(No Model.)

J. C. LUDWIG.

POLARIZED TELEGRAPHIC RELAY.

No. 315,427. Patented Apr. 7, 1885.

Fig. 1.

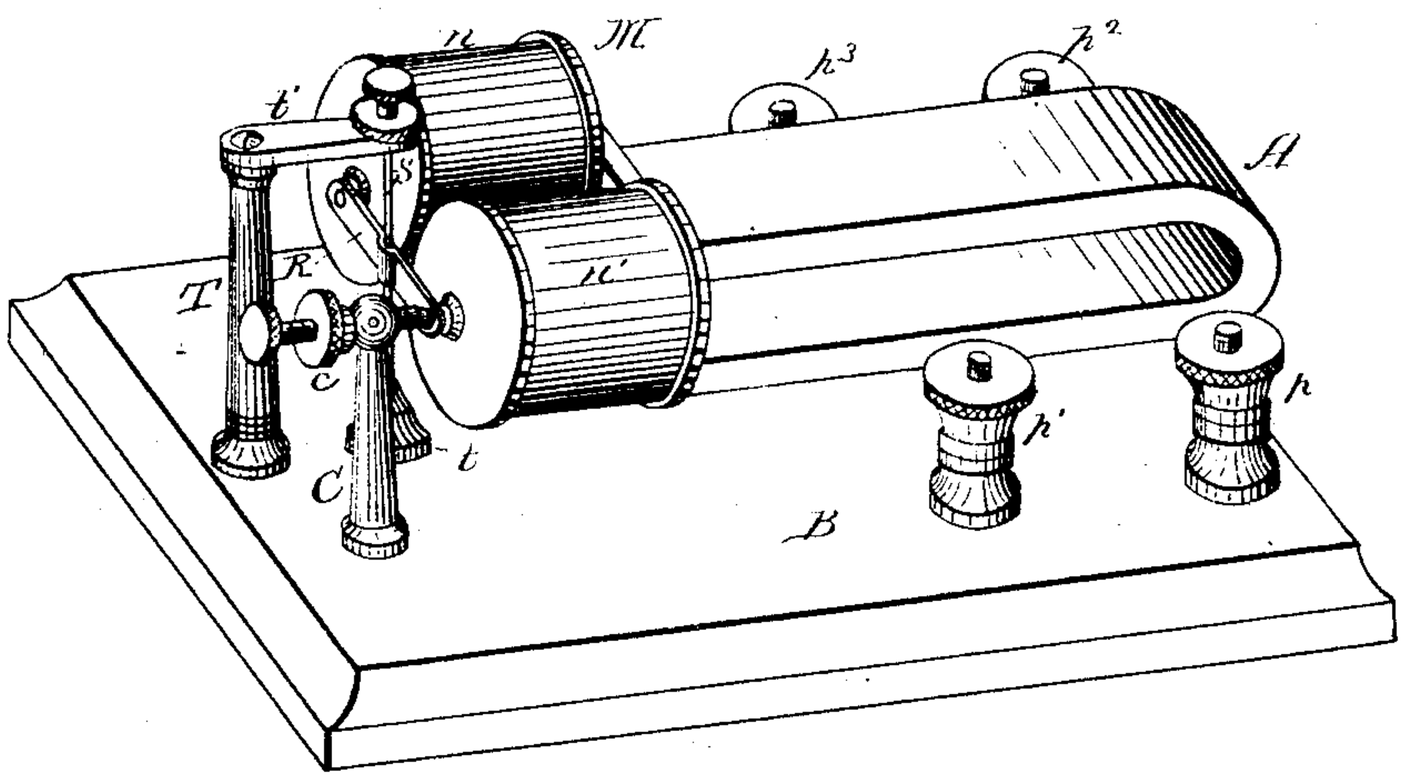


Fig. 2.

