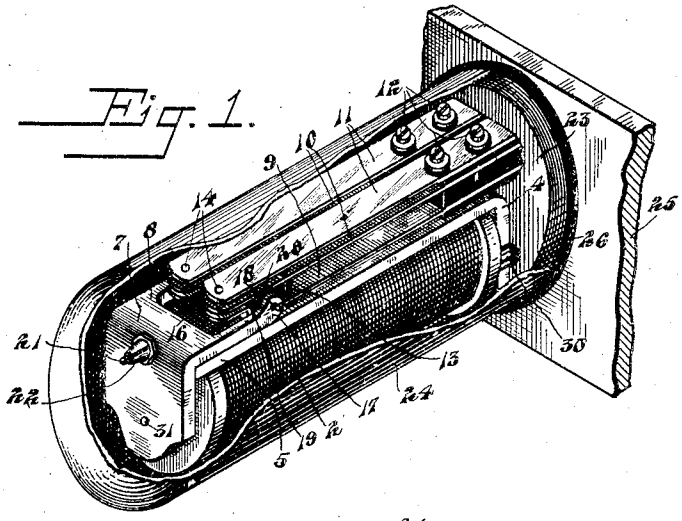
No. 784,872. PATENTED MAR. 14, 1905.

R. H. MANSON.

RELAY.

APPLICATION FILED AUG. 3, 1903.

Fig. 1.



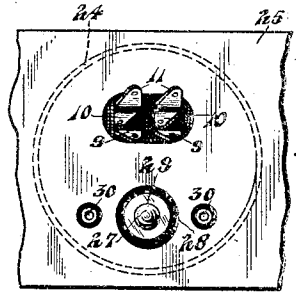


Fig. 2.

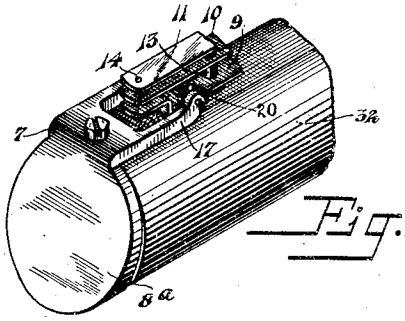


Fig. 5.

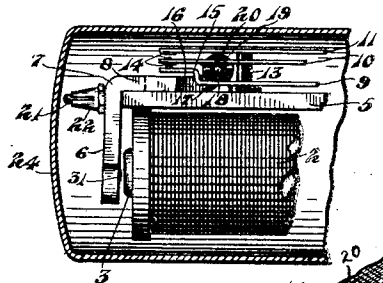


Fig. 3.

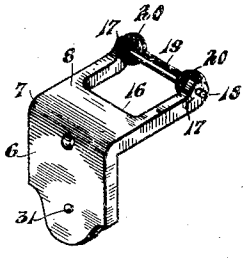


Fig. 4.

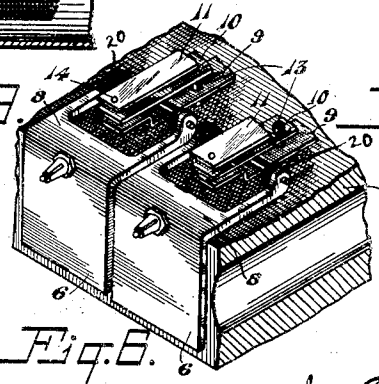


Fig. 6.

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No. 784,872. Patented March 14, 1905.

UNITED STATES PATENT OFFICE.

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RELAY.

SPECIFICATION forming part of Letters Patent No. 784,872, dated March 14, 1905.

Application filed August 3, 1903. Serial No. 168,003.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Relays, of which the following is a specification.

My invention relates to improvements in relays, and has for its object the provision of a relay provided with contact-springs in which the ends of the springs upon which the contacts thereof are mounted are brought forward toward the front end of the relay and are exposed to view to permit readily inspecting the same at any time and under any conditions of use.

