

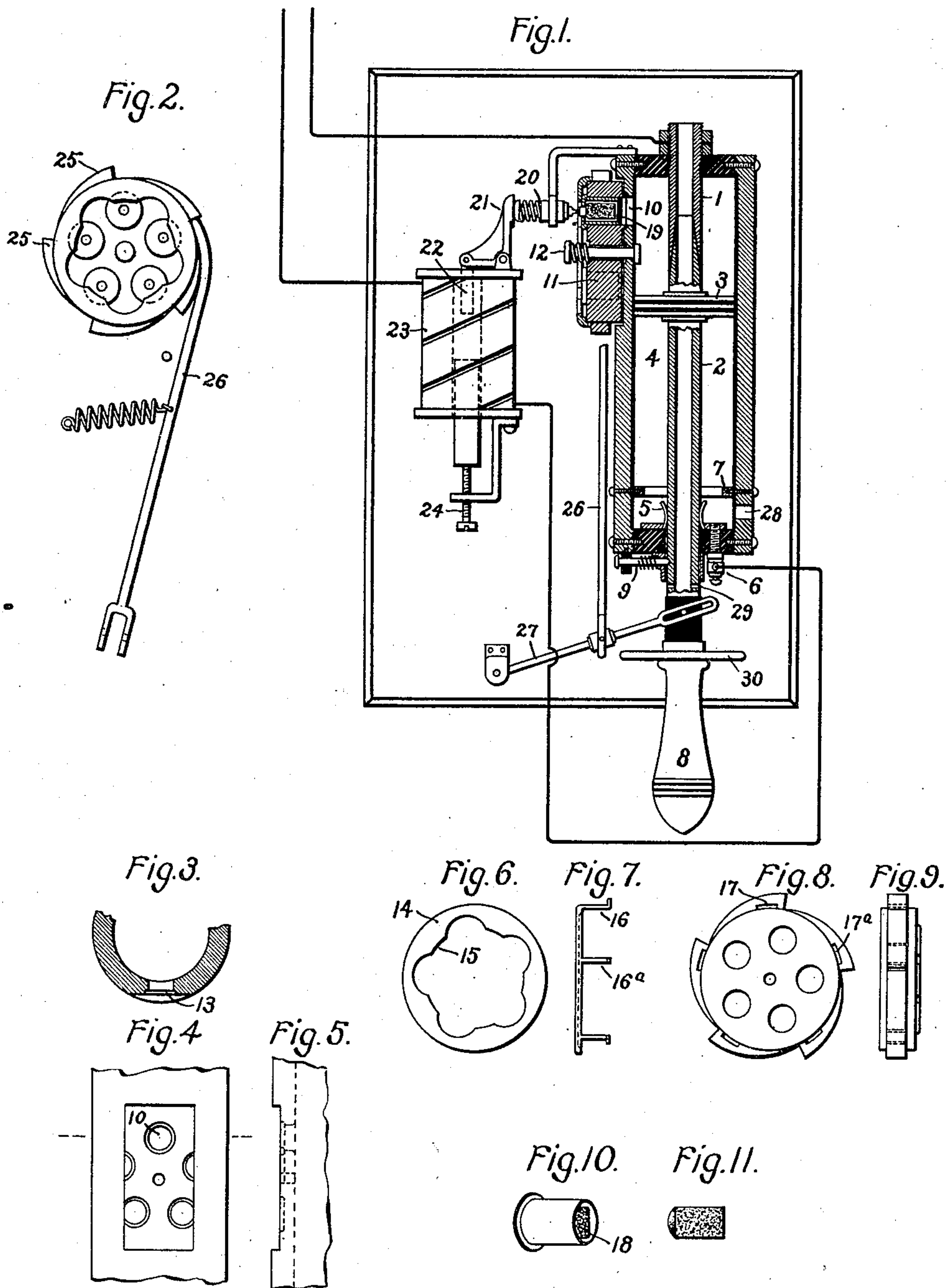
No. 723,183.

PATENTED MAR. 17, 1903.

R. H. READ.
CIRCUIT BREAKER.

APPLICATION FILED JUNE 29, 1901.

NO MODEL.



Witnesses.

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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 723,183, dated March 17, 1903.

Application filed June 29, 1901. Serial No. 66,460. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. READ, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Circuit-Breakers, (Case No. 1,739,) of which the following is a specification.

This invention relates to automatic circuit-breakers, the design being to permit the safe rupture of currents of large amperage and high potential.

In a companion application of earlier date I described a circuit-breaker employing tubular electrodes with means for driving a blast of air across the arc at the moment of circuit rupture, so that the arc products are driven in the tubes and the arc ruptured by their removal from the terminals.

My present invention relates to a device of the same general character, the object being to render the device self-contained and capable of generating gaseous pressure within itself. In carrying out the invention I mount the tubular electrode or electrodes so as to inclose the point of circuit rupture within a box or chamber and provide means for generating a body of gas under pressure when the circuit is to be opened. In the particular type of self-contained instrument described herein I apply gunpowder or similar highly combustible or explosive material as the gasifying medium, which is ignited by means controlled by an overload magnet or similar device acting at a determinate current condition. When the magnet operates, a blow is delivered to priming in cooperative relation to the powder charge, and the accumulating pressure is employed to force apart the electrodes, simultaneously driving the arc products back through the tubes and extinguishing the arc.

