(No Model.)

W. H. POWELL.

AUTOMATIC CIRCUIT BREAKER.

No. 571,097. Patented Nov. 10, 1896.

Fig. 1

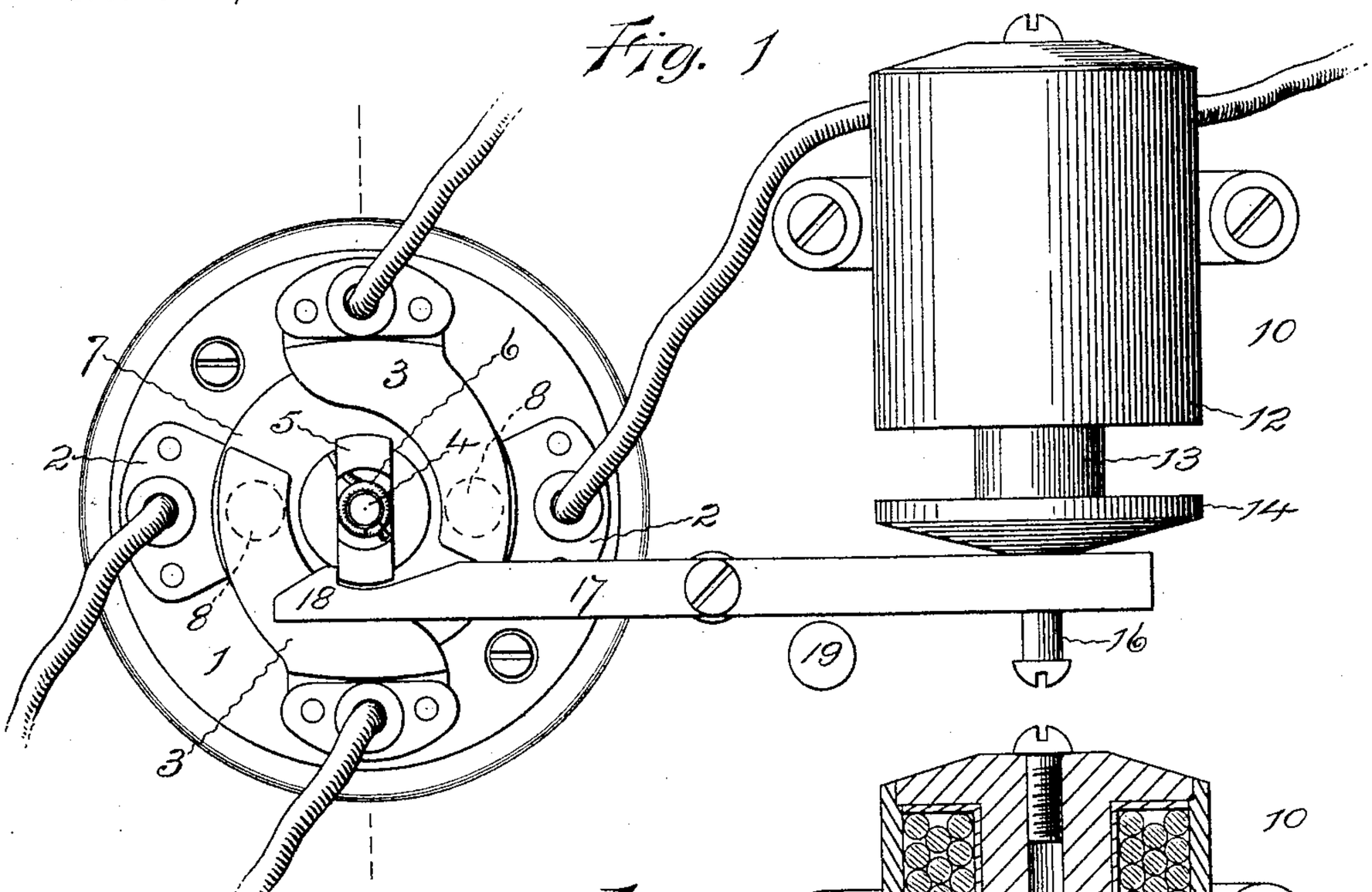
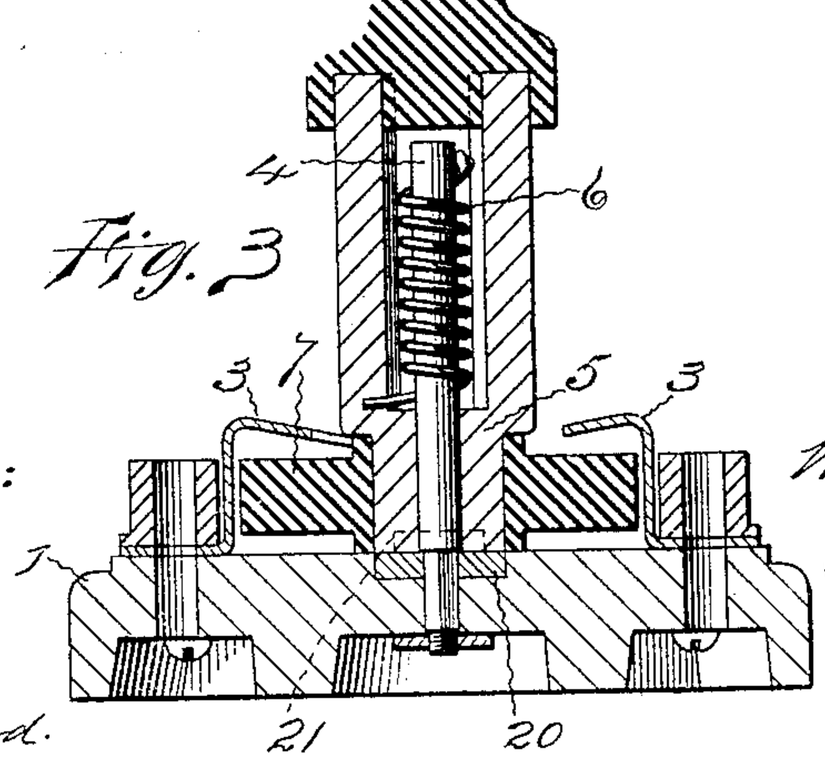


