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A. MUIRHEAD.

ELECTRIC TELEGRAPHY.

APPLICATION FILED AUG. 11, 1902.

NO MODEL.

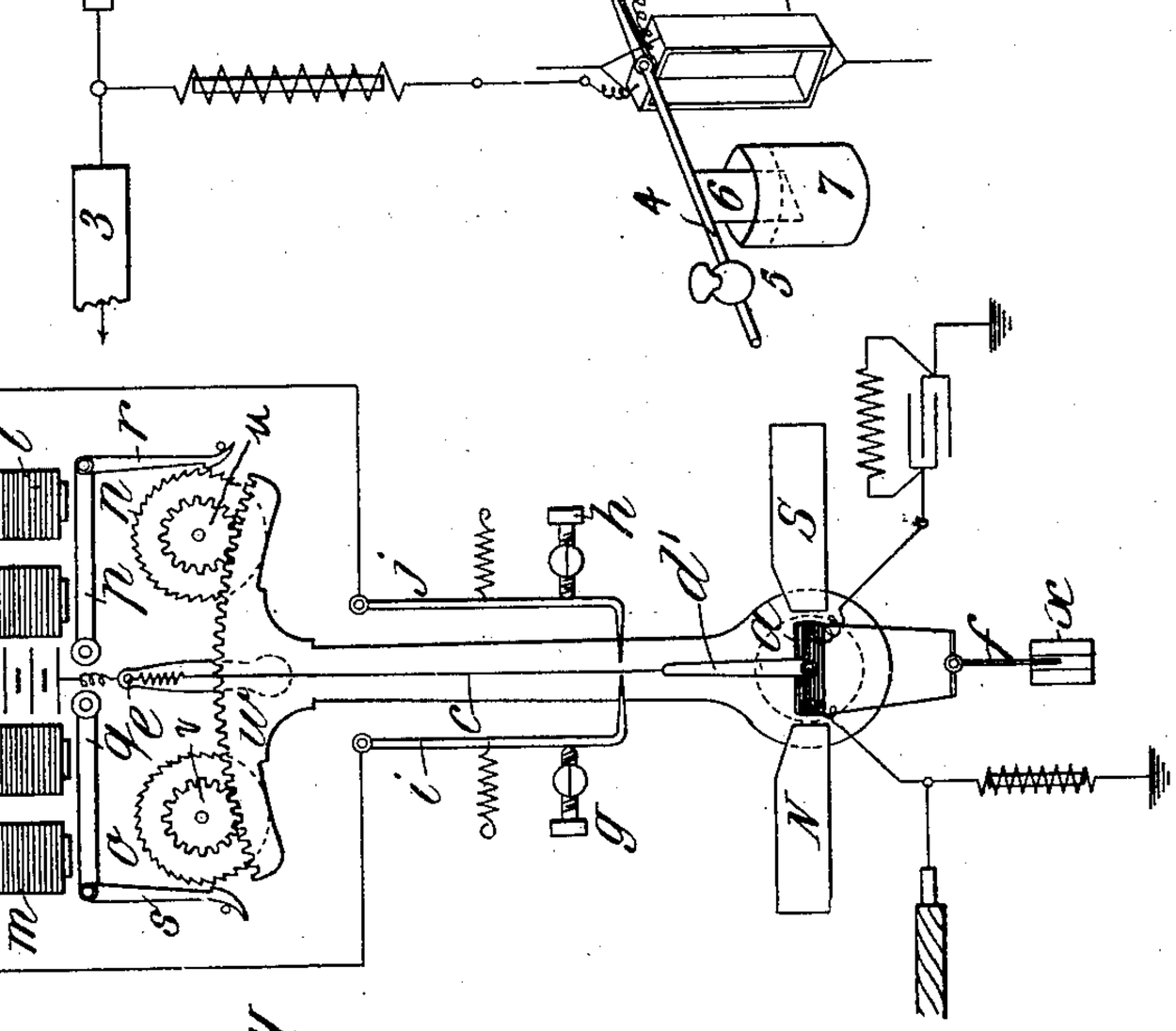

Fig. 3.

Fig. 4.

