(No Model.)

L. J. PHELPS.

POLARIZED RELAY.

No. 334,185. Patented Jan. 12, 1886.

Fig. 1.

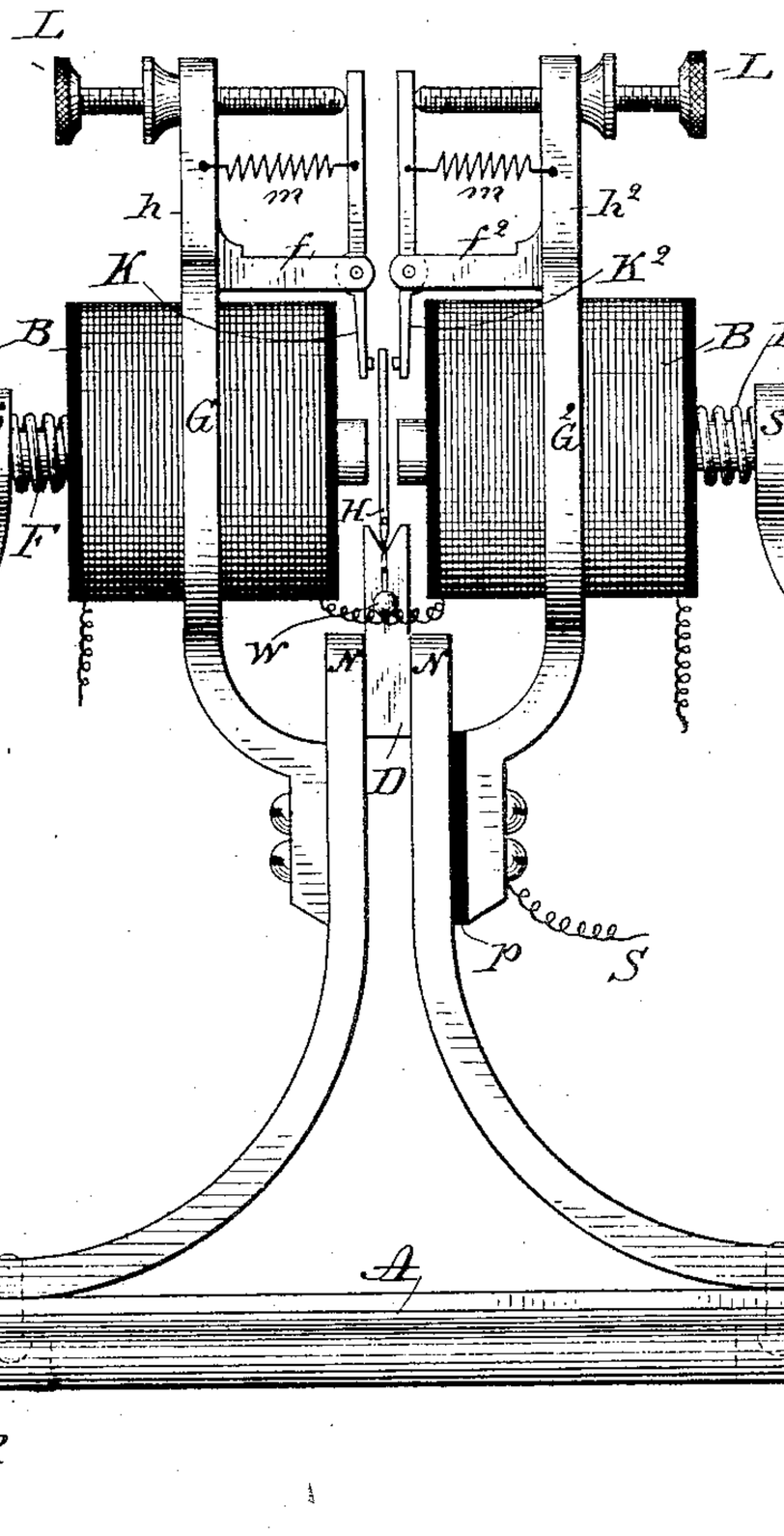


Fig. 2.

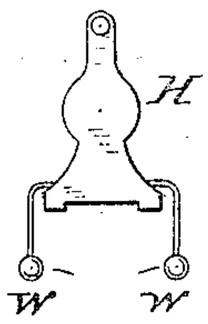
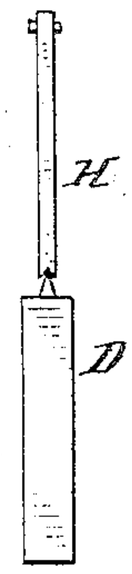


Fig. 3.



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By his Attorney: H. G. Townsend

UNITED STATES PATENT OFFICE.

LUCIUS J. PHELPS, OF NEW YORK, N. Y., ASSIGNOR TO THE RAILWAY TELEGRAPH COMPANY, OF SAME PLACE.

POLARIZED RELAY.

SPECIFICATION forming part of Letters Patent No. 334,185, dated January 12, 1886.

