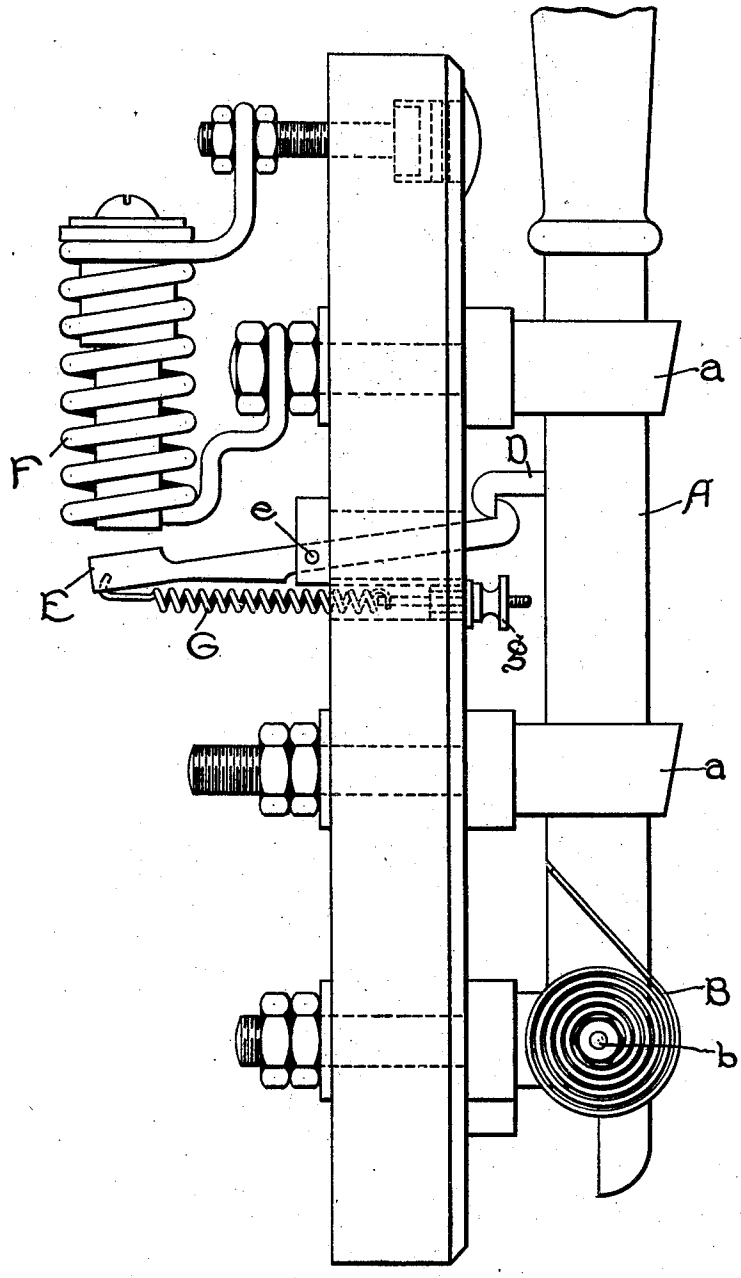
No. 761,776. PATENTED JUNE 7, 1904.

W. J. LLOYD.

CIRCUIT BREAKER.

APPLICATION FILED AUG. 19, 1903.

NO MODEL.



WITNESSES:

Wm. H. Jones.

R. E. Haymond.

INVENTOR.

William J. Lloyd.

BY L. A. Hawkins

ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 761,776. Patented June 7, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM J. LLOYD, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO STANLEY ELECTRIC MANUFACTURING COMPANY, OF PITTSFIELD, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 761,776, dated June 7, 1904.

Application filed August 19, 1903. Serial No. 169,993. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. LLOYD, a citizen of the United States, and a resident of Pittsfield, Massachusetts, have invented certain new and useful Improvements in Circuit-Breakers, of which the following is a specification.

My invention relates to circuit-breakers, and is especially adapted for use in street-car service. In practice the circuit-breakers on street-cars are placed in many different positions, as the convenience of each case dictates. With circuit-breakers as ordinarily constructed a change in the position affects the setting of the tripping device, thereby changing the opening-point of the breaker. By my invention I am able to provide a circuit-breaker which may be calibrated for any position and which will not have its opening-point changed by any alteration of its position. I accomplish this by providing a balanced armature for the tripping device. The use of a balanced armature necessitates the employment of a spring for the retractive force. With the ordinary arrangement springs are not suitable for the most efficient operation of a circuit-breaker, since the movement of the armature when it is drawn up by its solenoid elongates the spring and increases the retractive force as the armature moves. Thus the increasing magnetic attraction due to the movement of the armature is partly annulled, and the closing with a hammer blow, which is very desirable in circuit-breakers, is prevented. By my invention I so arrange the spring that the retractive force on the armature as it is drawn up is not increased, and a hammer-blow is obtained with a balanced armature.

