F. L. DODGSON.

RELAY.

APPLICATION FILED NOV. 3, 1906. RENEWED JUNE 6, 1908.

920,036.

Patented Apr. 27, 1909.

2 SHEETS—SHEET 1.

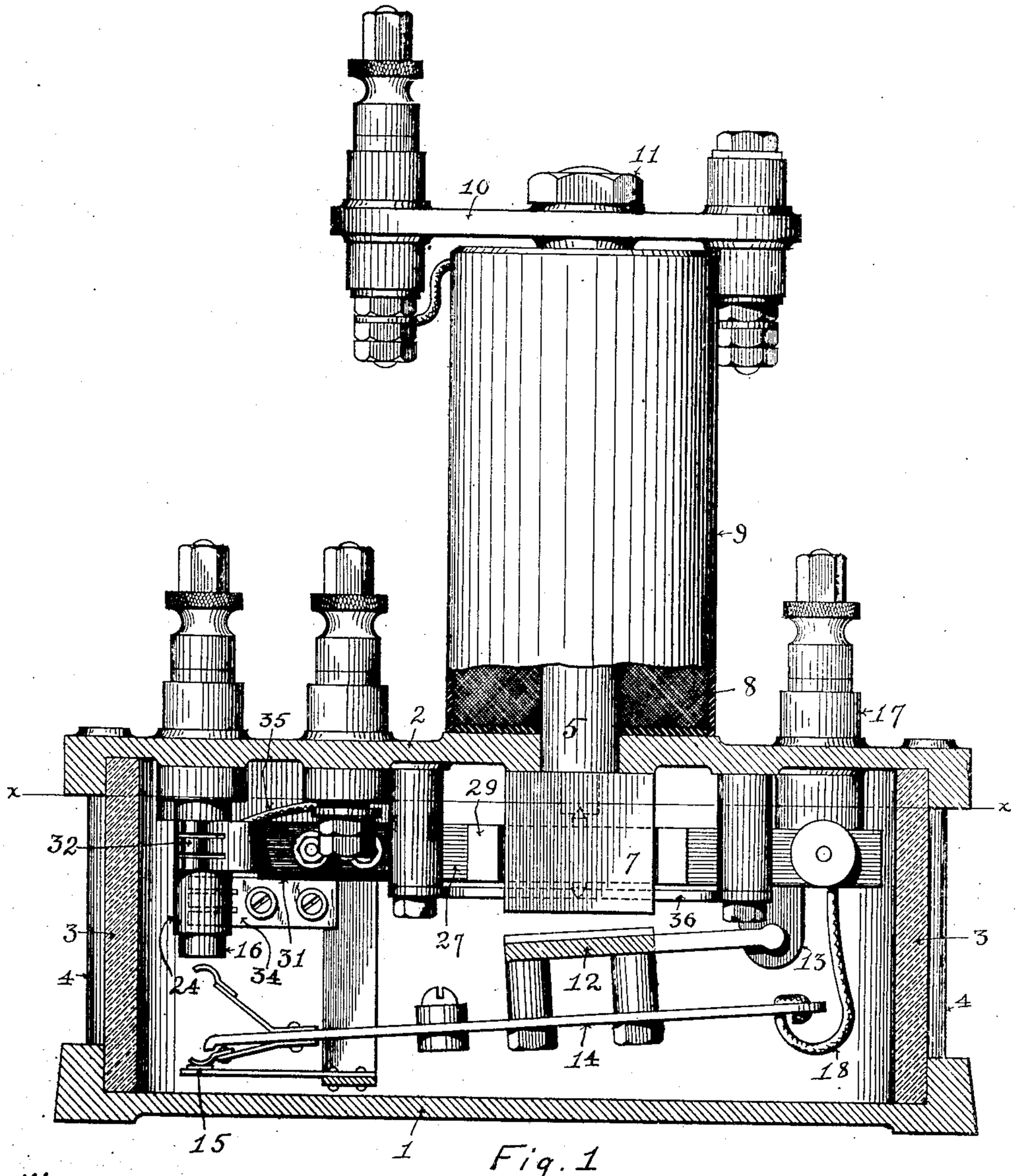

Fig. 1

WITNESSES.

