(No Model.) 2 Sheets—Sheet 1.

A. C. FRASER.

DOUBLE CURRENT RELAY OR ELECTRO MAGNET.

No. 286,917. Patented Oct. 16, 1883.

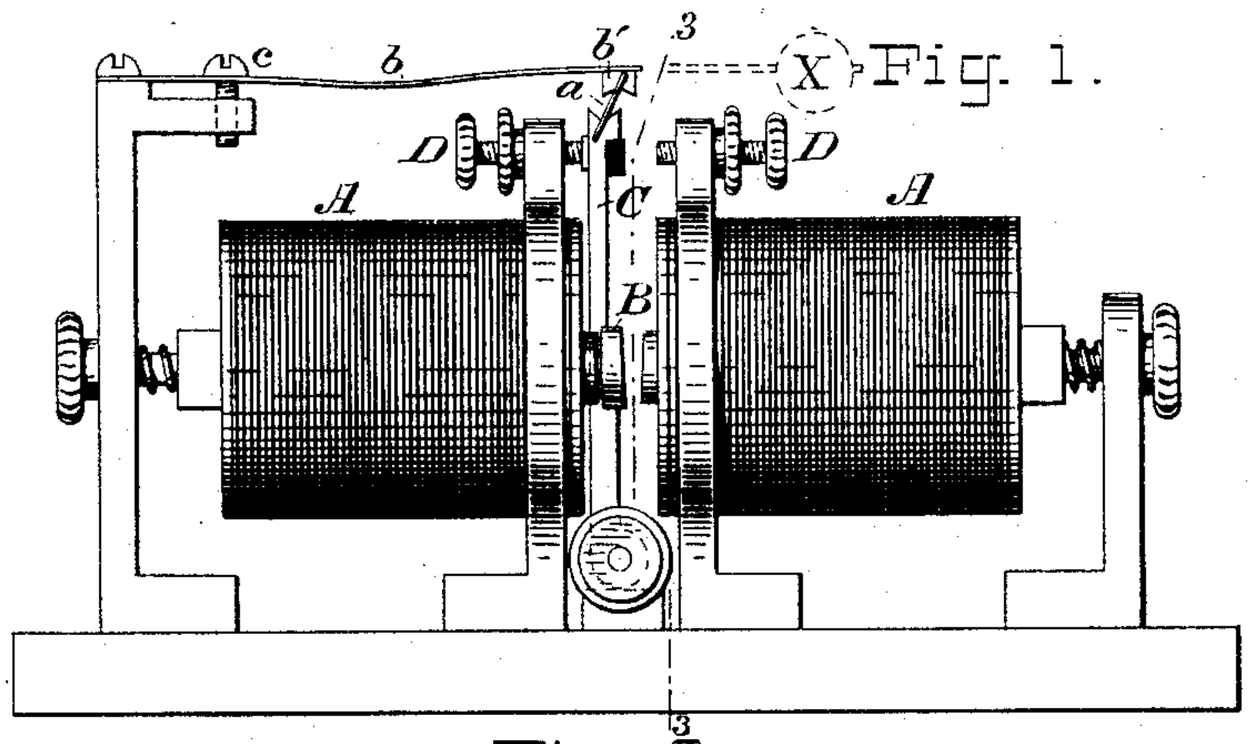


Fig. 1.