Fig. 2

Fig. 3



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AUTOMATIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 571,097, dated November 10, 1896.

Application filed June 15, 1896. Serial No. 595,546. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. POWELL, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automatic Circuit-Breakers, of which the following is a specification.

The invention relates to the class of electro-mechanical devices which are constructed and arranged to automatically cut out circuits when the quantity of electricity in the mains which supply the circuits becomes abnormally large or above the desired maximum.

The object of the invention is to produce a simple, small, and cheap device of this class which can be conveniently connected with any light, power, heat, or similar circuit and readily adjusted to the desired capacity, so as to surely operate and cut out the circuit in which it is connected the instant the current supplied for any reason becomes greater than the limit of safety for the apparatus connected in the circuit.

To this end the device consists in a rotary cut-out having conducting parts adapted to connect and disconnect stationary contacts or brushes with a spring that normally holds the conducting parts disconnected from the contacts, and a handle for turning the conducting parts into connection with the contacts and making tense the spring, and an electromagnet with its coils connected in series with the mains that pass to and are connected with the contacts of the cut-out, a weighted armature arranged to stand normally away from the magnet and be drawn to it when the current is greater than the predetermined maximum, at which time the current will be sufficiently strong to cause the magnet to draw the armature against its counter attraction, and a lever or latch connected to and movable with the armature and adapted to engage and retain the rotary parts of the cut-out when they are so turned that the spring is made tense and the conducting parts join the contacts, as more particularly hereinafter described, and pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a side view of the device with the cut-out engaged by the latch, the spring tense, and the conducting parts connecting the contacts and completing the circuit through the cut-out, the case in which the device is usually inclosed being removed. Fig. 2 is a view of the same, showing the magnet cut in central section, the armature drawn to the magnet, and the rotary parts of the cut-out in the position occupied after being released from the latch and thrown by the spring—that is, with the conducting parts disconnecting the contacts that are connected with the circuit-mains. Fig. 3 is a central section of the cut-out on plane denoted by the broken line of Fig. 1.

