No. 708,007. Patented Sept. 2, 1902.

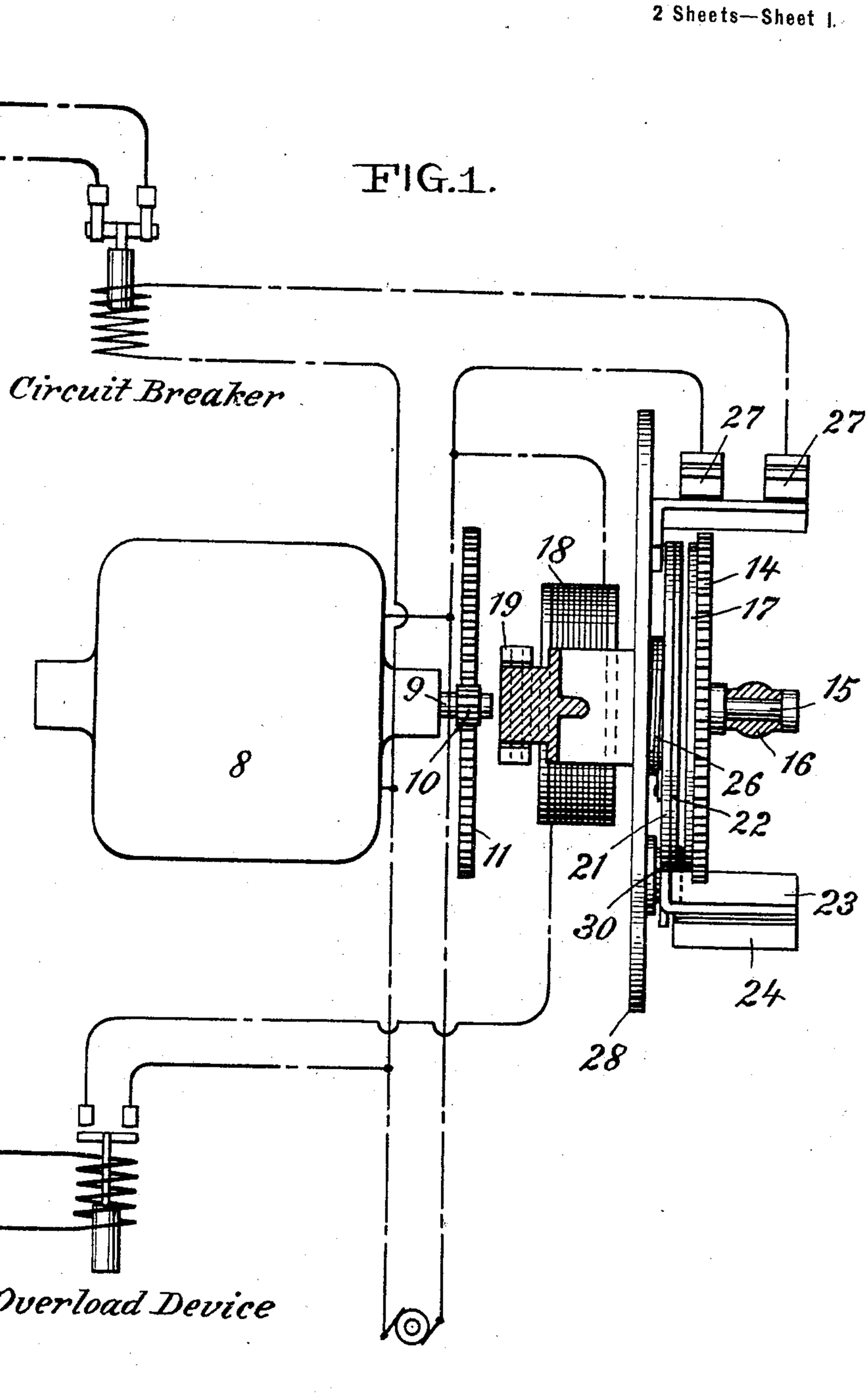
H. P. BALL.

TIME LIMIT DEVICE FOR CIRCUIT BREAKERS.

(Application filed Jan. 29, 1902.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.



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(No Model.) 2 Sheets—Sheet 2.

FIG. 2.

