W. K. HOWE.

RELAY.

APPLICATION FILED MAY 6, 1907.

Patented Dec. 19, 1911.

1,012,079.

Fig. 1

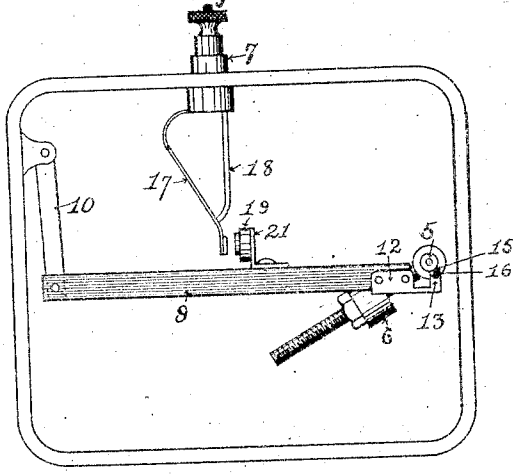


Fig. 2

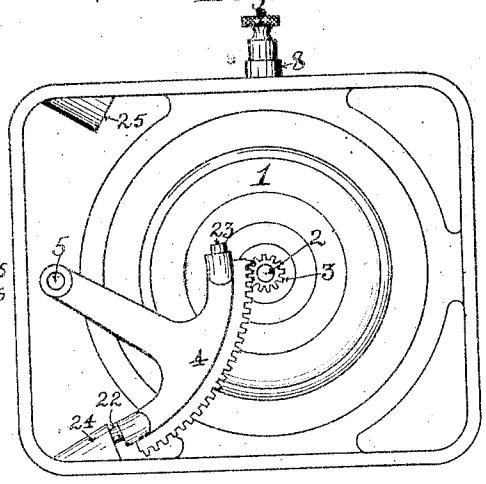


Fig. 3

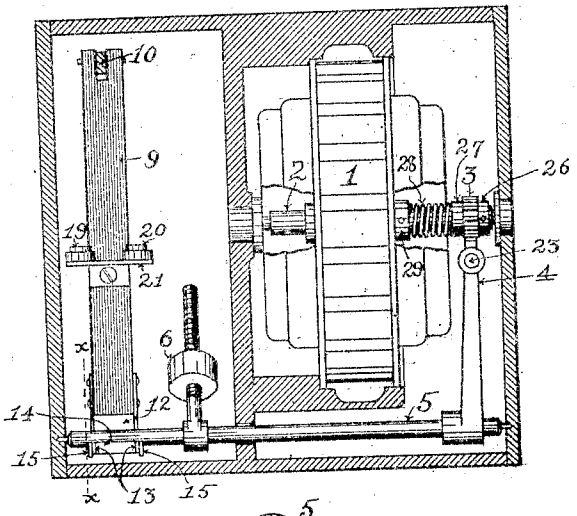
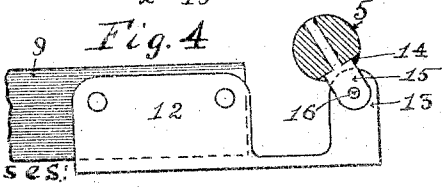


Fig. 4



Witnesses:
A. W. Hamburger
E. A. Kelly.

Inventor:
Winthrop K. Howe
by Macrum & Ellis
Attorneys

UNITED STATES PATENT OFFICE.

WINTHROP K. HOWE, OF BUFFALO, NEW YORK, ASSIGNOR TO GENERAL RAILWAY SIGNAL COMPANY, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

RELAY.

1,012,979. Specification of Letters Patent. Patented Dec. 19, 1911.

Application filed May 6, 1907. Serial No. 372,077.

To all whom it may concern:

Be it known that I, WINTHROP K. HOWE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Relays, of which the following is a specification.

My invention relates to electric circuit breakers, and particularly to that class of electric circuit breakers employed in railway signaling.

Heretofore relays used in railway signaling have employed electromagnets, the armatures of which have been made to operate the contact devices. It is well known that the distances through which an electromagnet will operate its armature are extremely limited, the power of an electromagnet varying approximately inversely as the distance between its core and armature. These devices have therefore been characterized by constructions in which the distance between the contact points has been increased at the expense of the amount of pressure exerted at such points when the electromagnets are energized. Thus it has been found that where only a feeble current is available for the operation of the relay, the amount of pressure produced at the point of contact by such devices is insufficient to make a reliable contact.

In order to overcome the difficulties above mentioned, I have produced the device herein described in which the movable contacting parts are actuated by a motor and its rotating shaft instead of by an electromagnet. My invention is so constructed that with a given amount of current applied to the motor, the actuating power of the motor, which may be slight, is so applied to the contacting points that the exerted pressure at such points is much greater than could be obtained by the application of the same amount of electric power to the similar parts of an electromagnet.

