No. 808,834. PATENTED JAN. 2, 1906.

C. L. GOODRUM.

RELAY.

APPLICATION FILED NOV. 11, 1905.

Fig. 1.

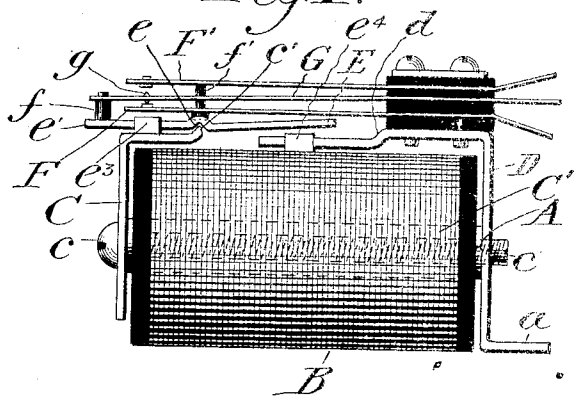


Fig. 2.

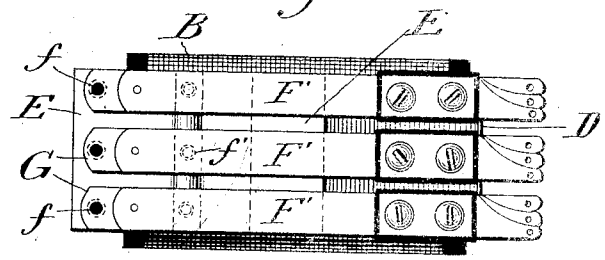
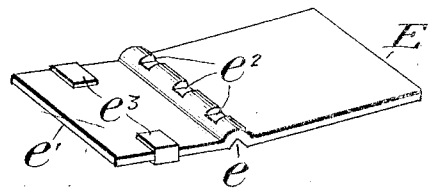


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES LANE GOODRUM, OF ROCHESTER, NEW YORK.

RELAY.

No. 808,834. Specification of Letters Patent. Patented Jan. 2, 1906.

Application filed November 11, 1905. Serial No. 286,935.

To all whom it may concern:

Be it known that I, CHARLES LANE GOODRUM, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Relays, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electromagnets; and its object is to produce an electromagnetic circuit-changing device or relay especially adapted for use in connection with telephone and telegraph apparatus and circuits and in which the parts are constructed and arranged to obtain a maximum effect from a given current, besides being easy to assemble. Further objects will more fully appear hereinafter.

I shall explain my invention as embodied in a relay designed and adapted especially for telephone-switchboards; but it will be understood that the invention may be embodied in many other forms of apparatus and is susceptible of many other applications.

An embodiment of the invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of an electromagnet arranged with circuit-changing springs in accordance with my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a detail.

Referring to the drawings, it will be seen that the electromagnet comprises a core A, provided with the usual actuating-coil B. Core A has attached thereto two pole-pieces C and D of special construction, one at each end of the core. These pole-pieces are preferably formed of sheet-metal punchings from soft iron. Pole-piece C is attached to the core by means of a screw *c* and extends upward and over the magnet-head and is provided with a ridge or projection *c'*, which constitutes a pivot for the armature, presently to be described. This ridge or projection *c'* may be formed upon the pole-piece C in any suitable manner, but preferably consists of the end of the pole-piece bent up and finished off in the shape of a wedge, as shown. The other pole-piece D is suitably secured to the opposite end of the core A by screw *c* and is formed with a foot *a*, by means of which the device may be fastened to a suitable support, and extend upward and over the top of the magnet-coil toward the pole-piece C. This pole-piece D serves as a support for the contact-springs or circuit-changing devices of the relay, to be presently described.

The armature E of the magnet consists of a sheet-metal punching formed with a notch *e* by bending the metal transversely, this notch being adapted to be engaged by the ridge or projection *c'* of the pole-piece C. The armature is thus pivoted upon said ridge or projection and extends into proximity to and overlies a portion of the pole-piece D. The magnetic circuit is thus completed and a powerful pull on the armature obtained.

