No. 815,822. PATENTED MAR. 20, 1906.

R. HERMAN.

RELAY.

APPLICATION FILED MAR. 28, 1904.

2 SHEETS—SHEET 1.

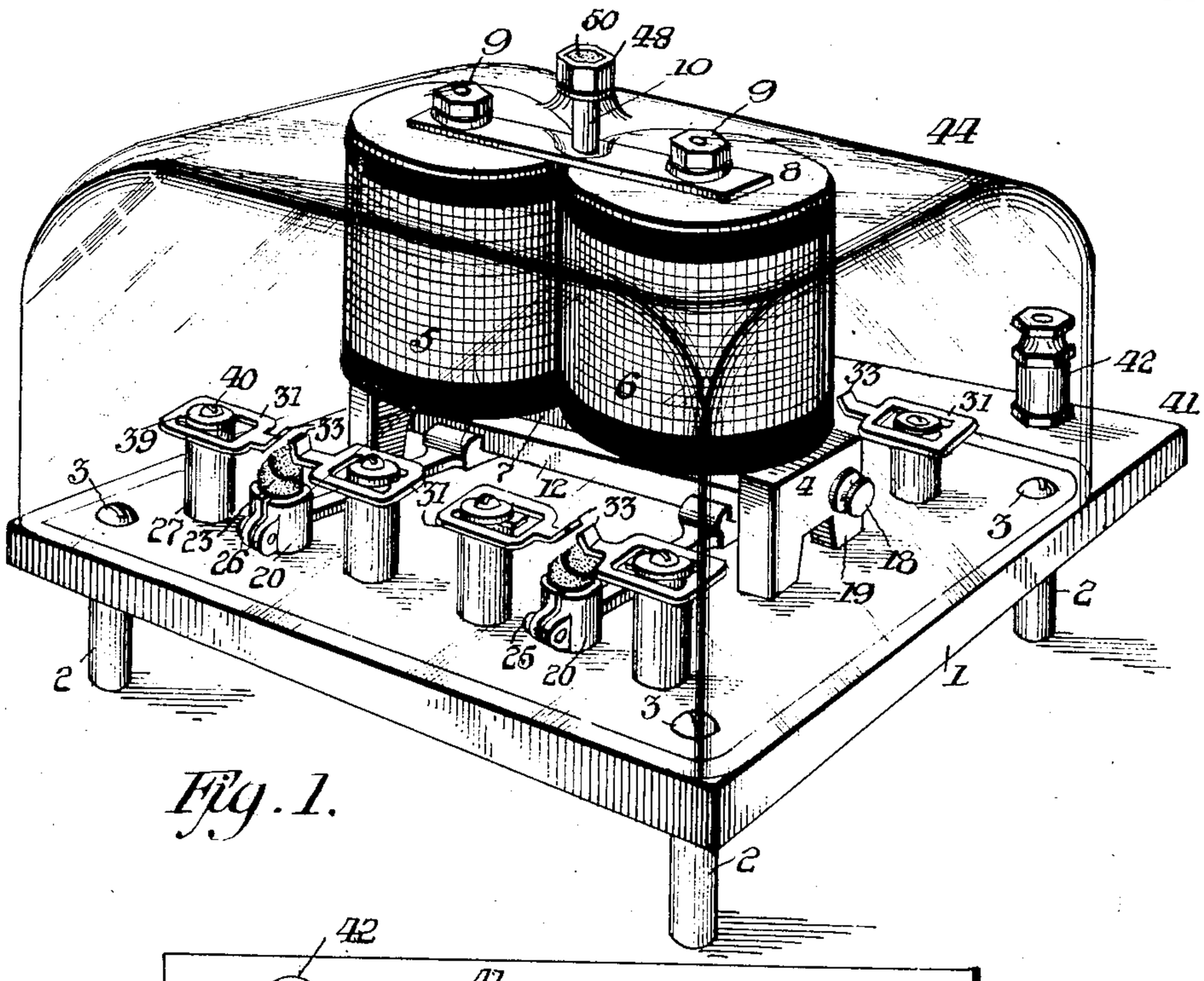


Fig. 1.

