

C. C. BADEAU.
CIRCUIT BREAKER.
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1,006,522.

Patented Oct. 24, 1911.

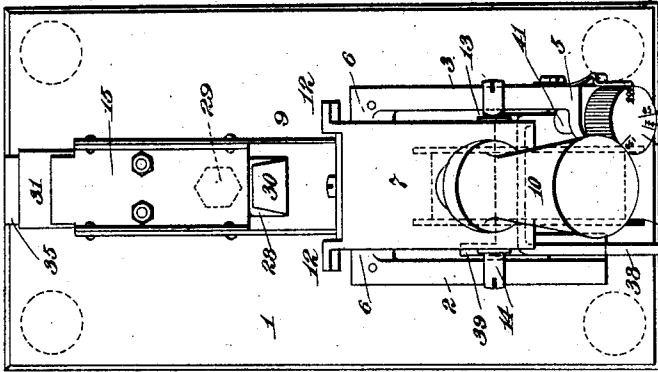


Fig. 3

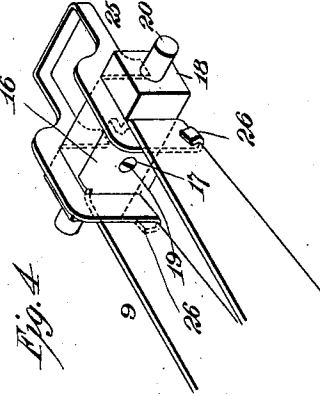


Fig. 4

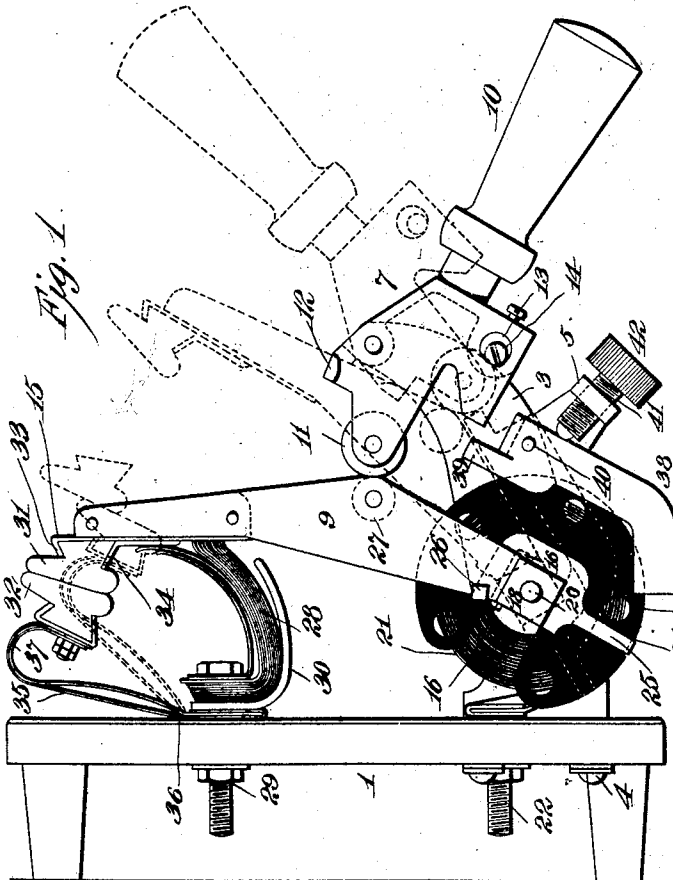


Fig. 1

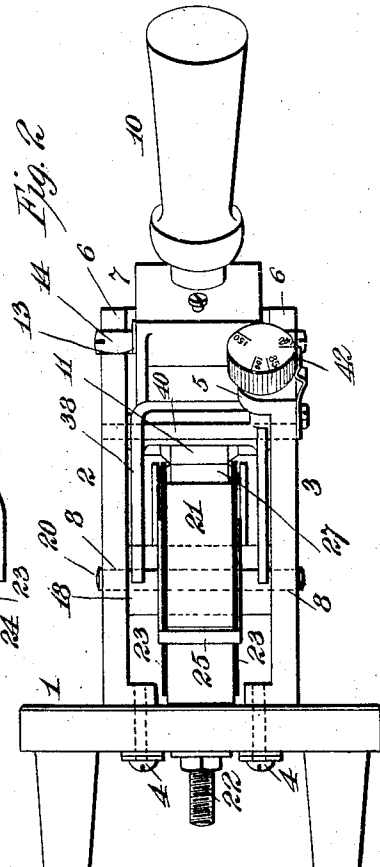


Fig. 2

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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER.

1,006,522.

Specification of Letters Patent.

Patented Oct. 24, 1911.

Application filed September 18, 1906. Serial No. 335,057.

