J. B. STRUBLE.

RELAY.

APPLICATION FILED FEB. 2, 1910.

988,955.

Patented Apr. 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1,

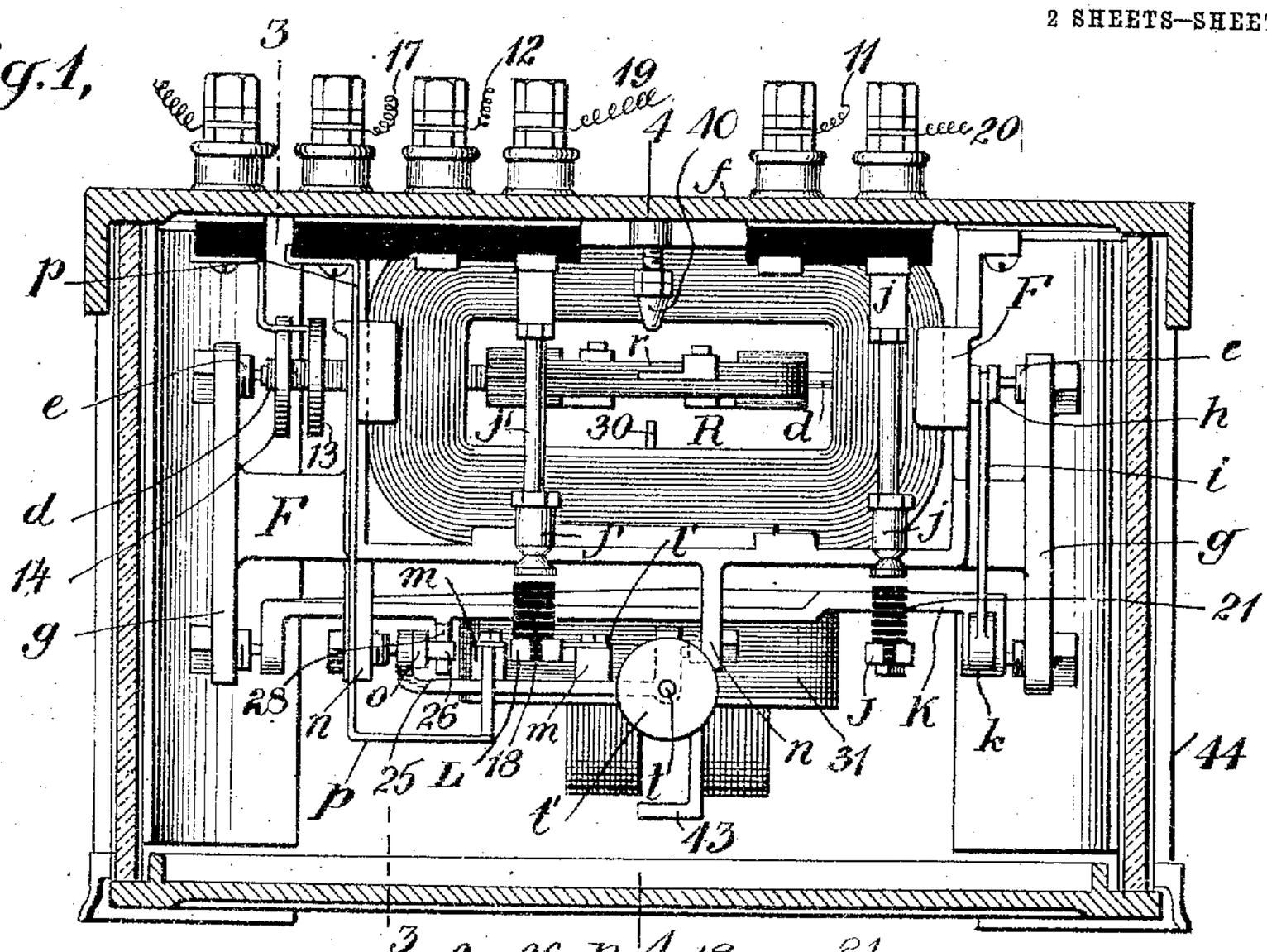
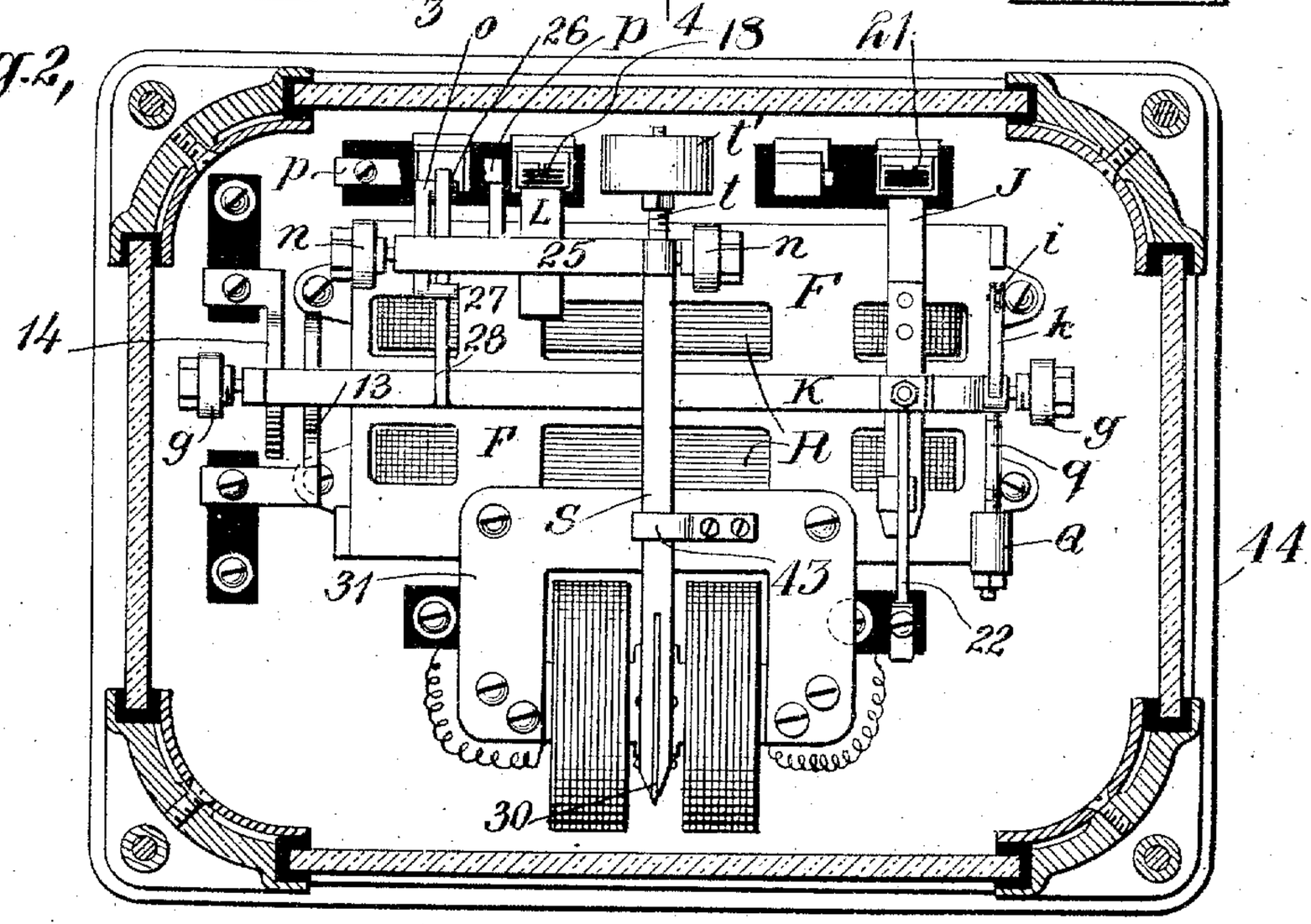


Fig. 2,



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2 SHEETS—SHEET 2.