The device may be inclosed in a wooden or metal box or case or simply attached to a back board, as desired, which, however, is not shown in the views, as it can be of any shape and construction.

The base 1 of the cut-out can be made circular, of wood, porcelain, or any other suitable insulating material, and attached to the back of the case or board in any convenient manner. On the face of the base are secured the contacts, to which the circuit-wires are connected. The contacts 2 are preferably formed as flat plates, while the contacts 3 are formed as brushes that project with a little spring above the plates.

The base at the center supports a post 4. This post is firmly secured in position against rotation, and it loosely supports a block 5. The post bears a spiral spring 6, one end of which is connected with the post and the other is connected with the block or an arm that projects from the block. The block is free to rotate upon the post, except as controlled by this spring. The spring is made of considerable length, so that it will have the necessary power when made tense to throw the block quickly to obviate arcing, and yet will remain under tension for some time without being so strained as to lose its elasticity.

Connected with the block 5 is a disk 7, of insulating material, which bears the conducting parts 8, that when the disk is in one position connect the contacts and brushes on the base and when the disk is in another position disconnect the contacts and brushes. The disk is so connected with the block that the conducting parts it bears connect the contacts and brushes when the spring is under tension. A handle 9 is attached to the block

5 or to a part projecting therefrom, and by means of this handle the block with the connected disk and conducting parts which the disk bears may be rotated. Secured to the base below the block is a disk 20, having lugs 21 arranged to engage the end of the block and limit the distance of its rotary movement.

The magnet 10 is secured to the back of the case by any suitable means. In the form shown one of the circuit-wires that is connected with one of the contacts of the cut-out is coiled on a bobbin 11 into a solenoid and the whole encased in a cylinder 12, so as to form an iron-clad magnet. The armature is preferably formed with a core 13 and a flanged head 14, and the core is preferably bored out or made with a chamber 15, into which pieces of lead or similar non-magnetic metal can be placed to adjust the weight of the armature. An opening can be made through the top of the magnet, through which the pieces of non-magnetic metal can be dropped into the chamber in the core.

Connected with the armature is a screw or stud 16. The shank of this screw extends loosely through a perforation in the latch-lever 17, and its head is arranged so that the armature may have a limited movement without moving the latch; but the armature cannot move its full distance without causing the head of the screw to engage the latch and move it. The latch 17 is preferably pivoted to the back of the case, or a post extending therefrom, between the cut-out and the magnet, and the end opposite to that which is engaged by the screw projecting from the armature is recessed or provided with a hook 18, that may be made to engage and hold a part of the block that is mounted on the post of the cut-out. A pin, stud, or post 19 may be connected with the case to limit the movement of the latch in one direction.

When there is only the normal amount of current and of course when there is no current, passing through the circuit-wires, the armature is not attracted by the magnet, and by gravity it drops away from the pole of the magnet. When the armature is away from the magnet, it engages the end of the lever and causes that end to be depressed, which of course raises the opposite end or the latch end of the lever. With the latch in this position when the block mounted on the base of the cut-out is rotated by means of the handle the hooked end will engage the portion of the block when the spring is made tense and retain the block in this position with the spring in that condition, as shown in Fig. 1. As above stated, when the block is in this position and the spring is tense the conducting parts connect the brushes and contacts on the base and complete the circuit through the cut-out. The parts are adjusted to remain this way as long as a normal current is passing through the mains, but when the current becomes abnormal or above the safety limit in quantity the magnet becomes of sufficient strength to draw the armature against the counter force, which in the form shown is gravity, and this of course moves the end of the lever in such manner as to cause the latch end to disengage from the block, which is then quickly thrown by the spring. By this action the conducting parts connected with the block are caused to suddenly disconnect the contacts and brushes and open the circuit. The parts remain in this position with the circuit open until the handle is again turned so the spring is made tense and the block engaged by the latch.