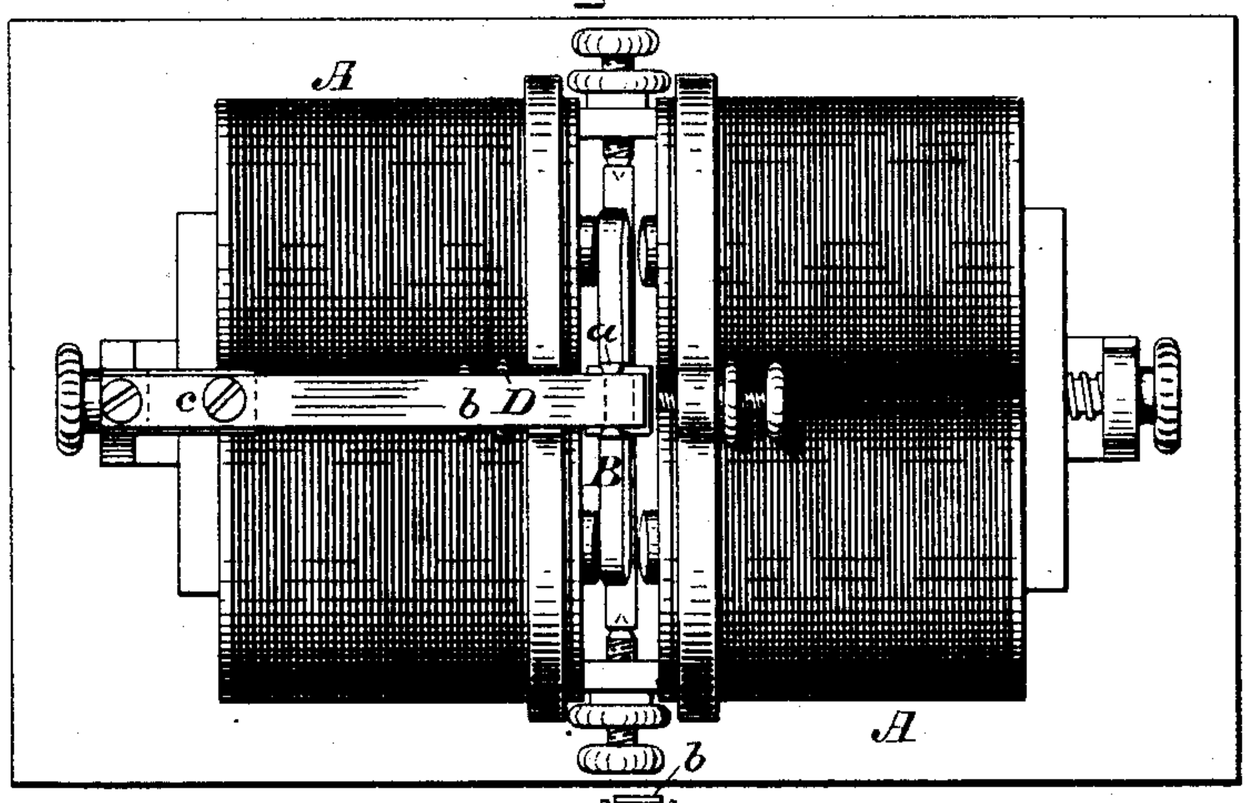


Fig. 2.

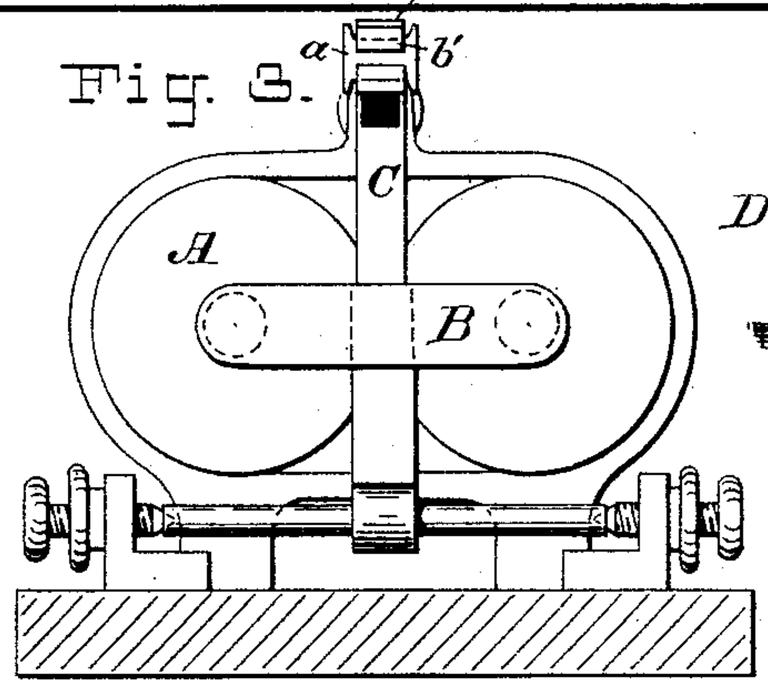


Fig. 3.