Application filed November 18, 1884. Serial No. 148,225. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS J. PHELPS, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Polarized Relays, of which the following is a specification.

My invention relates to the construction of relays of the class known as "polarized" relays, and is designed more especially as an improvement upon the type of relay known as the "Siemens" polarized relay. Like the latter, my relay embodies a polarized armature playing between two soft-iron magnet-cores normally polarized, so as to exhibit magnetism of the same sign, and wound with coils of wire connected or applied in such way that the current which increases the strength of one pole will decrease or reverse the polarity of the other; but in the manner of charging the electro-magnets and in the form and mounting, &c., of the armature, and in the construction and arrangement of the various parts, it embodies improvements which, among other things, add to the strength and delicacy of action, as well as to the stability of adjustment.

In my improved relay the electro-magnets are charged, not from the same pole of the permanent magnet, but from separate poles of a multipolar magnet having a common or central pole by which the armature is charged or magnetized.

The armature of my relay consists simply of a thin plate of soft iron mounted in upright position directly upon the mass of iron forming its charging-pole, and preferably provided with knife-edge bearings.

The improved details and combinations constituting my invention will be more specifically hereinafter set out in connection with the accompanying drawings, and will then be specified in the claims.

In the annexed drawings, Figure 1 is a side elevation of a relay constructed in accordance with my invention, the armature being shown in edge view. Fig. 2 is an elevation of the armature detached. Fig. 3 illustrates a modification in the manner of mounting the armature.

A, Fig. 1, represents the base of the instrument, upon which is mounted the magnet or magnets serving to charge the armature, and the two electro-magnets B B of the instrument. The electro-magnets B B are charged by magnetic contact or contiguity with separate magnet-poles, which poles are preferably the poles of a multipolar magnet, having a common or central pole of one sign and separate or distinct poles of the opposite sign. Such multipolar magnet may be of steel and have permanent magnetism of its own, or it may be kept constantly charged by electricity. It may be made in a single piece, or it may be compound, or made up of several magnets having like poles conjoined to form a common or central pole. The latter is the construction shown in Fig. 1, where I have indicated two permanent magnets, C C^2, fastened to the base A, and having their like poles, as N N, magnetically conjoined by contact with a piece of iron or steel, D, clamped between them in any suitable manner, so as to make the common or central pole of, say, north polarity. The opposite poles, S, of the magnets charge the cores of the two electro-magnets B B, whose soft-iron cores, in the construction shown, pass through the poles S S and have a screw-thread cut upon their outer ends for the reception of adjusting-nuts E, by which the electro-magnets may be adjusted away from the armature. Springs F serve to move the electro-magnets in the opposite direction when the nuts are turned to permit the cores to move inward toward the armature. The cores are polarized from the separate poles S in obvious manner.

G G^2 indicate yokes, in which the electro-magnets rest, and in which they may move backward and forward for the purposes of adjustment by the nuts E.

The armature is indicated at H. It consists of a thin plate of iron standing upright upon the polarized piece D, and preferably in direct magnetic contact therewith, although a thin piece of non-magnetic material—such as copper or brass—might be interposed. I prefer, however, to construct the relay with direct magnetic contact at this point, or with such a

thin piece of interposed non-magnetic material that the attraction shall not be greatly diminished. This construction is adopted in order that good electric contact may be maintained at this point, since the circuit controlled by the relay is in the present instance carried through the pole D and the armature.

The bearing for the armature-plate is a knife-edge bearing, as indicated, in order to give the greatest possible freedom of movement. The knife-edge may be formed on the armature itself, as shown in Fig. 1, or upon the block D, as shown in Fig. 4.

The stops for the armature are carried upon levers K K^2, the stop on K^2 being the contact-stop. The levers are mounted on brackets *f* f^2, projecting from the extensions *h* h^2, rising from the yokes G G^2. By this construction the stops are brought down between the electro-magnets, while at the same time facility of adjustment is secured. The screws L L, passing through the extensions *h* h^2, bear against the upper ends of the levers and hold the stops on the levers at the desired regulated position against the action of the springs *m m*, tending to draw the lower ends of the levers toward the armature. The yokes G G^2 are mounted on the permanent magnets, but the yoke G^2 is insulated from its support, as indicated at *p*. The poles of the circuit controlled by the relay are connected one to the yoke G, or to the magnet C, as shown at R, and the other to the yoke G^2, as shown at S, so that the circuit may be formed through C, block D, armature H, contact on K^2, and yoke G^2.

The coils of the electro-magnets B B are wound or connected in the usual and well-known way, so that a current of any given polarity which will strengthen the magnetism in the soft-iron core of one will decrease or reverse the magnetism in the soft-iron core of the other. The relay operates after the well-known manner of a Siemens polarized relay.

I do not limit myself to any particular form of magnet or magnets C C^2, nor to any particular devices for securing the desired adjustments, as these, as well as other elements of the relay, may be obviously modified in many ways without destroying the efficiency of the other novel and improved arrangements and combinations claimed.