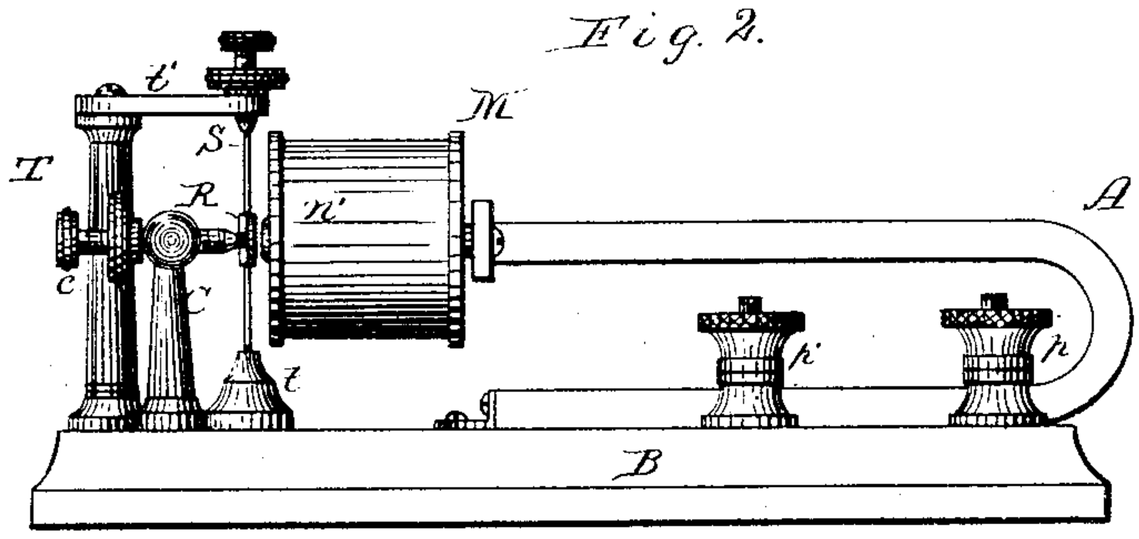
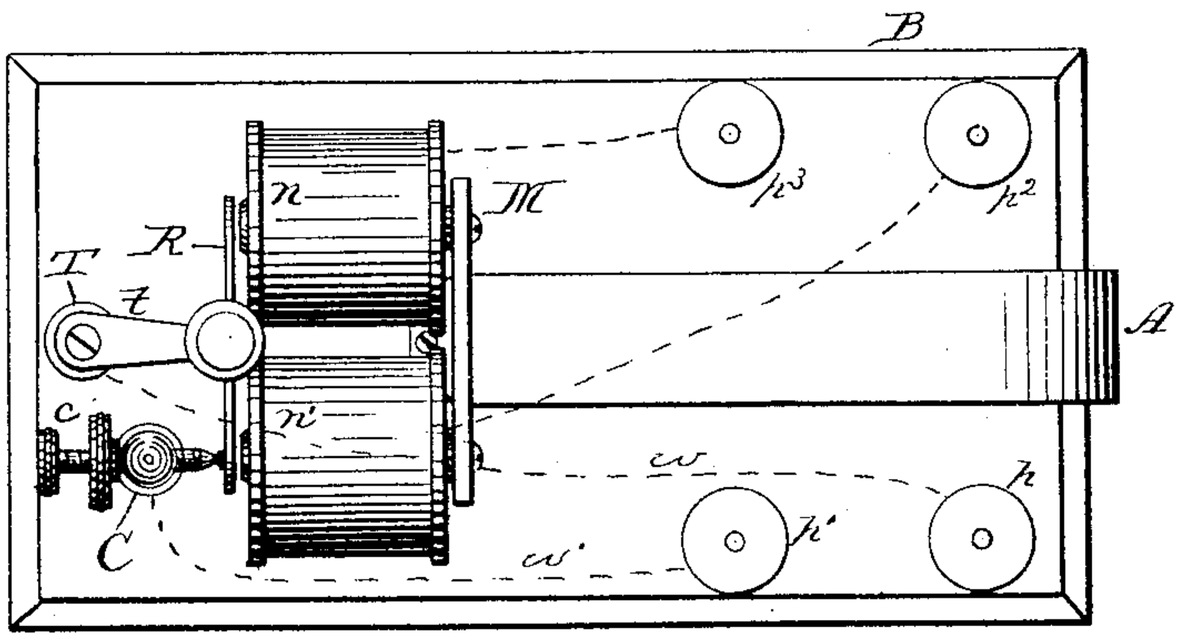


Fig. 3.



WITNESSES
P. W. Hale,
W. B. Hale

INVENTOR
John C. Ludwig,
By his Attorney,
John Heuston Jr.

UNITED STATES PATENT OFFICE.

JOHN C. LUDWIG, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF THREE-FOURTHS TO LOUIS A. GARNETT, OF SAME PLACE, AND JOHN HEWSTON, JR., OF BROOKLYN, CALIFORNIA.

POLARIZED TELEGRAPHIC RELAY.

SPECIFICATION forming part of Letters Patent No. 315,427, dated April 7, 1885.

Application filed December 18, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. LUDWIG, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Telegraphic Receiving-Instruments, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to a telegraphic receiving-instrument which may be used either as a sounder or as a relay for opening and closing a local circuit including the sounder.

The object of my invention is to provide a receiving-instrument which will respond promptly and vigorously to induced currents which flow only instantly in alternately-opposite directions, and by which this class of currents may be utilized for telegraphing the Morse code of characters. My new receiving-instrument is primarily designed for use in connection with a generating and transmitting apparatus, which is described and illustrated in an application for patent which I have heretofore filed on the 23d day of June, 1884, being numbered 135,842.

My improved instrument differs from the ordinary polarized relay in that in it I utilize but one pole of a permanent magnet, which communicates a similar polarity to the two cores of an electro-magnet, and in front of these two cores I pivot a balanced neutral armature the opposite ends of which are attracted with equal force by the two cores when no current traverses their coils. When, however, an instantaneous current traverses the coils in one direction, one of the cores will be strengthened and the other weakened in its attractive power. The strengthened core will then attract the adjacent end of the armature toward it, throwing out the other end against a stop, which may be utilized either as a sounding-stop or as a circuit-closing contact of a local circuit. The armature being thus attracted will remain under the control of the attracting-core by reason of being closer to it, until a reverse current is sent through the coils. Then the operation will be reversed, and the other core will have the overpowering attraction. It will thus be seen that although the effect of the currents themselves is but momentary, they may be utilized for producing movement of the armature at intervals corresponding to the dots and dashes of the Morse code.