Fig. 5.

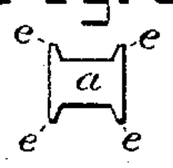
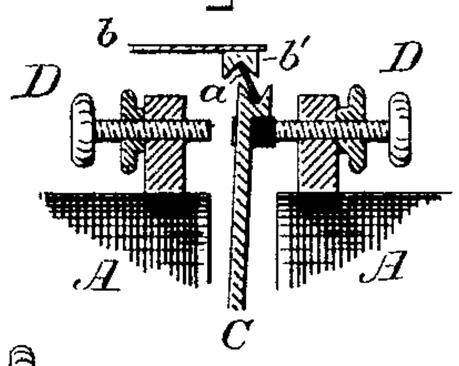


Fig. 4.



WITNESSES:

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INVENTOR:

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By his Attorneys,

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(No Model.) 2 Sheets—Sheet 2.

A. C. FRASER.

DOUBLE CURRENT RELAY OR ELECTRO MAGNET.

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Fig. 6.

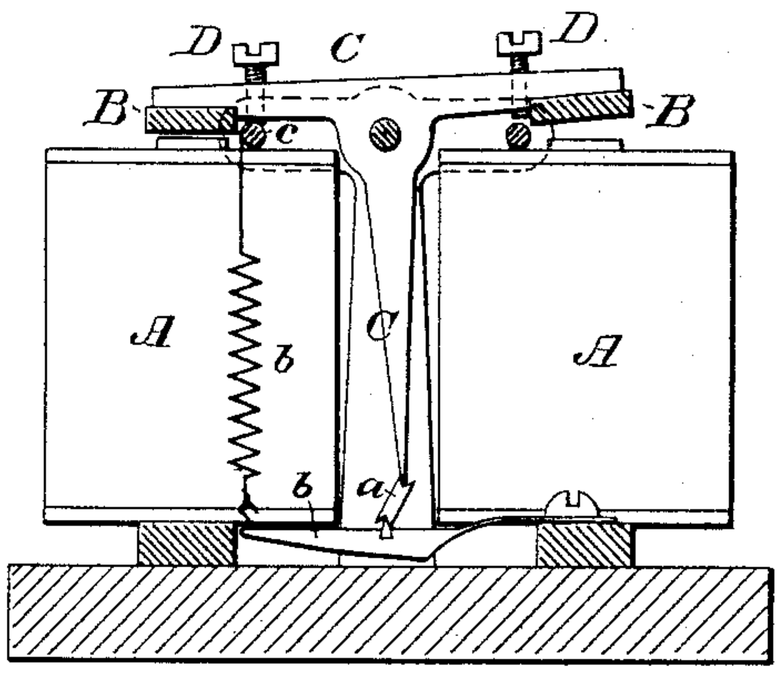


Fig. 7.