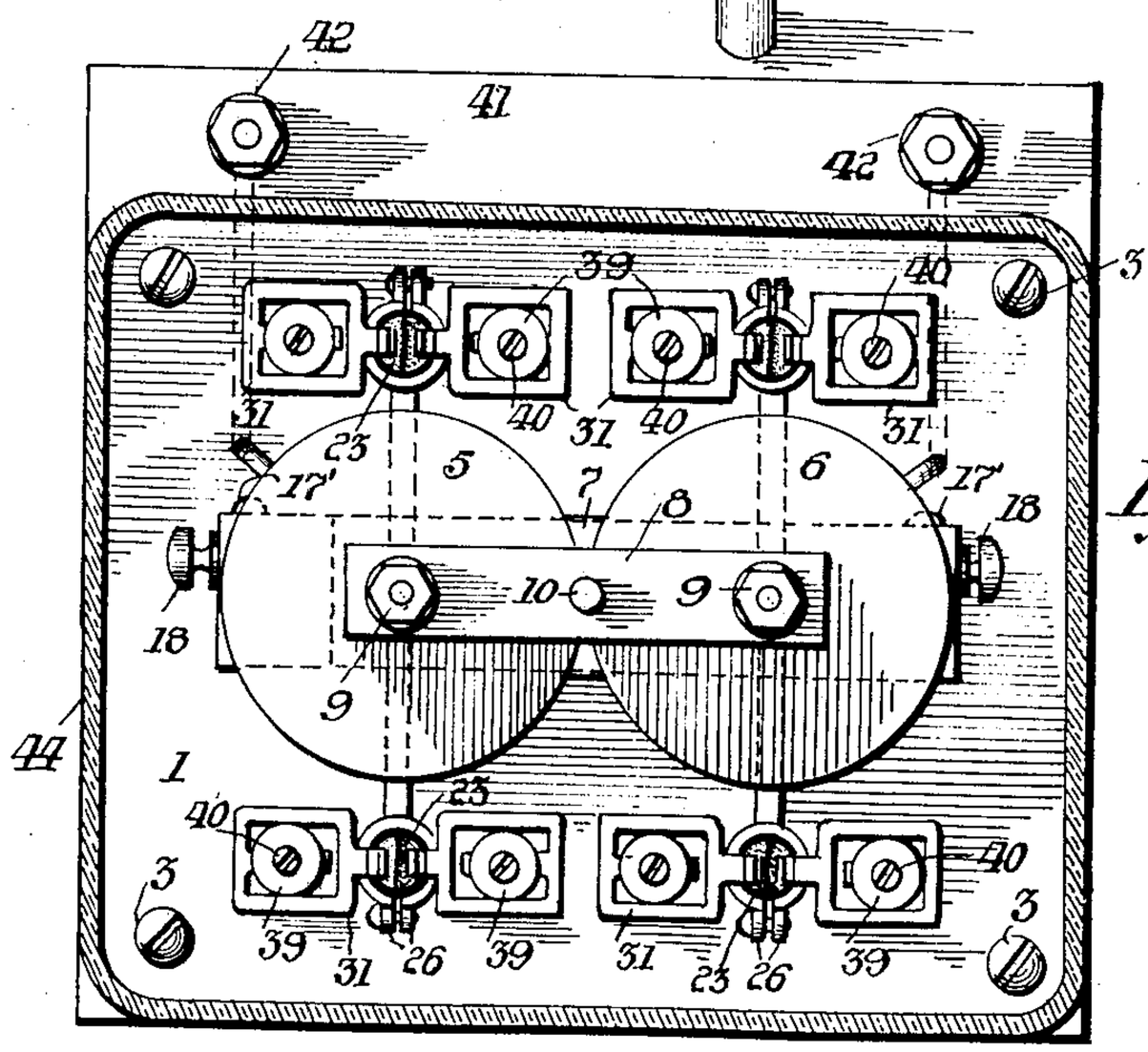
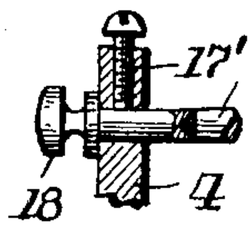


Fig. 2.

Fig. 7.



