C. E. EVELETH.

CIRCUIT BREAKER RETARDING DEVICE.

APPLICATION FILED MAY 25, 1904.

957,319. Patented May 10, 1910.

Fig. 1.

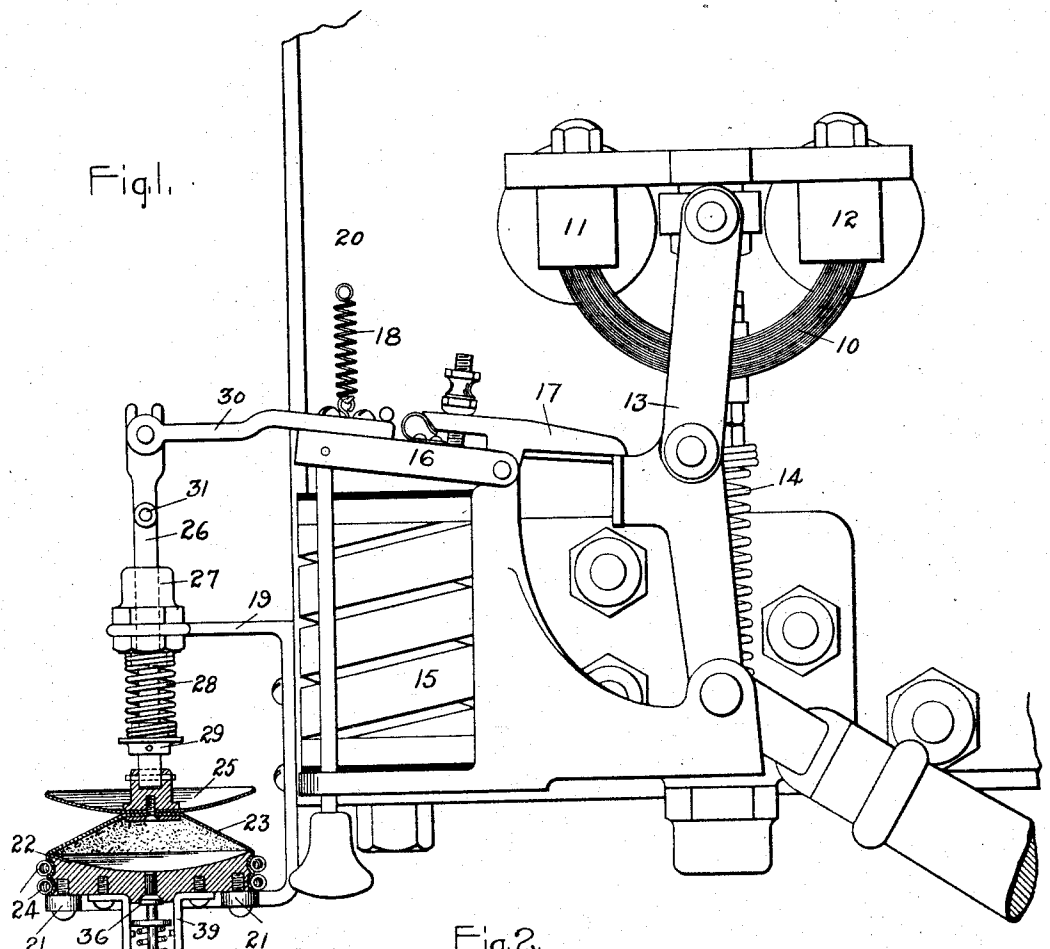
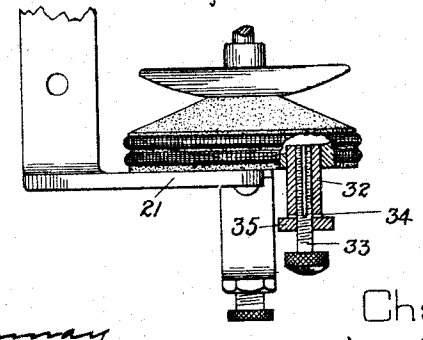


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER-RETARDING DEVICE.

957,319. Specification of Letters Patent. Patented May 10, 1910.

Application filed May 25, 1904. Serial No. 209,616.

To all whom it may concern:

Be it known that I, CHARLES E. EVELETH, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Circuit-Breaker-Retarding Devices, of which the following is a specification.