The armature, being loosely connected with the end of the latch-lever, is free to move without the load of the lever for a portion of its travel, that is, until it nearly reaches the pole of the magnet, where the strength of the pull is greatly increased, so that a strong pull may be exerted upon the end of the lever for causing it to unlatch from the block of the cut-out. This construction allows the armature to move freely until it has developed considerable speed and the power of the magnetic pull has increased so that the armature will have considerable momentum and will give the end of the lever such a blow as will cause it to surely move and free itself from the block. The weight of the armature can be adjusted and its distance from the pole of the magnet regulated so that it will remain down until just the amount of current required to lift it is passing through the coils of the magnet. The further the armature is from the pole of the magnet the more delicately can it be regulated, so that just the amount of pull to start it toward the magnet can be nicely determined. The armature may be allowed to drop to such a distance from the pole of the magnet that the pull when the armature is first drawn is comparatively weak, but when the latch-lever is engaged and moved the armature is so near the pole of the magnet that the pull is quite strong.

The drawings show a double-pole cut-out; but the device can be arranged in the same manner with a single-pole cut-out.

The device is simple, cheap, and easily connected with any kind of a circuit, whether it be a lighting-circuit, heating-circuit, or a power-circuit. The cut-out operates with a very quick movement and will open the circuit without arcing. The magnet is sure in action, and the armature can be readily regulated and adjusted so that it will operate with the exact predetermined amount of current. The cut-out is easily set and will always permit the passage of a normal amount of current, but will surely break the circuit when released from the hold of the armature-controlled latch-lever.

The magnet shown in the drawings is wound by coils of the main circuit-wires; but of course the magnet may be wound by coils shunted from the main circuit-wire.

I claim as my invention—

1. In a circuit-breaker, in combination, a cut-out having stationary contacts adapted to

be connected with circuit-wires, a rotary spindle, rotary connecting and disconnecting parts supported by the spindle, a spring for rotating the spindle in one direction and a handle for rotating the spindle in the opposite direction, a latch adapted to engage the spindle for holding the spindle with the spring under tension, an electromagnet with its coils adapted to be connected in series with the circuit-wires, and an armature loosely connected by an adjustable connection with the latch in such manner that the connection can be regulated so the armature will move independently of the latch for a predetermined portion of its travel and for the predetermined remainder of its travel engage with and pull the free end of the latch-lever toward the magnet, said armature being normally held down by gravity and adapted to be drawn upward by the pull of the magnet, substantially as specified.

2. In a circuit-breaker, in combination, a cut-out having stationary contacts adapted to be connected with circuit-wires, rotary connecting and disconnecting parts, a spring for rotating the connecting and disconnecting parts in one direction and a handle for rotating them in the opposite direction, a gravity-latch for holding the connecting and disconnecting parts with the spring under tension, and an armature with a recess for receiving non-magnetic metal, said armature being loosely connected with the gravity-latch by an adjustable connection, and an electromagnet with its coils adapted to be connected in series with the circuit-wires, substantially as specified.

3. In a circuit-breaker, in combination, a rotary cut-out having stationary contacts adapted to be connected with circuit-wires, a stationary post supporting a rotary block with a disk of insulating material bearing connecting and disconnecting parts, a spring connected with the post and with the rotary block, a handle connected with the block, a latch arranged to engage and hold the block with the spring under tension, a hollow armature with a screw loosely connecting the armature and the latch-lever, and a solenoid with its coils adapted to be connected in series with the circuit-wires, substantially as specified.

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