To all whom it may concern:

Be it known that I, CHARLES C. BADEAU, a citizen of the United States, residing at Bethlehem, in the county of Lehigh and State of Pennsylvania, have invented a certain new and useful Improvement in Circuit-Breakers, of which the following is a description.

The object I have in view is the production of a circuit breaker which will be of more pleasing appearance than those heretofore made, which will be more certain in its opening and closing movements, and will be cheap to construct and durable.

Further objects relate to details of construction in the overload device whereby it is made more exact and reliable than heretofore, to improvements of the contacts, and in other details, as will more fully appear from the accompanying drawings and following specification.

I attain these objects by the mechanism illustrated in the accompanying drawing, which shows one embodiment of the invention, and in which—Figure 1 is a side elevation of the circuit breaker, Fig. 2 is an end elevation, and Fig. 3 a front view; and Fig. 4 is a perspective view of the inner end of the main arm.

In the views, like parts are designated by the same reference characters.

In carrying out my invention I provide a base 1 of insulating material. To this base are attached the housings 2, 3 by means of the screws 4 which pass through openings in the base 1 and enter tapped openings in the housings. The two housings are alike except that the housing 3 has a lug 5 for attachment of the armature calibrating screw. The housings may be made of castings, and each has a bearing 6 for the handle lever 7 and a bearing 8 for the main shaft which supports the main arm 9. The handle lever 7 carries an operating handle 10 and a roller 11. It has a fixed stop 12 for limiting its movement in one direction, and an adjustable stop 13 for limiting the movement in the other direction. The adjustable stop 13 comprises a cylindrical rod having reduced extremities 14, the said extremities being cylindrical but of smaller diameter than the body of the rod and set eccentrically in relation thereto, as shown in Fig. 1. The extremities of the rod are notched for the attachment of a screwdriver,

and a set-screw is provided for holding it in position. The reduced extremities 14 are adapted to abut against and engage with the sides of the housings 2 and 3 so as to limit the extent of movement of the operating handle in one direction. By turning the stop 13 in its bearings, the position of the reduced portions can be changed and the extent of movement of the operating handle controlled.

The main arm 9 is made of copper or other good conducting material. The sides of the arm are of a single piece bent to U shape, and the extremities are connected together by a contact plate 15 which is riveted or otherwise secured to the sides of the arm. The base of the arm is formed with lips 16 (see Figs. 1 and 4) and a screw opening 17. This portion of the arm abuts against the square core-piece 18, the lips 16, 16 engaging on both sides of it, as shown in Fig. 1 in dotted lines. A screw 19 will pass through the opening 17 into a threaded opening in the square core-piece 18. This core-piece 18 has a hollow cylindrical bore, through which a cylindrical shaft 20 passes. This shaft supports the square core-piece 18 and permits the main arm to swing around this shaft. This core-piece 18 is preferably made of steel. A conducting ribbon or strip 21, similar to that shown in my Patent No. 747673 dated December 22, 1903, is employed, one extremity being attached to the core-piece by means of the screw 19 and the other extremity to the base 1 by means of the bolt 22, with which one of the leads to the switch is connected. Between the coil 21 and the main arms 9 are placed insulating washers 23. These washers, as shown in Fig. 1, have rectangular slots, so that they can be slipped over the core-piece and placed in position after the other parts are assembled. The washers have notches 24, within which a washer binder 25 engages. This washer binder is made of a strip of sheet copper having enlarged extremities which hook over the core-piece. Projections 26 on the extremities are bent under the sides of the main arm 9, as shown in Fig. 4, so as to hold the washer binder in place. The main arm carries a roller 27 which is adapted to be engaged by the roller 11 on the handle lever 7. Instead of rollers, cams may be employed, or if desired no rollers, whatever may be used, the end of the

handle lever engaging directly with the main arm, the parts sliding one on the other.

The main terminals 28 are formed of copper laminae secured to the frame 1 by a bolt 29 so that they rest within a support 30. The free extremities of the laminae abut against the contact plate 15. The shunt contacts are formed of carbon blocks 31, 32, the block 31 being supported below the contact plate 15 by means of the bent hooked-over end 33 of the contact plate engaging with it, the carbon being held in engagement with this hooked-over portion and clamped against it by means of a strip 34. This strip 34 also engages with one of the laminae 28 in order to make a better contact. The strip 34 therefore serves the double purpose of a secondary contact and a clamp for the carbon 31. The carbon 32 is carried upon a spring 35 which is clamped between the support 30 and the base 1. The spring 35 has double bends 36 and 37 therein. By employing two bends, the carbon block 32 will have a substantially parallel motion. This can be explained by the fact that as the carbon block 31 closes down upon the block 32 to straighten out the spring 35, it bends the spring 35 at the bends 36 and 37; the two bends equalize each other and cause the block 32 to move downward with its upper face parallel with the lower face of the block 31. The bolt 29 connects with the other terminal of the switch.