In the drawings and in the following specification I show and describe a polyphase motor operated by an alternating current. This is a typical use of my invention, but it will be understood that I may use any desired current and motor adapted thereto.

Referring now to said drawings, in which like characters of reference indicate corresponding parts,—Figure 1 is an elevation of the contacting mechanism. Fig. 2 is an elevation of the motor and gearing. Fig. 3 is a horizontal section of the entire apparatus. Fig. 4 is a detail section of the chair pivot on the line *x*—*x* of Fig. 3.

1 is a motor of the Tesla polyphase type to which the operating wires (not shown) are connected in the usual manner. Since this type of motor is well known in the art, further description of the same is unnecessary. The motor and controlling mechanism are mounted in any desired form of housing. Upon the shaft 2 of the armature is mounted a pinion 3. This pinion is in mesh with a segmental gear 4, which, in turn, is rigidly mounted upon a shaft 5, which is pivoted in the casing. Mounted upon the shaft 5 is an adjustable weight 6. If, now, the motor be energized, in the proper manner, the armature will rotate the pinion 3, which will raise the segment 4 and rotate the shaft 5 a part of a revolution. When current is cut off from the motor the combined action of the segment 4 and the weight 6 will rotate the motor armature in reverse direction. Consequently, the shaft 5 is rotated in the one direction by motor energization, and in the other direction by gravity. The lead-wires of the circuit to be made and broken by my device are attached to the binding-posts 7 and 8 (these posts standing directly in line with each other, are not both visible in a single view, but it will be understood that in Fig. 1 the post 8 stands directly behind the post 7 and in Fig. 2 the post 7 stands directly behind the post 8). A bar 9, of insulating material, is pivotally mounted at one end by a link 10 which is pivoted to a lug on the casing. To the other end of this bar 9 is secured a chair or bracket 12, which has pivot ears 13. The shaft 5 is cut away on one side, as clearly shown in Fig. 4 at 14, and in this cut-away portion are secured cranks or pivot-lugs 15. The cranks 15 and the ears 13 are pivotally connected at 16. It will now be seen that, as the shaft 5 is rotated over an arc of a circle, longitudinal movement will be imparted to the bar 9. Secured to the binding-post 7 is a contact spring 17 and a stop 18. A similar contact spring and stop are secured to the binding-post 8. Mounted upon the bar 9 are contact pieces 19 and 20, which are electrically connected by the carrying plate 21. The contact 19 is in position to make electrical con-

nection with the contact spring 17, and the contact 20 is in position to make electrical connection with the similar contact spring secured to the binding-post 8.

When the motor is energized, the shaft 5 rotated and the bar 9 moved longitudinally, the contacts 19 and 20 will make electrical connection with the contact springs of the binding-posts 7 and 8, and thus establish the desired circuit; and when the shaft 5 is rotated by gravity in the opposite direction, the bar 9 will be moved in the opposite direction, and the contact spring 17 and its mate being stopped by the stop 18 and its mate, the circuit will be opened.

In order to prevent shock to the contacting mechanism when the limit of movement is reached in either direction, I mount buffers 22 and 23, of resilient material on the ends of the gear segment 4, and upon the casing of the relay are the stops or blocks 24 and 25, which receive the blows of the buffers 22 and 23.

In order to prevent shock to the motor, and to prevent rebound of the segment when it is brought against a stop, either when the armature is being actuated by current or by gravity, I mount the pinion 3 in the following way: Upon the armature shaft 2 is a fixed collar 26, which faces up against the gear 3. On the opposite side of the gear 3 is a loose collar 27, which also faces up against the gear 3. Over the shaft 2 and between the collar 27 and a fixed collar 29 on said shaft is a compression spring 28. The pinion 3 is loosely mounted on the shaft 2. The collars 26 and 27 and the spring 28, accordingly, act as a friction clutch with the pinion 3; so that when the segment 4 reaches the limit of its movement in either direction, the acquired momentum of the armature is frictionally overcome without shock to the mechanism. In this manner I attain the advantages of a cushion connection between the motor and the other parts and at the same time avoid any friction due thereto during the movement proper, as would exist, for example, if the gear 3 and the segment 4 were in frictional contact instead of geared. By this construction I am enabled to make and break electrical connection between the contacts of a relay by the employment of a current which would be wholly inadequate, if sent through the coils of an ordinary relay to produce the certain establishment of a desired circuit. Consequently I am able to operate a relay with a greatly reduced current over ordinary distances and also to operate a relay with an ordinary current over distances heretofore prohibitive.

Having thus described my invention I claim:

1. In an electric circuit breaker, the combination with its fixed and movable contacts, motor, motor armature and shaft, of means connecting said motor shaft with the movable contacts including a clutch and a pivoted segment whereby the actuating power of the energized motor is utilized to close and hold closed the fixed and movable contacts, and gravity means adapted for opening said contacts when said motor is deënergized.