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2 SHEETS—SHEET 2

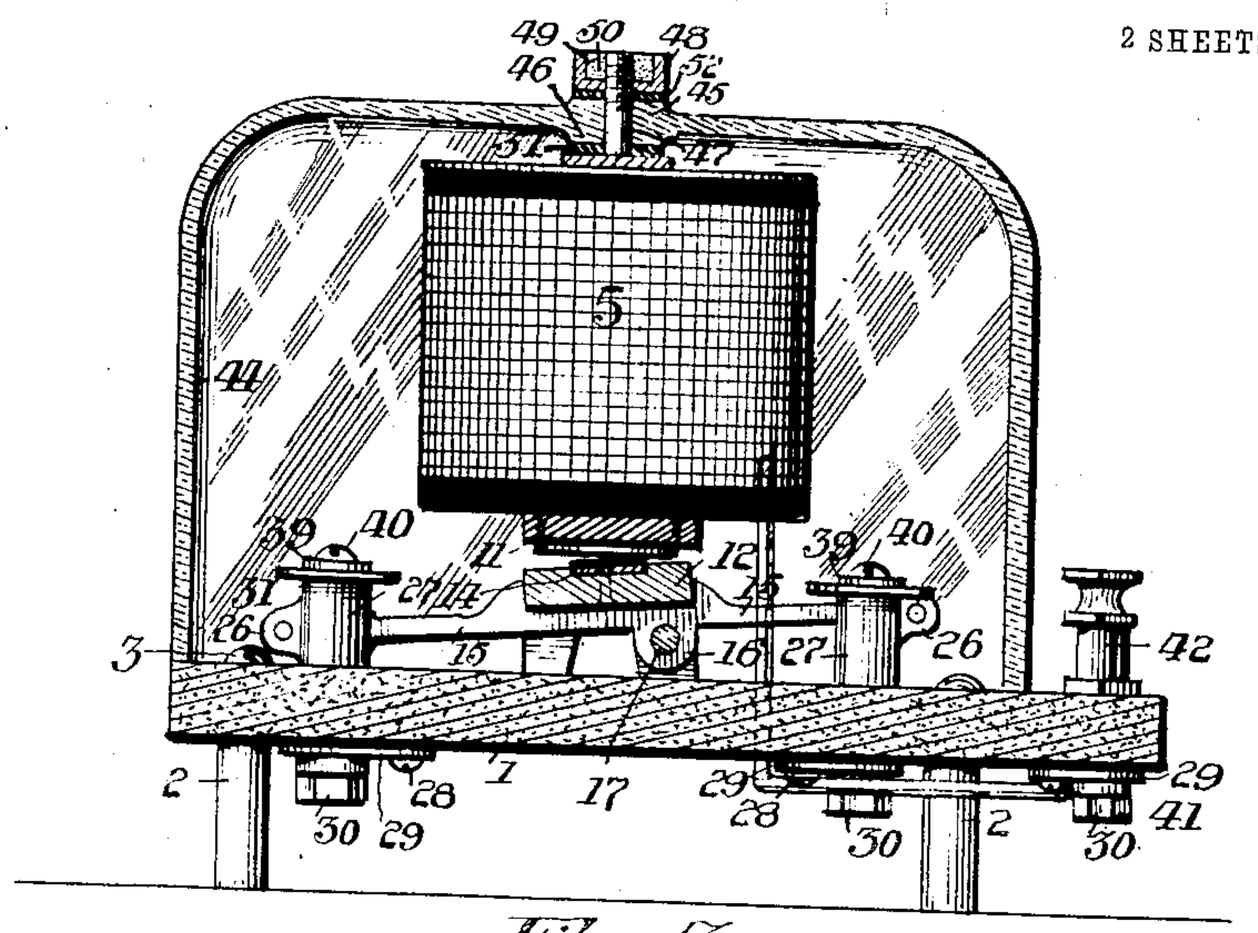

Fig. 3.

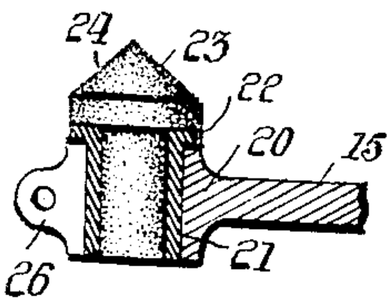

Fig. 4.

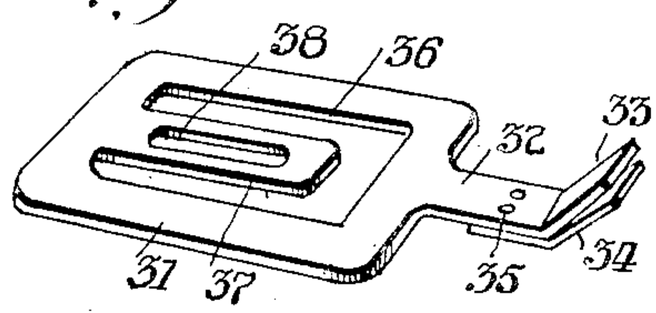

Fig. 5.