In the accompanying drawing, A represents a switch which when closed connects the contacts *a a*. Switch A is pivoted at *b*, and is retracted by spring B, which tends to pull the switch open. The switch is normally held closed by the catch D, which is engaged by the pivoted armature E. F is the solenoid-coil for the circuit-breaker, connected in series with contacts *a a*, adapted to draw up the outer end of armature E. Armature E is pivoted at *e* and is balanced with respect to the pivot. The armature is normally held in the position shown in the drawing by spring G. Spring G is arranged so that it is at all times nearly parallel to the line joining pivot *e* and the point of attachment of the spring to the armature. Thus the movement of armature E as it is drawn up by the solenoid increases the tension of spring G only to a very small extent. Moreover, as armature E is drawn up by its solenoid the angle between the spring and the line joining pivot *e* with the point of attachment of the spring decreases, so that the component of the retractive force of the spring which opposes the attraction of the solenoid is diminished. Thus the retractive force opposing the magnetic attraction of the solenoid may be made the same at open and closed positions of the armature or may be made to diminish as the armature closes. Thus the advantages of a balanced armature are obtained as regards the accuracy of the calibration for all positions of the breaker, and also the advantages of a quick and positive movement of the armature are obtained.

The tension of spring G may be adjusted by means of the setting-nut *g*. Thus the tripping-point of the circuit-breaker may be adjusted without altering the relation between the position of the armature and the retractive force exerted upon it by the spring.

It is evident that the use of my tripping device is in no way limited to the particular type of switch here shown, but may be used with any well-known type of switch adapted for the purpose. Accordingly I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes therein which do not depart from the spirit of my invention and which are within the scope of the appended claims will be obvious to those skilled in the art.

Having thus fully described my invention, I claim as new and desire to protect by Letters Patent—

1. In a circuit-breaker, a solenoid, a bal-

anced armature therefor, a retractile spring for said armature so disposed that the retractive force on said armature diminishes as said armature is attracted by said solenoid, and a switch adapted to be operated by the movement of said armature.

2. In a circuit-breaker, a solenoid, a balanced armature therefor, a retractile spring for said armature so disposed that the tension of said spring is exerted in a direction nearly parallel to the line joining the pivot of said armature and the point of attachment of said spring to said armature, and a switch adapted to be operated by the movement of said armature.

3. In a circuit-breaker, a solenoid, a balanced armature therefor, a retractile spring for said armature so disposed that the component of spring tension opposing the attraction of said solenoid on said armature diminishes as said armature is attracted by said solenoid, and a switch adapted to be operated by the movement of said armature.

4. In a circuit-breaker, a solenoid, a balanced armature therefor, a retractile spring for said armature so disposed that the tension of said spring is exerted in a direction nearly parallel to the line joining the pivot of said armature and the point of attachment of said spring to said armature, means for adjusting the tension of said spring without changing the direction of said tension, and a switch adapted to be operated by the movement of said armature.

5. In a circuit-breaker, a switch, a spring tending to open said switch, a catch carried by said switch, a solenoid, a pivoted armature balanced with respect to its pivot and engaging said catch and adapted to be attracted by said solenoid and means adapted to restrain said armature.

6. In a circuit-breaker, a switch, a spring tending to open said switch, a catch carried by said switch, a solenoid, a balanced armature engaging said catch and adapted to be attracted by said solenoid, and a retractile spring for said armature so disposed that the component of spring tension opposing the attraction of said solenoid on said armature diminishes as said armature is attracted by said solenoid.

7. In a circuit-breaker, a solenoid, a balanced armature therefor, means for exerting a retractive force on said armature diminishing as said armature is attracted by said solenoid, and a switch adapted to be operated by the movement of said armature.

8. In a circuit-breaker, a switch, a solenoid, an armature adapted to be attracted by said solenoid and by its movement to operate said switch, a spring arranged to exert a retractive force on said armature diminishing as said armature moves under the attraction of said solenoid, and means for varying the amount of said force without varying the relation between said force and the movement of said armature.

Signed at Pittsfield, Massachusetts, this 12th day of August, 1903.

WILLIAM J. LLOYD.

Witnesses:

L. A. HAWKINS,

R. E. HAYNES.