Mounted upon the shoulder *d* of pole-piece D are two sets of contact-springs F F', suitably insulated by washers. Intermediate these two sets of contact-springs is a third set of springs G, bearing upon the extension *e'* of the armature E through the intermediation of insulating-pegs *f*, thus maintaining the forward end of the armature normally in a retracted position. The springs G are provided with contacts *g*, which bear normally upon the lower set of contact-springs F. When the armature is attracted by pole-piece D, the central set of springs G is raised by the movement of extension *e'* of the armature, which bears against the pegs *f*, so as to break contact with the lower set of springs and make contact with the upper set.

The armature E is held in place upon its pivot *c'* by means of pins *f'*, of insulating material. These pins are attached one to each of the lower set of contact-springs and bear upon the armature E in notches e^2, formed in the bend of the armature immediately over the notch engaged by the transverse bearing-notch *e*. These pins under the action of the springs perform the double function of maintaining the armature seated upon the pivot ridge or projection *c'* and owing to their position in the notches e^2 prevent the lateral displacement of the armature upon its pivot. This mounting of the armature, in combination with its coöperating parts, is a very important feature of my invention.

In order to prevent sticking of the armature E, I provide strips of non-magnetic metal, one shown at e^3 extending across the under side of the extension *e'* of the armature and having its ends bent thereover, which is thus interposed between that portion of the armature and pole-piece C. The outer strip e^4 is placed across and over the pole-piece D, immediately under the operative end of armature E, and has its ends bent under in order to secure it to the pole-piece.

The function of the various parts of my electromagnet and the relay which these parts constitute, in combination with the circuit-changing devices, will be readily understood by those skilled in the art, and extended explanation is therefore deemed unnecessary. It may be observed, however, that the pins f', which are attached to springs F, extend upward through enlarged holes in springs G and support the pressure of springs F' upon their upper ends. When armature E, therefore, is attracted by pole-piece D, the intermediate set of springs G is raised, leaving the set F still pressing upon the armature. Contacts g engage the springs F' and lift them from their seat upon the pins f'.

In mounting the armature it will be seen that no riveting or securing is necessary, the armature being merely slipped in until its notched portion rests upon the ridge or projection c' of the pole-piece C with the pins f'' bearing in the small notches e' upon the upper surface of the armature.

As the circuit connections to the various sets of springs are well known and form no part of the present invention, it has been deemed unnecessary to illustrate or describe them.

My electromagnet is provided with a hollow core, so that the bolt e e may pass through from end to end and secure the entire frame together. By making the frame with a brass extension uniting the end pieces the magnet-coil can be removed, leaving the frame intact. Even in the form shown the coil can be dropped out in close places by withdrawing the screw e from hollow core C', leaving the springs and parts of the frame intact on the rack or frame usually supporting them.

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

1. In a relay, the combination with a core, of a coil thereon, an armature, front and rear pole-pieces, one of which forms a support for the relay, the other forming a support for the armature, contact-springs, and means removably securing the core to the supporting pole-piece.

2. In a relay, the combination with a core, of a coil thereon, an armature, front and rear pole-pieces, one of which forms a support for the relay, the other forming a support for the armature, contact-springs mounted on said supporting pole-piece, and means removably securing said core to the supporting pole-piece.

3. In a relay, the combination with a core, of a coil thereon, a rear pole-piece, a front pole-piece, and means operated from the front for securing both of the pole-pieces to the core.

4. In a relay, the combination with a core, of a coil thereon, a rear pole-piece adapted to support the relay, a front pole-piece, and means operable from the front securing both of the pole-pieces to the core.

5. In a relay, the combination with a core, of a coil thereon, a rear pole-piece adapted to support the relay, contact-springs, a front pole-piece, an armature mounted thereon, and means passing through the core adapted to secure the pole-pieces to said core.

6. In a relay, the combination with a core, of a coil thereon, a rear pole-piece adapted to support the relay, contact-springs mounted on said pole-piece, a front pole-piece, an armature mounted thereon, and a screw passing through the core adapted to secure the pole-pieces to the core.

7. A relay having a rear pole-piece adapted to form a support for said relay, and means operable from the front for removably securing the relay to said pole-piece.

8. A relay having a hollow core, a rear pole-piece to form a support for said relay, and means passing through the core to secure the relay to the pole-piece.

9. A relay having a hollow core, a rear pole-piece adapted to form a support for said relay, a front pole-piece, and a screw passing through said core and having threaded engagement with said rear pole-piece to hold it removably secured to said core, the head of said screw holding said front pole-piece in place.