Fig. 3,

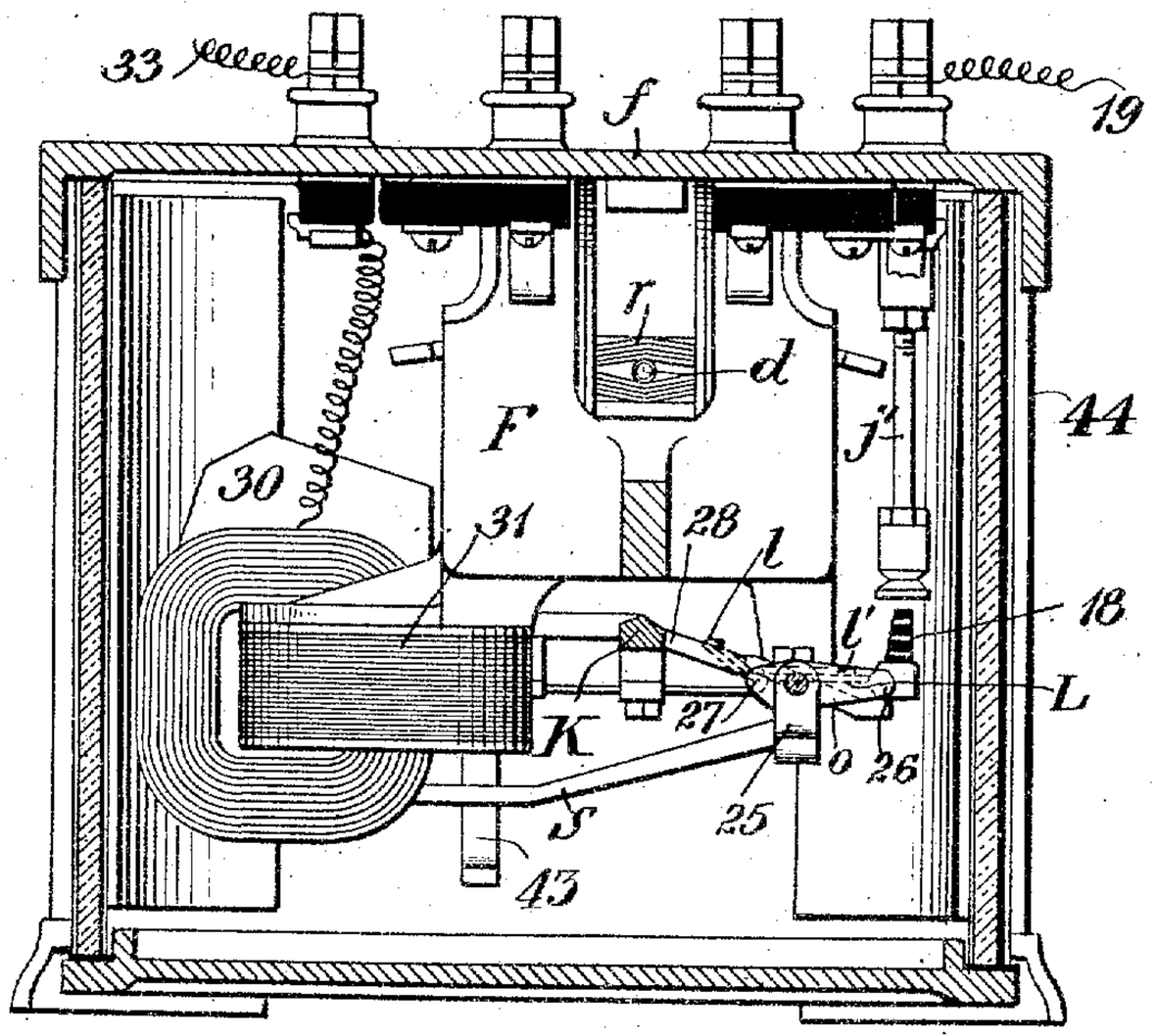
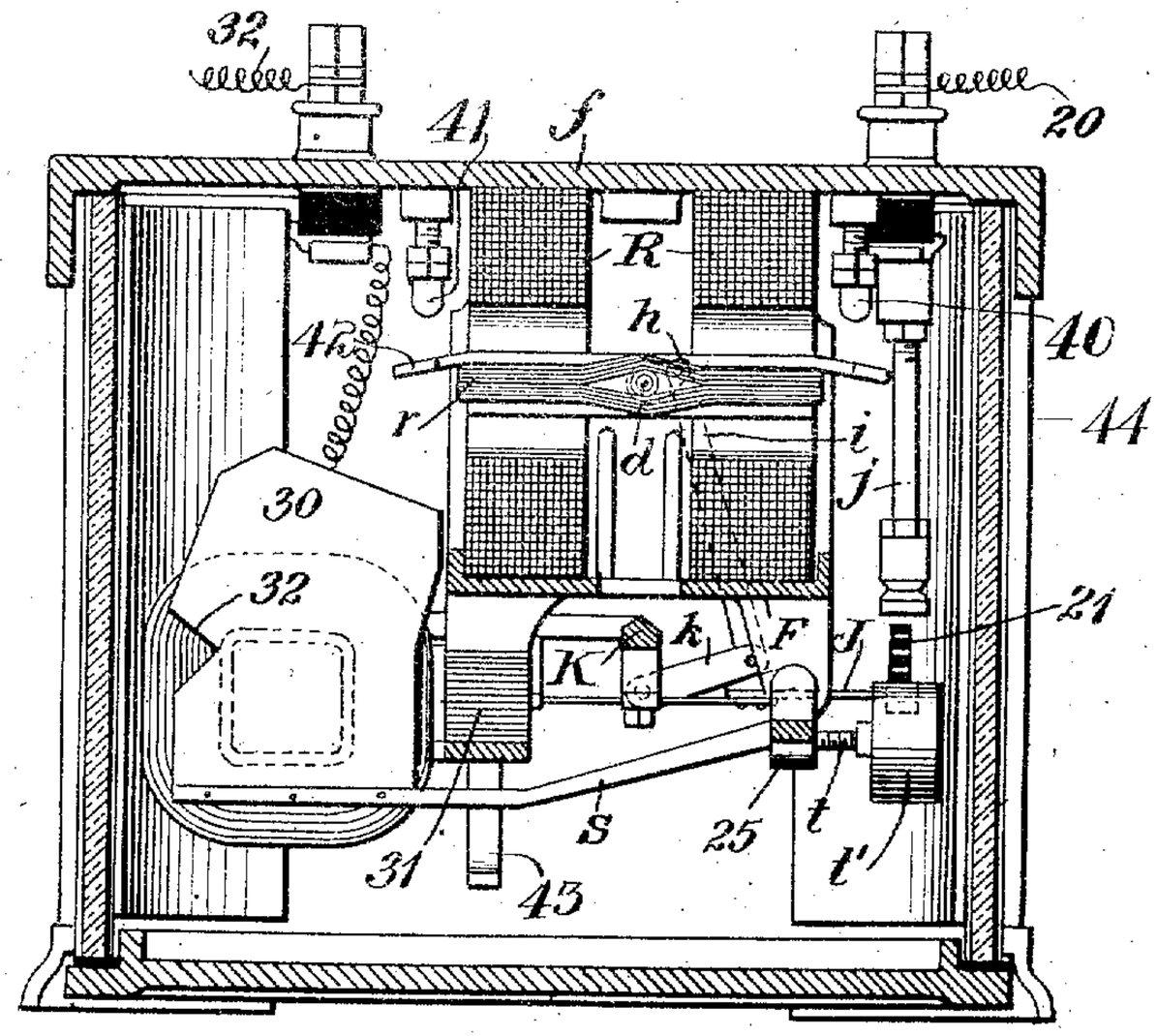


Fig. 4,



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UNITED STATES PATENT OFFICE.