The most efficient form of relay for telephonic and other similar use is that in which one arm of a pivoted elbow-lever forms the armature for the relay-magnet, and the other arm extends back over the magnet and serves to operate the contact-springs. This form of relay, while exceedingly efficient, is open to the objection that the rearwardly-extending arm which operates the contact-springs hides the contacts of said springs, so that unless the relays are individually mounted, which is seldom the case in an ordinary installation, it is impossible to inspect the contacts to determine whether or not they are in proper working condition. In an ordinary telephone installation of the common battery or relay type these relays number many thousands and to economize space are located side by side in rows, so that only the front ends of the relays are exposed to view. When, therefore, the contacts upon the springs are hidden by the armature as aforesaid, it is impossible to inspect the same without dismounting the relay, and this is inconvenient, if not practically impossible.

In the relay of my invention I still employ the elbow type of armature, but arrange the rearwardly-extending arm thereof and the cooperating springs in such manner that the ends of the springs are brought forward into view and are not hidden by the rearwardly-extending arm of the armature. I also secure greater efficiency than in the old form of relay, since the air-gap between the armature and magnet-core may be reduced.

One form of my invention is shown in the accompanying drawings, in which the same reference characters indicate like parts throughout the several views, and in which—

Figure 1 is a perspective view of the relay with the inclosing shell broken away to show the armature and springs thereof. Fig. 2 is a rear view of the mounting-plate. Fig. 3 is a side view of the forward portion of the relay. Fig. 4 is a perspective view of the armature. Fig. 5 is a perspective view of a different form of relay provided with my improvements, and Fig. 6 is still a different form.

In the figures, 2 represents the magnet-coil of the relay, which is mounted upon a suitable core 3, that is secured at its rear end, as by means of a suitable nut threading thereon, to the downwardly-bent end 4 of a plate 5, that extends parallel with the coil 2 to a point substantially in line with the forward end of the core 3. The core 3 and the plate 5, including the portion 4, form the fixed part of the magnetic circuit of the instrument, which circuit is completed by the downwardly-extending portion 6 of the bent armature 7, the arm 8 of which extends rearwardly and normally rests upon the outer face of plate 5.

The switch-springs of the relay consist of sets of superposed metal strips 9, 10, and 11, which are mounted upon said plate 5 at the rear end thereof and secured in place by suitable screws 12 passing therethrough and threading into the plate 5. These springs are superposed and are separated by suitable strips of insulation and are likewise insulated from the plate 5, the screws 12 passing through suitable insulated bushings in the ordinary manner, so that each spring is electrically isolated from the other parts of the device. The free ends of these springs extend toward the forward end of the magnet and are suitably spaced apart by an insulating-stud 13, the head of which rests upon the plate 5 and beneath the spring 9 to suitably space the same from the plate 5, the said spring being given

a tension toward the plate 5, so that this stud is likewise held in place. The stem of this stud passes freely through an aperture in the central spring 10, and the spring 11 rests upon the outer end of the said stem, this latter spring being likewise given a normal tension toward the plate 5, so that it is spaced therefrom by the said stud. These springs are provided at their forward end with platinum contacts 14, the lower spring 9 being bent at 15 to raise its forward end. In order that the armature may operate the springs without obstructing the front view of any of the contacts 14, the said portion 8 is cut away, as at 16, Fig. 4, to permit the said spring 15 to pass therethrough, and the outer ends of the arms 17 formed by said cut-away portion are bent upwardly to a slight extent at their outer ends and carry the transverse pin 18, extending beneath the spring 10. A suitable insulating-sleeve 19 is placed upon said pin and serves to engage and lift the spring 10 when the armature is actuated. Suitable insulating-washers 20 are also carried upon said pin 17 at the ends of the sleeve 19 to prevent any lateral displacement of the armature with reference to the springs. With this arrangement it will be seen that the portion 8 of the armature does not obstruct the view of any of the contacts 14 of the springs from the forward end of the relay. The armature in this particular instance rocks upon the corner of the plate 5 as a fulcrum and is held in place by the screw 21, projecting from the end of the plate 5, upon which the lock-nut 22 is threaded.