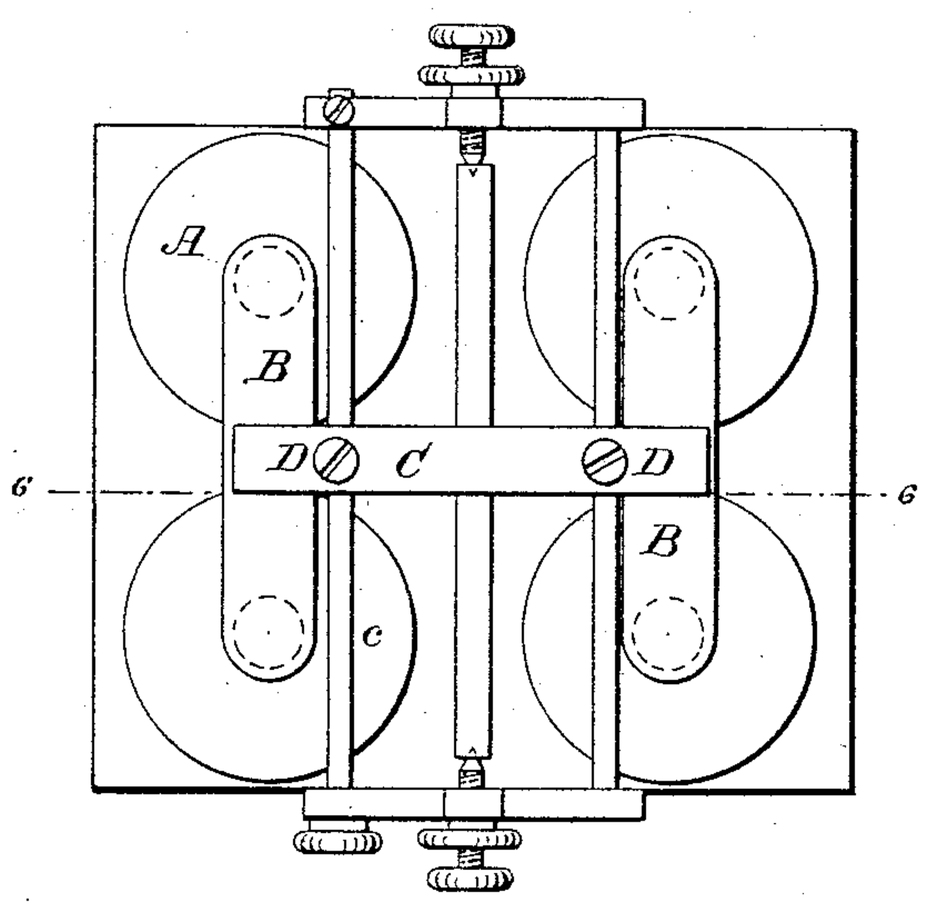


Fig. 8.

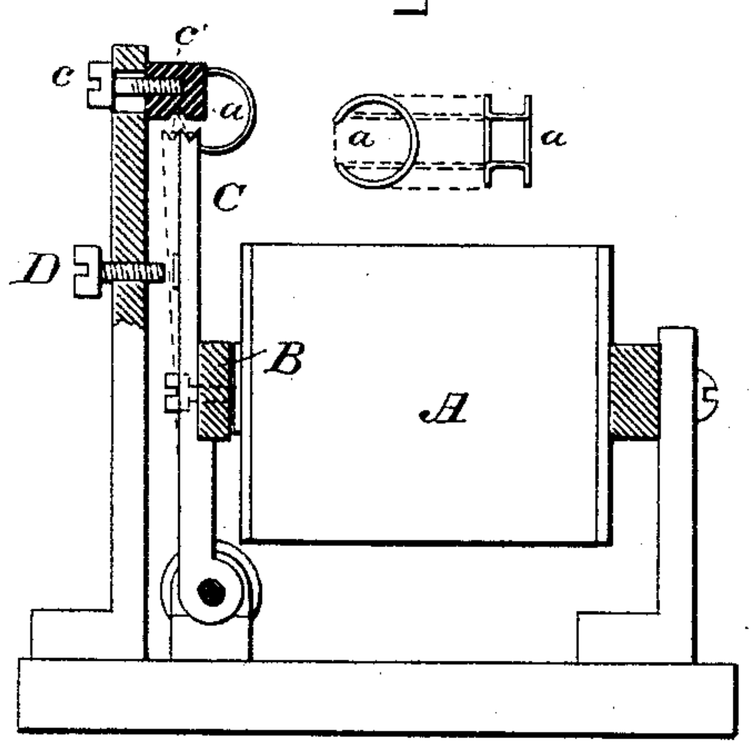
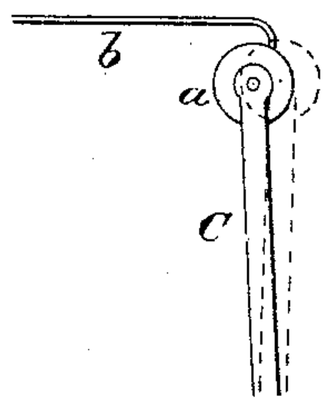


Fig. 9.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ARTHUR C. FRASER, OF BROOKLYN, NEW YORK.

