No. 859,676. PATENTED JULY 9, 1907.

R. H. MANSON.

RELAY.

APPLICATION FILED SEPT. 9, 1905.

Fig. 1.

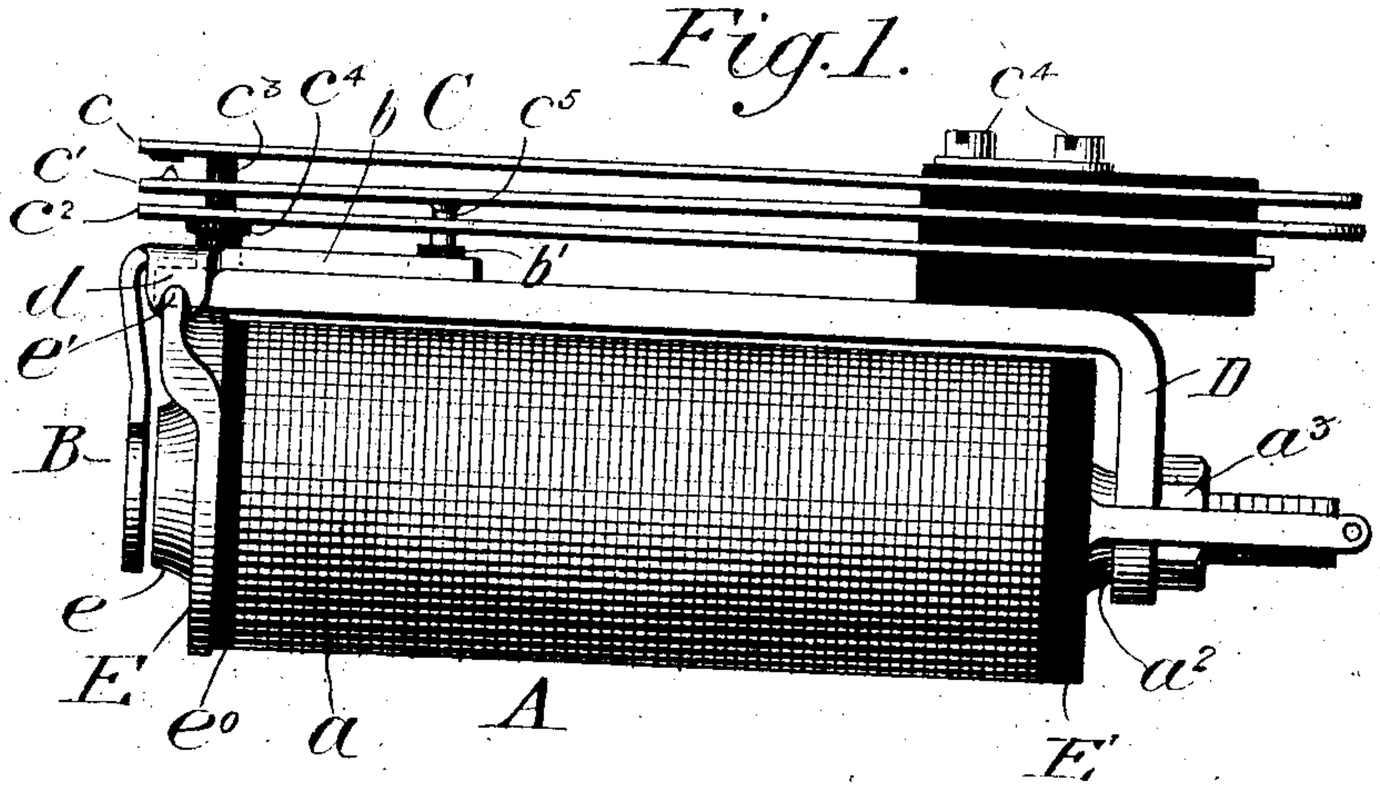


Fig. 2.