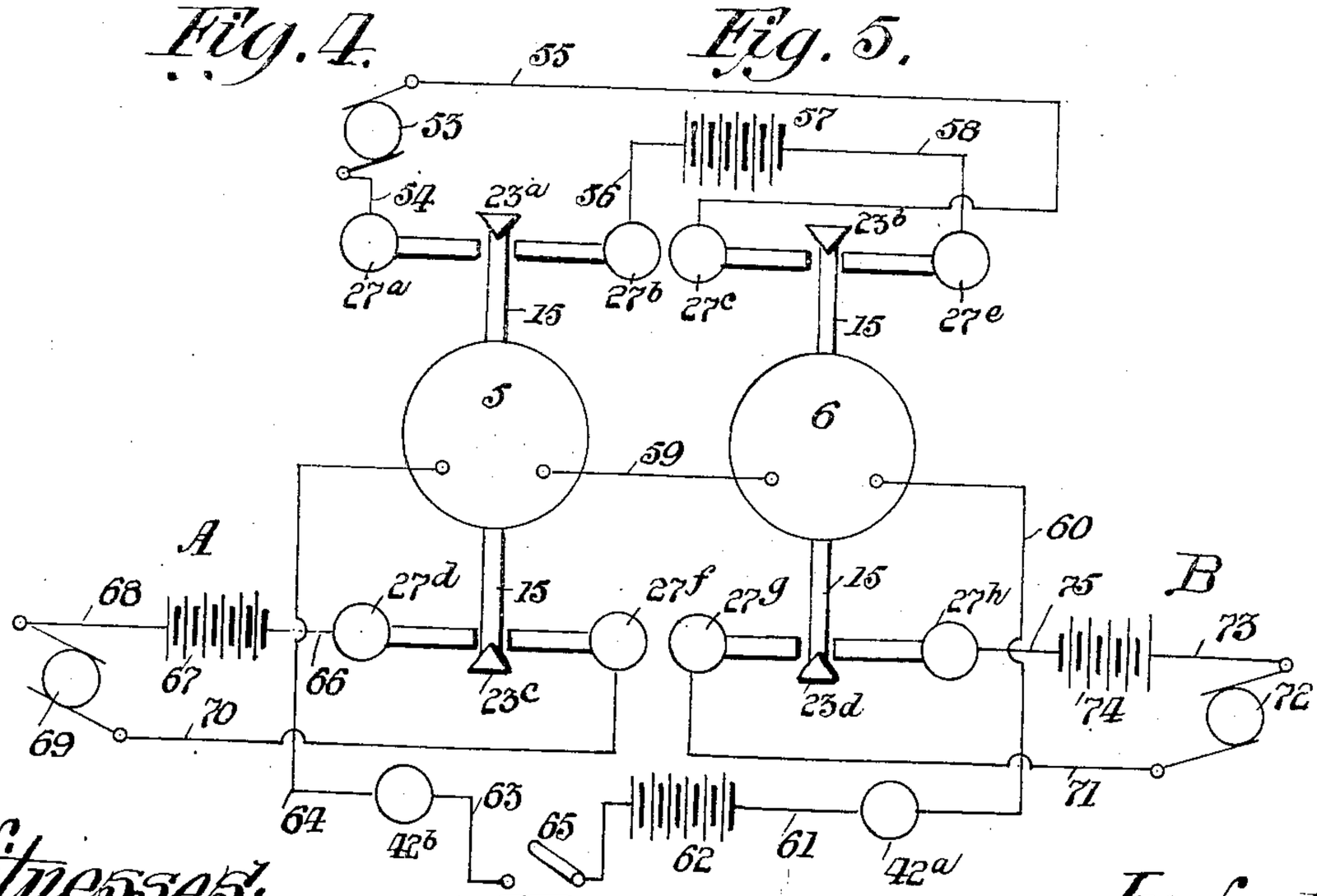

Fig. 6.

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UNITED STATES PATENT OFFICE

REINHOLD HERMAN, OF CRAFTON, PENNSYLVANIA, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

RELAY.

No. 815,822. Specification of Letters Patent. Patented March 20, 1906.

Application filed March 28, 1904. Serial No. 200,457.

To all whom it may concern:

Be it known that I, REINHOLD HERMAN, a citizen of the United States of America, residing at Crafton, 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, reference being had therein to the accompanying drawings.

This invention has relation to relays; and the object of this invention is to provide a relay for controlling electric circuits the efficiency of which is greater than relays of this character now used.