Fig. 2.

Fig 1.

Witnesses.
A. M. Parkins.
M. M. O'Connor.

Inventor,
Alexander Muirhead
By his Attorneys,
Baldwin Davidson & Wright.

UNITED STATES PATENT OFFICE.

ALEXANDER MUIRHEAD, OF SHORTLANDS, ENGLAND.

ELECTRIC TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 719,355, dated January 27, 1903.

Application filed August 11, 1902. Serial No. 119,247. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER MUIRHEAD, a subject of His Majesty the King of Great Britain, residing at Shortlands, in the county of Kent, England, have invented new and useful Improvements Relating to Electric Telegraphy, of which the following is a specification.

This invention has for its object certain improvements in the construction of cable-relays, whereby any variation of the "zero" of the relays due either to earth-currents or to changes in the working parts of the relays themselves is corrected.

In order that this invention may be more clearly understood, I will proceed to describe the same, aided by the accompanying drawings, wherein—

Figure 1 is an explanatory diagram of a certain form of relay-coil and attachments. Figs. 2 and 3 illustrate alternative means of carrying out the present invention, and Fig. 4 shows a modification.

Referring first to Fig. 1, I prefer in carrying out the present invention that the "directive force" should be applied either wholly or mostly direct to the contact arm or index that is attached to the relay-coil or to a separate arm borne by the suspension-wire—*i. e.*, to some part of the combination other than to the coil itself direct. By so doing any tendency to mechanical change of zero is much diminished.

a represents the movable part or coil, which may be delicately suspended by single torsionless fibers *b b*, the whole of the directive force being applied by means of a stretched wire *c*, attached to one end of the arm *d* and fixed at the other end *e*, so that the wire is supported at right angles to the plane in which the arm *d* moves. Obviously instead of employing the separate arm *d* I might attach the wire *c* directly to the relay contact-arm *f*, as shown in Fig. 4.

According to one method of carrying out my present invention I may, as shown in Fig. 2, on either side of the directive metallic wire *c* above described fix two adjustable contact-screws *g h* at such a distance from the wire that the latter only comes into contact with adjustable stops, such as *i j*, the positions of which are regulated by the screws *g h* when the zero of the contact-arm *f* varies beyond a certain amount. In electrical connection with these contact-stops *i j* I employ a battery *k* and two electromagnets *l m* for the purpose of actuating a suitable arrangement in mechanical connection with the arm *d*, to which the stretched directive-force wire *c* is attached. The circuit of these electromagnets and the battery is completed through the stretched wire *c* whenever the latter comes into contact with one or other of the contact-stops *i j*, the result being rotation or movement of the arm *d* or the support *e* of the stretched wire in connection therewith or of the suspension-piece which supports the contact-tongue in the direction to correct the zero of the contact-arm.

The mechanism which brings about the rotation of the part *e*, to which the stretched wire *c* is fastened and which constitutes the distant movable support for the said wire *c*, consists of two ratchet-wheels *n o*, to which motion is imparted through the vibration of the armatures *p q* of the electromagnets *l m* and their attached pawls *r s*, respectively. On the axes of the two ratchet-wheels *n o* are fixed two wheels *u v*, which gear into the toothed sector-arm *w*, whose center of rotation is beneath the signal-coil *a* in a line with the axis of rotation of the latter.

The *modus operandi* of the above mechanism is as follows: Whenever the movement of the signal-coil *a* exceeds a certain amount—for instance, the usual range of movement in signaling—in either direction, the stretched wire *c* comes into contact with one of the stops *i j* and closes the circuit of the battery *k* through the corresponding electromagnet *l* or *m*—say *l*—thus causing the armature *p* and its attached pawl *r* to work the sector-arm *w* around in the direction to break the contact that was just established between the stretched wire *c* and the limiting-stop *j*.