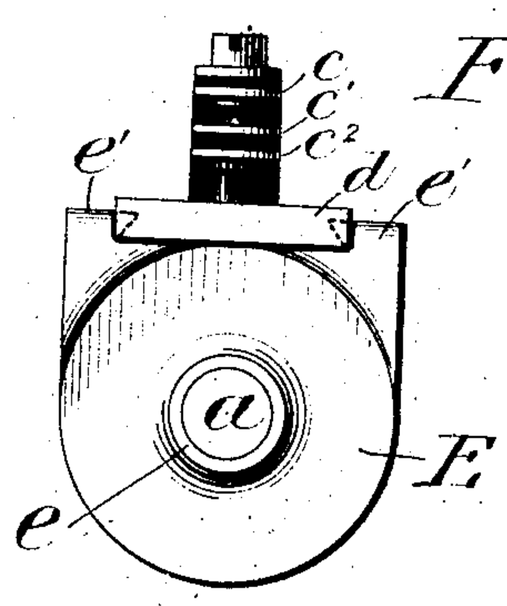
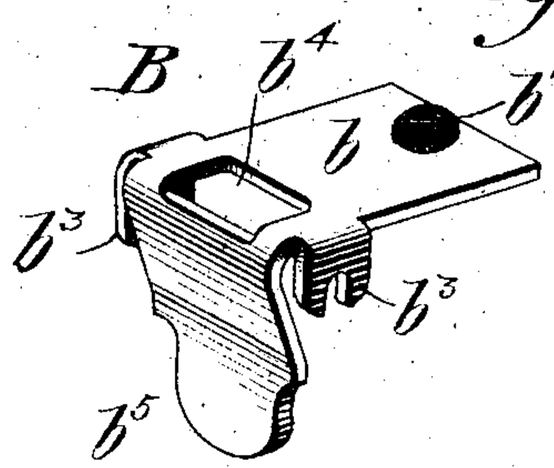


Fig. 3.



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UNITED STATES PATENT OFFICE.

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RELAY.

No. 859,676. Specification of Letters Patent. Patented July 9, 1907.

Application filed September 9, 1905. Serial No. 277,731.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Relays, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to relays, and has for its object the improvement of a type of relay largely employed in telephone exchanges.

In such exchanges the relays are ordinarily mounted upon racks, and for the sake of convenience they are usually secured "end-on", being arranged in rows and protected from dust and accidental injury by means of individual covers. The frame of each relay is composed essentially of a core and an extension bar secured to the core at one end and lying parallel thereto upon the outside of the winding, with its free end in the same plane as the free end of the core. The armature for such a relay is commonly made of soft iron in the shape of a bell-crank pivoted upon the end of the return bar or extension, with one arm extending back over the same and the other dropping in front of the core. Thus, when the end near the core is attracted the other end is raised up, in order to utilize this motion to the best advantage, contact springs are commonly mounted at the rear end of the extension bar, with their free ends extending forward above the horizontal arm of the armature lever, upon which they rest with interposed insulation so arranged that when the armature is moved the relations of the springs will be altered as desired. To secure the relay upon the rack the rear end of the core is commonly threaded or tapped, and the extension bar carrying the other parts is secured thereon by means of a suitable nut or nuts. The common fault with such relays as I have just described is their liability to lose the adjustment of their parts by the loosening of the nut or screws connecting the core and the return bar, a very slight motion of the latter at its rear end being multiplied at its forward end so as to prevent an accurate operation of the armature and springs. This my present invention absolutely prevents, since it removes the armature pivot entirely from the return bar, mounting it instead upon the forward head of the spool, which is rigidly fixed upon the core. The same extension pieces or ears on the head which support the armature serve also to prevent displacement of the extension bar.

My invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side view of a relay embodying the same; Fig. 2 is a front end view thereof with the armature removed, and Fig. 3 is a perspective view of the armature.

In the drawings A is the electro-magnet of the relay, wound upon a straight cylindrical core *a* provided with heads E and E′. The head E′ is of insulating material such as indurated fiber, or the like; while the head E is of brass or similar non-magnetic metal, faced on the inside with an insulating disk or supplementary head e^0.

