(No Model.)

C. D. HASKINS.

QUADRUPLEX NEUTRAL RELAY.

No. 523,119. Patented July 17, 1894.

Fig. 1

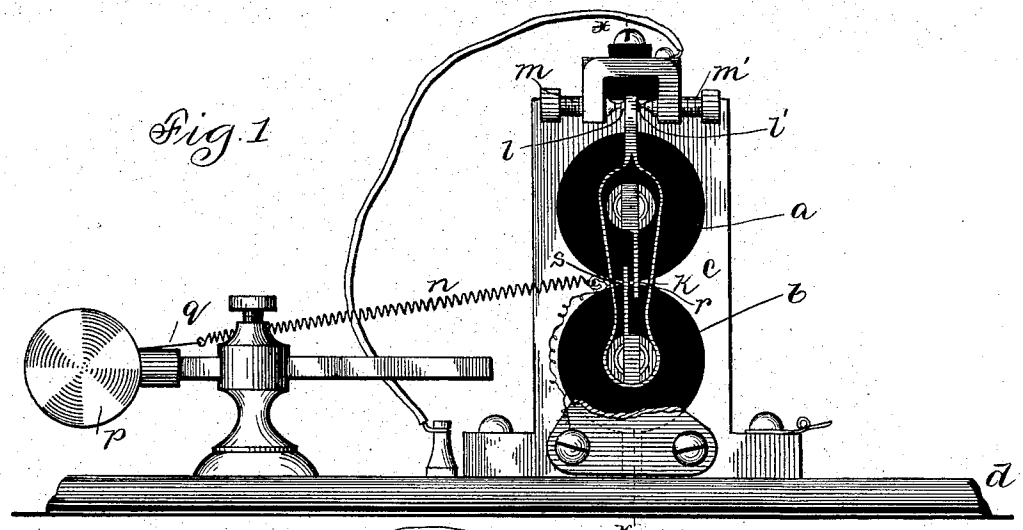


Fig. 2

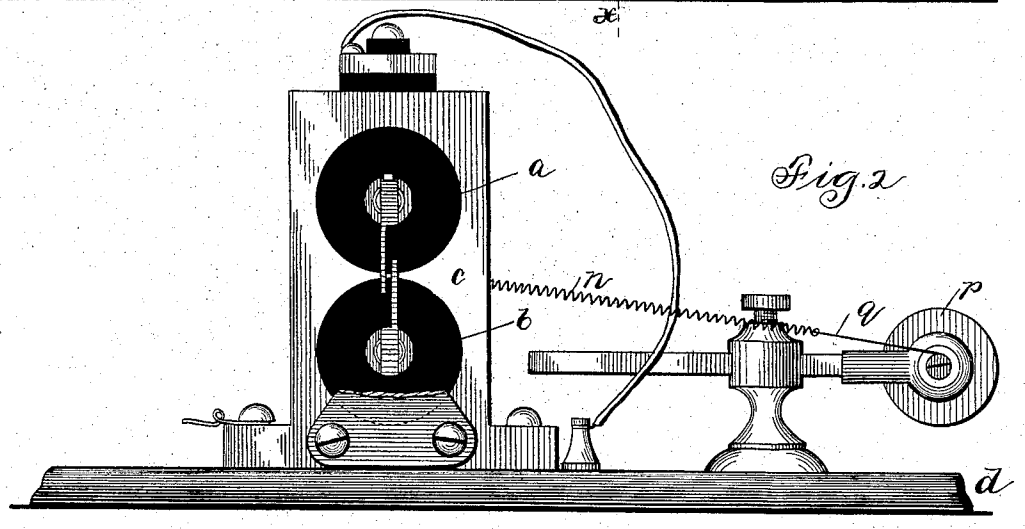
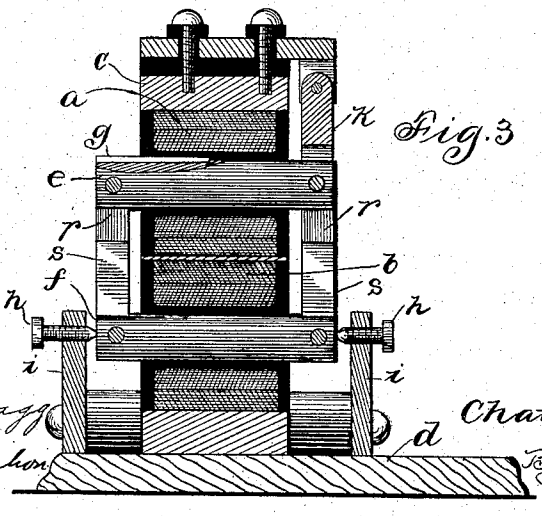


