

Feb. 3, 1931.

B. LAZICH

1,790,671

ELECTRICAL RELAY

Filed June 28, 1929

4 Sheets-Sheet 1

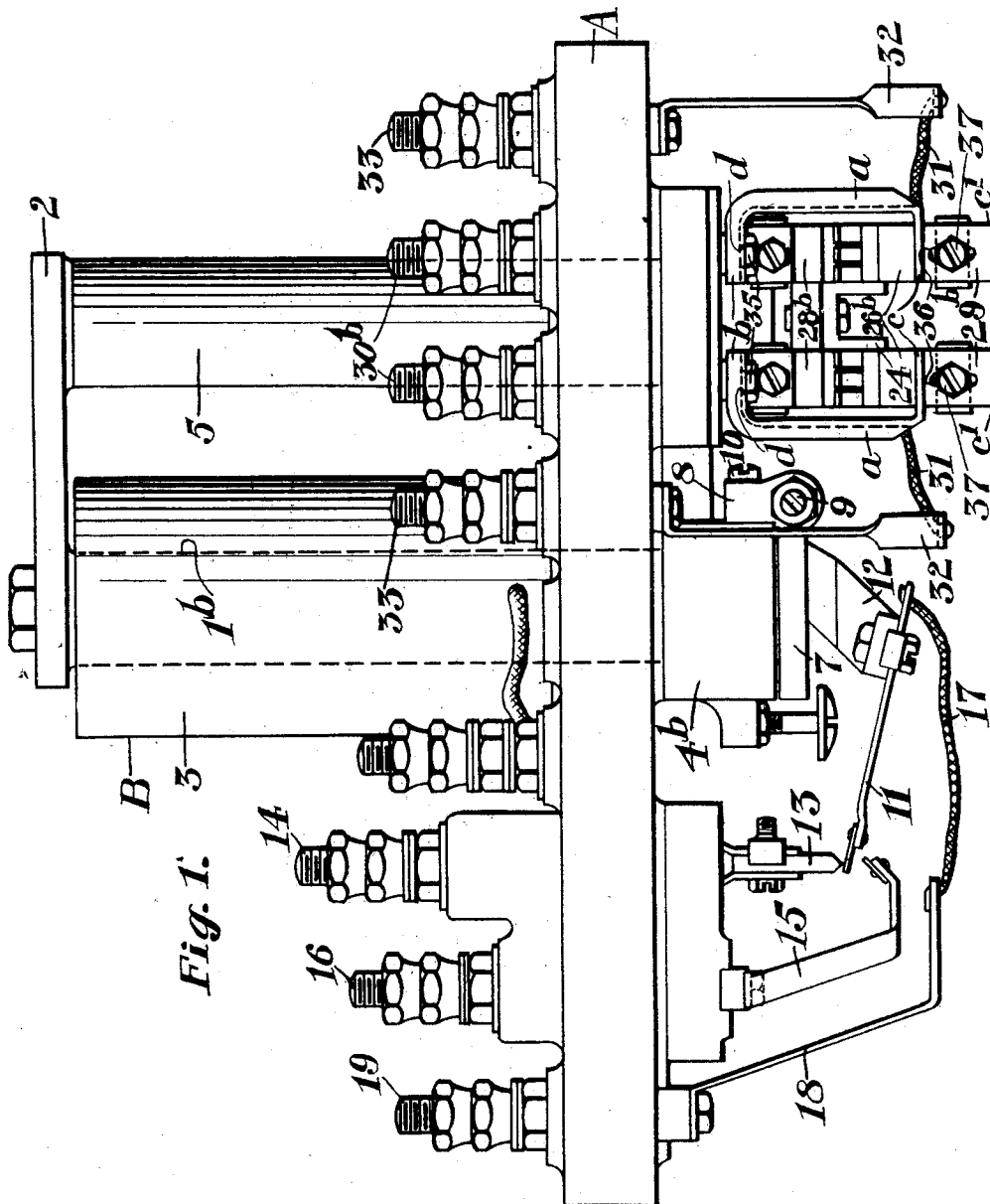


Fig. 1.

