E. B. CRAFT.

ELECTROMAGNETIC SIGNAL CONTROLLING DEVICE.

APPLICATION FILED SEPT. 10, 1906.

923,949. Patented June 8, 1909.

Fig. 1.

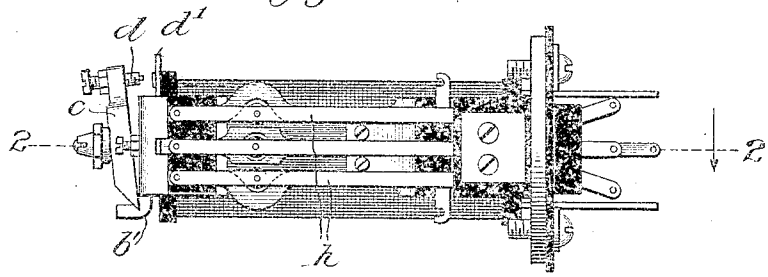


Fig. 2.

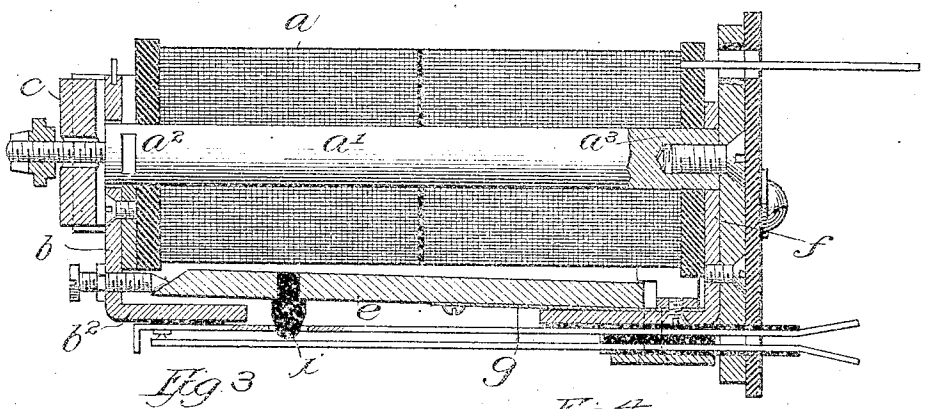


Fig 3

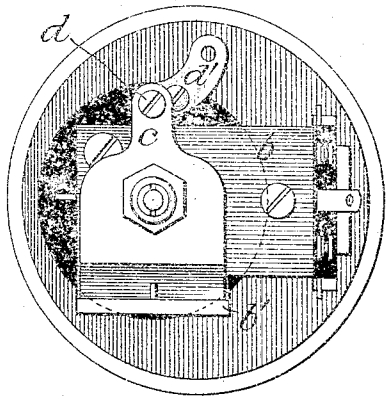
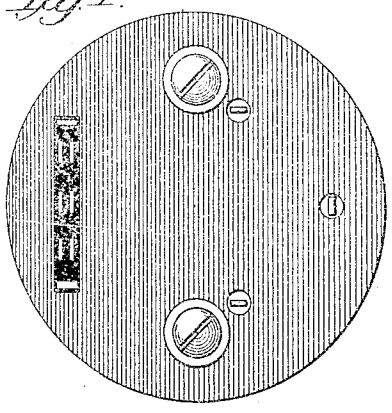


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

EDWARD B. CRAFT, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTROMAGNETIC SIGNAL-CONTROLLING DEVICE.

No. 923,949. Specification of Letters Patent. Patented June 8, 1909.

Application filed September 18, 1906. Serial No. 334,876.

To all whom it may concern:

Be it known that I, EDWARD B. CRAFT, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electromagnetic Signal-Controlling Devices, of which the following is a full, clear, concise, and exact description.

My invention relates to an electromagnetic signal-controlling device, and has for its object to provide an electromagnetic controller which will be efficient and reliable in operation, simple and cheap in construction, and which will be adapted to effect a sequence of relay operations, or to operate sequentially switches to control separate electric signal circuits.

The device of my invention is capable of especially advantageous use in connection with telephone exchanges where it may be employed as a combined line and cut-off relay.

I will describe my invention more particularly by reference to the accompanying drawing, which illustrates the preferred form thereof, reserving for the appended claims a statement of the parts, improvements and combinations which I consider novel with me.

In the drawing, Figure 1 is a side view in elevation of an electromagnetic signal controlling device constructed and equipped in accordance with my invention; Fig. 2 is a sectional plan view thereof in line 2—2 of Fig. 1; Fig. 3 is a front view; and Fig. 4 is a view from the rear.

Like parts are designated by similar letters of reference throughout the several views.