Fig. 3



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UNITED STATES PATENT OFFICE.

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QUADRUPLEX NEUTRAL RELAY.

SPECIFICATION forming part of Letters Patent No. 523,119, dated July 17, 1894.

Application filed April 3, 1893. Serial No. 468,826. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. HASKINS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Quadruplex Neutral Relays (Case No. 11,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telegraph relays, and more particularly to neutral relays used in connection with quadruplex telegraphy. Its object is to avoid the false signal which is incident to the quadruplex apparatus heretofore employed.

In quadruplex systems of telegraphy one line is provided at each end with two receiving and two transmitting instruments, with circuits so arranged that four messages may be simultaneously transmitted over the single line—that is to say, four operators are required at each end of the line, two for sending and two for receiving. Considering the apparatus at one end of the line, we have two receiving instruments, one a polarized relay, and one a neutral relay. The transmitting instruments consist, one of a double current transmitter or pole-changer, and the other of a single current transmitter or continuity-circuit-preserving key. The receiving instruments are wound differentially in the well known way, so that current sent through their coils by the transmitting instrument at the same end of the line will not operate either of them. This is accomplished in brief by sending current in branches through the differential windings, one branch going to ground, and the other branch to line, the electrostatic capacity and resistance of the line being equalized by a condenser and rheostat, in the well known way. In the working of quadruplex systems of this class a well known defect exists. This defect is a false signal which is caused at the neutral relay when the polarity of its current is changed by the double current transmitter at the distant end during the time that the armature of said neutral relay should be affected only by the operation of the single current transmitter. This false signal results from the fact that the operator of the continuity-circuit-preserving key at the transmitting end has no control over the polarity changing transmitter, and while the former may be sending a dash, for instance, the operator of the pole changing transmitter may reverse the direction of current on the line and thus the direction of current through the neutral relay. This would occur while the neutral relay armature is drawn up against the poles of the magnet, and results in a sudden change of polarity in the electro-magnet. The soft iron armature momentarily retaining the polarity of the magnetism previously induced therein by the electro-magnet, there is a momentary repulsion between the armature and the poles of the electro-magnet which "kicks" the armature away and makes the false signal already mentioned. This false signal has been heretofore prevented by various devices, especially designed for this purpose, as is shown, for example, in Moffatt and Blakeney No. 351,993 of November 2, 1886; Jones, No. 360,528 of April 5, 1887, and Charles D. Haskins, No. 405,211, of June 11, 1889, and No. 455,398 of July 7, 1891, all for quadruplex telegraphy.

My present invention is intended to obviate such false signals, and it consists, briefly, in providing a neutral relay with an armature which is surrounded by practically the same electrical influence as surrounds the electro-magnet with which it works. In other words, the armature of my invention is preferably an exact duplicate of the electro-magnet, both as to form, size and magnetic properties and electrical surroundings. Thus whatever electrical influences actuate the electro-magnet, equally actuate the armature, and any change of polarity in one is simultaneously accompanied by a change of polarity in the other. Hence, reversals of direction of the current never cause a repulsion even of momentary duration between the armature and the electro-magnet.

While it is true that there is an instant in which there is no attraction between the armature and electro-magnet, I have found in practice that the inertia of the armature lever is sufficient to resist the retractile force of the spring for a time long enough to hold the armature in its place for this brief instant.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of a relay of my invention. Fig. 2 is a rear elevation. Fig. 3 is a sectional view on line *x*—*x* of Fig. 1.