This invention is applicable to all forms of cable-relays, especially to that form referred to in the specification of British Letters Patent No. 3,343 of 1900, granted to me. The stretched wire *c* of Fig. 2 may be attached to the aluminium bar *d'* and the arrangement adjusted until the index *f* is exactly over the middle of the central section of the contact-plate *x*, (or I may attach the stretched wire *c*

of Fig. 2 direct to the index *f*, as shown in Fig. 4) and then the screws *g h* adjusted on either side of the stretched wire *c* at such a distance that the latter comes into contact with one of the stops *i j* whenever the deflection of the contact-tongue of the relay on either side of the zero or center of the middle section of the contact-plate *x* exceeds a certain amount. As an alternative arrangemen to effect the same purpose I may make use of the current which flows in the inductance-shunt employed by me in connection with systems of retransmission on cables (after the manner described in the specification of British Letters Patent No. 12,731 of 1898) to actuate certain mechanism continuously. One method of carrying out this part of my invention is illustrated diagrammatically by Fig. 3, in which the stretched wire *c* (which need not in this instance be electrically conductive) is shown fixed at one end to the arm *d* and at the other end to an arm *z*, attached to a second recorder-coil 1. This second coil 1 is inserted in the circuit of the inductance-shunt 2, through which the slow portion of the current received from the cable 3 passes. A rod 4, carrying an adjustable weight 5 and a vane 6, dipping into oil in the vessel 7, is attached to the coil 1 in order to give to the latter the slow period required for the purpose of this invention. The current which flows through the coil 1 is regulated in direction and in strength to produce sufficient movement of the point or support *e* of the wire *c* to counteract that of the coil *a*, which may be due to any wandering zero in the received signals or earth-currents. The inductance of the shunt 2 prevents the quick changes in the current received from the cable, which constitute the signals, from affecting the slow coil 1, but allows all slow currents, such as those due to earth-currents, to pass through the coil 1 and deflect the end *e* of the stretched wire *c* in the direction to oppose the deflection of the index *f* caused by the portion of the earth-current which flows through the coil *a*.

Although I have described and illustrated my invention as applied to a cable-relay, it will be apparent that it can be applied with equal advantage to any other form of telegraphic relay or recorder-coil instrument.

The index, as shown, comprises the arm or support *d* and the finger or part *f*, carried thereby.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination in a telegraphic relay, of a receiving-coil energized by message impulses, an index actuated by the coil, means applied directly to the index, independently of the coil to give directive force thereto and further means serving to turn a part of said first-named means to give directive force to the index and thereby correct the "zero" thereof.

2. The combination in a telegraphic relay of the movable parts thereof comprising the oscillating coil actuated by message impulses and the index actuated by the coil, a single stretched fiber connected at one end to said movable parts and at the other end to a movable support to thereby give directive force to the index and means for moving said support when the zero position of the index materially varies whereby it is corrected.

3. The combination in a telegraphic relay, of a receiving-coil energized by message impulses, an index, connections between the coil and index by which the latter is operated when the coil is moved, means movable at one end simultaneously with the index and serving to give directive force thereto, further means acting to move the other end of said first-named means to thereby adjust said directive force to correct the "zero" of the index, and means whereby said further means are automatically put into operation by said first-named means when the latter has been moved to an appropriate extent.

4. The combination in a telegraphic relay, of a receiving-coil energized by message impulses, an index actuated thereby, a stretched conductive wire or fiber serving to give directive force to the index and connected at its outer end to a movable support, a local battery, its circuit, contact devices, and electromagnetic devices included in the local circuit and means whereby the electromagnetic devices act when energized to move said support, the arrangement being such that whenever a material variation of the "zero" of the index occurs, the conductive fiber completes said local circuit and a correction of the "zero" is thereby effected.

5. The combination in a telegraphic relay, of a suspended oscillatable receiving-coil energized by message impulses, an index connected therewith, a stretched conductive wire or fiber serving to give directive force to the index, a movable support to which its outer end is connected, electric contacts arranged on opposite sides of the fiber, a local battery in whose circuit said contacts are included, electromagnetic devices also in the local circuit and means whereby the electromagnetic devices when energized effect a movement of said support whereby variations of the "zero" position of the index are automatically corrected.

In testimony whereof I have hereunto subscribed my name.

ALEXANDER MUIRHEAD.

Witnesses:
A. F. SPOONER,
T. S. WITHERS.