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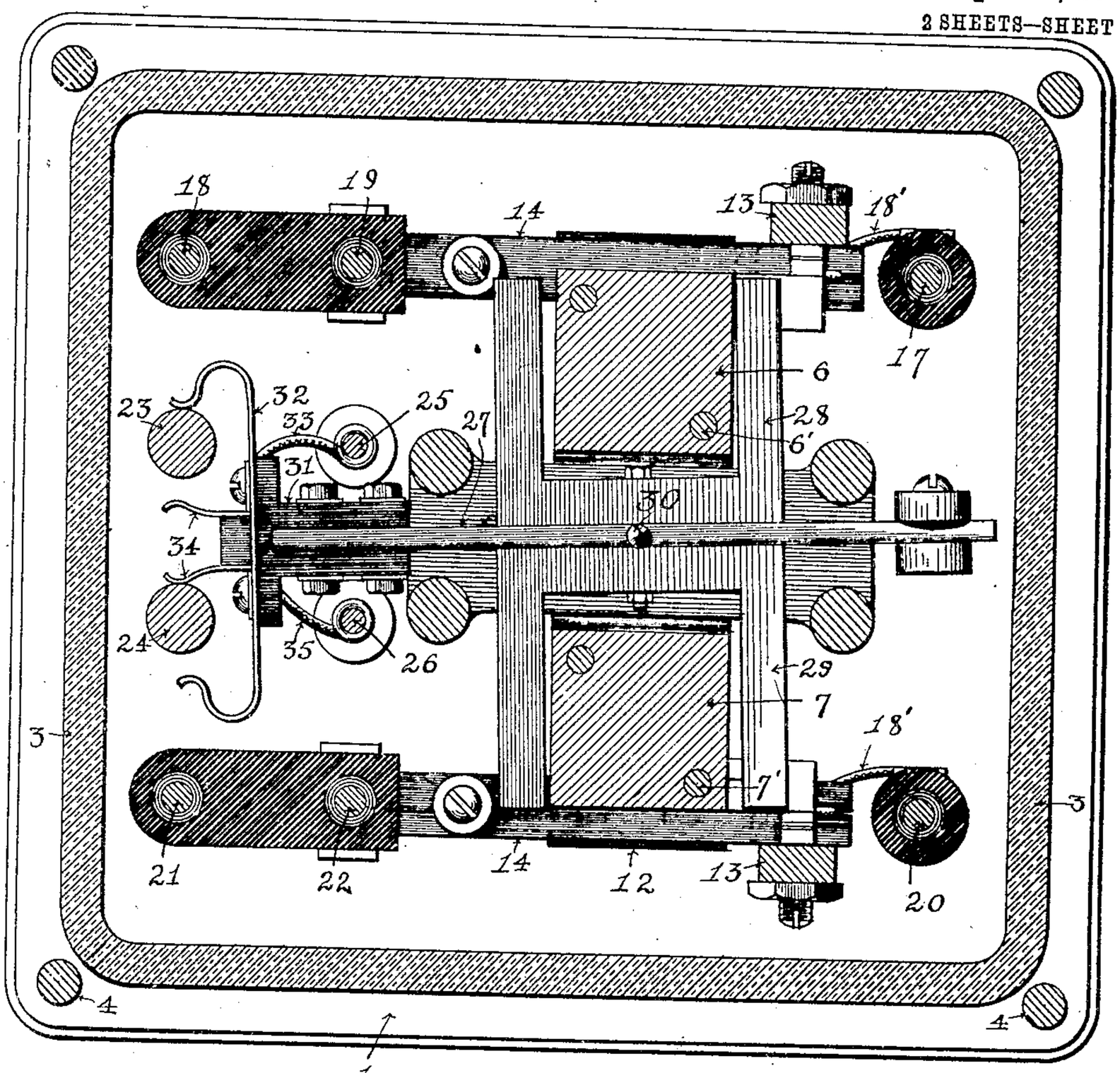

Fig 2.

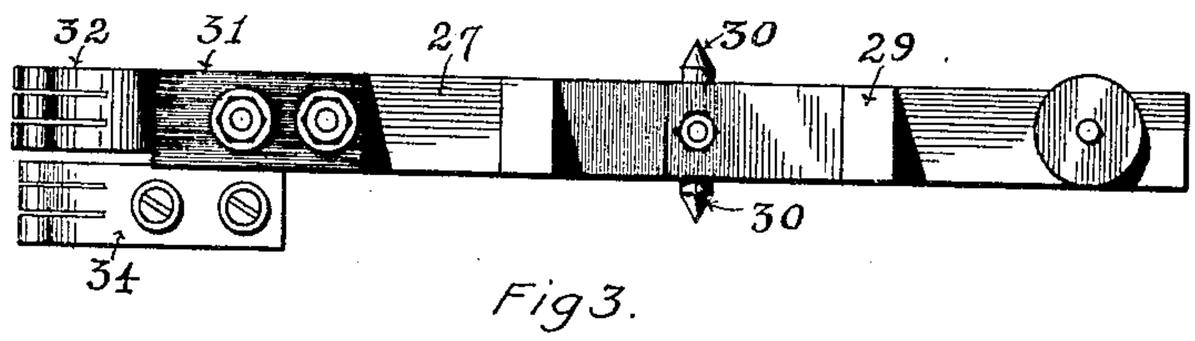

Fig 3.