JACOB B. STRUBLE, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RELAY.

988,955. Specification of Letters Patent. Patented Apr. 4, 1911.

Original application filed July 24, 1909, Serial No. 509,396. Divided and this application filed February 2, 1910. Serial No. 541,474.

To all whom it may concern:

Be it known that I, JACOB B. STRUBLE, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to slow release relays adapted for use in connection with signaling systems for railways.

It is particularly adapted for use in polarized or wireless track circuit systems of the type described and claimed in my co-pending application, Serial No. 509,396, filed July 24th, 1909, although its use is not so restricted.

The present application is a division of my application, Serial No. 509,396, filed July 24th, 1909.

I will describe a relay embodying my invention and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of a slow release relay embodying my invention. Fig. 2 is a bottom plan view, partly in section, of the relay shown in Fig. 1. Fig. 3 is a section on the line 3—3 of Fig. 1, and Fig. 4 is a similar view on the line of 4—4 of Fig. 1.

Similar reference characters designate similar parts throughout the several views.

Referring now to the drawings, the reference character R designates field coils of the relay which are supported by a frame indicated generally by F, this frame being in turn supported by a plate *f* forming the top of an inclosure 44 for the relay. The frame F is so formed that it also supports other parts of the mechanism, as will hereinafter appear. An armature *r* comprising a coil of wire is supported by a shaft *d* pivoted in bearings *c*, adjustably secured in arms *g* forming part of the frame F. The shaft *d* is insulated from the armature in any suitable manner. The armature winding may be electrically connected with an outside circuit by means of coils 13 and 14 of copper ribbon or other suitable material connected with suitable terminal posts. The armature and shaft are adapted to rock in each direction from the intermediate position shown in the drawings, and these rocking movements are limited by the engagement of a plate 42 carried by the armature with stationary stops 40 and 41. The shaft *d* is provided at one end with a crank arm *h* which is connected by a link *i* with an arm *k* of a rocking frame K which is pivoted in the lower ends of the arms *g*. This frame K carries a spring arm J to which a contact 21 is secured, and which is adapted to engage the end of a metal rod *j* to which the wire 20 is electrically connected. This contact 21 may be electrically connected with an outside circuit by means of a flexible conductor 22 connected with a suitable terminal post. Another contact 18 is carried by a spring arm L which is secured at its rear end to a rear projection *l* of a plate *l'* which is supported on short porcelain posts *m* or any other form of insulations, secured to a lever 25 pivoted in arms *n*, *n*, secured to the frame F. The lever 25 has a part *o* rigidly secured to it and which carries two pins which constitute projections 26 and 27 which are adapted to be engaged by an arm 28 rigidly secured to the rocking frame K, which is operated by the movement of the armature *r*. The contact 18 is adapted to engage a metal rod *j'* to which wire 19 is electrically connected. An electrical conductor designated by *p*, which may be in the form of a copper ribbon or other flexible conductor, connects the contact 18 with the wire 17. Extending from the frame K in a direction opposite to the arm *k* is an arm or rod *q* on which a weight Q is adjustably mounted. This weight Q is intended to balance the parts and hold them in their intermediate positions, that is with both contacts 18 and 21 disengaged as indicated in Fig. 1 in which position the armature *r* is deënergized.