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4 Sheets-Sheet 2

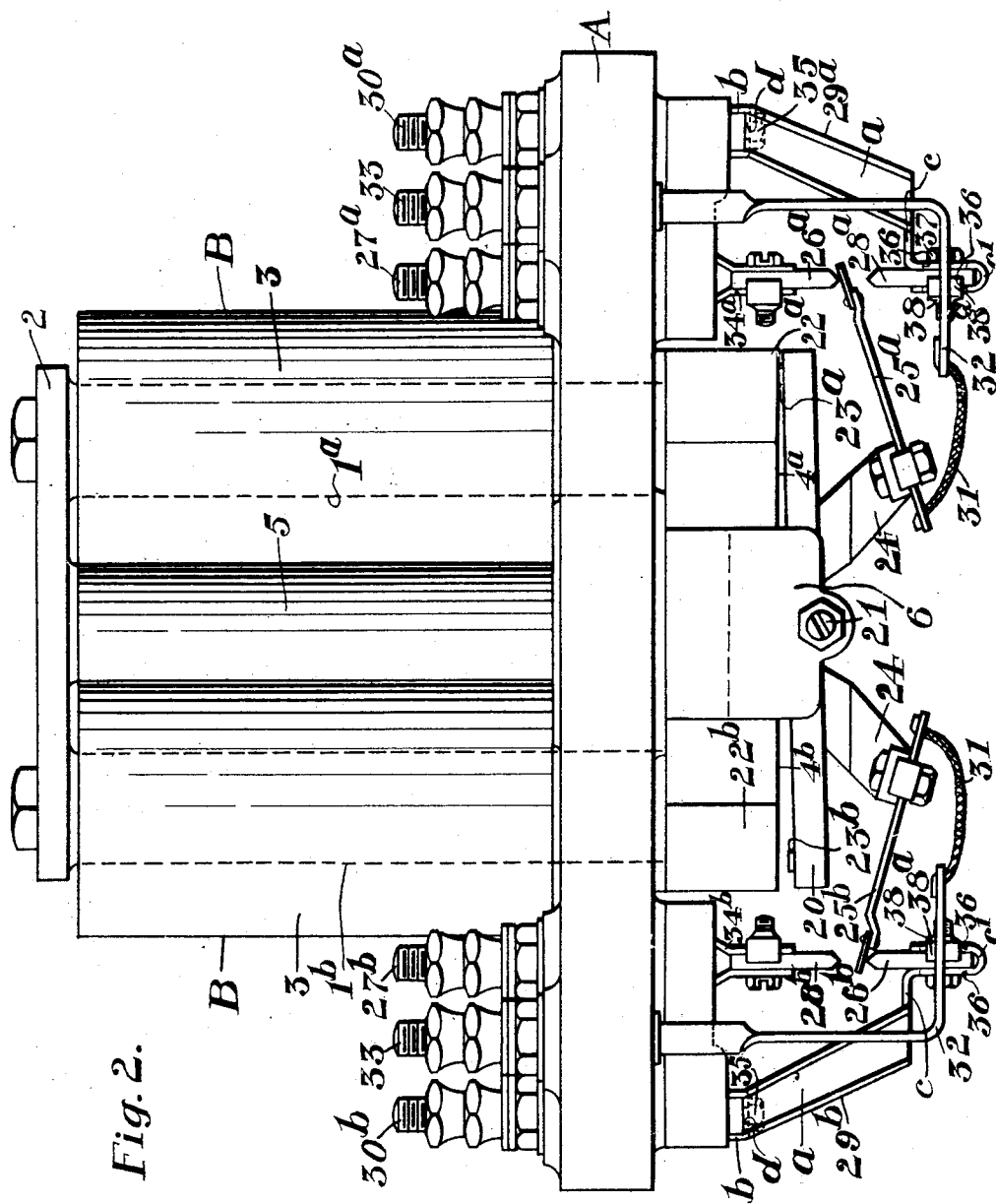


Fig. 2.