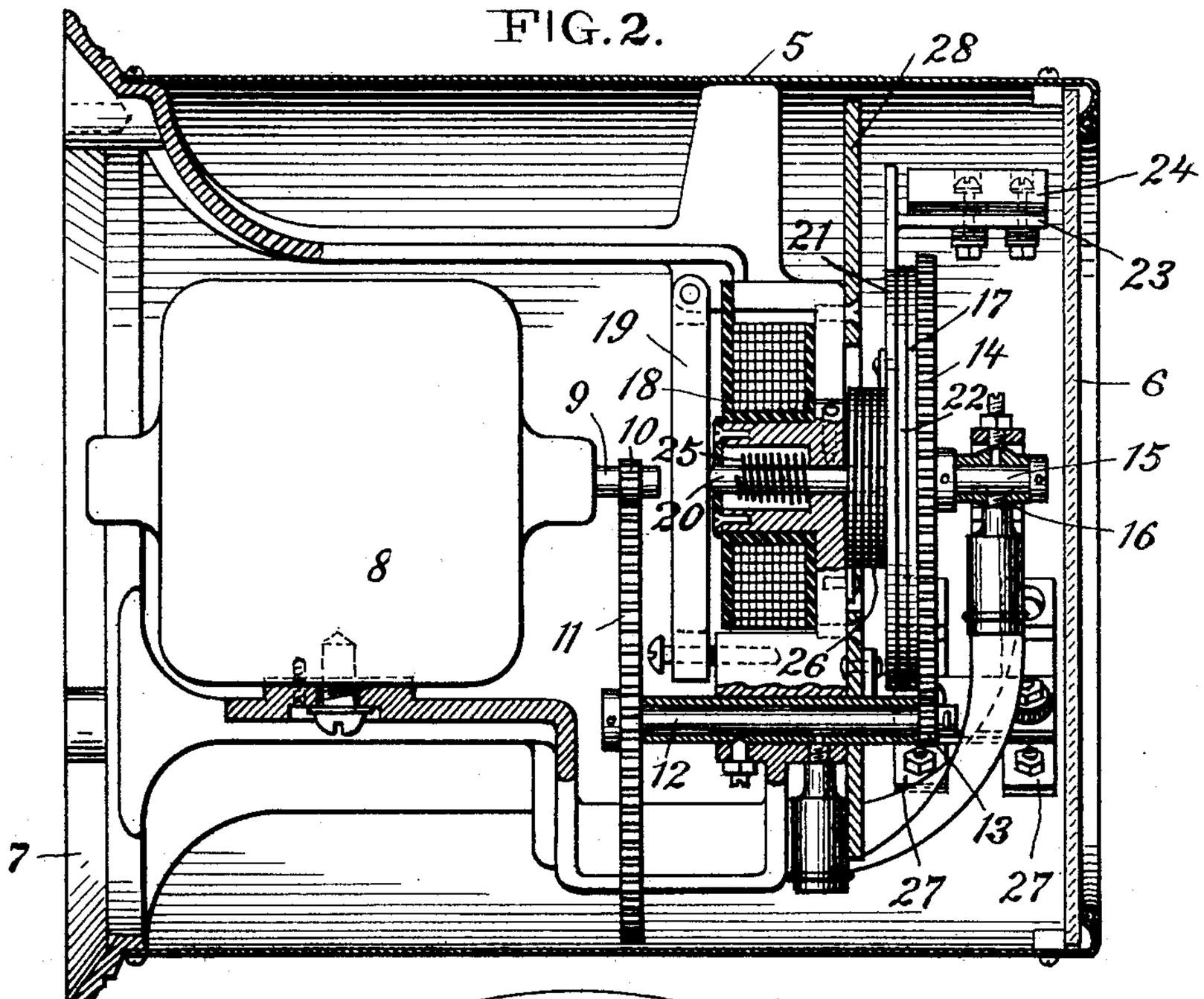
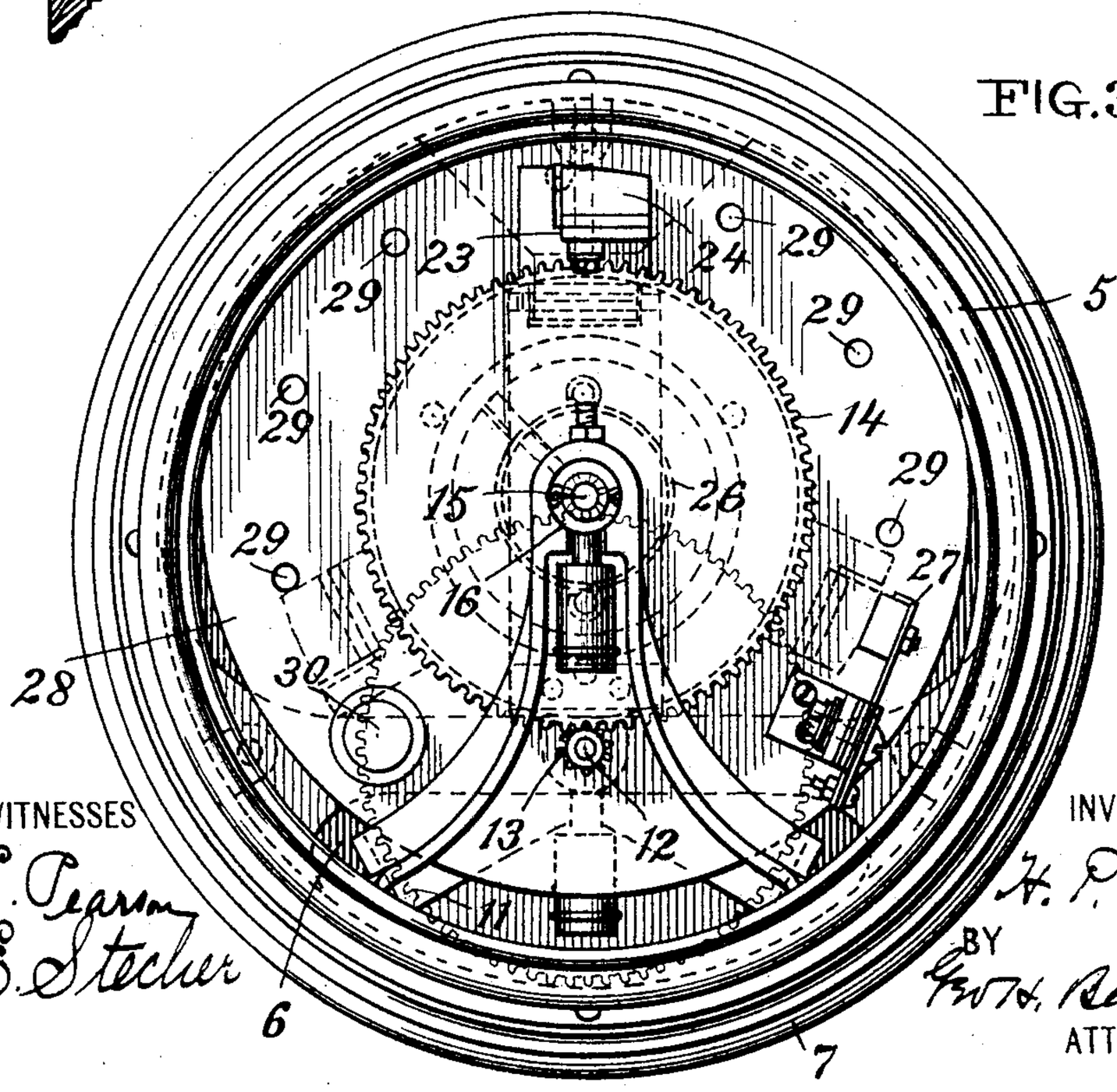