The novel features of the invention will be more particularly hereinafter described and will be definitely indicated in the claims appended to this specification.

In the accompanying drawings, which illustrate an organized apparatus for carrying out my present improvements, Figure 1 is a sectional elevation of a circuit-breaker embodying the same. Fig. 2 is a detail view of

the cartridge-magazine and its feed device. Fig. 3 is a sectional detail of the wall of the arc-inclosing chamber by which communication is effected with the magazine. Figs. 4 and 5 are a face view and a side elevation, respectively, of the same. Figs. 6 and 7 are details showing the cartridge-retainer. Figs. 8 and 9 are a face view and a side elevation, respectively, of the cartridge-magazine; and Figs. 10 and 11 are views of a cartridge employed.

1 and 2 represent tubular metallic electrodes, one of which may be fixed and the other movable. The cooperating ends are tapered to fit snugly together to afford a good conductive path for the current. The movable electrode is provided with a piston 3, of insulating material, adapted to slide freely within a chamber 4, inclosing the abutting ends of the tubular electrodes. The walls of this chamber may be formed of metal or may be of insulating material, such as fiber or wood, wire-wound. A metal chamber is shown and is lined with fireproof material and provided with insulating-plugs at the ends, firmly secured in any suitable way. Current may be led to the movable electrode by a group of elastic contact-fingers 5, fixed to a metal ring screwed to one of the insulating-plugs, to which a terminal 6 is connected. A collar 7 limits the opening movement of the movable electrode. The latter is provided with a handle of insulating material 8 to permit hand-closing. A spring-pin 9, engaging a notch in the wall of the movable tube, holds the circuit closed and permits a desired accumulation of pressure around the contacts before the circuit is broken. An opening is formed in the wall of the arc-inclosing chamber, as indicated at 10, and a cartridge-disk 11 is mounted on a stud 12, fixed in the wall of the chamber. It is held elastically in its seat against the wall by a short helical spring, as indicated in Fig. 1. The face of the wall is provided with a plain surface, the outer edge of the opening 10 being provided with a counter-sunk recess 13, into which is forced by the spring an annular ridge on the inside of the cartridge-disk, terminating each opening in the same, as will be understood from inspection.

tion of Fig. 1. The disk is provided with as many cartridge-openings as desired, so as to form a magazine adapted to admit of repeated use of the circuit-breaker after being loaded. Five chambers are shown. A movable cap 14, having projections, as 15, to lock the cartridges in place, is mounted on the disk. This cap may have a number of prongs 16 16^a, &c., which pass through wide slots in the disk, as indicated at 17 17^a, &c., and may be then bent out so as to lock it in position, as indicated in Fig. 7. By turning the cap with respect to the disk the cartridges may be inserted, and then by shifting the projections 15 in alinement with the cartridges they are locked in the disk. The cartridge may be formed of a copper shell having a cylindrical chamber, and in order to prevent a violent explosion I employ a solid powder charge of square or prismatic form, as indicated at 18, leaving a small amount of free air-space around the powder and preventing any violent increase of pressure and avoiding expulsion of the powder from the shell. I prefer to employ smokeless powder compressed into prismatic form, by which a slow-burning property is communicated, thus guarding against too rapid increase of pressure, which would endanger the safety of the apparatus and preventing deposit of solid matter in the tubular electrodes. A light wad, as indicated at 19, Fig. 1, may be placed outside of the block of powder, so as to prevent access of moisture to the priming.

A spring-retracted exploder 20 is mounted on a suitable bracket fastened to the apparatus, in coöperative relation to the head of which is a hammer 21, connected with a pin 22, mounted in the axis of a coil 23, the core of which is normally gravitatively retracted, but within grip of the magnetic field, as indicated in Fig. 1. An adjusting-screw to calibrate the tripping-point of the circuit-breaker is provided, as indicated at 24. The cartridge-magazine may be provided with a number of teeth, as 25, forming a ratchet-feed with a pawl 26, pivotally mounted on a lever 27, connected with the movable electrode of the circuit-breaker. An opening is provided in the electrode-inclosing chamber below the piston, as indicated at 28, to permit rapid retraction of the movable electrode.

A number of lateral openings 29 may be provided above a barrier 30, connected with the handle above the point at which the operator grips the movable terminal. Thus in closing the circuit the operator grasps the handle 8 and pushes the movable electrode up until the circuit is completed, as indicated in Fig. 1. In doing so the lever 27 is lifted, thereby rotating the cartridge-disk and bringing one of the cartridges in communication with the opening 10, thereby setting the circuit-breaker for automatic release. In case of an overload on the circuit the armature is raised by the trip-coil 23, delivering a ham-

mer-blow to the pin 22, thereby firing the priming in the cartridge in a manner similar to the explosion of a cartridge used in a fire-arm. This ignites the prism of powder, which burns with comparative slowness, delivering pressure within the chamber around the abutting electrodes. After this pressure has reached a value sufficient to start the movable electrode the latter falls under pressure and gravity or an assisting spring, if desired, and a hot blast of carbonic-acid gas and other products of combustion is driven toward the ends of both tubes, instantly extinguishing the arc. In resetting the circuit-breaker a new cartridge is automatically shifted into operative relation to the pressure-chamber around the electrodes, and the apparatus is again ready for action.