Fig. 3 shows the normal position of the armature, which does not quite touch the forward end of the core 3, and when a suitable electric current passes through the magnet said armature is attracted and the portion 8 thereof is lifted and serves to move the spring 10 from contact with the lower spring 9 and into contact with said upper spring 11. It will be evident that the invention is not limited in all its phases to the method of pivoting here shown.

The relay thus far described is shown as provided with duplicate sets of springs; but it will be evident that a greater or less number of sets may be provided and that the number of springs in each set and the arrangement and operation may be varied according to the particular results to be accomplished in each case.

I have shown the relay mounted upon a circular plate 23, having a threaded exterior upon which the dust-proof shell 24 may be threaded to entirely inclose the relay. This plate 23 is insulated from the supporting-plate 25 by means of a thin sheet of fiber 26 or other suitable material, and the core 3 of the relay is provided with a reduced end 27, as shown in Fig. 2, extending through a suitable insulating-bushing 28 to the rear of said plate 25 and upon which a nut 29 is placed to clamp the whole device securely into position upon the plate 25. The ends of this plate 25 are shown broken away; but it will be understood that in an installation for a large number they would be mounted side by side with only a slight clearance between them. The terminals 30 of the magnet-coil project through said plate 25 and are insulated therefrom, while the rear ends of the springs 9, 10, and 11 also project through a suitable aperture of said plate and to which the circuit-conductors are adapted to be soldered. To prevent the armature from sticking to the forward end of the core 3, a rivet 31, of non-magnetic material, such as brass or copper, is carried by the armature and is adapted to engage the end of the core when the armature is attracted.

It will be understood that the invention is not limited to a type of relay in which a plate 5 is employed, but is adapted to be used in those relays in which a shell 32 is employed in place of the plate 5, as shown in Fig. 5, the lower end 8^a being of suitable form to cooperate with the shell. Fig. 6 shows the invention applied to relays in which a single bar 33, preferably of cast-iron, forms the shell of a plurality of magnets. My improvement, it is apparent, increases the efficiency of the relay, for the reason that the spring 10, owing to its greater length, requires a less range of movement than in the old type, and therefore the air-gap between the portion 6 of the armature and the core 3 may be reduced. In the type of relay of Fig. 6 the close arrangement of the sets of springs makes my improvement of especial value.

While I have described one particular construction embodying my improvements, I do not desire to be limited in all respects thereto, as it is apparent that various modifications may be made without departing from the spirit and scope of the invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a relay, the combination with a magnet structure, of an armature-lever having one arm extending across in front of one end of the magnet of said structure and adapted to be attracted by said magnet and the other arm extending rearwardly at the side of said structure, said armature-lever being pivoted to said structure, a set of superposed switch-springs disposed longitudinally of said structure and having their free contact-carrying ends extended to near the forward end thereof and outside of said rearwardly-extending arm, whereby the movement of said armature shall operate said springs without obstructing a full view of the contacts from directly in front of the magnet structure.

2. In a relay, the combination with a magnet structure, of an armature-lever consisting of two arms at an angle to each other, one arm

extending across in front of the magnet structure and adapted to be attracted thereby and the other extending rearwardly at the side of said structure, said armature-lever being pivoted to said structure adjacent the angle of said parts, a set of switch-springs disposed longitudinally of said structure and having their free contact-carrying ends adjacent the forward end thereof and outside of said rearwardly-extending arm of said armature-lever whereby the contacts carried by said springs are exposed to view from the forward end of said structure, and means engaging the springs at a point behind the contacts for operating said springs by said rearwardly-extending arm of the armature-lever, substantially as described.