My invention relates to retarding or time limiting devices for electric circuit-breakers and it has for its object to provide a novel device which will operate to trip the circuit-breaker after a predetermined period of time where the overload on the system is light and continuing, or suddenly where the overload is large.

In carrying out the above object, I make use of a diaphragm or bellows type of dashpot such as that disclosed in Patent No. 796,646, granted August 8, 1905, to Edward M. Hewlett.

The character of my invention will be best understood upon reference to the following description taken in connection with the accompanying drawings, and the novelty will be particularly pointed out in the appended claims.

In the accompanying drawing, Figure 1 is a view in elevation of a circuit-breaker provided with a retarding device constructed in accordance with my invention, the retarding device being partially shown in section; and Fig. 2 is a side elevation of a portion of the retarding device illustrating the leak valve construction.

The circuit-breaker evidently may be of any desired type, and I have illustrated my invention in connection with one of the types now in common use, which is fully disclosed in Patent No. 533,083 granted January 25, 1895, to W. B. Potter. In this circuit-breaker, a portion of which is shown, the bridging contact 10 is held closed against the contacts 11, 12 by a toggle 13 which constantly tends to open under the tension of the spring 14. A series coil 15 has a pivoted armature 16 on which is pivotally and adjustably mounted a detent 17 whose function is to lock the toggle so as to hold the contacts closed. An abnormal current in the system energizes the coil 15 which attracts the armature 16 against the tension of the return spring 18 and thereby moves the detent 17 out of engagement with the toggle and allows the spring 14 to break the circuit between the contacts 10, 11 and 12.

In applying the general structure of the Hewlett application above referred to, a supporting frame or bracket 19 is provided which is secured to the base 20 of the circuit-breaker adjacent to the series coil 15. The lower portion of the frame 19 is provided with two forwardly extending arms 21 upon which is mounted the cup 22 of the retarding device. The mouth of the cup 22 is covered by a flexible diaphragm 23 formed of kangaroo leather or other flexible air-tight material. The edge of the leather diaphragm is connected to the periphery of the cup by two ring springs 24 which press the leather into corresponding annular grooves in the exterior of the cup so as to form an air-tight joint. The center of the leather diaphragm is secured by an air-tight connection to the center of a convex piston 25 having a curvature to conform to the interior of the cup. Movement is transmitted to the piston 25 by a rod 26 extending down through a suitable guide 27 secured to the outer end of the upper arm of the frame 19. A coiled tension spring 28 surrounds the rod 26 and is secured at its lower end to a collar 29 on the rod 26 and at its upper end to the guide 27. The upper end of the rod 26 is bifurcated for the reception of the outer end of an arm 30 secured to the armature 16 of the circuit-breaker, and a stop 31 on the rod 26 engages the guide 27 to limit the downward movement of the piston.

In the bottom of the cup 22 is a leak valve 32 shown in Fig. 2. This leak valve comprises a screw 33 having a channel milled parallel to its axis and providing a small opening between the fluid reservoir of the retarding device and atmosphere. In practice it is found that a very fine adjustment of a leak may be obtained by varying the position of the screw 33. When the screw is set to the desired adjustment it is locked in position by a jam-nut 35. In addition to the leak valve 32, the cup 22 is provided with an outwardly-opening emergency valve 36 which is normally held closed by a coiled spring 37, the pressure of which may be varied by a screw 38 threaded within a sup-

porting bracket 39. The screw 38 may be locked in any adjusted position by the jam-nut 40.

In the operation of the above device, whenever the current in the system exceeds the point for which the breaker is set, the armature 16 will be drawn down by the coil 15, and its downward movement will be more or less retarded by both the spring 28 and the air in the fluid reservoir or retainer formed by the cup 22 and the diaphragm 23. The leak valve 32 always provides a small opening for the escape of the air from the reservoir chamber, and the emergency valve 36 is set to operate only when the pressure in said chamber reaches a definite amount. From this it follows that when the overload is light, the downward movement of the piston 25 will be insufficient to compress the air in the reservoir chamber sufficiently to open the emergency valve 36, but the air in said chamber will escape through the leak valve and thereby permit a definite period of time to elapse before the armature 16 reaches a position to remove the detent 17 from engaging position to trip the breaker. Since the breaker is tripped only when the piston 25 reaches the lower limit of its movement, if the light overload should not continue a sufficient length of time to allow the piston to reach its tripping position it will be apparent that the parts would return to normal position without tripping the breaker. On the other hand, if the overload is excessive, the piston 25 would be forced downward with such force as to compress the air in the reservoir chamber sufficiently to open the emergency valve 36 and thereby permit a sudden and practically instantaneous escape of the air in said chamber and a consequent tripping of the breaker.