2. In an electric circuit breaker, the combination with a motor and its armature shaft; of fixed contacts, movable contacts, means for bringing said fixed contacts and said movable contacts together by the energization of said motor, and the rotation of said armature shaft, comprising a pinion mounted on said armature shaft, a segment in mesh with said pinion, a shaft on which said segment is mounted, a reciprocating bar carrying said movable contacts and a crank connection between said bar and said shaft.

3. In an electric circuit breaker the combination with a motor and relay contacts; of a pinion driven by said motor, a gear in mesh with said pinion, a shaft rotated by said gear, a reciprocating bar, a crank connection between said bar and said shaft, and an adjustable weight carried by said shaft whereby said contacting mechanism is actuated by said motor when it makes electrical connection between said relay contacts and it is actuated by said weight when it breaks electrical connection between said relay contacts.

4. In an electric circuit breaker the combination with a motor, relay binding posts and relay contacts carried by said binding posts; of a segment which is actuated by said motor when moved in one direction and which is actuated by gravity when it moves in the opposite direction and means between said segment and said relay contacts comprising a shaft on which said segment is rigidly mounted, a reciprocating bar, a crank connection between said bar and said shaft and movable contacts carried by said bar which are adapted to make and break contact with said relay contacts.

5. In an electric circuit breaker, the combination with a motor, its armature shaft and contacts; of means connecting said shaft and said contacts for employing the actuating power of the motor to close and hold closed said contacts, gravity means for opening said contacts when said motor is deenergized and means for frictionally overcoming the acquired momentum of said armature shaft after said motor is deënergized.

6. In an electric circuit breaker the combination with a motor and fixed and movable contacts; of a segment which is actuated by said motor when moved in one direction and which actuates said motor when it moves in the opposite direction, means

actuated by said segment for making and breaking electrical connection between said movable contacts and said fixed contacts, means for preventing shock to said contacting mechanism when said segment has reached the limit of its motion in either direction and a friction clutch between said motor and said segment.

7. In an electric circuit breaker, the combination with a rotary motor and fixed and movable contacts; of a segment which is actuated by said motor when rotated in one direction and which actuates said motor when it moves in the opposite direction, means actuated by said segment for making and breaking electrical connection between said movable contacts and said fixed contacts and a clutch between said motor and said segment.

8. In an electric circuit breaker, the combination with a motor, its armature shaft, fixed contacts, movable contacts, a segment, and means connecting said movable contacts and said segment; of a spring actuated friction clutch mounted on said armature shaft between said segment and said motor whereby when said segment has reached the limit of its movement in either direction, the acquired momentum of said armature is frictionally overcome without shock to the mechanism.

9. In an electric circuit breaker, the combination with a motor, its armature shaft, fixed contacts, movable contacts, a segment, and means connecting said movable contacts and said segment; of a friction clutch mounted on said armature shaft between said segment and said motor, comprising two fixed collars, a pinion loosely mounted on said shaft next to one of said fixed collars, a loose collar mounted on said shaft contacting with said pinion, and a spring located between said loose collar and the other of said fixed collars, whereby when said segment has reached the limit of its movement in either direction, the acquired momentum of said armature is frictionally overcome without shock to the mechanism.

10. In an electric circuit breaker, the combination with a motor, its armature shaft and fixed contacts; of a pinion mounted on said armature shaft, a gear in mesh with said pinion, a shaft rotated by said gear, a reciprocating bar, a crank connection between said bar and said shaft, contacts carried by said reciprocating bar, and means acting on said bar for breaking electrical connection between said contacts when said motor is deënergized.

11. In an electric circuit breaker, the combination with a motor, its armature shaft and fixed contacts; of a pinion mounted on said armature shaft, a gear in mesh with said pinion, a shaft rotated by said gear, a reciprocating bar, a crank connection between said bar and said shaft, contacts carried by said reciprocating bar, means acting on said bar for breaking electric connection between said contacts when said motor is deenergized, and means mounted on said armature shaft for frictionally overcoming the momentum of said armature shaft after said motor is deënergized.

12. In an electric circuit breaker, an armature, means for causing a movement of said armature, a shaft upon which said armature is mounted, a pinion on said shaft, a segment meshing with said pinion, said segment adapted to have its center of gravity raised by a movement of said armature caused by the action of said means for causing a movement of said armature, movable contacts connected to said segment having a normal and a reverse position, fixed contacts adapted to co-act with said movable contacts when in reverse position, said segment adapted to return said movable contacts to normal position from reverse position.

In testimony whereof, I have hereunto set my hand in the presence of two witnesses.

WINTHROP K. HOWE.

Witnesses:
F. L. Dodgson,
Clarence H. Littell.