DOUBLE-CURRENT RELAY OR ELECTRO-MAGNET.

SPECIFICATION forming part of **Letters Patent No. 286,917**, dated October 16, 1883.

Application filed April 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. FRASER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Double-Current Relays or Electro-Magnets, of which the following is a specification.

For some purposes—notably in electric signaling—it is necessary to continue or prolong the effect of the charging of an electro-magnet after the same has been discharged, or to hold its armature in the attracted position after the magnet has ceased to attract it. My invention relates to means for effecting this result; and it was designed, primarily, for use in cases where it is necessary to effect the breaks and closures of one circuit through the medium of two other circuits. In such case the three circuits converge at what may properly be termed a "double-circuit relay," since it is an instrument acting to close and break one circuit operated by magnets placed in two other circuits. The momentary closure of one of the operating-circuits serves to draw the armature-lever against the contact-stop, and thereby to close the local or actuated circuit, while the momentary closure of the other operating-circuit serves to draw the lever away from the stop and break the actuated circuit.

My invention is applicable to an instrument of this character; and its object is to provide an effective means of insuring that the lever shall remain in either position when attracted thereto.

My invention is also applicable to the lever of a polarized magnet or relay, which is worked by currents in a single circuit in alternately-opposite directions, and which may act on a magnetized armature either by attraction or repulsion, or both.

In the accompanying drawings, Figures 1 to 5 show the preferred form of my invention as applied to a double-circuit relay, and the remaining figures illustrate modifications thereof.

Fig. 1 is a side elevation. Fig. 2 is a plan. Fig. 3 is a vertical transverse section, taken in the plane of the line 3 3 in Fig. 1. Fig. 4 is a fragmentary vertical longitudinal mid-section, and Fig. 5 is a detail view. Fig. 6 is a vertical section of a modification taken in the plane of the line 6 6 in Fig. 7, which is a plan thereof. Fig. 8 is a similar section to Fig. 6, showing another modification, and Fig. 9 is a sketch illustrating a further modification.

In all the figures, A A are electro-magnets, B is the armature, C is the armature-lever, and D D are stop-screws, limiting the movement of said lever, one of which may be a contact-screw for completing a local circuit through the lever, and the other an insulated stop-screw. All these parts are of the ordinary construction, and require no description.

The left-hand magnet in Fig. 1 acts to close the local circuit, and the right-hand one to break it. The desideratum is that when the circuit is closed by the exciting of the left-hand magnet, it shall remain closed until the right-hand magnet is excited, when it shall be broken, and remain broken until the left-hand magnet is again excited. This result has been heretofore accomplished by providing a spring-catch to retain the armature of one magnet in its attracted position, and arranging the other magnet to withdraw this catch. This method requires two armatures, two armature-levers, and two retracting-springs. My invention is designed to accomplish the same result by simpler means.

Referring to Figs. 1 to 5, where the magnets are placed face to face with a single armature between them, *a* is a toggle-link, and *b* a spring acting thereon. The link *a* is interposed between the end of the lever C and the spring *b*, and consists of a small piece of sheet metal whose opposite edges rest, as knife-edges, in V-grooves in the lever end, and in a block, *b'*, fixed to the spring *b*, so that it may have a limited motion without appreciable friction. The spring *b* presses toward the fulcrum of the lever C, and is adjusted by a screw, *c*. When the lever C is at mid-stroke the link *a* is directly in line therewith; but as the lever moves to either side of mid-stroke, the link, transmitting to it in oblique direction the pressure of the spring *b*, aids its movement, and forces it to the extreme of its stroke, at

which point the spring acts upon it to the greatest mechanical advantage, by virtue of the oblique position of the link, to retain it in that position. The link and lever thus together constitute a toggle-lever or toggle-joint, which is pressed upon by a spring, so that it tends to double up. When the lever C is at either side, it must be subjected to a certain pull from the opposite magnet to overcome the resistance of the spring, and the magnetic attraction must continue until the lever has passed mid-stroke, after which its movement can be completed by the spring. To prevent the displacement of the link *a*, I provide it with ears *e e*, as shown in Fig. 5, which take outside the lever C and block *b'*, as shown in Figs. 1, 2, and 3.