FIG. 3.



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UNITED STATES PATENT OFFICE.

HENRY PRICE BALL, OF NEW YORK, N. Y., ASSIGNOR TO GENERAL INCANDESCENT ARC LIGHT COMPANY, A CORPORATION OF NEW YORK.

TIME-LIMIT DEVICE FOR CIRCUIT-BREAKERS.

SPECIFICATION forming part of Letters Patent No. 708,007, dated September 2, 1902.

Application filed January 29, 1902. Serial No. 91,743. (No model.)

To all whom it may concern:

Be it known that I, HENRY PRICE BALL, a citizen of the United States, residing at New York city, county and State of New York, have invented a Time-Limit Device for Circuit-Breakers, of which the following is a specification.

My invention relates to a device adapted to be included in an electrical-distribution system and between an overload device and a circuit-breaker, and which has for its object to close a circuit through a circuit-breaker, and thus open the main circuit after a predetermined period has elapsed from the time of energizing of the overload device.

A particular feature of improvement of my device consists in the means provided for adjusting the time limit between the energizing of the overload device and the circuit-breaker. By means of this feature several time-limit devices may be incorporated in an electrical-distribution system and so adjusted as to operate independent circuit-breakers at different intervals of time.

A further feature of improvement consists in the construction by means of which the moving parts of the device will instantly return to their initial position should the overload on the line decrease before the time limit at which the device is set to act is reached.

Various other features of improvement are embodied in my device which will be set forth in the specification and claims.

The accompanying drawings will serve to illustrate my invention, and in which—

Figure 1 is a diagram illustrative of an electrical-distribution system embodying my device in connection with an overload device and a circuit-breaker. Fig. 2 is a longitudinal section through the time-limit device. Fig. 3 is an end view looking from the right.