At its rear end the core is reduced, as shown at a^2, and is threaded to receive a nut a^3, between which and the shoulder a^2 is clamped the extension or return bar of iron D. This bar is made in the shape of a bell-crank, with its long arm extending the length of the magnet parallel to the core *a*, and having its extremities *d* in approximately the same plane as the pole piece or end of the core *a*.

The brass head E is punched and formed up with a circular body, a raised flange or collar *e*, and two projecting ears *e′*. In assembling the relay this head is forced on the core with the collar surrounding the pole-piece and projecting over slightly beyond the end of the same. This is for the purpose of preventing the armature from sticking, thus saving the copper or brass rivet usually employed for that purpose. When in position the projecting ears *e′* on the head extend upwardly and outwardly, as shown in Figs. 1 and 2 and the extremity *d* of the bar D is received and held between them, being thus absolutely guarded against displacement, even though the nut a^3 should become quite loose, a dovetail, screw, or other fastening holding it down.

The springs C, which may be of any required number and arranged in any desired order, are secured by screws c^4 upon the rear end of the return bar D. They are separated by the usual insulating strips, and are provided at their rear ends with perforations or reduced portions for soldered connections. Lying parallel with the return bar D, their forward ends come over the extremity *d* of the bar, toward which they are given a set. Between them and the bar, however, lies the armature B, which is mounted in a novel and improved manner. This armature is shown by itself in Fig. 3. Its general shape is that of a bell-crank, with side lugs or ears b^3 and an opening b^4. Its upper arm *b* carries an insulating stud *b′*, and underlies the springs C when in position. The arm b^5 drops down in front of the pole-piece of the magnet, and the opening b^4 is for the purpose of receiving the insulating stud or post c^4 having a shoulder upon which rests the lowermost springs c^2, and a reduced upper portion c^3 upon which rests the uppermost spring only, the intermediate spring *c′* playing between the other two, whose positions are thus fixed. To move this intermediate spring it is provided with a stud c^5 riveted to it and passing down through a clearance opening in the spring c^2 to rest upon the insulating spot or stud *b′* on the armature. Thus when the arm *b* is raised or lowered it raises or lowers the spring *c′*.

The side lugs or ears b^3 of the armature are notched to straddle the ears e' of the spool head E, as clearly shown in Fig. 1. The importance of this arrangement is apparent when it is considered that thus the armature action is made absolutely certain, since the spool head E is fixed, and even though the nut a^3 of the bar D should become quite loose at the rear end of the magnet, the dovetail shown in dotted lines in the drawing, or its equivalent would hold down the end of the bar D into the notch between the ears e' of the head E, thus preventing lateral displacement of either the bar end or the springs.

The relay thus produced is exceedingly efficient in operation and although the armature is not in any wise supported upon the end of the return bar, I find that its magnetic circuit is sufficiently good to insure quick and strong operation in addition to perfect reliability.

I have illustrated and described my invention thus far without any particular reference to the arrangement of the contact springs. It will be observed however that the invention contemplates what I may call a visible contact relay. That is, the contact springs have their free ends extending forward and overlying the upper arm of the armature, so that the latter will not obscure the view of the contact points. I shall claim this in combination with the other features of the invention, but it is not in itself an essential part of the invention. The form and arrangement of contacts, and the connection between them and the armature, is a matter of choice with the manufacturer, and I do not wish to limit myself therein.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. The combination with a magnet, of an armature therefor having two arms extending at an angle to each other, a magnet head having a projecting ear adapted to fit into a notch in said armature and to form a fulcrum therefor upon which it may rock, one of said arms of the armature serving as a portion of the magnetic circuit of the magnet, and parts adapted to be operated by said armature when it is actuated, substantially as described.

2. The combination with a magnet, and an armature therefor comprising two arms at an angle to each other, a spool head upon said magnet having a projecting edge upon which said armature is fulcrumed intermediate of its ends, one of the arms of said armature extending transversely of the magnet and the other longitudinally thereof, said armature serving, when the magnet is energized, to shorten the path for the magnetic lines, and parts adapted to be operated by said armature, substantially as described.

