No. 710,367. Patented Sept. 30, 1902.

C. J. REED.

CIRCUIT BREAKER.

(Application filed Feb. 17, 1899.)

(No Model.)

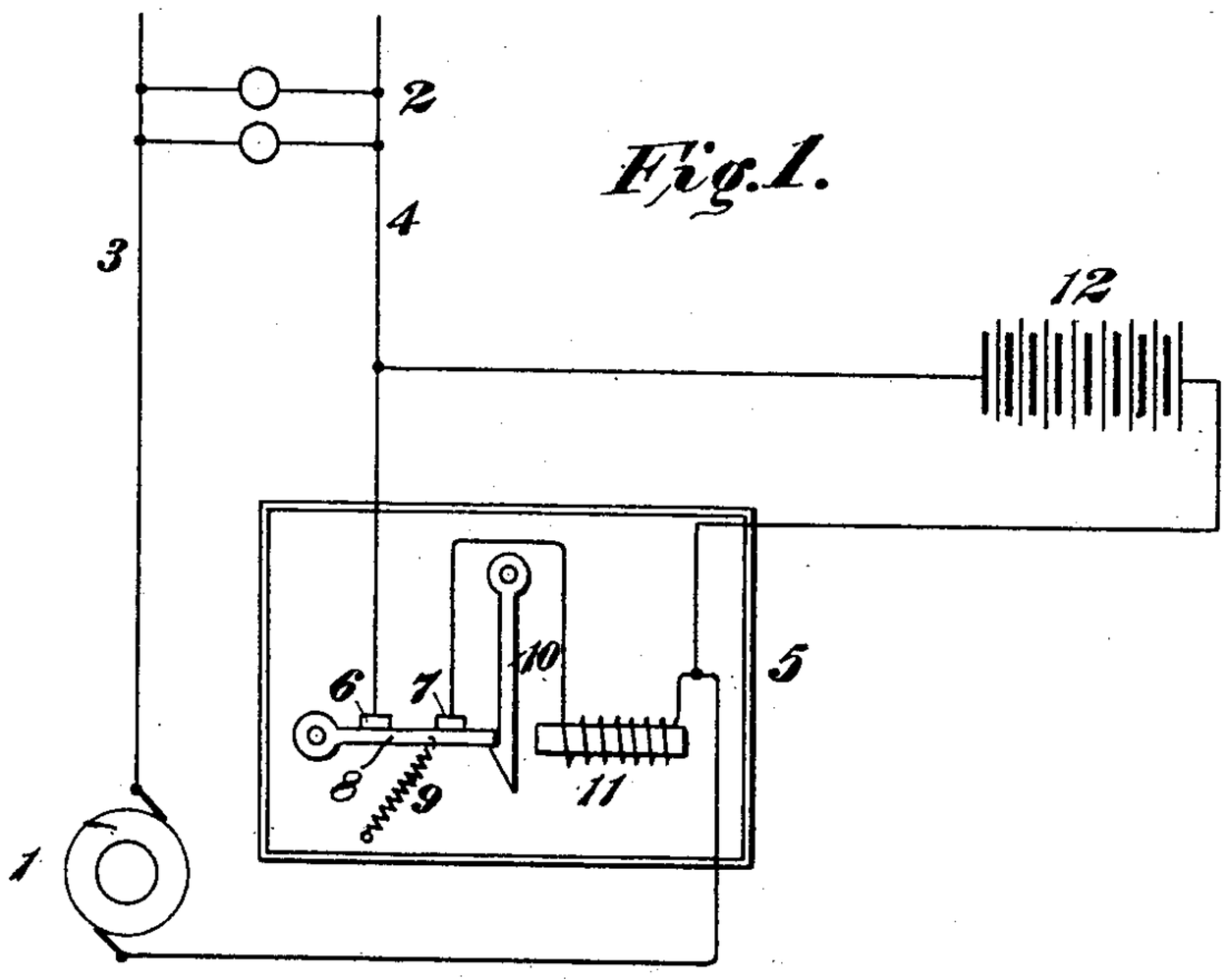
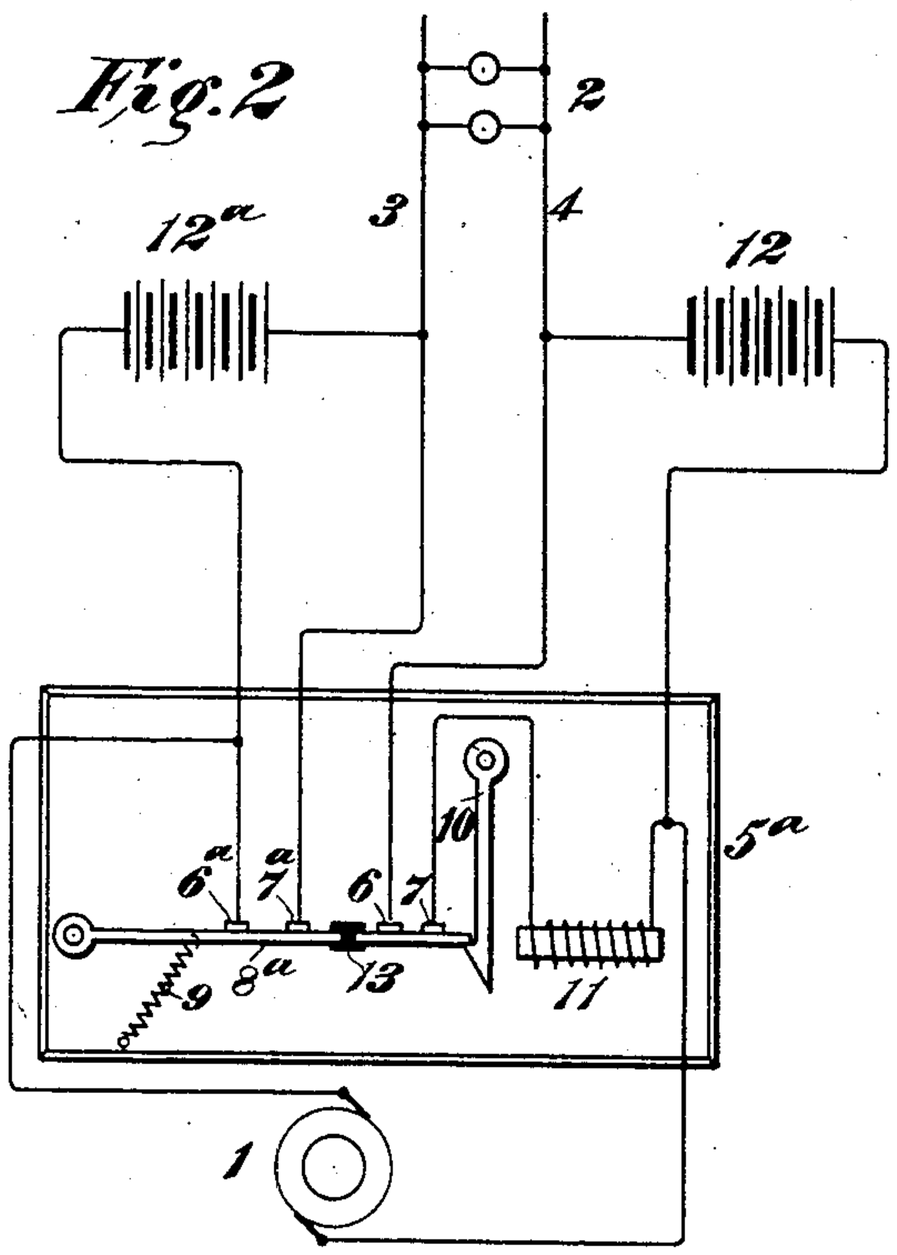