Heretofore in relays of this character the contact-blocks have been of such a construction as to break the arc at only one point; and it is the object of my improved relay to so construct the same that the arc will be broken at a plurality of distinct points, thus dividing the arc over the plurality of points, thereby insuring a positive action of the relay.

My invention further comprises a number of features adapted to produce a compact, simple, and reliable form of relay.

With the above objects in view reference will be had to the accompanying drawings, wherein like numerals of reference indicate like parts throughout the several views, in which—

Figure 1 is a perspective view of my improved relay. Fig. 2 is a top plan view thereof, showing the glass casing in horizontal section. Fig. 3 is a central vertical sectional view of my improved relay. Fig. 4 is a detail sectional view of one of the contact-blocks. Fig. 5 is a detail perspective view of one of the contact-springs. Fig. 6 is a diagrammatical view of the relay and its wiring. Fig. 7 is a detail view of a portion of the bridge, showing the journal of the shaft.

In the accompanying drawings the reference-numeral 1 designates the base of my improved relay, which is preferably made of marble, slate, or some suitable insulating material, and this base is supported upon legs 2, which are secured to the base by screws 3. Centrally secured to the top of this base is a bridge 4, upon which is mounted the electromagnets 5 and 6, these electromagnets being secured to the cross-frame 7 of the bridge and secured together at their top by a cross-plate 8, which is secured to said magnets by bolts 9 9, and mounted centrally upon said plate is a post 10, the object of which will be hereinafter more fully described. These electromagnets have a large number of turns of wire in their coils, and the core of each magnet passes down through the cross-frame 7 of the bridge 4, as designated by the reference-numeral 11. Pivotally mounted in the standards of the bridge 4 is the armature 12, which has copper plates 14 projecting on its upper surface and directly beneath each core of the electromagnets. This armature is supported by the arms 15 15, each of said arms carrying a downwardly-projecting lug 16, through which passes a shaft 17, this shaft having its ends pointed and bearing in journals 18 18, which in turn are provided with V-shaped ends to receive the pointed ends of the shaft. These journals are secured in the bridge by set-screws 17′ 17′, as illustrated in Fig. 7 of the drawings. The arms 15 15 are provided on their outer ends with split spring sleeves 20 20 20 20, and in these split spring sleeves are secured the insulation-collars 21 21, which have their upper ends flanged, as indicated at 22, and mounted in said collars are the carbon contact-blocks 23, these contact-blocks having their upper ends beveled, as designated by the reference-numeral 24, and these contact-blocks and insulating-collars are secured in the split spring sleeves by the screw-bolts 25, which pass through the lugs 26 of each sleeve. Upon each side of these electromagnets I mount two sets of binding-posts, and, as illustrated in the accompanying drawings, each set of binding-posts upon each side of the electro-magnets are in alinement with each other, two binding-posts comprising each set. These binding-posts, as designated by the reference-numeral 27, are secured to the base of the relay by screws 28, which pass through an outwardly-extending arm 29 of the binding-posts, this construction preventing the binding-posts from rotating the contacts out of line upon the base of the relay, and upon the lower end of each binding-post are binding-nuts 30.

Upon the top of each binding-post 27 is secured a contact-spring 31, which, as illustrated in Fig. 5 of the drawings, is preferably rectangular in shape and is stamped from a piece of material suitable for this purpose. Each spring is provided with a projecting arm 32, the outer end of which is bent up-

wardly at an angle to conform with the angle of carbon contact-blocks 23, as indicated by the reference-numeral 33, and to this outwardly-extending arm 32 is secured a strip of platinum 34 by means of the rivets 35. This strip of platinum has its outer end bent upwardly at an angle a few degrees less than the angle of the bent-up portion 33 of the arm 32. The object of this construction will be hereinafter more fully described. The body portion of the spring 31 is cut away, as designated by the reference-numeral 36, leaving an inwardly-projecting arm 37, having a slot 38 formed therein, and this spring 31 is secured upon the top of each binding-post 27 by a washer 39 and a screw 40, said screw passing through the washer, through the slot 38 of the spring, and into the binding-post. These binding-posts, as heretofore stated, are arranged in sets, and each binding-post of the set is so disposed that the projecting arms 32 of each spring of the binding-post will lie in alinement with each other, and these binding-posts are so spaced apart as to leave a small space between the upwardly-bent ends 33 of these arms, and this space is arranged directly over and in vertical alinement with the contact-blocks 23. By this construction it will be seen that I have provided four contact-blocks—two upon each side of the electromagnets—and the advantage of this will be apparent from the description of the operation of my improved relay. Upon the projecting edge 41 of the base 1 I mount the binding-posts 42 42, said posts being connected to the electromagnets 5 and 6 by wires which pass through the base 1. The case or cover, as designated by the reference-numeral 44, is preferably made of glass, as illustrated in the accompanying drawings, and this glass casing is adapted to rest upon the base 1 of the relay and be secured thereto by a nut and a seal which is secured on a post 10, carried by the plate 8 of the electromagnets. The top of the glass case has centrally formed thereon a boss 45, and a similar boss 46 is formed upon the inner side of the top of the casing, and passing through said bosses and the top of the glass case is an aperture 47, through which the post 10 passes, this post being threaded upon its outer end and receives the nut 48, this nut being recessed, as indicated at 49, to receive a suitable sealing material 50, whereby when the glass case has been placed over the relay the same may be locked thereon by this sealing material and cannot be removed without detection. Prior to securing the glass case upon the relay I insert a rubber gasket 51 upon the post 10, and another rubber gasket 52 is placed on this post after the glass casing has been placed over the relay, these gaskets taking up all jar of the relay and preventing the glass casing from breaking when the same is being secured thereon.