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4 Sheets-Sheet 3

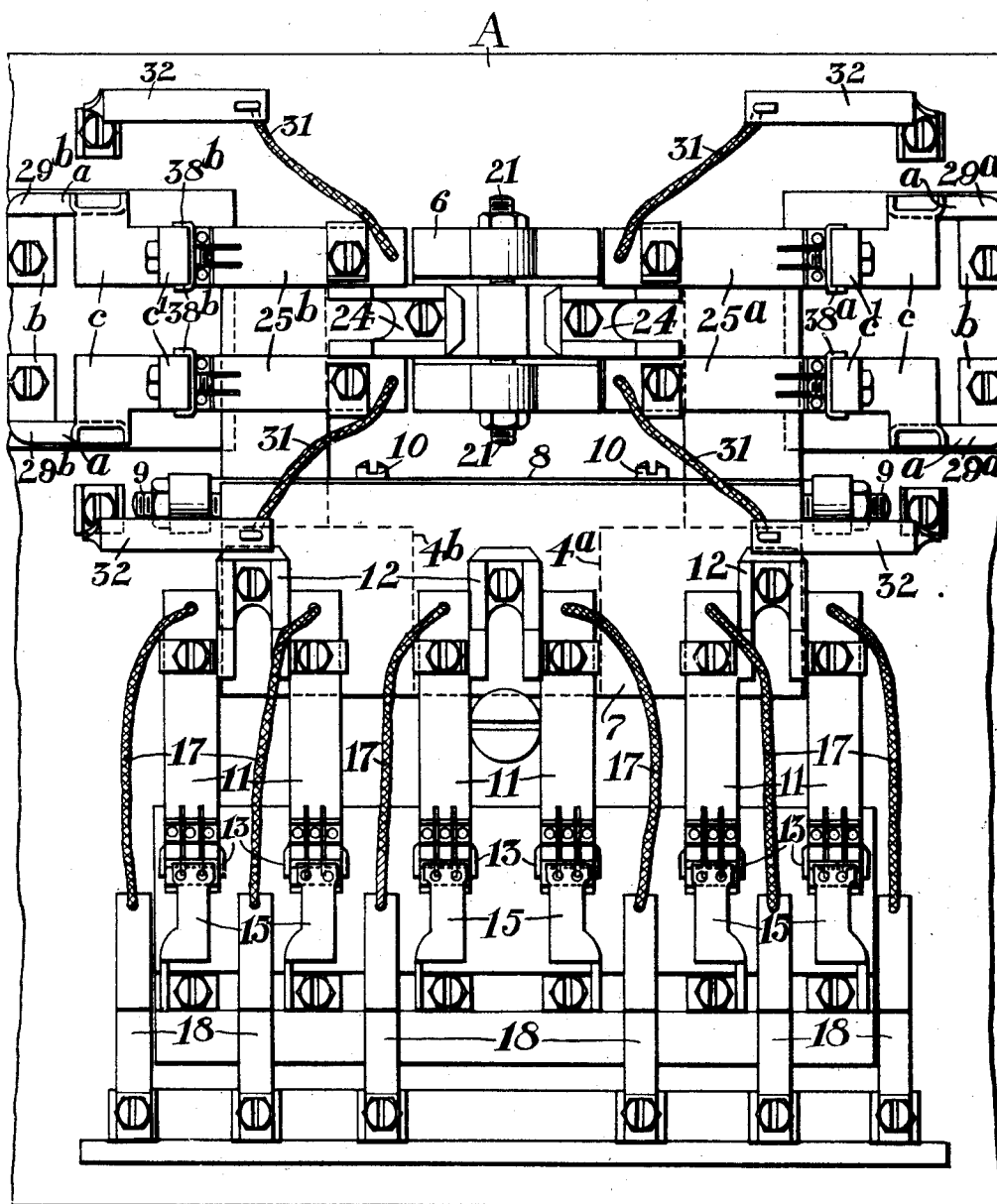


Fig. 3.