Fig. 1.

Fig. 2



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CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 710,367, dated September 30, 1902.

Application filed February 17, 1899. Serial No. 705,843. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. REED, a citizen of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Breakers, (Case No. 807,) of which the following is a specification.

My invention relates to devices employed for automatically opening electric circuits when the current therein exceeds a predetermined amount, such devices being generally known as "circuit-breakers" and being employed in order to protect dynamos adapted for a given quantity of current from injury when the current in the circuit becomes materially greater than the normal by reason of overloads or short circuits.

It is well known that when a circuit carrying a high electromotive force or a large current, or both, is suddenly interrupted the resulting arc is of such proportions as to materially injure the separated metal terminals, provided no means are employed for diverting, suppressing, or extinguishing the arc.

In order to prevent injury to the main contact-terminals of circuit-breakers, various means have been proposed and used, among which is a shunt-path of comparatively high resistance around the main terminals which is automatically interrupted by either thermal or mechanical action subsequent to the separation of the main terminals.

My present invention contemplates the employment of an auxiliary circuit that is normally in shunt around the main-circuit terminals of the circuit-breaker; but it differs from any means heretofore employed in that the auxiliary or shunt circuit is not interrupted, but includes a means for generating a counter electromotive force which is substantially equal to the generator electromotive force, whereby the flow of current to the translating devices is prevented.

In the accompanying drawings, Figure 1 is a diagram of a system of distribution embodying a single-pole circuit-breaker constructed in accordance with my invention, and Fig. 2 is a similar diagram of a system embodying a double-pole circuit-breaker constructed in accordance with my invention.