The circuits of my improved relay are clearly illustrated in the diagrammatical view of the drawings, taken in connection with the other views, and in Fig. 6 I have shown the relay in series with three main-line circuits and a local circuit, and the reference-numeral 53 designates a motor of one of the main-line circuits, the one brush of which is connected to the binding-post 27^a of Fig. 6 by a wire 54, and the other brush of said motor is connected by a wire 55 to the binding-post 27^c. The binding-post 27^b is connected by a wire 56 to a battery 57, which is connected to the binding-post 27^e by a wire 58, the binding-posts 27^a and 27^b constituting one set of binding-posts, between which operates the contact-block 23^a, and the binding-posts 27^c and 27^e constituting another set, between which operates the contact-block 23^b.

As illustrated in Fig. 6 of the drawings, the above binding-posts, motor 53, and battery 57 comprise one of the main circuits, and located upon the opposite side of the relay is the local circuit. This local circuit is in series with the electromagnets 5 and 6, these magnets being connected together by a wire 59, and the magnet 6 is connected to the binding-post 42^a by a wire 60, this binding-post in turn being connected by a wire 61 to a battery 62, the other pole of said battery being connected by a wire 63 to a similar binding-post 42^b, and this post is again connected by a wire 64 to the magnet 5, thus completing a circuit through the electromagnets, and the reference-numeral 65 designates a switch which is located between the battery 62 and the binding-post 42^b. Upon this side of the relay are connected two main-line circuits A and B, and the connections of the circuit A are as follows: The binding-post 27^d upon this side of the relay is connected by a wire 66 to one pole of a battery 67, the other pole of said battery being connected by a wire 68 to one brush of a motor 69, while the other brush of said motor is connected by a wire 70 to the other binding-post 27^f of the set of binding-posts between which the contact-block 23^c operates. The connections of the B circuit are as follows: The binding-post 27^g is connected by a wire 71 to one brush of a motor 72, while the other brush of said motor is connected by a wire 73 to one pole of a battery 74, the other pole of this battery being connected by a wire 75 to the binding-post 27^h of this set, between which operates the contact-block 23^d. It will thus be seen by this wiring that complete circuits exist between the binding-posts on one side of the relay and the electromagnets and the binding-posts upon the opposite side of the relay, and when the switch 65 is closed a circuit will be completed through the electromagnets, and they will be energized, the armature 12, attracted to the cores of the magnets 5 and 6, and the contact-blocks 23^c and 23^d, moved into engagement with the

contact-springs 31, completing a circuit, the contact-block 23^c completing a circuit through the main-line circuit A and the contact-block 23^d completing a circuit through the main-line circuit B. In completing these circuits the beveled sides 24 of the contact-block engage the upwardly-bent ends of the springs 31, these beveled surfaces of the contact-block engaging the upwardly-bent end of the platinum strip 34, forcing said platinum strip into engagement with the upwardly-bent end 33 of the spring 31, thus insuring a positive contact between the block and the spring, and it will be noted that when the current passes through circuits A and B and also through the other main-line circuit these currents are entirely confined to themselves without passing through any moving wire or any part of the instrument, and if this strip of platinum should fail to contact with the end 33 of the spring the current will pass through the platinum strip, through the rivets 35, through the spring to the binding-post. When this operation takes place, the main circuit on the opposite side of the relay is broken, this being occasioned by the construction of the armature beneath the electromagnets, said armature being pivotally mounted and carrying the outwardly-extending arms 15 15, which in turn carry the contact-blocks 23.