The electromagnet *a* is provided with the usual core a', the end a^2 whereof is provided with a lateral magnetic extension or plate *b*, preferably L-shaped, and secured to the end of the magnet spool. Said extension is magnetically separated from the end a^2 of the core by an air-gap, the plate being preferably cut away to receive the end a^2 of the core, the space between the core and plate forming an annular air-gap. An armature *c* is mounted before the end a^2 of the core a', preferably upon a lip b' of the extension *b*, said armature being adapted to respond to the passage of a small amount of current through the magnet, to engage the plate or magnetic extension *b* and the core a^2, to bridge the gap. Said armature when attracted, by bridging the magnetic gap, increases the magnetic surface of the polar end of the core, due to the plate *b*, and is firmly held in its attracted position. The magnet and armature are thus rendered very sensitive and efficient in operation. Contacts *d d'* are arranged to be operated by the armature *c* when attracted, and said contacts, when the device is employed in telephone work, may serve as the line signal contacts. The magnet is provided with a second armature *e*, lying alongside the magnet spool, said armature being movably supported upon a lateral magnetic extension *f* from the end a^3 of the magnet core. A spring *g* is secured at one end to the armature *e* and at the other end to the extension *f*, to serve as a flexible connection between the armature and extension, said spring also serving to return the armature *e* to its normal position when the magnet is deënergized. Said armature lies in position to respond, upon an increase of current in the magnet, to the attractive force of the portion b^3 of the extension *b*, said portion b^2 extending alongside the magnet parallel to the armature *e*. Contact springs are mounted upon edge alongside the magnet, and the armature *e* carries insulating buttons *i* adapted when the armature is attracted to operate said springs. The contact springs in telephone service may control the line and line signal circuits in the manner of the well-known cut-off relay.

In the preferred form of my invention, I employ a magnet having two windings, one for operating armature *c*, and the other for receiving the additional current necessary to the operation of armature *e*.

It will be noted that by the particular construction of the relay of my invention it is possible to mount the contact springs to lie on the side instead of above the coil, so that the contacts are less likely to accumulate dust or become inoperative.

I claim:—

1. The combination with an electromagnet, of an armature therefor responsive to current in said magnet, contacts operated by said armature, a magnetic extension from the magnet core, magnetically separated therefrom, a second armature lying alongside said magnet and responsive upon an increase of current in said magnet to the attractive force

of said extension, and contact springs mounted upon edge alongside said magnet adapted to be operated by said second armature.

2. The combination with an electromagnet, of a magnetic extension from the core of said magnet, magnetically separated therefrom, an armature mounted before said core adapted to respond to current in said magnet, a second armature for said magnet responsive upon an increase of current in said magnet to the attractive force of said extension, and mechanism operated by said second armature.

3. The combination with an electromagnet, of a lateral magnetic extension from the core of said magnet, magnetically separated therefrom by a slight gap, an armature mounted before said core adapted to respond to current in said magnet, mechanism controlled by said armature and a second armature lying alongside said magnet and responsive upon an increase of current in said magnet, to the attractive force of said extension.

4. The combination with an electromagnet, of a lateral magnetic extension from the core of said magnet, separated therefrom by an air-gap, a lip upon the lower portion of said extension, an armature mounted upon said lip before the magnet core, and responsive to current in said magnet to bridge said gap, a second armature adapted to respond upon an increase of current in said magnet to the attractive force of said extension, and mechanism operated by said armatures.

5. The combination with an electromagnet, of an L-shaped lateral magnetic extension from one end of the core of said magnet, separated therefrom by an air-gap, an armature mounted before said core and responsive to current in said magnet to bridge said gap, an L-shaped magnetic extension from the other end of said core, an armature movably mounted upon said extension and responsive upon an increase of current in said magnet, to the attractive force of said first-mentioned extension, and mechanism operated by said armature.

6. The combination with an electromagnet, of an L-shaped lateral magnetic extension from one end of the core of said magnet, separated therefrom by an air-gap, a lip upon the lower portion of said extension, an armature mounted upon said lip, before the core, and responsive to current in said magnet to bridge said gap, an L-shaped magnetic extension from the other end of said core, a spring secured at one end of said extension, an armature lying alongside the magnet and secured to the other end of said spring, said last-mentioned armature responding upon an increase of current in said magnet, to the attractive force of said first-mentioned extension, and contacts operated by said armature.

7. The combination with an electromagnet, of a magnetic extension from the core of said magnet, magnetically-separated therefrom, an armature mounted before said core and responsive to current in said magnet, a second armature for said magnet, said armature responding upon an increase of current in said magnet to the attractive force of said extension, and contact mechanism operated by said armatures.

8. The combination with an electromagnet, of a plate of magnetic material secured to one end of said electromagnet, said plate being cut away to receive one end of the magnet core, the space between the core and plate forming an air-gap, an armature for said magnet mounted before the core thereof, adapted when attracted to engage said core and plate to bridge the air-gap, and contact mechanism operated by said armature.

9. The combination with an electromagnet, of an L-shaped magnetic plate secured to one end of said magnet, said plate being cut away to receive one end of the core of said magnet, the space between the core and plate forming an annular air-gap, an armature mounted before said core adapted to respond to current in said magnet to engage said plate and core, a second armature for said magnet responsive upon an increase of the current in said magnet to the attractive force of said extension, and contact mechanism operated by said armatures.

In witness whereof, I hereunto subscribe my name this 7th day of September A. D. 1906.

EDWARD B. CRAFT.

Witnesses:
CLARENCE A. COGGIN,
ROY. T. ALLOWAY.