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4 Sheets-Sheet 4

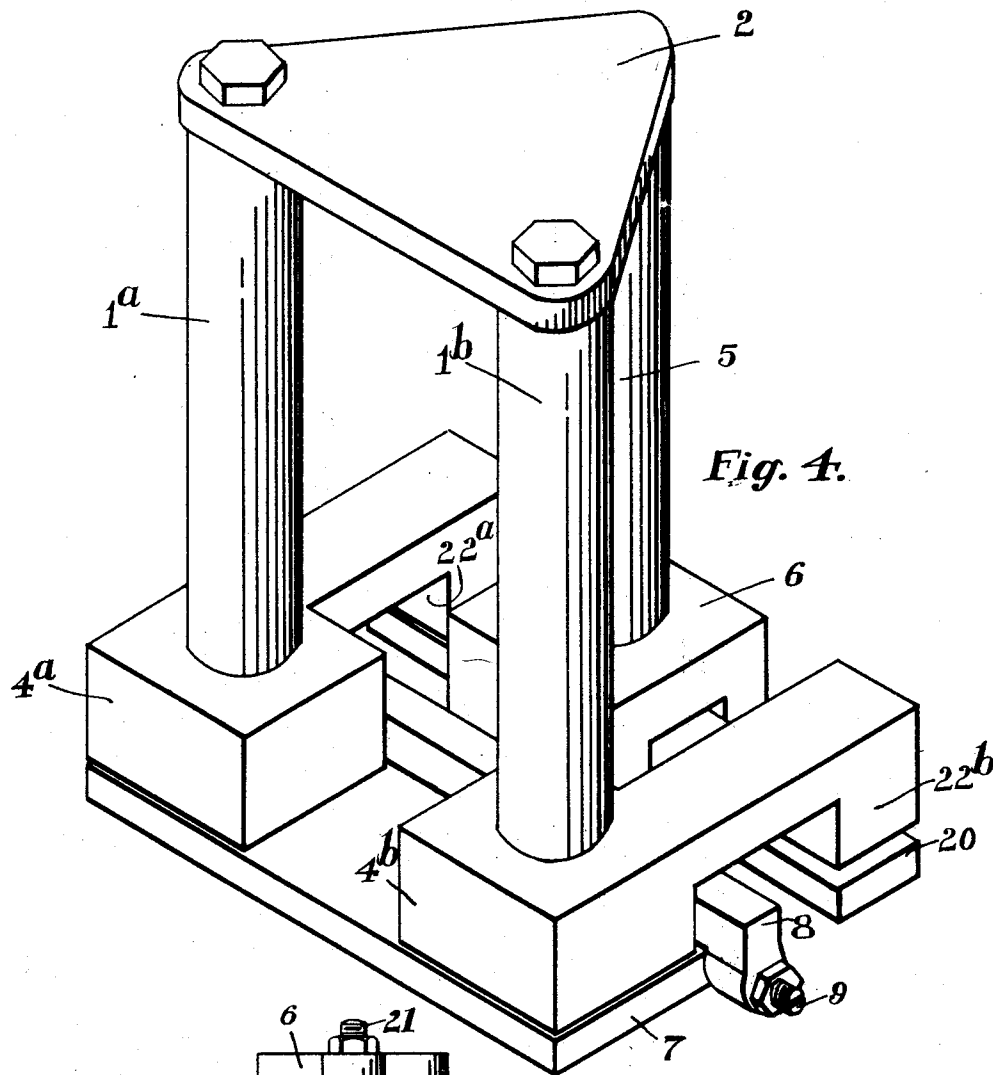


Fig. 4.

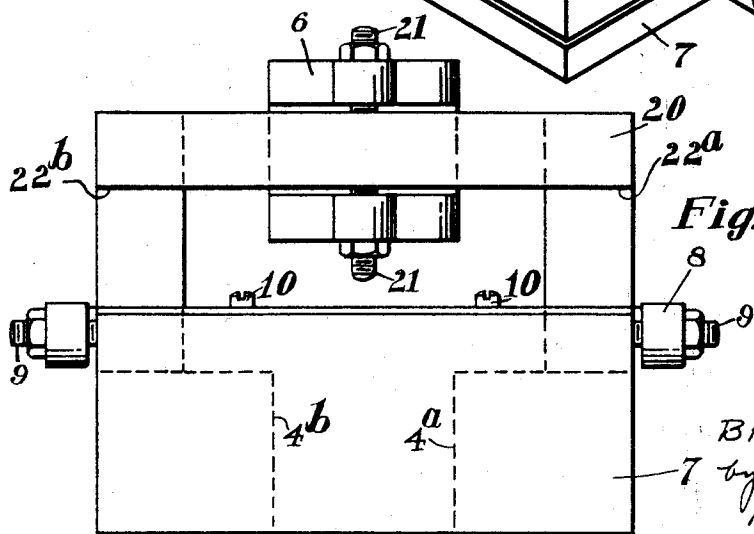


Fig. 5.

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UNITED STATES PATENT OFFICE

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ELECTRICAL RELAY

Application filed June 28, 1929. Serial No. 374,331.

My invention relates to electrical relays, and particularly to polarized relays of the type comprising a neutral armature responsive to the presence and absence of operating current, and a polarized armature responsive to the polarity of the operating current.