From the foregoing description it will be observed that the circuit A, through the battery 67 and the motor 69, and the circuit B, through the battery 74 and motor 72, are simultaneously made and simultaneously broken by the energizing and deënergizing of the relay, and it will also be observed that the circuit through the battery 57 and the motor 53 is also made and broken by the energizing and deënergizing of the relay-magnet, but in reverse order—that is, the circuit through battery 57 and motor 53 is made when the circuit through the lines A and B is broken, and vice versa—and it will be still further observed that while the circuit A is broken at two points—that is, at the opposite sides of the carbon block 23^c—and the circuit B is similarly broken at the two sides of carbon block 23^d the circuit including battery 57 and motor 53 is broken at four points—to wit, at both sides of each of the carbon blocks 23^a and 23^b.

It will be noted that when the circuits are broken the arc is broken at more than one point—that is, if the current was four amperes the same would be practically divided between the four points of break, as shown in main-line circuit of Fig. 6.

It may be noted that various changes may be made without departing from the general spirit and scope of the invention.

The operation of the relay as above described effects the following result: Two independent main lines, each containing a battery and a motor, are simultaneously closed by the energizing of the relay-magnet, and the third line, also containing a battery and a motor, has its circuit opened on the deënergizing of the relay-magnet, and the last-named circuit is closed while the two other circuits are open, the relay being adapted to be used in certain positions where it is desired to open and close the circuit through a line containing a battery and a motor and in alternative order therewith to simultaneously open and close two independent lines, each containing a battery and a motor.

What I claim, and desire to secure by Letters Patent, is—

1. In a relay, a magnet-winding, a pivoted lever, an armature carried by said lever and adapted to be attracted by said magnet-winding, a wedge-shaped insulated contact-block carried at the end of said lever, a pair of binding-posts, and a pair of spring-contacts carried by said posts and adapted to be bridged by said block.

2. In a relay, a magnet-winding, a pivoted lever, an armature carried by said lever and adapted to be attracted by said magnet-winding, a wedge-shaped insulated carbon contact-block carried at the end of said lever, and a pair of spring contact-plates adapted to be bridged by said block.

3. In a relay, a magnet-winding, a pivoted lever, an armature carried by said lever and adapted to be attracted by said magnet-winding, a wedge-shaped insulated contact-block carried at the end of said lever, a pair of binding-posts opposite said end of said lever, and a pair of spring-plates carried by said posts and extending into the path of movement of said block, the ends of said plates being bent to engage the wedge-faces of said block.

4. In a relay, a pivoted lever provided at its end with a split-ring sleeve, an insulating-collar carried within said sleeve, a contact-block having a wedge-shaped head supported within said collar, and stationary spring-contacts adapted to be bridged by said block.

5. In a relay, a pivoted lever provided at its end with a split-ring sleeve, an insulating-collar carried within said sleeve, a contact-block having a shank surrounded by and supported in said collar and an enlarged wedge-shaped head, and stationary spring-contacts adapted to be bridged by said block.

6. In a relay, a magnet-winding, a lever pivoted intermediate its ends, an armature carried by said lever adapted to be attracted by said magnet-winding, contact-blocks carried at each end of said lever, and a pair of spring-contacts opposite each contact-block and adapted to be bridged thereby.

7. In a relay, a magnet-winding, a lever pivoted intermediate its length, an armature carried by said lever and adapted to be attracted by said magnet-winding, contact-

blocks carried at opposite ends of said lever, and a pair of spring-contacts opposite each end of said lever and adapted to be bridged alternately by said blocks when opposite ends of said lever are raised.

8. In a relay, a magnet-winding, a lever pivoted intermediate its length, an armature carried by said lever and adapted to be attracted by said magnet-winding, wedge-shaped contact-blocks carried at opposite ends of said lever, and a pair of spring-plates supported opposite each end of said lever and extending into the path of movement of said blocks, the ends of said plates being bent to engage the wedge-faces of said blocks.

9. In a relay, a pair of spring-contacts, each formed as a rectangular plate, the interior of the rectangle being cut away, and having a tongue projecting inwardly from one side of the rectangle to engage a support and a second tongue projecting outwardly from the opposite side of the rectangle toward the other contact, and a magnetically-actuated contact-block adapted to bridge said outwardly-projecting tongues.