Like parts are referred to by similar letters of reference in the three views.

The magnets *a b* are mounted within a frame *c*, which may be fastened upon a suitable base *d*. The magnets are of the usual differentially wound type. The cores of the magnets consist of rods *e f* which project beyond the magnets and the frame *c*. The core *e* of the upper magnet *a* is held stationary by being splined to the drum of the spool by a spline *g*, or in any other suitable manner. The lower core *f* of magnet *b* is allowed freedom of motion within the spool. This core is preferably mounted at its ends upon pivot screws *h h*, which in turn are mounted upon the upright standards *i i*. By means of this method of mounting the core *f* is capable of rotary movement. This rotary movement, however, is limited by the lever *k* which is screwed upon one end of the core *f*. The upper end of this lever *k* is provided with contact points *l l* and is limited in its movement by the contact screws *m m'* in the usual manner. Point *l* is caused to rest normally upon contact screw *m* by means of a retractile spring *n* which is attached to the lever *k*. The retractile force of this spring is controlled by means of the thumb-screw *p*, to the shank of which is attached the other end of the spring *n* by means of the cord *q*.

Extensions *r r* of the magnet core *e* are provided, which are adapted to attract extensions *s s* of the armature core *f*, which are preferably symmetrically placed with relation to the extensions of the magnet core *e*. This construction practically results in the production of two electro-magnets, one of which, with its core, is fixed, while the core of the other is adapted to have a rocking movement.

It should be noted that while the ideal condition for a relay embodying my invention is one in which the armature is an exact duplicate as to electrical surroundings and magnetic properties, nevertheless, this condition may be departed from and yet good practical results secured. I do not wish to limit myself to a construction in which there is exact identity of surrounding conditions in the two, nor do I wish to limit myself to the precise mode of embodying my invention herein shown and described, as it is obvious the same result may be secured by modifications of details which will readily suggest themselves. Nor do I wish to limit myself to the special application of my invention herein shown, as many different uses for it may be found. For example, two electro-magnets so related to each other that they are adapted to exert the same reciprocal influence upon each other, substantially as I have described, may be advantageously used in any circuit upon which an alternating current is used, as by means of this arrangement the momentary repulsion between the armature and the pole of the electro-magnet of the ordinary construction, is obviated; but

What I claim as new, and desire to secure by Letters Patent, is—

1. In a neutral relay, the combination with an electro-magnet provided with a core, of an armature adapted to be affected by said electro-magnet and serving as the core of a helix connected in the same circuit with the helix of said electro-magnet, said helices being equivalent as to magnetic inductive influence upon their respective cores, said cores being equivalent as to magnetic susceptibility; whereby reversal of the current flowing in said helices causes the magnetization of said cores to fall, change sign and rise in unison, substantially as described.

2. In a neutral relay, the combination with an electro-magnet provided with a stationary core, of a pivotally mounted armature adapted to be affected by said electro-magnet and serving as the core of a stationary helix connected in the same circuit with the helix of said electro-magnet, said helices being equivalent as to magnetic inductive influence upon their respective cores, said cores being equivalent as to magnetic susceptibility; whereby reversal of the current flowing in said helices causes the magnetization of said cores to fall, change sign, and rise in unison, substantially as described.

3. In a neutral relay, the combination with an electro-magnet provided with a core carrying an arm at right angles to the axis thereof, of an armature adapted to be affected by said electro-magnet and serving as the core of a stationary helix connected in the same circuit with the helix of said electro-magnet, said armature core being pivoted to rotate about its axis and carrying an arm at right angles to its axis adapted to engage the arm of the core of said electro-magnet, said helices being equivalent as to magnetic inductive influence upon their respective cores, said cores being equivalent as to magnetic susceptibility; whereby reversal of the current flowing in said helices causes the magnetization of said cores to fall, change sign, and rise in unison, substantially as described.

In witness whereof I hereunto subscribe my name this 20th day of March, A. D. 1893.

CHARLES D. HASKINS.

Witnesses:
GEORGE MCMAHON,
GEORGE L. CRAGG.