Referring now particularly to Fig. 1 of the drawings, 1 is a direct-current electrical generator supplying energy to the translating devices 2 through conductors 3 and 4. The circuit-breaker 5 is diagrammatically illustrated; but it will be understood that the details of construction may be in accordance with modern practice and that they may be varied to suit the desires or convenience of the designer. For the purpose of the present invention it is sufficient to say that two stationary contact-terminals 6 and 7 are mounted upon a suitable non-conducting base. A hinged, pivoted, or otherwise movably-mounted member 8 is so located and arranged as to be brought into engagement with both contact-terminals 6 and 7 in order to close the circuit between the generator 1 and the translating devices 2. I have shown a spring 9 connected at one end to the base and at the other end to the member 8 in order to act alone or in conjunction with gravity to move the said member away from the stationary contacts 6 and 7 when released. In order to normally hold the member 8 in engagement with the contact-terminals 6 and 7, I provide a pivoted latch 10, of magnetic material or provided with an armature of such material, and adjacent thereto I locate an electromagnet 11, the coil of which is connected in series between the generator 1 and the translating devices 2 when the circuit-breaker is closed. Any known means may be employed for so adjusting the pull of this magnet that it will serve to withdraw the latch 10 when the current flowing from the generator exceeds the amount which may be safely supplied to the translating devices. All of the features thus far described are well known in the art and, as has already been stated, may be of any suitable construction.

In order to prevent injury to the contact-terminals of the circuit-breaker by reason of arcing between them when such terminals are separated, I provide a neutral electrolytic cell or a plurality of such cells 12 and connect the same in shunt to the circuit-breaker above described. I prefer to use sheets of lead supported by a porous non-conductor soaked in a solution of sulfuric acid and water of a specific gravity between 1.2 and 1.4, this type of cell being preferred on account of its convenience and reversibility. I desire it to be un-

stood, however, that my invention is not limited to any particular form or kind of electrolytic cell.

It will be understood from the drawings and the foregoing description that when the circuit-breaker is closed the neutral cells 12 are short-circuited and that as soon as the circuit-breaker is opened the cells become connected in series in the main circuit, and therefore become charged as an accumulator until the counter electromotive force of the cells equals the electromotive force of the generator, after which the passage of current is obviously impossible. In practice the counter electromotive force exerted by the cells 12 is very small the instant the circuit-breaker is opened, but increases so rapidly that the current dies out in a fractional part of a second.

Referring now to Fig. 2, the generator 1, translating devices 2, and supply-conductors 3 and 4 are or may be the same in construction as the corresponding parts shown in Fig. 1. The circuit-breaker 5^a is the same in construction and operation as the circuit-breaker 5, (shown in Fig. 1,) except that it is of the double-pole variety, there being a pair of stationary contact-terminals 6^a and 7^a in addition to the terminals 6 and 7 in order to interrupt both line conductors 3 and 4. The movable member 8^a is accordingly made in two parts mechanically connected, but electrically insulated by means of an insulating-piece 13. The spring 9, latch 10, and electromagnet 11 are or may be the same in construction and arrangement as the corresponding parts in Fig. 1. In this case I have shown a neutral electrolytic cell or plurality of cells connected in shunt around the contact-terminals 6 and 7 and a similar cell or plurality of cells 12^a connected in shunt around the terminals 6^a and 7^a. It will be readily understood that the operation of this modification will be substantially the same as that above described, except that both sides of the main circuit are interrupted instead of one. In this case the counter electromotive force of the neutral cells on each side of the system must not be less than one-half the electromotive force of the generator.

I claim as my invention—

1. The combination with an electric generator and a main circuit therefor, of a normally locked device for opening said circuit which is released by the action of an excessive current to automatically open the circuit and a neutral electrolytic cell or a series of such cells connected in shunt to said circuit-opening device, said cell or cells being short-circuited when the device is closed and being connected in the main circuit, in series with the generator, when the device is open.

2. The combination with an electric generator and main circuit therefor, of a device for opening both sides of said main circuit, which is normally locked in closed position and is automatically released by an excessive current in the circuit, and a neutral electrolytic cell or a series of such cells connected around each break in the circuit, said cells being short-circuited when the breaks are closed and connected in series with the generator when the breaks are open.

3. In a direct-current electric circuit, the combination with separable terminals and means for effecting the separation of said terminals upon the occurrence of an excessive current in the circuit, of a neutral electrolytic cell or series of cells permanently connected in shunt to said terminals, whereby said cell or series of cells receives the entire current of the circuit when the terminals are separated.

In testimony whereof I have hereunto subscribed my name this 7th day of February, 1899.

CHARLES J. REED.

Witnesses:
JAMES W. LAWS,
ROBT. B. FLETCHER.