

No. 762,338.

PATENTED JUNE 14, 1904.

F. R. McBERTY.

RELAY.

APPLICATION FILED OCT. 27, 1902.

NO MODEL.

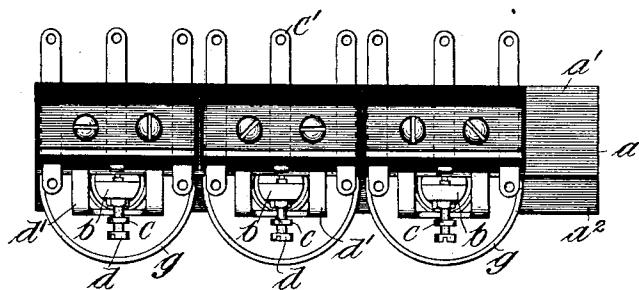


Fig. 1.

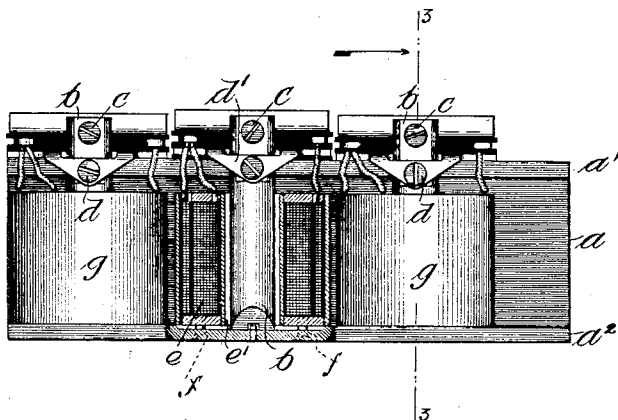


Fig. 2.

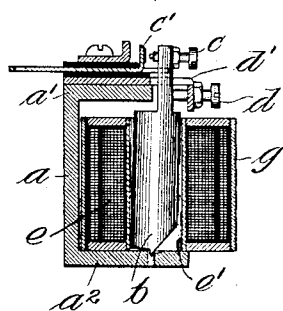


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## RELAY.

SPECIFICATION forming part of Letters Patent No. 762,338, dated June 14, 1904.

Application filed October 27, 1902. Serial No. 128,875. (No model.)

*To all whom it may concern.*

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Relays, of which the following is a full, clear, concise, and exact description.

My invention relates to a relay, and has for its object to provide an instrument which will be especially adapted for use in connection with telephone-exchange systems to control subsidiary devices, such as signal-lamps.

My invention particularly contemplates an improved structure which will be simple and compact to permit a large number of relays to be mounted together in a small space and which will be cheap to manufacture, while retaining a high degree of efficiency.

When a number of relays—such, for instance, as are used in telephone-switchboards—are to be associated together in one bank or strip, it is customary to mount the desired number, each relay of which is complete in itself, upon a common metallic supporting-strip. Each of these relays usually comprises, in addition to its magnetizing-helix, a core, a return pole-piece, and an armature, and in addition there is the supporting-strip common to all the relays.

Where ease in assembling and cheapness of manufacture is an object, it is desirable that a relay shall have as few parts as possible consistent with efficient operation. It is also desirable that the parts constituting the magnetic circuit be few in number in order to reduce the number of joints in the circuit, and thus eliminate all unnecessary magnetic resistance.

To this end my invention contemplates a structure wherein the number of parts in the magnetic circuit of each relay is but two and wherein when a number of relays are mounted together to constitute a strip or bank one of these parts is common to all the relays in the strip. My idea is, in general, to construct

a strip of relays by mounting a number of magnet-coils at intervals along a flanged horizontal iron supporting-strip, with the several magnet-levers mounted to rock in bearings or pivots upon the flange of said supporting-strip, said magnet-levers serving to actuate the relay contact-points, as usual.

A feature of the invention lies in constructing the several magnet-coils to surround or inclose their respective movable levers, whereby each lever is, in effect, a laterally-movable core for the magnetizing coil or helix, while the flanged strip forms a stationary return pole-piece common to all the movable cores. Said strip thus serves to complete the external magnetic circuits between the extremities of the several movable levers as well as to support the other parts of each relay. The whole strip of relays constitutes a self-contained structure, which may be treated as a unit in assembling telephone-switchboard apparatus.

The arrangement whereby the part which serves to complete the magnetic circuit of each relay is made stationary and contains no movable portion, such as the armature of the ordinary relay, makes it possible to construct that part of such large mass that the magnetic circuit is particularly good, and thus to avoid inductive disturbances, such as are produced by one relay in the circuit of a neighboring relay when the magnetic return-circuit is of high resistance.

I will describe my invention particularly by reference to the accompanying drawings, which illustrate the preferred form thereof, and the features or combinations which I regard as novel will be pointed out in the appended claims.

Figure 1 is a plan view of three supervisory relays mounted together upon a metallic strip which serves as a return pole-piece common to the three magnets, the whole making a self-contained structure. Fig. 2 is a view of said strip of relays in elevation, one of the magnets being shown in section. Fig. 3 is a view in ver-

tical cross-section taken on the line 3 3 of Fig. 2.