Figs. 6 and 7 show a modification wherein the lever C has three arms, two of which bear the separate armatures of two magnets, and the third is acted on by the toggle-link *a*. The V-notches are in the ends of the link *a*, and the knife-edges are formed on the end of the lever C, and on a lever, *b'*, which stands in place of the spring *b* in Fig. 1. This lever *b'* is filed thin at its point of attachment, to render it flexible and serve in place of fulcruming, and it is acted on by a helical spring, *b*, which is adjustable by winding more or less of a thread connected to it on a spindle, *c*, in the usual manner. The operation is the same as before described.

The two magnets A A may be electro-magnets, each in a separate circuit, and the armature or armatures B be of soft iron, or the latter may be permanently magnetized and the magnets be both included in one circuit, but so connected or polarized that, with a current in a given direction, one will attract the magnetic armature while the other will repel it. This constitutes the well-known "polarized relay," which is worked by currents in alternately-opposite directions. With this construction, one of the magnets may be omitted, when the other will attract the armature in one direction and repel it in the other. Such a construction is shown in Fig. 8, which also illustrates a modification of my spring and toggle arrangement. Here the spring and the toggle-link are combined in one piece, which is shown in side and front elevation above the figure. A fixed block, *c'*, preferably of insulating material, adjustable vertically to alter the tension of the spring, receives the upward pressure of the spring-link *a*. This link is shortest or most compressed when the lever C is at mid-stroke and elongates as the lever moves to either side thereof. If one magnet is stronger than the other, or the force acting on the armature in one direction is stronger than that acting in the other, the link *a* may be set in line with the lever C when it is nearest the weaker magnet or force instead of when it is at mid-stroke.

My invention may also be applied to advantage to ordinary relays to insure a firm contact, and by arranging the link to press all in one direction it may be made to serve as the retracting-spring thereof.

In Fig. 9, I have shown a modification wherein the link is replaced by a wheel of equal radius, which receives the downward pressure of the end of the spring, which is turned down to act as a knife-edge. It will be understood that only that portion of wheel extending along a radius drawn from its center to the point on its periphery which is in contact with the spring is essential. A weight may be substituted for the spring in my invention.

In Fig. 1, I have indicated by dotted lines at X the substitution of a weighted lever for the spring *b*.

I claim as my invention—

1. An armature-lever arranged adjacent to the poles of an electro-magnet, and adapted to be impelled in alternately-opposite directions by opposite alternately-acting and momentary forces, in combination with a link arranged in line with the lever when the latter is in a position of equilibrium adapted to communicate a yielding pressure thereto in the direction of its fulcrum, whereby, when the lever is moved to either side of said position, the link assumes a position oblique thereto, and its pressure is exerted to force the lever farther to that side, substantially as set forth.

2. The combination of two oppositely-arranged and oppositely-acting electro-magnets, a lever bearing the armature or armatures thereof, a toggle-link arranged in line with said lever when the latter is in an intermediate position, and adapted to communicate a yielding pressure thereto in the direction of its fulcrum, whereby, when the lever is attracted to either magnet, the said pressure will be exerted obliquely upon it to retain it in that position, substantially as set forth.

3. The combination of armature-lever C, suitable stops limiting its movement, link *a*, of rigid material, spring *b*, or a weight acting upon said link, and knife-edge connections between said link, and said spring or its equivalent and said lever, substantially as set forth.

4. The combination of spring *b*, adjustment *c* therefor, rigid link *a*, lever C, bearing-armature B, stops D D, and electro magnet or magnets A, substantially as set forth.

5. The link *a*, formed of sheet metal with ears *e e*, in combination with block *b'*, or its equivalent having a V-groove, and with lever C, having a V-groove, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ARTHUR C. FRASER.

Witnesses:

WILLIAM D. LANDRAY,

HENRY CONNETT.