10. In a relay, the combination with a core, of a coil thereon, a rear pole-piece secured to the core and extending along the top of the coil, a front pole-piece secured to the other end of the core and extending rearwardly a distance toward the rear pole-piece to leave an air-gap between the pieces, means for removably securing the core to said pole-pieces, a plate pivoted over the end of the front pole-piece, the rear part of said plate forming an armature and overlapping the end of the rear pole-piece, and switch-springs secured to the rear pole-piece and extending forwardly over said plate and having engagement with the front part of said plate, current-flow through said coil causing attraction of the armature part of the plate to cause actuation of said springs.

11. In a relay, the combination with a core, of a coil thereon, a rear pole-piece secured to the core and extending along the top of the coil, a front pole-piece secured to the other end of the core and extending rearwardly a distance toward the rear pole-piece to leave an air-gap between the pieces, means for removably securing the core to said pole-pieces, a plate pivoted over the end of the front pole-piece, the rear part of said plate forming an armature and overlapping the end of the rear pole-piece, and switch-springs secured to the rear pole-piece and extending forwardly over said plate and having engagement with the front part of said plate, current-flow through said coil causing attraction of the armature

part of the plate to cause actuation of said springs, said switch-springs serving to hold said plate on its pivot.

12. In a relay, the combination with a core, of a coil thereon, a rear L-shaped pole-piece secured to the rear end of the core and extending forwardly a distance along the top of the coil, an L-shaped front pole-piece secured to the front end of the core and extending rearwardly a distance to leave a non-magnetic gap between the pole-pieces, means passing through the core for securing the pole-pieces to the core, a pivot edge at the end of the front pole-piece, a plate of magnetic material pivoted on said edge along an intermediary line, the part of said plate to the rear of said pivot forming an armature, the part of said plate in front of said pivot forming an actuating-lever, and circuit-changing springs mounted at their rear ends on the rear pole-piece and being connected at their front ends with the actuating-lever, said springs normally causing pressure against said lever to hold the armature part away from the rear pole-piece, current-flow through said coil causing attraction of the armature part, whereby said circuit-changing springs are actuated.

13. In a relay, the combination with a hollow core, of a coil thereon, a rear L-shaped pole-piece secured to the rear end of the core and extending forwardly a distance along the top of the coil, a front L-shaped pole-piece secured to the front end of the core and extending rearwardly a distance along the top of the coil to leave a non-magnetic gap between the ends of the pole-pieces, means passing through said core connecting said pole-pieces and removably securing them to the core, the end of the front pole-piece offering a pivot edge, a magnetic plate pivoted on said edge at an intermediary line, the rear part of said plate forming an armature, the front part of said plate forming an actuating-lever, and switching mechanism mounted on the rear pole-piece and having connection with the actuating-lever, said switching mechanism serving normally to depress said actuating-lever to retain the armature out of contact with the rear pole-piece, current-flow through said coil causing said armature to be attracted to complete the magnetic circuit through the pole-pieces and causing switching mechanism to be actuated, said switching mechanism serving also to retain said plate in position on said pivot edge.

14. In a relay, the combination with a hollow core, of a coil thereon, an L-shaped rear pole-piece secured to the rear end of the core and extending forwardly a distance along the top of the coil, a front L-shaped pole-piece secured to the front end of the core and extending rearwardly a distance along the top of the coil, a screw passing through said core adapted to removably hold said pole-pieces on said core, a non-magnetic gap between the ends of the pole-pieces, the end of the front pole-piece being shaped to form a pivot edge, a plate of magnetic material pivoted at an intermediary line on said edge, the rear part of said plate forming an armature and the front part thereof rorming an actuating-lever, and actuating and contact switch-springs mounted at their rear ends on the rear pole-piece and extending forwardly therefrom, the front end of the actuating-springs having connection with said actuating-lever and tending normally to depress said lever to retain the armature away from the rear pole-piece and out of engagement with the contact-springs, current-flow through said coil causing energization of the relay, whereby the armature is attracted toward the rear pole-piece, said actuating-lever being raised to carry the actuating-springs into engagement with the contact-springs.

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

CHARLES LANE GOODRUM.

Witnesses:

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GEORGE L. MEADE.