10. In a relay, a pair of spring-contacts, each formed as a rectangular plate, the interior of the rectangle being cut away, and having a slotted tongue projecting inwardly from one side of the rectangle to engage a support and a second tongue projecting outwardly from the opposite side of the rectangle toward the other contact, the adjacent ends of said outwardly-projecting tongues being bent at an angle to the plane of the contacts, and a wedge-shaped magnetically-actuated contact-block adapted to engage the bent ends of said tongues.

11. In a relay, a pair of spring-contacts each having a projecting tongue extending toward the other, spring-clips carried at the ends of said tongues, and a magnetically-actuated contact-block adapted to engage both spring-clips and to press them against said tongues.

12. In a relay, a pair of spring-contacts, each having a projecting tongue extending toward the other and bent at the end at an angle to the plane of the contacts, spring-clips carried at the ends of said tongues, and a wedge-shaped magnetically-actuated contact-block adapted to engage said spring-clips and to press them against the ends of said tongues.

13. In a relay, a pair of spring-contacts, each having a projecting tongue extending toward the other, platinum spring-clips carried at the ends of said tongues, and a magnetically-actuated carbon contact-block adapted to engage both of said spring-clips and to press them against said tongues.

14. In a relay, an insulating-base, a supporting-bridge secured thereto, a magnet supported on said bridge and having its axis at right angles to said base, an armature pivoted beneath said bridge, and an insulating-cover engaging said base and secured to the outer end of the magnet-core.

15. In a relay, an insulating-base, a supporting-bridge secured thereto, a magnet supported on said bridge and having its axis at right angles to said base, an armature pivoted beneath said bridge, an insulating-cover engaging said base, and clamping means extending through the center of said cover and engaging the magnet-core.

16. A relay comprising a base, electromagnets mounted upon said base, an armature mounted beneath said electromagnets, insulated contact-blocks carried by said armature, a plurality of binding-posts mounted upon said base, contact-springs carried by said posts, said contact-springs being arranged to be engaged by some insulated blocks and disengaged by others when said electromagnets are energized, an insulated cover adapted to rest upon said base, and means for securing the said cover to the top of the electromagnets, substantially as described.

17. In a relay, the combination of a base, electromagnets mounted thereon, a central pivoted armature-lever, an armature carried on said lever, an insulated contact-block mounted on each end of said lever, a pair of contact-springs mounted on a pair of binding-posts at each end of said lever, said springs being disposed above the contact-blocks at each end of the lever whereby when the lever is elevated by the energizing of the magnet, one of the contact-blocks will be thrown upwardly between two of the springs, while the contact-block at the opposite end of the lever will be thrown downwardly from between the springs at that end.

18. In a relay of the character described, the combination of an electromagnet, a plurality of binding-posts arranged in pairs, a spring-tongue carried by each binding-post, a pivoted armature, and insulated contact-blocks carried by said armature and so disposed thereon that at one position of the armature one of said contact-blocks will engage the springs of one pair of binding-posts and at another position of the armature another of said contact-blocks will engage the springs of another pair of said binding-posts.

19. In a relay, the combination of an electromagnet, an armature, and means controlled by said armature for closing two independent circuits at one movement of the armature and simultaneously opening a third independent circuit.

20. In a relay, the combination of an electromagnet, an armature, and means carried by the armature for completing an electric circuit at one movement of the armature and at the same movement of the armature breaking an independent circuit at two points.

21. The combination of an electromagnet,

and armature, an electric circuit including a battery and a motor and means carried by said armature whereby as the said electromagnet is energized and deënergized the said circuit will be broken and made on both sides of said battery.

22. In a relay of the character described, the combination with an electromagnet, an armature, binding-posts arranged in pairs, contact-springs carried by said posts, and a plurality of insulated contact-blocks carried by said armature, said blocks having beveled heads and each block being adapted to simultaneously engage both springs of one pair of binding-posts.

23. In a relay of the character described, the combination with an electrically-actuated armature, of a plurality of insulated contact-blocks carried by said armature, a plurality of binding-posts, contact-springs carried by said posts, said contact-blocks having beveled heads and adapted to simultaneously engage two of said springs whereby a circuit will be closed, substantially as described.

24. In a relay of the character described, the combination with an electrically-operated armature, of a plurality of binding-posts, contact-springs carried by said posts, and a plurality of insulated contact-blocks carried by said armature and adapted to be engaged by said contact-springs whereby when said insulated blocks are interposed between said springs a circuit will be closed.

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

REINHOLD HERMAN.

Witnesses:

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