3. The combination with a magnet having a core and suitable parts affixed thereto to bring the magnetic poles therof close together, an armature for the magnet having two arms extending at an angle to each other, said armature being supported to rock upon a fulcrum formed integrally on one of the spool-heads of said magnet as one of its arms is attracted by one of said poles, and parts adapted to be actuated by said armature, substantially as described.

4. The combination with a magnet, of an armature therefor having two arms bent at an angle to each other, a spool-head having a projecting edge upon which as a fulcrum said armature is supported intermediate of its ends and may rock, one of said arms being transversely disposed with reference to the magnet, and the other longitudinally disposed and extending alongside the magnet, and switch contacts controlled by said latter part, substantially as described.

5. The combination with a magnet, of an armature therefor having two arms extending at an angle to each other, one spool-head of the magnet having a projecting edge upon which as a fulcrum said armature is supported intermediate of its ends and may rock, one of said arms of the armature being in position to be attracted by the magnet, and switch contacts controlled by the said armature, substantially as described.

6. The combination with a magnet-coil, of a core therefor provided with metallic parts forming an external magnetic circuit normally open at one portion, a bent armature of magnetic material having two arms at an angle to each other so supported as to close the normally open portion or gap in the external magnetic circuit or shorten its path for the lines of force when the core is magnetized, one spool-head of the magnet having a projecting edge upon which the armature rocks as its fulcrum, and a bunched set of flat superposed contact springs operated by said armature, said set being supported by and secured to a rigid portion of the parts forming the external magnetic circuit, substantially as described.

7. The combination with a magnet-coil, of a core therefor provided with metallic parts forming an external magnetic circuit normally open at one portion, a bent armature having two arms at an angle to each other and supported upon an integral part of one spool-head of the magnet as a fulcrum in a manner so that one of said arms will close said normally open portion or gap in the external magnetic circuit or shorten the path for the lines of force when the core is magnetized, and a bunched set of flat superposed contact-springs carried by the framework of the electromagnet and operated by said other arm, 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 and adapted to be attracted by said magnet and the other arm extending rearwardly at the side of said magnet, said armature lever being pivoted upon an integral part of one spool head of the magnet, a set of superposed switch springs disposed longitudinally of said structure and having their free contact-carrying ends extending 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, substantially as described.

9. 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 and adapted to be attracted thereby and the other extending rearwardly at the side of said magnet, said armature lever being pivoted upon an integral part of one spool-head of the magnet adjacent its angle, a set of switch springs disposed longitudinally of said structure and having their free contact carrying ends adjacent the forward end thereot 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.

10. The combination with a magnet structure, of an armature lever therefor consisting of two parts at an angle to each other and pivoted on a projecting edge of the spool-head at the forward end of said structure, one part of said armature extending across in front of the magnet and adapted to be attracted thereby, while the other arm extends rearwardly at the side of said magnet, 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 a spring of said set at a point to the rear of the contacts of the spring to operate the same when the magnet is energized, substantially as described.

11. 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 and adapted to be attracted thereby and the

other extending rearwardly at the side of said magnet, said armature lever being mounted to rock upon a projecting edge of one spool head of said magnet, 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.

12. 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 a projecting edge of one spool head of said magnet, one part of said armature extending across in front of the magnet and adapted to be attracted thereby, while the other arm extends rearwardly at the side of said magnet, 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.

13. 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 on an integral part of one spool head of the magnet, a set of superposed switch springs disposed longitudinally of said structure and having their free contact carrying ends extending 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.

14. In a relay, the combination of a magnetic frame composed of a core and a return bar parallel thereto, with a spool-head on the core having extensions receiving the end of the bar between them, with a set of contact springs mounted upon said bar and having their free ends extending near the end thereof, and a bell-crank armature having notched side ears straddling the end of the bar and resting on the extensions of the spool-head, one arm of the bell crank extending in front of the end of the core, and the other beneath the contact springs with means to engage and actuate the same, substantially as described.

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

RAY H. MANSON.

Witnesses:
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ABEL J. ROBERTS.