My invention consists in the novel construction, which will be definitely pointed out in the appended claims, and will be readily understood from the following particular description in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of my improved receiving-instrument. Fig. 2 is a side elevation, and Fig. 3 a top view, thereof.

Referring to the drawings, A designates a permanent magnet of horseshoe shape, with one limb attached to a base-board, B, and the other lying above it. Directly to the pole of this upper limb is secured the yoke-piece of a small electro-magnet, M, the coils n n' of which have soft-iron cores, to which, of course, is communicated a magnetic polarity the same as that of the permanent magnet-pole to which their yoke-piece is attached. In front of the poles of this small electro-magnet is an equal-armed oscillating armature, R, the middle of which is fastened to a vertical arbor, S, which is stepped in a bearing, t, at its foot, and has a top bearing in the overhanging arm t' of a metal post, T. Behind one end of the armature R is arranged an adjustable contact-screw, c, supported in a metal post, C. The metallic step-bearing t and post T are connected by a wire, w, (shown in dotted lines, Fig. 3,) with a binding-post, p, and the post U is connected by a wire, w', also shown in dotted lines, with a binding-post, p'. When the instrument is used as a relay, to these two binding-posts p p' are to be connected, respectively, the wires of a local circuit, including a local battery and a sounder. One coil-terminal of the electro-magnet O is connected to a binding-post, p^2, and the other to a similar post, p^3. One of the posts p^2 and p^3 is to be connected with the line-wire and the other with a switch, which may be used to connect it either directly to earth or to earth through the generator at a home station.

The armature R of the relay is entirely neutral and made of soft iron. It is arranged quite close to the poles of the electro-magnet M, and when no current traverses the coils of said magnet it will be attracted equally at both ends, and if either end is pressed closer to its adjacent pole than the other is to the opposite pole of the magnet the armature will remain in such position as long as no current passes, and also while a current in a given direction is passing, as will presently be explained.

Now, we will suppose that in the construction of the relays the electro-magnet M is attached to the north pole of the permanent magnet A, and a north polarity is consequently communicated to the soft-iron cores of said electro-magnet. Suppose, further, that the induced current generated and sent on the line flows in such direction through the coils of the relay electro-magnets that were the cores of said magnets neutral the current would give to core of spool *n* a north polarity and to core of spool *n'* a south polarity. Now, it is obvious that as the cores already have a north polarity the effect of the current will be to make stronger the north polarity of core of coil *n* and weaken, if not altogether neutralize that of core of coil *n'*, so that the core of coil *n* will have the strongest attraction for the armature R, and will draw the adjacent end of said armature toward it, throwing the other end out against the contact-screw *c*, and thus closing the local circuit and operating the sounder. Although the magnetizing effect of the induced current will cease almost instantly, the armature will remain attracted by the pole to which it is nearest until a reverse current passes, and will keep the local circuit closed meantime. As soon, however, as a reverse current is caused to traverse the line and coils of the relay, this reverse current weakens the power of core of coil *n* and re-enforces that of the core of coil *n'*, so that the armature R is drawn away from the contact-screws *c*, the local circuit is opened, and the sounders make a back stroke. It will thus be seen that the intervals of movement of the relay-armatures may be made to correspond to the dots and dashes of the Morse code of signals.

It will be observed that but one pole of the permanent magnet is made use of in my relay, the other pole being not made use of to magnetize the armature as in the ordinary polarized relay. If the armature of my relay were magnetized, the instrument would be less sensitive in proportion to the degree of polarization of said armature, as the end of the armature having an opposite polarity to that of the coil-cores would be always attracted by the adjacent core, and that delicate balance of power between the two cores upon which the prompt and vigorous action of the relay depends would be destroyed. This relay may be disconnected from a local circuit and used as a sounding-receiver directly.

I do not limit myself, of course, to the form of permanent magnet shown in the drawings, as it is simply necessary that the pole not utilized shall be so disposed that it will not affect the armature in a manner to destroy its normal balance.

Having now described my invention, and explained the operation thereof, I claim—

1. In a telegraphic receiving-instrument, the combination, with a permanent and an electro magnet having its two cores similarly polarized by one of the poles of said permanent magnet, of an oscillating neutral armature having its opposite ends arranged within attractive distance of the electro-magnet cores, respectively, substantially as described.

2. The combination, with the permanent magnet, of the electro-magnet having its yoke-piece in contact with one of the poles of said permanent magnet, and the oscillating neutral armature pivoted in front of the poles of said electro-magnet, substantially as described.

3. The combination, with the permanent magnet, the electro-magnet having its cores polarized by one of the poles of said permanent magnet, and the neutral armature pivoted to oscillate in front of the poles of said electro-magnet, of a local circuit arranged to be closed and opened by said armature, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN C. LUDWIG.

Witnesses:

J. S. FITZGERALD,

GEO. I. N. MONELE.