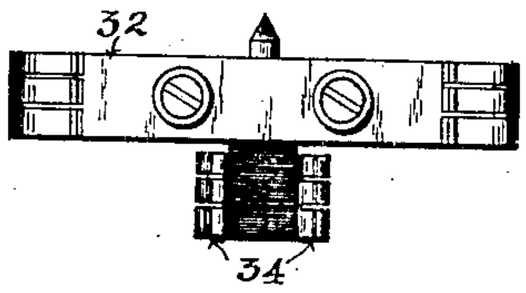

Fig 4.

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UNITED STATES PATENT OFFICE.

FRANK L. DODGSON, OF BUFFALO, NEW YORK.

RELAY.

No. 920,036. Specification of Letters Patent. Patented April 27, 1909.

Original application filed May 17, 1906, Serial No. 317,269. Divided and this application filed November 3, 1906, Serial No. 341,956. Renewed June 6, 1908. Serial No. 437,199.

To all whom it may concern:

Be it known that I, FRANK L. DODGSON, 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 relays, and more particularly to relays of the polarized type employed in railway switching and signaling systems.

The object of my invention is to provide a polarized relay in which certainty of action is insured and in which the loss of magnetic energy is reduced to the minimum.

A further object is to embody in a polarized relay the improvements of my Patent No. 896,809, Aug. 25, 1908, of which this is a divisional application.

Referring to the drawings herewith, Figure 1 is a side elevation, partly in section on the axis of one of the magnet coils. Fig. 2 is a horizontal section on the line *x*—*x* of Fig. 1. Fig. 3 is a side elevation of one of my permanent magnets, my swinging contact arm and contacts. Fig. 4 is an end elevation of the contact arm and contacts.

I will first describe the relay proper. In the drawings I have shown a two-arm, four-contact relay. The housing of the apparatus is made up of a base-plate 1, a carrying-plate 2, and a surrounding glass or other non-conducting body 3. The peripheries of the body 3 are seated within flanges on the plates 1 and 2, and the parts are held together by screws 4. With the use of water-proof cement the housing affords a damp-proof chamber for the working parts of the relay. The magnet cores are made up of cylindrical bodies 5 and rectangular shaped and enlarged ends 6 and 7. The bodies 5 of the cores fit snugly through holes in the carrying-plate 2 and are secured to it by screws 6′, 7′ (see Fig. 2) passing through said plate and threaded into the rectangular ends 6 and 7 on two diametrically opposite corners. The windings 8 and the shells 9 are slipped over the cores 5 and held down firmly by the binding-post 10, which, in turn, is held down by nuts 11 threaded to the upper ends of the cores 5. The yoke 10 carries the binding-posts for the circuit of the magnets.

12 is an armature common to both magnet cores. This armature is pivotally secured to lugs 13 which are secured to the plate 2, and faces the rectangular ends 6 and 7 of the cores. Mounted with but insulated from the armature 12 are contact arms 14, which, when the magnets are deënergized make electrical connection with the back contacts 15 which are electrically connected with the binding-posts 19 and 22; and which, in the energized state of the magnets, make electrical connection with the contacts 16, which are electrically connected with the binding-posts 18 and 21. The inleading wires connect with the binding-posts 17 and 20, which are connected with their respective contact arms 14 by flexible conductors 18.

Having thus indicated the parts and general construction of the relay proper, I will now describe the features of my invention.

Pivotally mounted between the poles 6 and 7 is a non-magnetic arm 27. The pivots 30 on this arm are carried by a lug on the plate 2, shown in broken outline in Fig. 1 and by a plate 36 which is secured to lugs on the plate 2. The arm 27 has thus a limited motion in rotation in a horizontal plane. Rigidly secured to this plate 27 are permanent magnets 28 and 29. These magnets are horse-shoe-shaped, or, perhaps more properly rectangular in form, the inner rectangular area being slightly in excess of the cross-section of the pole pieces 6 and 7 to permit of sufficient swing of the arm 27. At one end of the arm 27 is secured an insulating piece 31 and secured to this piece 31 are contact brushes 32 and 34 insulated from each other.

