerted, the switch-contact and the



mercury and hood may be placed in a hermetically-sealed housing, thus excluding dust, dirt, and moisture and entirely preventing loss of mercury by volatilization. This switch  
 5 is ordinarily adapted for use as a circuit-breaker, since it can be operated by a small and comparatively weak electromagnet or other automatic means. It can be used upon any circuit and with any current, and its sim-  
 10 plicity and small size enable it to be produced at an extremely low cost.

I have shown in the drawings a simple structure to effect magnetic control, 7 representing an armature playing between and  
 15 controlled by electromagnets 8 8". To provide a considerable range of armature movement, the magnets may have tapering or paraboloidal pole-pieces, as shown, the armature being bored to permit its passage over the  
 20 pole-pieces, thus permitting a small air-gap and a long throw. The free end of the armature may carry a rack-sector engaging a pinion on shaft 5, as shown.

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

1. A circuit-changer comprising circuit-terminals, a liquid conductor connecting them, and an insulating-shell movable to surround one terminal and thus break the circuit.
- 30 2. A circuit-changer comprising two circuit-terminals, one surrounding the other, a

conducting liquid between them, and a movable non-conducting wall to separate the terminals or permit their contact.

3. A circuit-changer comprising two terminals, one inclosing the other a conducting liquid between them, and a movable hood having insulating-walls to inclose the inner terminal and open the circuit. 35

4. A circuit-changer comprising a conducting liquid such as mercury, a contact or terminal contacting therewith, and a non-conducting shell or hood arranged to enter said liquid and pass around and inclose the contact, its edge rising suitably above the surface to rupture the circuit. 40 45

5. A circuit-changer comprising a body of conducting liquid such as mercury, a switch contact or terminal lying permanently therein, a non-conducting shell or hood mounted  
 50 on a shaft and adapted to turn therewith and enter said liquid, surround the contact lying therein and rise suitably above the surface, whereby said circuit is opened, and means for operating said shaft. 55

In witness whereof I have hereunto set my hand this 26th day of May, 1899.

EUSTACE OXLEY.

Witnesses:

DUGALD MCKILLOP,  
 EDWARD WILLIAMS, Jr.