I will describe one form of relay embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view showing, in side elevation, one form of relay embodying my invention. Fig. 2 is a view showing the relay shown in Fig. 1 as it appears when viewed from the right in Fig. 1. Fig. 3 is a bottom view of the relay shown in Figs. 1 and 2. Fig. 4 is an isometric view illustrating the magnetic structure of the relay shown in Figs. 1 and 2. Fig. 5 is a bottom view of the apparatus shown in Fig. 4.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1, 2, and 3, the relay comprises a top plate A of suitable insulating material, such as porcelain or bakelite, which serves as a support for all of the operating parts of the relay. Mounted on the top plate A is an electromagnet B, which comprises, as usual, a pair of parallel cores 1^a and 1^b connected at the top by a back strap 2, each core being provided with a winding 3, the windings 3 being connected in series in the usual manner. The cores 1^a and 1^b pass through the top plate A, and terminate, on the underside of the top plate, in enlarged pole pieces 4^a and 4^b, respectively.

Also mounted on the top plate A is a constantly magnetized core 5, here shown as a permanent magnet. The upper end of the core 5 is ground to the same true plane as the underside of the back strap 2 and engages the underside of the back strap 2, while the lower end of the core 5 passes through the top plate A and terminates in a bifurcated pole piece 6 located on the underside of the top plate A. The arrangement of these parts is shown most clearly in Figs. 4 and 5.

The electromagnet B controls a neutral armature 7 of magnetizable material. The armature 7 is pivotally supported by two

pivot pins 9 threaded through the downwardly projecting lugs of a bracket 8 which is attached to the sides of the pole pieces 4^a and 4^b by means of screws 10. With the armature 7 supported in this manner, it will be evident that this armature will move toward or away from the pole pieces 4^a and 4^b in accordance with the pressure or absence of operating current in windings 3 of electromagnet B. It will also be evident that this armature is unaffected by the permanently magnetized core 5 because the pole piece 6 of the permanently magnetized core 5 is spaced a considerable distance from the armature 7.

A plurality of contact fingers 11, here shown as six in number, are attached to the underside of the armature 7 by supports 12 of moulded insulation, each support 12 carrying two contact fingers. Referring to Fig. 1, when electromagnet B is energized so that armature 7 is drawn upwardly toward pole pieces 4^a and 4^b, into the position shown in the drawing, the contact fingers 11 each engage a front contact 13 attached to a terminal post 14 mounted on the top plate A. When electromagnet B is de-energized, however, so that armature 7 drops away from the pole pieces 4^a and 4^b under the influence of gravity, the contact fingers 11 then each engage a back contact 15 attached to a terminal post 16 mounted on the top plate A. Electrical connections are separately made to the contact fingers 11 by means of a plurality of flexible connectors 17, each of which is connected at one end with a contact finger 11 and at the other end with a strap 18 attached to a terminal post 19 mounted on the top plate A.

As best seen in Figs. 2 to 5, inclusive, a polarized armature 20, also of magnetizable material, is pivotally supported at its center between the bifurcations of the pole piece 6 by means of two horizontally disposed pivot pins 21 threaded through the two bifurcations, respectively, and extending into suitable bearings in the armature 20. The pole pieces 4^a and 4^b have integral extensions 22^a and 22^b, respectively, (see Figs. 4 and 5) the pole faces of which overlie the armature 20 at

its opposite ends. The armature 20 is arranged to swing toward one or the other of these pole faces, stops 23^a and 23^b, (Fig. 2), being attached to the armature to prevent the armature from coming into actual contact with the pole faces. It will thus be apparent that the armature 20 is influenced by both the permanently magnetized core 5, and the electromagnet B. The pole face toward which the armature 20 swings depends upon the polarity of the operating current which is supplied to electromagnet B. When the armature is once swung toward one of the pole faces, it will remain in the position which it then occupies until current of the opposite polarity to that which caused it to swing toward the said pole face is supplied to electromagnet B. In other words, de-energizing electromagnet B will not affect the polarized armature 20.

