

G. F. PACKARD. AUTOMATIC CIRCUIT BREAKER.

No. 577,447.

Patented Feb. 23, 1897.

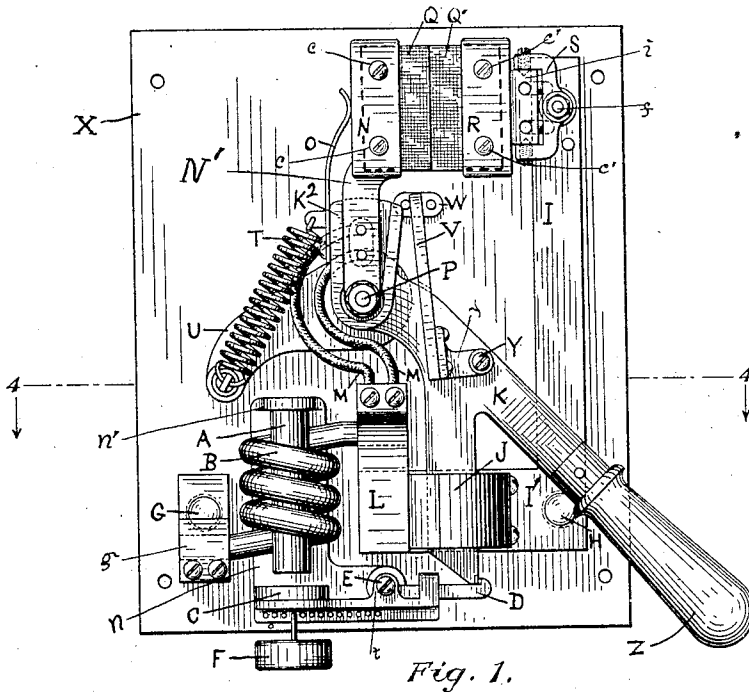


Fig. 1.

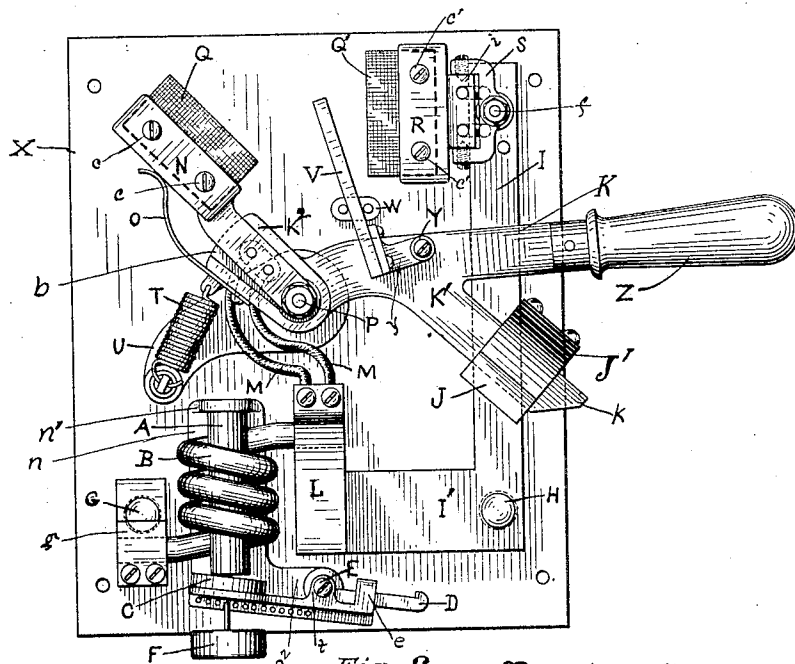


Fig. 2.

Witnesses
Lewis P. Bell
James H. Power

G. Frederick Packard Inventor
 By his Attorneys *Chapin & Denny*

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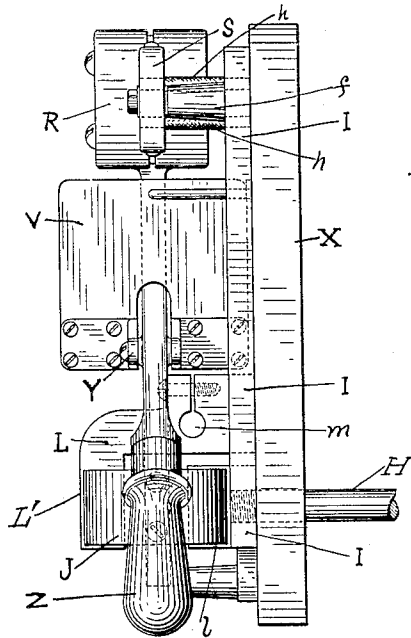


Fig. 3.