When the armature *r* is energized it will rock in one direction or the other, depending on the polarity of current which energizes it and will rock the frame K correspondingly. No matter which way the armature *r* and the frame K rock, the contact 18 will be closed. If they rock in one direction the arm 28 will engage pin 26 and lift it, and if in the opposite direction the arm 28 will engage pin 27 and depress it, both movements having the same effect upon con-

tact 18. It is, however, only when the armature r and frame K rock to cause the arm 28 to engage the pin 26 that the contact 21 will be closed.

Referring to my co-pending application, Serial No. 509,396, showing a railway signaling system for which this relay is adapted, it will be seen that when the pole changers operate there is a short period when the current is cut off from the armature r, during which time the armature passes through its intermediate position. The ordinary effect of this would be to open contact 18 for an instant and so let the home signal go to danger. To prevent this I provide a means for retarding the movement of the contact 18, comprising a metallic vane 30 carried by an arm S projecting rearwardly from the lever 25, which vane moves in the magnetic field of a magnet 31. The lever 25 is also provided with an arm t projecting in the opposite direction and on which a weight t' is adjustably secured, which weight serves as a counter-balance to the arm S and vane 30. As here shown the magnet 31 is an electromagnet, but I do not desire to limit myself to this specific type of magnet. When an electromagnet energized by alternating current is used, the vane 30 is preferably provided with a V-shaped notch 32 in the front edge thereof. The inner point of this notch, when the armature r is deënergized, is substantially opposite the top surface of the iron core of the magnet 31, while when the armature is energized and has rocked in either direction the point is substantially opposite the bottom surface thereof, and the vane is held in such position as long as the armature is energized.

In order to illustrate the purpose of the notch 32, assume for example an alternating current magnet without shading coils, and a symmetrical disk of aluminum placed with its center directly over the center of the polar face. Then if magnetic flux due to alternating current passes through this disk there will be no tendency of the disk to shift in either direction. But if the center of the disk is not coincident with the center of the pole face, the disk as a whole tends to shift farther away from the pole-piece in the direction of a line passing through the center of the disk and the center of the pole face. In other words, the eddy currents produced in the disk have a repelling effect upon the magnetic field and tend to move away from it; and if more of the material of the disk is on one side of the center of the pole face than the other, more eddy currents will be in a position corresponding to the center of the disk and hence tend to force the disk away from the poles. Thus in the case of the vane 30, if the notch 32 were not present the vane when in the position shown in the drawing would tend to move upward and if in its lowest position would tend to move downward and so would disturb the operation of the relay. But with the notch 32 cut in the vane, it serves to cut out a certain amount of the eddy currents and while the vane will still have a tendency to move downward from its lowest position, this tendency will not be strong enough to overcome the action of the weight t' when the armature r assumes its intermediate position. But the vane will exert a retarding action on the downward movement of the weight and consequently on the downward movement of the contact 18. Any tendency of the vane to move above the position shown in the drawings will be restrained by upward pressure of the arm 28 on the pin 26, and the downward movement of the vane may be limited by means of a stop 43.

A means for assisting the vane to retard the disengagement of the contact 18 consists in arranging the spring arm L which carries the contact 18 to be deflected. This spring arm is below the plate l' and is secured to it only at its rear end. The plate l' being rigidly secured to the lever 25 will move as long as the latter does but as soon as the contact 18 engages the end of rod j' the movement of the contact will cease and the front edge of the plate l' will move away from the spring arm L and the latter will deflect slightly. The parts are so arranged that the contact 18 engages the end of rod j' before the lever 25 completes its movement. Assuming now the armature r becomes deenergized, the weights Q and t' tend to restore the parts to their intermediate position, but the vane tends to retard the movement of lever 25 which accordingly is comparatively slow and as the lever 25 and plate l' can have some movement before the spring arm L will straighten out or resume its normal position relatively to the plate, there will be time for the armature to reverse its position before the contact 18 will open.