The polarized armature 20, as shown in Figs. 2 and 3, is provided at one end with two contact fingers 25^a, and at the other end, with two similar contact fingers 25^b, but any other number of contact fingers may be provided at either end. Each two contact fingers 25 are fastened to the armature 20 by means of a support 24 similar to the insulating supports 12 by means of which the contact fingers 11 are fastened to the neutral armature 7. When operating current of one relative polarity is supplied to the windings 3 of electromagnet B so that the polarized armature 20 is swung toward the pole face of the extension 22^a of the pole piece 4^a (see Fig. 2), the contact fingers 25^a each engage a normal contact 26^a, and the contact fingers 25^b each engage a normal contact 26^b. When operating current of the opposite relative polarity is supplied to the windings 3 of electromagnet B, however, so that armature 20 is swung toward the pole face of the extension 22^b of the pole piece 4^b, the contact fingers 25^a then each engage a reverse contact 28^a, while the contact fingers 25^b each engage a reverse contact 28^b. The normal contact 26^a and the reverse contact 28^b are fastened, by means of clamps 34^a and 34^b, respectively, to terminal posts 27^a and 27^b mounted on the top plate A. The normal contact 26^b and reverse contact 28^a are fastened by means of supports 29^b and 29^a, respectively, which I will presently describe, to terminal posts 30^b and 30^a mounted on the top plate A. Electrical connections are separately made to the contact fingers 25 by means of flexible connectors 31, each of which is attached at one end to a contact finger 25 and at the other end to a member 32 fastened to a terminal post 33 mounted on the top plate A.

Each support 29 comprises a body portion *a* having an integral upper portion *b* and an integral lower portion *c*. The upper portion *b* is horizontal, as best seen in Fig. 1, and is provided with a hole *d* shown

dotted in Figs. 1 and 2. The hole *d* receives a screw 35 which is screwed into the associated terminal post 30 to fasten the support in place. The body portion *a* extends downwardly from the upper portion *b* in a plane which is substantially at right angles to the plane of the upper portion *b* as best seen in Fig. 1, and has its longer axis inclined at an acute angle with the plane of the upper portion *b* in the direction of the armature 20 as best seen in Fig. 2. Both the upper portion *b* and the body portion *a* are preferably channel-shaped in order to increase the rigidity of the support. The lower portion *c* extends horizontally toward the armature 20, with its axis at right angles to the axis of the upper portion *b*, as best seen in Fig. 2. The end of the lower portion *c* is bent to form a substantially U-shaped stirrup *c*¹ which receives the associated contact 26 or 28, as the case may be. To permit vertical adjustment of the associated contact, the vertical sides of the stirrup *c*¹ are provided with registering elongated openings 36, the openings in one side of the stirrups 29^b being partly visible in Fig. 1. A screw 37 passes through these openings and through a suitably located hole in the associated contact, and is screwed into a strap 38. The strap 38 has ears 38^a which engage the edges of the contiguous side of the stirrup *c*¹ to prevent the strap from turning.

It will thus be apparent that I have provided a polarized relay in which both the neutral and polarized armatures are pivotally supported in a plane which is parallel to the plane of the top plate A, and which as here shown extends at right angles to the plane of the cores 1^a and 1^b. It will also be apparent that I have provided a polarized relay in which the neutral armature 7 is responsive to the presence and absence of operating current in electromagnet B, and not to the polarity of the operating current in electromagnet B, while the polarized armature 20 is responsive to the polarity of the operating current supplied to electromagnet B, and not to the presence or absence of the operating current in electromagnet B.

One advantage of a relay embodying my invention is that the pivot pins which support the neutral armature and the pivot pins which support the polarized armature are located in such positions that after the relay is assembled, they may be readily inspected at any time to locate dirt or other foreign material.

Another advantage of a relay embodying my invention is that the air gaps for both armatures are visible when the relay is assembled.

Still another advantage of a relay embodying my invention is that the same type of contacts and pivot pins may be used for both the neutral and polarized armatures.

A further advantage of a relay embodying

my invention is that since the polarized armature is pivotally supported in a plane which extends parallel to the plane of the top plate, the size of the polarized armature is not limited, and any desired number of polar contacts may therefore be easily provided.

Although I have herein shown and described only one form of relay embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A relay comprising an electromagnet having two parallel cores connected together at one end by a back strap and each provided at the other end with an enlarged pole piece, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized core having one end in engagement with said back strap, and a second armature polarized by said constantly magnetized core and pivotally supported in a plane extending at right angles to said cores for swinging motion toward one or the other of said enlarged pole pieces.