The same letters of reference are used to designate the same parts wherever they are shown.

The iron strip *a*, of  $\sqsubset$ -shaped cross-section, which supports the several parts, serves also as a return pole-piece common to the several electromagnets. The lower flange *a'* of the strip is preferably a little wider than the upper flange *a''* and supports the lower ends of the vertically-disposed movable cores *b b* of the several electromagnets, said cores projecting up beyond and in front of the edge of the upper flange, in position to draw themselves over against the flange when magnetized. The lower ends of the movable cores may be sharpened to chiseled edges to rest in a V-shaped channel cut longitudinally in the top of the lower flange *a'*, so that each core is thus supported on a knife-edge bearing and is adapted to move to and fro within certain limits with the greatest freedom. A screw *c* is carried on the top of each movable core and is adjusted so that when the core is drawn over toward the upper flange *a''* of the armature-strip the platinum contact-point of said screw will come against a contact-anvil *c'*, also mounted upon but insulated from said strip. The several movable cores are held from falling too far backward by an adjustable stop, which may be a set-screw *d*, mounted in a yoke-piece *d'*. Said yoke-pieces may be formed by lateral projections from a strip which lies at the top of the upper flange *a''* of the return pole-piece, and, if desired, each yoke-piece may be separately mounted upon and insulated from the upper flange, so that the back contact of the movable core against the set-screw *d* may serve to control a separate local circuit.

Each of the movable cores *b b* is provided with a magnetizing-helix *e*, surrounding the same, said helix being wound upon a tube or spool *e'*, which is enough larger than the core inclosed thereby to allow the latter sufficient range of movement therein. In the sectional views shown in Figs. 2 and 3 an additional helix or winding is shown outside the helix *e* and separated therefrom by suitable insulating material, which is indicated by the vertical black lines. The lower heads of the magnet-spools may be secured to the lower flange *a'* of the supporting-strip by screws *f, f*, as indicated by dotted lines in Fig. 2. I have shown each of the magnet-helices surrounded by a copper sheath *g*, which serves to shield the magnet inclosed thereby from the magnetic effects so developed by adjacent coils. The upper flange *a''* serves as a convenient support upon which the several strips carrying the contact-points and the strips which form connecting-terminals for the magnet-helices may be mounted.

It will be observed that the whole strip of relays constitutes a self-contained structure which is exceedingly simple, solid, and compact. In addition to the obvious mechanical advantages the device has the further advantage that the movable part of the relay is not apt to become stuck against the return pole-piece by residual magnetism in the latter, since said return pole-piece is so large that a practical short circuit would be provided for lines of force emanating from any pole that might be permanently developed upon the edges of the flanges thereof.

Having described the preferred form of my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. A strip of relays for a telephone-exchange switchboard, comprising a flanged horizontal supporting-strip of soft iron, a number of electromagnet-coils supported at intervals along said strip, movable magnet-levers, one for each coil, vertically supported in sharp bearings in the flange of said supporting-strip, and relay-contacts operated by said magnet-levers, said strip serving to complete the magnetic circuit of all of said magnet-levers, as described.

2. A strip of relays for a telephone-exchange switchboard, comprising an iron strip of  $\sqsubset$ -shaped cross-section, movable cores supported vertically in knife-edge bearings in the lower flange of said strip and extending up beyond the edge of the upper flange in position to be attracted thereto, a magnetizing-helix wound upon a hollow spool surrounding each core, a contact-point carried at the top of each core, and contact-anvils mounted upon the upper flange of the strip, in position to be engaged by said contact-points.

3. In a strip of relays the combination with a magnetizing-helix *e* for each relay, of a movable core *b* for each relay surrounded by the magnetizing-helix, and a stationary strip of channel-iron *a* forming a return pole-piece common to all the relays.

4. In a strip of relays the combination with a channel-shaped stationary return pole-piece *a* common to all the relays, of a plurality of movable cores *b* each having one end pivoted upon one of the flanges of the channel and the other end in proximity to the other arm of the channel, and a magnetizing-helix *e* surrounding each core, whereby the greatest possible portion of the magnetic circuit of each relay is made common.

5. A strip of relays comprising a magnetizing-helix for each relay, a movable core within the magnetizing-helix, and a stationary return pole-piece common to all the relays of the strip, said stationary return pole-piece also constituting the strip upon which the relays are supported.

6. A strip of relays, each relay comprising  
a magnetizing-helix, a movable core within  
the helix, and a stationary return pole-piece  
completing the magnetic circuit common to  
5 all the relays, the mass of the common return  
pole-piece being larger than the combined  
mass of all the movable cores, whereby mag-  
netic lines of force generated in the helix of

one relay are prevented from threading the  
helix of another relay.

In witness whereof I hereunto subscribe my  
name this 30th day of August, A. D. 1902.

FRANK R. McBERTY.

Witnesses:

EDWIN H. SMYTHE,  
S. G. McMEEN.