In the drawings, 5 indicates a suitable inclosing casing. The front end of the casing is closed by a transparent plate of glass 6. The rear end of the casing incloses a casting 7, which forms a support for the operating parts of the device.

8 indicates a motor of any suitable type, which may be connected in circuit in such manner as to be continuously operated or operated only when an overload takes place. In place of using an electrically-actuated motor I may use a mechanically-driven motor.

Connected to the shaft 9 of the motor is a pinion 10, which meshes with a gear 11, mounted on shaft 12. On the rear end of shaft 12 is a pinion 13, which meshes with disk gear 14, mounted on end of shaft 15, which shaft is supported in the bearing 16. Upon the inner face of the disk gear 14 is secured a disk of leather or other suitable material having a frictional surface 17.

18 indicates a magnet in circuit with the overload device. Mounted at the rear of this magnet is a pivoted armature 19. Arranged within the magnet and adapted to have a longitudinal and rotary motion when acted upon is a pin 20, on the outer end of which is a disk 21, on the face of which is secured a disk of leather or other frictional material 22. Connected to the disk 21 is an arm 23, carrying a carbon block or other bridge device 24.

25 is a spring secured at one end to the pin 20 and bearing at its other end upon the body of the magnet. This spring serves to push the pin toward the front of the case and to separate the disks 22 and 17.

26 is a spring secured at one end to the disk 21 and at the other end to the magnet 18. The arrangement of this spring is such that it will normally rotate the disk-arm 23 and bridge 24 to the left.

Secured on the lower part of the inside of the case are the contacts 27 27, adapted to be connected to the circuit-breaker.

Mounted on the front of the magnet 18 is a fixed disk 28, having formed in it the holes 29. Eight of such holes are shown.

30 is a pin adapted to fit in the holes 29 and which may be moved from one hole to the other.

The operation of my device is as follows: The motor may be arranged to be constantly operated or thrown into action on the occurrence of an overload on the main line. Assuming for the purpose of description the motor to be constantly operated, the movement of the motor will be transmitted through the pinion 10, gear 11, shaft 12, pinion 13, disk gear 14 to disk 17, which at the time, owing to the retractile action of the spring 25, is not in contact with the disk 22. As soon

as an overload takes place the magnet 18 attracts its armature 19, which, impinging upon the pin 20, forces the disk 22 in contact with the disk 17. This causes a rotation of the disk 22 to the right, and assuming that the arm 23 and the bridge 24 are at such moment in contact with the pin 30 in one of the openings 29, as indicated in the dotted lines at the left of the drawing Fig. 3, the arm 23 will move circumferentially to the right around the disk 28 until the bridge device 24 bridges the spring-contacts 27, as indicated in the dotted lines at the right of the drawing Fig. 3, thereby closing the circuit to the circuit-breaker. As soon as the circuit is closed to the circuit-breaker the magnet 18 is cut out of circuit and the disk 22, under the action of the spring 26, is immediately rotated to the left until the arm 23 and bridge 24 are again in contact with the pin 30.

It will be readily understood that by moving the pin 30 forward circumferentially to the left and nearer to the contacts 27 the time limit within which the bridge device will bridge the contacts 27 will be decreased. It will further be understood that should the overload which energizes the magnet 18 be decreased before the predetermined time limit is reached—that is, before the arm 23 and the bridge 24 can bridge the contacts 27—the spring 26 will act and return the arm 23 and bridge 24 to their initial position.

In all time-limit devices of which I am aware the moving bridge device employed must finish a certain definite range of movement before it can be returned to its original position. Such an arrangement is objectionable owing to the fact that it may become totally inoperative for a certain period. For instance, assuming the range of movement to require ten seconds and that the device is set to operate the circuit-breaker at two seconds there would be a period of eight seconds during which the device would be inoperative. It may occur that before the bridge device has completed its movement a second overload takes place on the line, at which time the bridge device will not be in a position to meet the overload, but, as stated, will be totally inoperative. In my improved device the bridge device is instantly returned to its initial position by the cessation of the overload, so that the device as a whole is always in a condition to take care of an overload irrespective of the time limit at which the device is set to act.

I have described the mechanical features of the device in general terms, as I wish it understood that I do not limit myself to the precise mechanism shown and described and as it will be evident that many changes may be made therein without departing from the intent of my invention.

Having thus described my invention, I claim—

1. In a device such as described, the combination of a rotating member, a circuit-closing member, electroresponsive means for engaging said members, and means for returning the circuit-closing member to its original position upon the cessation of an overload.