While I have shown a specific way of igniting the combustible material or explosive, I desire to have it understood that other methods of generating the pressure-gases may be employed without departing from the scope of my invention. For example, I may ignite by electric means and even by the arc itself, as described in a copending application, Serial No. 69,893, filed July 27, 1901. I do not restrict the invention, moreover, to any particular gasifying material, as a wide range of selection obtains in this particular.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. Means for extinguishing electric arcs comprising relatively movable electrodes, a piston for separating the same, and means responsive to predetermined conditions of the circuit including the electrodes for delivering gaseous pressure to the piston and at the arc to open the circuit.

2. Means for extinguishing electric arcs comprising a movable electrode, an inclosure around the same, a piston on the electrode, a tubular exit for the arc products through one of the electrodes, and means for delivering gaseous pressure to the inclosure.

3. Means for extinguishing electric arcs comprising relatively movable electrodes, means for shifting them together or apart, a gasifying material, means for causing the latter to generate pressure at a determinate current in the circuit, and means for directing the gas to extinguish the arc.

4. Means for extinguishing electric arcs comprising relatively movable electrodes, a piston connected to a movable electrode, a chamber containing the piston and the contact ends of the electrodes, a gasifying medium, and means for generating pressure thereby when the current attains a determinate value.

5. A circuit-breaker comprising relatively movable electrodes, a magazine containing a plurality of gas-generating charges, means for shifting the charges successively into operative relation to the electrodes, an automatic

device for releasing gas from the charges, and means for extinguishing the arc by the released gas.

5 6. A circuit-breaker comprising relatively movable electrodes, means for shifting them together or apart, a combustible charge, an igniting device, and means for directing the resulting pressure to extinguish the arc.

10 7. A circuit-breaker comprising one or more tubular electrodes, an explosive charge, an igniting device operated at a determinate current value, and means for directing a blast of gas by the pressure generated through the tubular electrode and across the arc.

15 8. A circuit-breaker comprising one or more tubular electrodes, a cartridge - magazine, means for shifting the cartridges successively into operative relation to the electrodes, an exploder acting at a determinate current
20 value, and means for directing the resulting pressure through the tubular electrode to extinguish the arc.

25 9. A circuit-breaker comprising one or more tubular electrodes, a chamber communicating therewith, an explosive cartridge in communication with the chamber, and electromagnetic devices for firing the cartridge at a determinate current value.

30 10. A circuit-breaker comprising one or more tubular electrodes, a chamber communicating therewith, a cartridge - magazine, means for shifting the cartridges successively into communication with the chamber, and an electric firing device for the cartridges.

35 11. A circuit-breaker provided with a movable electrode, an explosive for blowing out the arc, and electromagnetic means for firing the explosive.

40 12. A circuit-breaker comprising one or more tubular electrodes, a piston controlling their separation, an explosive for operating the piston and delivering gaseous pressure across the arc, and automatic means for igniting the explosive at a desired time.

45 13. A circuit-breaker provided with a movable terminal, a slow-burning explosive charge for delivering gradually-accumulating pressure to extinguish the arc, a chamber

communicating with the movable terminal in which pressure is stored, connections for delivering a blast transverse to the arc, and means for igniting the charge. 50

14. A circuit-breaker comprising a tubular electrode, a cartridge for delivering pressure to the tube to extinguish the arc of circuit rupture, said cartridge containing a slow-burning powder, and automatic means for igniting the charge. 55

15. A circuit-breaker comprising a tubular electrode, a cartridge for delivering pressure to the tube to extinguish the arc of circuit rupture, said cartridge containing a solid block of explosive powder, an automatic igniter controlled by the current, and means for preventing the expulsion of the powder from the cartridge-shell. 60

16. Means for extinguishing the arc formed on opening an electric circuit, comprising circuit-terminals, a closed chamber having a vent intercepting the arc when formed, an explosive compound within the chamber, and means for igniting the same whereby a blast of gas is driven through the vent across the terminals. 65

17. A circuit - interrupter comprising a closed chamber containing a vent intercepting the arc when formed, a cartridge-magazine, means for shifting a cartridge into active position when the circuit is closed, and means for exploding the cartridge to extinguish the arc. 70

18. A circuit - interrupter comprising a closed chamber, relatively movable electrodes, a cartridge-magazine, means for feeding the cartridges successively into active position relatively to the chamber, an exploder to ignite the cartridge, and means for directing the gas-pressure to separate the electrodes and extinguish the arc. 80

In witness whereof I have hereunto set my hand this 27th day of June, 1901. 90

ROBERT H. READ.

Witnesses:

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