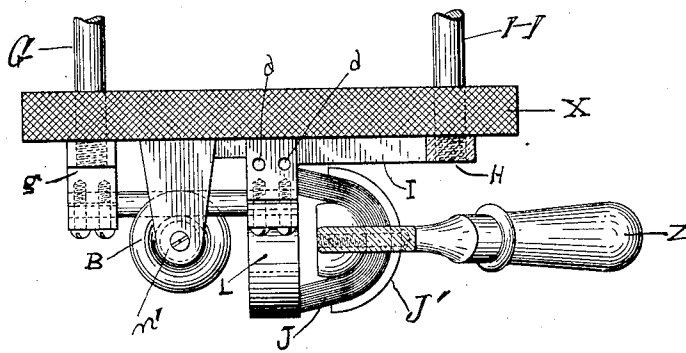
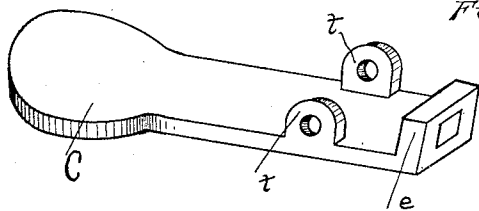


Fig 5.

Fig. 4.



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James H. Power

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UNITED STATES PATENT OFFICE.

GRANVILLE FREDERICK PACKARD, OF FORT WAYNE, INDIANA.

AUTOMATIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 577,447, dated February 23, 1897.

Application filed September 22, 1896. Serial No. 606,661. (No model.)

To all whom it may concern:

Be it known that I, GRANVILLE FREDERICK PACKARD, a citizen of the United States, residing at Fort Wayne, in the county of Allen, in the State of Indiana, have invented certain new and useful Improvements in Automatic Circuit-Breakers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in automatic circuit-breakers.

The objects of my invention are to provide an automatic circuit-breaker of simple and economical construction, positive, efficient, and reliable in operation, compact in arrangement, adapted for use with either continuous or alternating currents, provided with a weighted drop-armature adapted to break the circuit upon a predetermined increase of the current in the main circuit, so arranged that the contacts in both circuits separate horizontally and are reset by a downward pull of a lever-arm instead of a push of said arm, as is sometimes constructed, provided with an improved means for securing the carbons between which the arc is established and an improved means for severing the said arc.

My improvement comprises an electromagnet arranged in the working circuit, a weighted drop-armature carrying a catch and in operative relation to said magnet and adapted to break the circuit on the occurrence of an abnormal or a predetermined increase of current in the main circuit, a pair of carbon-contacts for the shunt-circuit, an arc-rupturing device for said carbons, and a lever-arm pivoted on a proper insulating base-block and carrying a bridging contact or brush in the main circuit.

The novel features of my invention are the means for breaking the shunt-circuit, the manner of securing and the means for adjusting and alining the carbon-contacts, and the construction and arrangement of the insulating arc-rupturing device.

Similar reference-letters indicate corresponding parts throughout the several views, in which—

Figure 1 is a view in elevation of my improved circuit-breaker, showing the relative arrangement of the operating parts when the main and shunt circuits are closed. Fig. 2 is a similar view of the same, showing the relative arrangement of the parts at the moment succeeding the breaking of the said circuits by an abnormal current strength. Fig. 3 is a side view of Fig. 1, taken at right angles thereto. Fig. 4 is a horizontal section taken on the line 4-4 of Fig. 1. Fig. 5 is a detail perspective of the drop-armature, showing the apertured lugs thereon for the holding-trigger.

The base-block X, of proper dimensions and proper insulating material, preferably marble or slate, is provided near its corners with suitable perforations for securing it to the wall or other desired position, and has suitable lateral openings for the terminals of the line-wires G and H. Near one edge of the said base-block and upon one side thereof is rigidly secured the metallic plate I, having upon its lower end a lateral extension I', provided upon its forward end with a right-angular lug *l*, Fig. 3, adapted to form one of the contacts for the laminated brush J, Fig. 4, which is fixed upon the lever-arm K, hereinafter described, by means of the semicircular metallic back J', secured thereto by proper holding-screws.