2. In a device such as described, the combination of a rotating member, a circuit-closing member, electroresponsive means for engaging said members upon the existence of an overload, means for returning the circuit-closing member to its original position upon the cessation of an overload, and means for limiting the degree of movement of the circuit-closing member.

3. In a device such as described, the combination of a rotating member, a rotatable member, electroresponsive means for engaging the rotating member and the rotatable member, and means for restoring the rotatable member to its original position when the electric energy which energizes the electroresponsive means falls below a predetermined point.

4. In a device such as described, a rotating member, a rotatable member, electroresponsive means for engaging the rotating and rotatable members, means for limiting the degree of rotation of the rotatable member, means for restoring the rotatable member to its original position, and a circuit-closing device carried by the rotatable member.

5. In a device such as described, the combination of a circuit-closing member, means for imparting a definite speed of movement forward to the circuit-closing member upon the creation of an overload, means for limiting the degree of movement of the circuit-closing member, and means for imparting a definite speed of movement backward to the circuit-closing member upon the cessation of an overload.

6. In a device such as described, the combination of a rotating member, a circuit-closing member, electroresponsive means for engaging said members upon the existence of an overload, means for returning the circuit-closing member to its original position upon the cessation of an overload, and means for adjusting the range of movement of the circuit-closing member.

7. In a device such as described, the combination of a circuit-closing device set in motion by the creation of an overload on the circuit in which it is connected, means for limiting the motion of said circuit-closing device, and means for imparting a reverse motion to the circuit-closing device immediately upon the cessation of an overload.

8. A device such as described, comprising a motor, a disk driven by said motor, a second disk, means for moving said second-named disk into frictional relation with said first-named disk upon an overload, a bridge device carried with said second-named disk, a pair of contacts with which said bridge device coacts, means for separating the disks when the overload ceases, and means for determining the time limit within which the device will act.

9. A device such as described, comprising a motor, a disk driven by said motor, a second disk, means for moving said second disk into frictional relation with said first-named disk upon an overload, a bridge device carried with said second-named disk, a pair of contacts with which said bridge device coacts, means for separating the disks and restoring the second-named disk and bridge device to their original position, and means for determining the time limit within which the device will act.

10. In a device such as described, the combination of a driven disk, a second disk, means for moving said second disk into frictional relation with said first-named disk upon an overload, means for determining the period of rotation of the second-named disk, and a circuit-making device actuated by said second-named disk.

11. In a device such as described, the combination of a driven disk, a second disk, means for moving said disk into frictional relation with said first-named disk upon an overload, means for determining the degree of rotation of the second-named disk, and a circuit-making device actuated by the second-named disk.

12. In a device such as described, the combination of a driven disk, a second disk, means for moving said second disk into frictional relation with said first-named disk, means for restoring said second-named disk to its original position after the frictional relation with the first-named disk has ceased, means for limiting the degree of movement of the second-named disk, and a circuit-making device actuated by the second-named disk.

13. In a device such as described, the combination of a driven disk, a second disk, means for moving said second-named disk into frictional relation with said first-named disk, a contact-making device actuated by said second-named disk, and a disk provided with means for limiting the range of movement of the second-named disk.

14. In a device such as described, the combination of a driven disk, a second disk, means for moving said second disk into frictional relation with said first-named disk, a bridge device carried by said second-named disk, a pair of contacts with which said bridge device coacts, a disk having spaced openings, and a pin adapted to be placed in said openings which will coact with the bridge device and limit the movement of said device.

15. In a device such as described, the combination of a driven disk, a second reciprocating disk, means for reciprocating said second disk toward and from the first-named disk, a bridge device carried by said second-named disk, a pair of contacts with which said bridge device coacts, and means for adjusting the range of movement of the bridge device.

16. In a device such as described, the combination of a driven disk, a second disk carrying a bridge device, an electromagnet, an armature for said magnet, a pin between said armature and said second-named disk, means for separating the first and second named disks, and means for rotating the second-named disk to its original position.

17. In a device such as described, the combination of a driven disk, a disk to be driven, a bridge device carried by said second-named disk, a disk over the periphery of which said bridge device travels, and means carried by said third disk for limiting the movement of the bridge device over its periphery.

18. A device such as described, comprising a driven disk, a second disk, electrically-actuated means for moving said second disk into operative relation with said first-named disk, a bridge device carried by said second-named disk, a pair of contacts, with which said bridge device coacts, means for determining the range of movement of the bridge device, and means for restoring the bridge device to its original position when the electrically-actuated means for throwing the disks into contact is not active.

In testimony whereof I affix my signature in the presence of two witnesses.

HENRY PRICE BALL.

Witnesses:
J. E. PEARSON,
C. E. STECHER.