The overload device is actuated by the armature 38. This armature is of the horse-shoe shape shown in Figs. 1, 2 and 3, and has a lug 39 extending back of the pivot 40 and bent arms so formed as to be within the magnetic field of the pole piece 18 when the switch is in position for use, viz. with the base 1 vertical. The lug is adapted to engage with the handle lever 7 in order to trip the switch. The arms of the armature 38 are adapted to be influenced by the pole-piece 18. The armature normally lies away from the pole piece in the full line position shown in Fig. 1. The pole-piece is adapted to attract the armature 38, pivoting the latter and causing the lug 39 to strike against the handle lever. The lug 39, in engaging with the operating handle 7, throws the latter from the position in which it holds the switch closed, and allows the movable switch member to fly to its open position. The part of the armature above the pivotal point also serves another useful purpose, owing to the fact that it is within the field of the magnet 21 and receives flux from said magnet, which assists in the control of the armature. It will be obvious from the drawing that, owing to the manner in which the armature is pivoted, the portion 39 thereof will move away from the poles of the magnet when the free ends of said armature are moving toward the magnet poles.

Both the portion 39 of said armature and the free ends thereof tend, of course, to move toward the poles of the magnet, and it will be understood, therefore, that the free ends of the armature will only move toward the magnet poles, in response to excessive current in the magnet, when the magnetization of the magnet is high enough to make the pull on the free ends of the armature predominate over the pull on the portion 39. This arrangement of armature permits easy calibration of the circuit breaker, since a very slight adjustment of the armature results in increasing the magnetic reluctance of the magnetic circuit at one end of the armature, and simultaneously decreasing the reluctance at the other end of the armature. The adjustment of the armature is easily made by a calibrating screw 41, carried by the bracket 5 and engaging with the armature 38, as is clearly shown in the drawings. This screw is provided with a head, upon which marks may be made to indicate the proper position of the screw, in order that the circuit breaker may open at certain values of current.

The operation is as follows: In Fig. 1 the switch is shown closed. To open the switch the handle is moved to the dotted-line position. The conducting ribbon or strip 21, acting as a spring as well as a magnet coil, will move the arm 9, separating the main contacts 28 from the plate 15, and then separating the carbon contacts 31 and 32. To close the switch the handle is moved to the full-line position, causing the roller 11 to roll upon the roller 27. As shown in the drawings, the supports for the handle lever and the rollers 27 and 11 are in the same horizontal line when the switch is closed. The switch will therefore be held closed by toggle action between the arm 9 and the handle lever 7, but may be very easily released. The automatic overload device is actuated by the attraction of the armature 38 to the core 18. When this occurs, the lug 39 engaging with the handle lever 7 will strike the latter and move the roller 11 to one side of the center, so that the main arm 9 will be free to be moved by the ribbon 21. The lug 39 serves still another purpose, viz. to prevent the armature 38 from freezing to the core 18. The armature when engaged with the core is shown in dotted lines in Fig. 1, the core when the switch is closed being in such a position that one of its sides will be parallel with the engaging face of the armature. When the operating handle is moved from the dotted-line position to the solid-line position to close the switch, it will come in contact with the lug 39 and will cause the armature to pivot, releasing the armature from contact with the core. The eccentric stop 13 is made adjustable, so that the switch can be regulated for delicacy of operation. This

stop is located in a fixed position relative to the centers of the rollers 11 and 27 when the breaker is closed.

In accordance with the patent statutes I have described the principle of operation of my invention together with the form which I now consider to be the best for carrying out my invention, but I desire it understood that such means are merely illustrative, and the invention may be carried out in other ways.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A circuit breaker comprising a fixed contact member, housings; a movable contact member pivotally supported in said housings and cooperating with said fixed contact member, an operating lever pivotally supported in said housings and arranged to move said movable contact member to a closed position and hold it there by toggle action, adjustable means cooperating with said lever and said housings for limiting the closing movement of said lever, a magnet coil located between said housings and surrounding the pivot of said movable contact

member, a magnet core located within said coil, and an armature pivotally supported in said housings and arranged to cooperate at one end with said core and at its other end with said operating lever to move the latter and allow the switch to open upon occurrence of overload.

2. In a circuit breaker, a contact arm, a roller in cooperative relation thereto, a handle and a roller in cooperative relation thereto, one of the said rollers operating on the other during the closing movement of the breaker.

3. A circuit breaker having a contact making and breaking arm, a roller on the arm, a handle lever pivoted in a stationary support and having a roller which operates directly on the first roller and an adjustable stop, such stop being located in a fixed position relative to the centers of the rollers when the breaker is closed.

This specification signed and witnessed this 31st day of August, 1906.

CHARLES C. BADEAU.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."