Their regularly-shaped metallic plate L, Fig. 3, is rigidly secured at its upper end in any proper manner, as by holding-screws, to the said base-block X, and is provided with a pendent portion L', arranged in horizontal alinement with the said lug *l*, but separated from it by an intervening space. This portion L' also forms a contact for one side of the brush J, which bridges said space. The upper portion of said plate L has a lateral aperture *m*, having a vertical slot leading outwardly therefrom. In this aperture one end of the coil B of the electromagnet is inserted and secured therein by proper clamping-screws so arranged as to slightly contract the width of said slot. The other end of coil B is secured in the binding-post *g* in the usual manner. Near the lower end of said base-block X, and between the said plate L and the binding-post *g*, is rigidly fixed by proper holding-screws the bracket-plate *n*, Figs. 1

and 2, having upon its upper end a lateral projecting lug n' , from the free end of which the vertically-arranged magnetic core A of the said magnet is rigidly suspended by a holding-screw, Fig. 4, or other proper manner. To the laterally-projecting lug n upon the lower end of the said bracket-plate n is pivotally mounted the drop-armature C on the pivot E by means of the apertured ears t , the forward end thereof being immediately below and in vertical alinement with the said core A and in operative relation to said magnet. The said armature is provided upon its lower face with a depending flange provided with a series of measured lateral perforations from which the weight F is suspended and adjusted in accordance with the predetermined strength of current in a well-understood manner. The other end of the said armature is provided with a vertical lug e , centrally apertured, Fig. 5, in which aperture the trigger D is loosely mounted, having a limited vertical play therein for the purpose of allowing for a limited fluctuation of current strength below the predetermined abnormal current without disengaging the said lever K from said trigger D. One end of the said trigger is pivoted on the said pivot pin or screw E between the said ears, and is provided at its free end with a vertical terminal lug adapted to form a holding engagement with the said lever-arm K.

The metallic lever-arm K, of suitable dimensions, has upon its outer free end a handle Z, of wood or other proper insulating material, and has upon its lower face a pendent oblique lug K' , on which is mounted the metallic brush J, adapted to bridge the said space between the plate L and the lug l . The said brush is secured in position by the curved metallic plate J' , having proper holding-screws, as shown. The lower protruding end k , Fig. 2, of said lug K' is adapted to detachably engage the said trigger D when both circuits are closed. The forward or pivoted end of said hand-lever has an upwardly-projecting oblique lug K^2 , centrally apertured at its base for the pivot P, on which the said hand-lever is pivotally mounted, and its outer face has a radial recess b , in which the carbon-holder N has a limited lateral play for the purpose hereinafter described.

To the said base-block X is rigidly fixed the plate U, its rear end being centrally apertured for the said pin P and adapted to form a bearing-plate for said lever-arm, its forward end being provided with a proper holding-pin having its head provided with a lateral perforation in which the forward end of the retracting-spring T is secured. The other end of the said retracting-spring is secured to a perforated lug on said lug K^2 of said lever K.

The carbon-holder N has a stem N' , pivoted at its lower end on the pin P, and has one face thereof recessed to receive the carbon Q, which is secured in position in said recess by the holding-screws c , which pass entirely

through the said carbon. The back of the said holder N is split or slit near its upper and lower sides to admit of more tightly clamping said carbon by the said screws. The flexible cables M in the shunt-circuit have their lower ends properly secured in the perforations d in the top of the said plate L, Fig. 4. Their other ends pass through an enlarged slot in the said lug K^2 (shown in dotted outline in Fig. 1) and are then secured in proper perforations in the stem N' , Figs. 1 and 2. In the upper portion of the said plate I is properly secured the post f , on which is pivotally mounted the supporting-bracket S. The carbon-holder R is identical in form and construction with the said holder N, excepting it is wanting in a vertical stem N' , and is provided upon its back with an integral lug i , by means of which the said holder is swiveled in the said bracket S. The carbon Q' is arranged and secured in the recessed face of the said holder R by the holding-screws c' in the manner above described. The carbon-holder R and the said plate I are electrically connected, by means of the short cables h , in a well-understood manner, Fig. 3. It is obvious that as the said carbon-holder R is swiveled in the bracket S, which in turn is pivoted on the said post f , it is adapted for self-alinement when brought into contact with its companion carbon Q and form a perfect contact therewith. The flat steel spring O has its lower end fixed to the forward edge of the said lug K^2 of the said lever-arm K, and its upper free end is adapted to bear upon the back of the said carbon-holder N to prolong the contact of the said carbons after the main circuit has been broken by the release of the said lever-arm from its engagement with the trigger D upon the lifting of said armature by the said magnet.

The arc-rupturing device V is a plate in substantially vertical arrangement, of proper insulating material, pivoted at its lower end to the outer face of the lever K by means of the bracket-plate v and the pivot Y, and has its upper end slidably mounted in a proper guide W, so arranged as to be automatically thrust into the arc as the carbons become separated.