3. The combination with a magnet structure, of an armature-lever therefor consisting of two parts at an angle to each other and pivoted at the forward end of said structure, one part of said armature extending across in front of the magnet structure and adapted to be attracted thereby, while the other arm extends rearwardly at the side of said structure, a set of switch-springs disposed longitudinally of said structure and at the same side of the structure as said latter part of the armature, said set consisting of a plurality of superposed springs, the free ends of said springs being raised above the plane of said rearwardly-extending part of the armature, and a member carried by said latter part of the armature engaging an intermediate spring of said set at a point to the rear of the contacts of the springs to operate the same when the magnet is energized, substantially as described.

4. In a relay, the combination with a magnet structure, of an armature-lever consisting of two parts at an angle to each other, said lever being pivoted adjacent the angle of said structure and having one part extending across in front of the magnet structure and adapted to be attracted thereby while the other part extends rearwardly at the side of said structure, said latter part having a portion cut away and a transverse member in the rear of said portion, a set of switch-springs mounted longitudinally of said structure, a lower spring of said set passing through said cut-away portion of the armature-lever and beneath said transverse portion, the other springs of the set passing above said transverse portion of the armature and terminating adjacent the free end of the lower spring, whereby the contacts of said set of springs are exposed to view from the front end of the relay and said springs are operated by said transverse part of the armature engaging the springs at a point to the rear of the contacts of the springs, substantially as described.

5. In a relay, the combination with a magnet structure, of an armature-lever consisting of two arms at an angle to each other, one arm extending across in front of the magnet structure and adapted to be attracted thereby and the other extending rearwardly at the side of said structure, said armature-lever being mounted to rock upon an edge of said structure, a set of switch-springs disposed longitudinally of said structure and having their free ends adjacent the forward end thereof and outside of said rearwardly-extending arm of said armature-lever whereby the contacts carried by said springs are exposed to view from the forward end of said structure, and means engaging the springs back of the contacts thereof for operating said springs by said rearwardly-extending arm of the armature-lever, substantially as described.

6. The combination with a magnet structure, of an armature-lever therefor consisting of two parts at an angle to each other and adapted to rock upon an edge of said structure, one part of said armature extending across in front of the magnet structure and adapted to be attracted thereby, while the other arm extends rearwardly at the side of said structure, a set of switch-springs disposed longitudinally of said structure and at the same side of the structure as said latter part of the armature, said set consisting of a plurality of superposed springs, the free ends of said springs being raised above the plane of said rearwardly-extending part of the armature, and a member carried by said latter part of the armature engaging an intermediate spring of said set back of the contacts to operate the same when the magnet is energized, substantially as described.

7. The combination with a magnet structure, of an armature-lever therefor consisting of two parts at an angle to each other and adapted to rock upon an edge of said structure, one part of said armature extending across in front of the magnet structure and adapted to be attracted thereby, while the other arm extends rearwardly at the side of said structure, a set of switch-springs disposed longitudinally of said structure and at the same side of the structure as said latter part of the armature, said set consisting of a plurality of superposed springs, the free ends of all of said springs being raised above the pivotal point of the armature, and a transverse member carried by said latter part of the armature and engaging under an intermediate spring of said set back of the contacts to operate the same when the magnet is energized, substantially as described.

8. In a relay, the combination with a magnet structure, of an armature-lever having one arm extending across in front of one end of the magnet of said structure and adapted to be attracted by said magnet and the other arm extending rearwardly at the side of said structure, said armature-lever being pivoted to said structure, a set of superposed switch-springs disposed longitudinally of said structure and

having their free contact-carrying ends extended to near the forward end thereof and outside of said rearwardly-extending arm, and means for operating said springs by the movement of said armature and at the same time leaving all the contacts of said springs exposed to view from directly in front of the magnet structure, said means engaging the springs at a point back of the contacts, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 30th day of July, 1903.

RAY H. MANSON.

Witnesses:

ROBERT LEWIS AMES,

GAZELLE BEDER.