In case of the magnet 31 being a permanent magnet, or an electromagnet energized by direct current, the notch 32 in vane 30 would be unnecessary, for in these cases the vane 30 would act in the well-known manner to resist movement owing to the eddy currents which are set up in a metallic vane when it moves in a constant magnetic field. The magnetic field will set up no eddy currents in the vane while the vane is quiet, hence no unbalancing and no tendency to move will result.

Having thus described my invention, what I claim is:

1. In a relay, the combination of an armature having movement to two positions, a movable contact, mechanism interposed between the armature and the contact and operated by the armature for closing the

contact when the armature moves to either of the said positions; and a retarding device for holding the contact closed while the armature moves from one of said positions to the other.

2. A relay having its field and armature energized by currents of changeable relative polarity, combined with two movable contacts, mechanism interposed between said contacts and the armature, and operated by the armature for closing one contact when the armature is influenced by current of either polarity, and for closing the other contact only when the armature is influenced by current of predetermined polarity.

3. A relay having its field and armature energized by currents of changeable relative polarity, combined with two movable contacts, mechanism interposed between the armature and the contacts and operated by the armature for closing one contact when the armature is influenced by current of either polarity and for closing the other contact only when the armature is influenced by current of a predetermined polarity, and means for retarding the opening of the first mentioned contact during the period necessary to effect a change in the polarity of the current.

4. A relay having its field and armature energized by currents of changeable relative polarity, combined with two movable contacts, mechanism interposed between the armature and the contacts and operated by the armature for closing one contact when the armature is influenced by current of either polarity and for closing the other contact when the armature is influenced by current of a predetermined polarity, and means for retarding the opening of the first mentioned contact during the period necessary for changing the polarity of the armature current, said means comprising a magnet and a vane connected to the contact and extending between the poles of the magnet.

5. A relay having its field and armature energized by currents of changeable relative polarity, combined with two movable contacts, one being carried by a spring arm which deflects when the movable contact engages a fixed contact, mechanism interposed between the armature and said contacts and operated by the armature to close the said contact carried by the spring arm when the armature is influenced by current of either polarity and to close the other contact only when the armature is influenced by current of a predetermined polarity, and means for retarding the movement of part of the mechanism during the period necessary for changing the polarity of its current, whereby the contact carried by the spring arm is prevented from disengaging its fixed contact.

6. In a relay, the combination of an armature having movement to two positions, two movable contacts, mechanism interposed between the armature and the contacts and operated by the armature for closing one contact when the armature moves to either of its said positions and for closing the other contact when the armature moves to only one of its said positions, and a retarding device for holding the first mentioned contact closed while the armature is moving from one of said positions to the other.

7. In a relay, the combination of an armature having movement to two positions, a movable contact, mechanism interposed between the armature and the contact and operated by the armature for closing the contact when the armature moves to either of the said positions; and a retarding device for holding the contact closed while the armature is moving from one of the said positions to the other, said device comprising a magnet and a vane carried by the contact and movable in the magnetic field of the magnet.

8. In a relay, the combination of an armature having movement to two positions, two movable contacts, mechanism interposed between the armature and the contacts and operated by the armature for closing one contact when the armature moves to either of its said positions and for closing the other contact when the armature moves to only one of its said positions, and a retarding device for holding the first mentioned contact closed while the armature is moving from one of said positions to the other, comprising means for producing a magnetic field, and a vane carried by the contact and moving in the magnetic field.

9. In a relay, the combination of an armature having movement to two positions, a movable contact, mechanism interposed between the armature and the contact and operated by the armature, for closing the contact when the armature moves to either of the said positions; and a retarding device for holding the contact closed while the armature is moving from one of the said positions to the other comprising means for producing a magnetic field, and a vane moving with said contact and moving in the magnetic field.

In testimony whereof I have signed my name to this specification in the presence of two subscribed witnesses.

JACOB B. STRUBLE.

Witnesses:

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C. P. HENNINGTON, JR.