23 and 24 are contacts connecting with binding-posts on the carrying-plate 2. These contacts 23 and 24 and the contact brushes 32 and 34 are so positioned that when the arm 27 is swung in one direction the brush 32 will make electrical connection with the contact 23 and the brush 34 will make electrical connection with the contact 24; and when the arm 27 is swung in the other direction the brush 32 will make electrical connection with the contact 24 and the brush 34 with the contact 23. From a binding post 25 a flexible conductor 33 connects with the contact brush 32, and from a binding-post 26 a flexible conductor 35 connects with the contact brush 34.

The most important feature of my invention is the means whereby I effect the movement of the arm 27. The permanent magnets are so arranged as regards their polarity

that like poles of both magnets are on the same side of the pole pieces of the electro magnet: that is to say, referring to Fig. 2, if the right hand leg of the permanent magnet 28 is a positive pole then the right hand leg of the permanent magnet 29 would be a positive pole; and naturally the left hand leg of both magnets would be negative poles. Suppose now that current is flowing through electromagnet in the direction which would make the pole piece 6 of negative polarity and the pole piece 7 of positive polarity; the right hand leg of the permanent magnet 28 would therefore be attracted toward the pole piece 6, and likewise the left hand leg of permanent magnet 29 would be attracted toward pole piece 7, and further, the left hand leg of permanent magnet 28 would be repelled from pole-piece 6 and the right hand leg of magnet 29 would be repelled from pole piece 7. The whole tendency therefore of the magnetic effect is to rotate the two permanent magnets in a counter clockwise direction. If now the current in the electro-magnet is reversed so that pole piece 6 becomes a positive polarity and pole piece 7 negative polarity, the direction of all four poles of the permanent magnets would be reversed and the tendency would be to rotate in the clockwise direction. Of course every energization of the magnets, whichever direction of flow may occur in the coils 8, will lift the armature 12 and establish the circuit of the front contacts through the binding posts 18 and 21. By this method of construction and arrangement of the permanent magnets about the magnet poles, leakage and loss of magnetic energy—in previous construction a serious difficulty—is practically eliminated. Moreover, I hereby attain in a polarized relay the same advantages of construction which exist in my relay, above referred to, namely: symmetrical arrangement, increased magnetic efficiency, and supporting all of the working parts on a single plate and housing the same and at the same time permitting of removal and replacement of the magnet coils without disturbance of the adjustment of the working parts.

Having thus described my invention, what I claim is:

1. In combination with the electro-magnet, armature, contact arms and contacts of a relay, a neutral armature, two permanent magnets carried by said neutral armature, pivots carrying said neutral armature and permanent magnets so that said permanent magnets swing in a plane at right angles to the cores of the electro-magnet, said permanent magnets having their polarity so arranged that the magnetic effect of all four poles tends to rotate them in the same direction.

2. In a relay, in combination with the electro-magnet, pole pieces, an armature governed by said magnet, a pole changing arm and contacts and permanent magnets surrounding the three sides of said pole pieces and arranged as to their polarity so that the magnetic effect of all four poles tends to rotate them in the same direction.

3. In a relay in combination with the electro-magnet, pole-pieces, armature and contacts for establishing a circuit or circuits, means for determining the direction of current flow in a circuit, comprising a pole-changer, an arm governing the same, permanent magnets secured to said arm and in the magnetic field of said pole pieces on three sides of said pole pieces and so arranged as to their fixed polarity, that whenever current is sent through the magnet of said relay said armature is moved to establish a circuit or circuits and whereby said pole-changer is moved to establish direction of flow in a circuit in accordance with the direction of flow of current in said electro-magnet.

4. In a relay, in combination with the electro-magnet, armature and contacts for establishing a circuit, means for changing the direction of current flow in a circuit in accordance with the direction of current flow in the relay coils comprising contacts, a pivoted arm and permanent magnets secured to said arm, said permanent magnets lying in the magnetic field of the poles of the relay magnet and upon three sides of the same and arranged so that the magnetic effect of all four poles tends to rotate them in the same direction.

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

FRANK L. DODGSON.

Witnesses:
A. F. DIETRICH,
C. L. YAGER.