2. A relay comprising a supporting plate, an electromagnet mounted on said plate and having two parallel cores extending through said plate, said cores being connected together at one end by a back strap and each provided at the other end with an enlarged pole piece, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized core mounted on said plate and having one end in engagement with said back strap, and a second armature polarized by said constantly magnetized core and pivotally supported in a plane extending parallel to the plane of said plate for swinging motion toward one or the other of said enlarged pole pieces.

3. A relay comprising a plate, an electromagnet mounted on said plate and having two parallel cores extending through said plate, said cores being connected together at one end by a back strap and each provided at the other end with an enlarged pole piece, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized core extending through said plate and having one end in engagement with said back strap and the other end provided with a bifurcated pole piece, and a second armature pivoted between the bifurcations of said bifurcated pole piece in a plane extending parallel to the plane of said plate for swinging motion toward one or the other of said pole pieces.

4. A relay comprising an electromagnet

having two vertically disposed parallel cores connected together at one end by a back strap and each provided at the other end with an enlarged pole piece, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized core having one end in engagement with said back strap, and a second armature polarized by said constantly magnetized core and arranged to swing about a horizontal axis toward one or the other of said pole pieces in response to current of one relative polarity or the other in said windings.

5. A relay comprising a top plate, an electromagnet mounted on said top plate and having two vertically disposed parallel cores connected together at their upper ends by a back strap and each provided at their lower end with an enlarged pole piece located underneath said top plate, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized vertically disposed core mounted on said top plate and having one end in engagement with said back strap and the other end terminating in a bifurcated pole piece located underneath said top plate, two horizontal pivot pins one screwed through each bifurcation of said bifurcated pole piece, and a second armature pivotally supported on said pivot pins and arranged to swing toward one or the other of said enlarged pole pieces in response to current of one relative polarity or the other in said windings.

6. A relay comprising a top plate, an electromagnet mounted on said top plate and having two vertically disposed parallel cores connected together at their upper ends by a back strap and each provided at their lower end with an enlarged pole piece located underneath said top plate, two windings one on each core, a first armature responsive to the presence and absence of current in said windings, a constantly magnetized vertically disposed core mounted on said top plate having one end in engagement with said back strap and the other end terminating in a bifurcated pole piece located underneath said top plate, two horizontal pivot pins one screwed through each bifurcation of said bifurcated pole piece, two integral extensions one on each of said enlarged pole pieces, and a second armature pivotally supported on said pivot pins and arranged to swing toward one or the other of said integral extensions.

7. A relay comprising a top plate, an electromagnet mounted on said top plate and having two parallel cores extending through said top plate, said cores being connected together at one end by a back strap and each provided at the other end with an enlarged pole piece, two windings one on each core, a first armature responsive to the presence

and absence of current in said windings, a constantly magnetized core mounted on said top plate and having one end in engagement with said back strap, and a second armature polarized by said permanently magnetized core and pivotally supported intermediate its ends in a plane extending parallel to the plane of said top plate for swinging motion toward one or the other of said enlarged pole pieces.

8. A relay comprising a horizontal top plate, an electromagnet mounted on said top plate and comprising two vertically extending cores connected together at their upper ends by a back strap, each core being provided at its lower end with an enlarged pole piece located on the underside of said top plate, windings on said cores, a neutral armature responsive to the presence and absence of current in said windings, a constantly magnetized vertically extending core mounted on said top plate and having its upper end ground to the same true plane as the underside of said back strap and engaging the underside of said backstrap, said core being provided on its lower end with a bifurcated pole piece located on the underside of said top plate, two horizontally disposed pivot pins, one screwed through each bifurcation of said bifurcated pole piece, two extensions one integral with each of said enlarged pole pieces, a polarized armature pivotally supported at its center on said pivot pins for swinging motion in a vertical plane toward the pole face of one or the other of said extensions, said polarized armature being provided with stops to prevent said armature from engaging the pole faces of said extensions, and contacts controlled by both said armatures.

9. A relay comprising an electromagnet having a back strap and two spaced pole pieces, a constantly magnetized core having one end engaging said back strap and the other end terminating in a bifurcated pole piece located between said enlarged pole pieces, a magnetizable armature pivotally supported intermediate its ends in said bifurcated pole piece for swinging motion in the plane of said permanently magnetized core and having the ends of said armature adjacent said two enlarged pole pieces, respectively, and contact mechanism controlled by said armature.

In testimony whereof I affix my signature.
BRANKO LAZICH.