The purpose of the spring 28 is to return the piston 25 to its normal position, and in the above operation it will be apparent that the spring is stretched by the downward movement of the piston. The particular connection at the upper end of the rod 26 with the arm 30 also permits the circuit-breaker to return to normal position independently of the retarding device.

I do not wish to be limited to the particular use herein disclosed, since my retarding device is capable of use in other connections, and I aim to cover by the terms of the appended claims all such uses. It will also be apparent that certain modifications may be made in the specific matter illustrated without departing from the spirit and scope of my invention, such as the substitution of other forms of valves, different arrangements of the parts and the like. I therefore do not wish to be limited to the specific matter illustrated but desire to cover by the claims all such alterations and substitutions.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A time limit-device comprising a movable element, a fluid-reservoir having a yielding wall moved by said element, a leak-opening in the reservoir for regulating the movement of said element, and means for freeing said element from the retarding action of the reservoir when the pressure upon the element exceeds a predetermined amount.

2. A time-limit device comprising a movable element, a fluid-reservoir having a yielding wall moved by said element, a leak-opening in the reservoir to regulate the movement of said element, and an escape-valve opening when the pressure upon the movable element exceeds a predetermined amount to permit free movement of said element.

3. The combination with a movable member, an electroresponsive device for exerting on said member a pressure dependent on current through said device, and a circuit controlling means actuated by said member at a definite point in its travel, of a fluid reservoir or container having a yielding wall connected to resist the movement of said member and a plurality of escape valves for the contained fluid arranged to operate at different pressures of said fluid.

4. The combination with a movable member, an electroresponsive device for exerting on said member a pressure dependent on the current through said device, and a circuit controlling means actuated by said member at a definite point in its travel, of a fluid reservoir or container having a yielding wall connected to resist the movement of said member, a small valve for regulating the emission of the contained fluid and a larger valve for permitting more rapid emission of fluid when a predetermined pressure is obtained.

5. The combination with a circuit breaker, an electroresponsive device comprising an armature movable in response to current through said device and means whereby said armature trips said circuit breaker at a predetermined point in its travel, of a fluid reservoir or container having a yielding wall connected to said armature and a plurality of escape valves of different capacity for the contained fluid arranged to operate at different pressures of said fluid.

6. A time-limit device comprising a movable element, a fluid reservoir or container having a yielding wall adapted to be moved by said element, a leak valve or opening and a spring-pressed emergency valve both for the emission of fluid from said reservoir, means for adjusting said leak valve to vary the size of its opening, and means for adjusting the spring pressure of the emergency valve to vary its responsiveness.

7. A time-limit device comprising a mov-

able element, a flexible diaphragm and piston operated thereby, a cup covered by said diaphragm, a leak valve and an emergency valve of large capacity both for the escape of fluid from said cup, and means for adjusting the emergency valve to vary its responsiveness.

8. A time-limit device comprising a movable element, a flexible diaphragm and piston operated thereby, a cup covered by said diaphragm, a leak valve and an emergency valve of large capacity, both for the escape of fluid from said cup, means for adjusting the leak valve, and means for adjusting the emergency valve.

9. The combination with a circuit-breaker and its trip device, of a time-limit device therefor comprising a movable element, a fluid reservoir or container having a yielding wall adapted to be moved by said element, and a plurality of escape valves for the contained fluid arranged to operate at different pressures of said fluid.

10. The combination with a circuit breaker, an electroresponsive device comprising an armature movable in response to current in the circuit to be controlled and means whereby said armature trips said circuit breaker at a predetermined point in its travel, of a fluid reservoir or container having a yielding wall for resisting the movement of said armature, and a plurality of escape valves of different capacities for the contained fluid arranged to operate successively at different pressures of said fluid.

In witness whereof, I hereunto set my hand this 23rd day of May, 1904.

CHARLES E. EVELETH.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.