In order to prevent disturbance of the armature from sudden jars communicated to the instrument, I provide the armature with one or more balance weights or arms, *w*, which are of such size or are supported at such distance from the pivotal points of support for the armature that they shall by their inertia counterbalance any tendency of the armature to change its position with relation to its stops by the effects of a sudden jar or movement given to its point of support.

The action of the inertia counter-balance will be readily understood from the following explanation: When a sudden jar is communicated to the relay in a line with the line of motion of the armature, the armature itself will, by being so moved with the other parts, acquire a momentum of its own, and if there be nothing to counteract the effects the inertia will tend to cause the armature to continue its movement after the cessation of movement in the other parts. If the movement is in a line away from the stop with which the armature is in contact, then the inertia will carry the armature away from such stop and produce a disturbance of action. When, however, the inertia counter-balance is employed, the same sudden jar or movement which acts upon the relay-armature will also act upon the counterbalance-weight, and the latter, owing to the fact that it is upon the opposite side of the fulcrum from the armature, will by its own inertia obviously counteract the tendency of the armature itself to continue its movement. If the counterbalance-weight be of proper size or located at a proper distance from the fulcrum, there will be an exact balance of action and the disturbing effects of jars or sudden movements communicated to the relay through any part upon which it rests will be nullified. This device is of special utility when the relay is employed upon a moving railroad-car, according to my system of induction-telegraphy.

I am aware that in some forms of polar relay—as, for instance, in the modifications of Siemens polar relay—a bifurcated soft-iron piece is attached to one pole of the permanent magnet, and the electro-magnets of the instrument are in connection with the two bifurcations. In such instrument, however, the part that constitutes the permanently or continuously magnetized portion corresponding in the instrument to the ordinary polar relay has only the two poles of the ordinary bar-magnet. In my invention the part corresponding to such permanent magnet has two or more distinct poles of one name, and a common pole of the opposite name, and my improved relay may be defined as one whose permanently or continuously magnetized portion comprises two or more distinct polar portions of the same name, and a pole of the opposite name common to the said distinct poles, the whole constituting in effect a multiple permanent magnet of an ordinary polarized relay.

What I claim as my invention is—

1. The combination, substantially as described, of two permanent magnets having like poles conjoined, an armature polarized from the conjoined ends, and electro-magnets between which said armature is placed, said magnets having their cores polarized, respectively, from the two divergent poles of the permanent magnet—to wit, those that are of opposite name to the two poles that polarize the armature.

2. The combination, in a polarized relay, of two permanent magnets having two of their poles of the same polarity clasping a block of soft iron, two magnets having their cores, respectively, in magnetic connection with the two

remaining poles of the permanent magnet, and an armature polarized from the connected poles and playing between said electro-magnets.

3. The combination, substantially as described, of the two permanent magnets C C', the block D, clamped between like poles of said magnets, electro-magnets B B, having their cores arranged in line and projecting from the separated poles of the magnet, and an armature consisting of a plate of soft iron mounted on the block D between the contiguous poles of the electro-magnets.

4. The combination, in a polarized relay, of the two permanent magnets having two like poles magnetically united, and their two separate opposite poles extended above or beyond the point of union, and two electro-magnets supported in yokes carried by the permanent magnets, the cores for said electro-magnets being in magnetic connection, respectively, with the said two separate poles for the permanent magnets.

5. The combination, in a polarized relay, of a multipolar permanent magnet having a common or central pole of one polarity and two separate poles of the opposite polarity, of electro-magnets having their cores passing through the said separate poles, and adjusting-nuts applied to said cores and acting thereon to retract them from the armature in opposition to springs, as and for the purpose described.

6. In a polarized relay having a multipolar magnet with a common or central pole of one polarity for charging the armature, electro-magnets whose cores are arranged in line and are connected to the opposite poles of an armature consisting of a plate of soft iron mounted on the common or central pole, and stops therefor mounted on adjustable levers, as and for the purpose described.

7. The combination of the multipolar magnet having a central pole of one polarity, the yokes G G', supported by said magnet, the electro-magnets mounted thereon, an armature charged from the common or central pole, and adjustable contact-stops and adjusting devices mounted on extensions from the yokes.

8. The combination of the two permanent magnets, the yokes G G', mounted thereon, the contact-levers, the brackets *f f'*, the adjusting-screws, the electro-magnets mounted in the yokes, and the armature playing between said electro-magnets, as and for the purpose described.

9. The combination, in a polarized relay, of a multipolar magnet, an armature polarized from a common or central pole, electro-magnets whose cores pass through poles of opposite name, the adjusting-nuts E, and the springs F, as and for the purpose described.

10. The combination, with the armature for a telegraph-receiver, of an inertia counterbalance, for the purpose described.

11. The combination, with the upright relay-armature, of a weighted arm extending downward to the opposite side of the pivotal point for said armature, and adapted to have an inertia the equivalent to that of the armature, as described.

Signed at New York, in the county of New York and State of New York, this 21st day of October, A. D. 1884.

LUCIUS J. PHELPS.

Witnesses:
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WM. H. BLAIN.