The operation of my automatic circuit-breaker thus described will be readily understood, and, briefly stated, is as follows: By pulling downward on the handle z of the lever K and engaging the end k of the lug K' thereof with the trigger D against the tension of the said retracting-spring T the arc-severing plate V will be withdrawn from between the said carbons Q and Q' , which will be in direct contact, and the brush J will be in contact with the plate L and the lug l , whereby both circuits are closed, the shunt-circuit comprising the cables M, the carbon-holders N and R, the carbons Q and Q' , the cables h , and the plate I, the main circuit comprising the post g , the coil B, the plate L, the brush J, and the plate I. When the strength

of the current becomes abnormal or reaches a predetermined limit, the weighted armature C will be lifted into contact with the core A of the said electromagnet, thereby releasing the said lever K from its engagement with the trigger D, after which the said lever will promptly take the position seen in Fig. 2 under the tension of the said retracting-spring T, thereby opening both circuits, but not simultaneously, the opening of the shunt-circuit being prolonged as follows: As the radial slot *b* of the said lug K² is of sufficient width to afford a limited amount of lateral play for the arm of the carbon-holder N the contact of the said carbons will be prolonged very perceptibly under the tension of the said spring O after the breaking of the main circuit by the withdrawal of the brush J from its bridging contact with the plate L and the lug *l*, thereby avoiding the destructive effects of an arc between the said brush J and the plate L and the lug *l*. As the said carbons are thus separated by the release of said lever K the arc-rupturing plate V is automatically thrust upwardly between the said carbons, thereby abruptly and completely severing the arc.

It is obvious that the details of construction for automatically severing the arc at the final breaking of the circuit may be variously modified without departing from the spirit of my invention, which consists in the automatic interposition of a solid insulating-body across the normal path of the arc simultaneously with the parting of the carbon-contacts.

Having thus described my invention and the manner of employing the same, what I desire to secure by Letters Patent is—

1. The combination in an automatic circuit-breaker of metallic contacts for closing the main circuit between the terminals; high-resistance contacts for closing the shunt-circuit between the terminals; a pivoted hand-lever carrying the bridging-contact for the main circuit; an arc-rupturing plate pivotally mounted on said hand-lever and adapted to be automatically thrust or interposed across the path of the arc, as described; an armature to which is attached a weight or spring to resist the magnetic pull of the armature, and having a catch or trigger adapted to holdingly engage the said hand-lever when the working circuit is closed; and an electromagnet arranged as described for actuating the said armature, all substantially as described.

2. In an automatic circuit-breaker, the combination of a pivoted hand-lever carrying the bridging-contact for the main circuit, and adapted to separate the metallic contacts before the high-resistance contacts leading to the same terminals are separated, as described; means for securing said hand-lever in its normal position when the circuits are closed; means for automatically releasing the said hand-lever from such position to open the circuits; metallic contacts for closing the

main circuit between the terminals; high-resistance contacts for closing the shunt-circuit between the terminals; and an arc-rupturing plate or shield pivotally mounted on the said hand-lever and adapted to be automatically thrust across the path of the arc upon the breaking of the shunt-circuit, all substantially as described.

3. In an automatic circuit-breaker, a main operating-lever K pivotally mounted on the base-block carrying a bridging-contact for the main circuit, and having upon its inner end an oblique lug K² provided upon its outer face with a radial and outwardly-flaring recess for the purpose specified; in combination with the carbon-holder N having a fixed carbon Q, and pivotally mounted in said recess as shown, and adapted for a limited play therein for the purpose of prolonging the contact of the carbons after the breaking of the main circuit; the carbon-holder R provided with the fixed carbon Q' and the pivoted hanger-bracket S whereby it is adapted for self-alinement with its companion; the arc-rupturing plate V pivotally fixed on said handle and adapted to be automatically interposed across the path of the arc, as described; a weighted armature C provided with a catch or trigger D adapted to holdingly engage the said operating-lever when the working circuit is closed; and an electromagnet for actuating the said armature, all substantially as described.

4. In an automatic circuit-breaker means for prolonging the contact of the carbons in the shunt-circuit for the purpose of avoiding an arc in the main circuit, comprising a hand-lever K pivotally mounted as shown on a proper base-block, carrying a bridging-contact for the main circuit and having upon its inner end the projecting lug K² recessed as described; the carbon-holder N having a carbon Q fixed therein as shown, and provided with a handle N' pivotally arranged in said recess and adapted for a limited lateral play therein for the purpose specified; the carbon-holder R provided with the fixed carbon Q', and the pivoted hanger-bracket S whereby it is adapted for self-alinement with its companion, the lugs *l* and *l'* on the respective plates I and L adapted to form cooperating contacts with the brush J, as shown, a spring O fixed as shown on said lug K² with its free end adapted to bear against the back of said carbon-holder N; and the spiral retracting-spring T having one end fixed as shown and the other end secured to the said lug K² whereby both circuits are closed against the tension of said retracting-spring, all substantially as described.

Signed by me at Fort Wayne, Allen county, State of Indiana, this 16th day of September, A. D. 1896.

GRANVILLE FREDERICK PACKARD.

Witnesses:

DANIEL B. KEHLER,
JAMES H. POWER.