E. GRAY.

Transmitter for Electro-Harmonic Telegraph.

No. 165,728. Patented July 20, 1875.

Fig. 1.

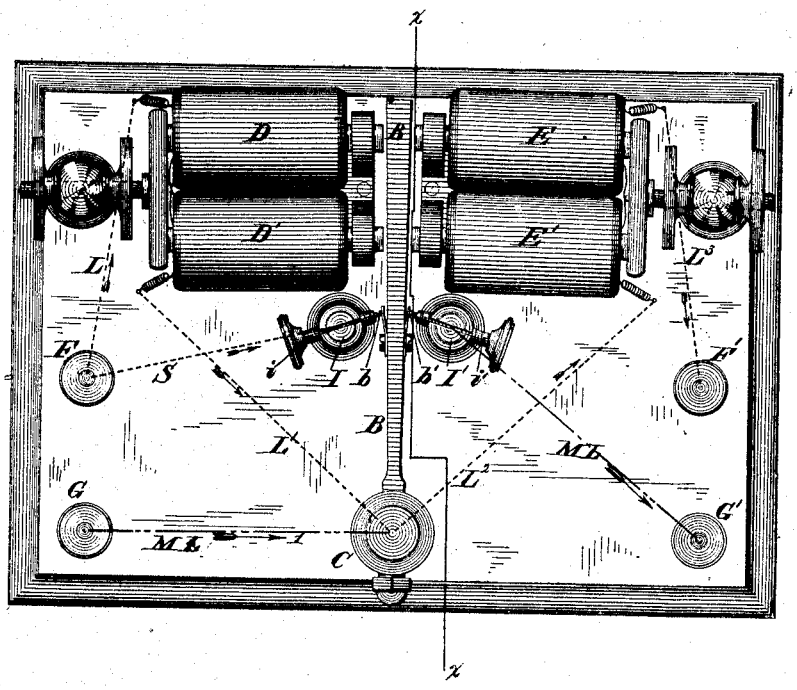
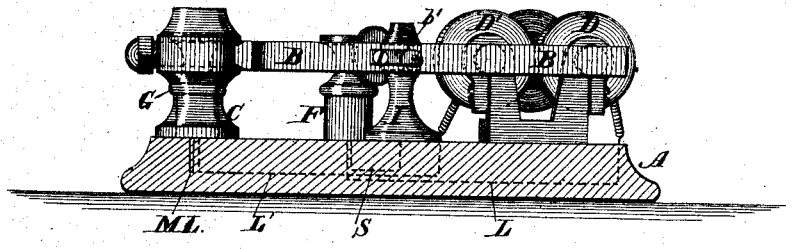


Fig. 2.



WITNESSES

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ELISHA GRAY, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN TRANSMITTERS FOR ELECTRO-HARMONIC TELEGRAPHS.

Specification forming part of Letters Patent No. **165,728**, dated July 20, 1875; application filed June 28, 1875.

To all whom it may concern:

Be it known that I, ELISHA GRAY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Transmitters for Electro-Harmonic Telegraphs, of which the following is a specification:

My invention relates to telegraphic apparatus of that class in which a circuit-breaking spring is automatically vibrated with sufficient rapidity to produce a musical tone.

In such instruments as heretofore constructed, so far as my knowledge extends, electro-magnets, by which the spring is attracted, have always been placed on one side of the vibrating bar or electro-tome by which the musical note was produced. A tendency has consequently existed toward the disturbance of its vibrations.

The object of my invention is to remedy this defect; to which end my improvements consist in arranging upon opposite sides of the vibrating spring of the electro-tome, electro-magnets of such relative power as to impart impulses of equal force upon each side of the vibrating spring alternately at equal intervals, thus securing its isochronous vibration. My invention further consists in combining, with the magnets and vibrating spring or reed, shunting-wires so arranged as automatically to transfer the current from one magnet to the other without the use of a switch.

In the accompanying drawings, which show so much of my improved apparatus as is necessary to illustrate the subject-matter herein claimed, Figure 1 is a plan or top view; and Fig. 2, a vertical transverse section therethrough, on the line *x x*, Fig. 1.

The apparatus is mounted upon an ordinary base-board, A. A steel-bar spring or vibrating reed, B, tuned to give a musical tone of a given pitch when thrown into vibration is secured by one end to a post, C, while its free end extends between two pairs of magnets, D D′ E E′, arranged transversely to the reeds in the plane of its vibration, their poles being arranged just far enough apart to accommodate this vibratory movement. F F′ G G′ are binding-screws, to which the main and local battery wires are respectively connected. The magnets D D′ are wound with a resistance of about sixteen ohms or units of resistance, while magnets E E′ have only a resistance of about four ohms.

It is a well-known fact that when two magnets of different resistances, other things being equal, are placed in the same circuit and a battery-current sent through them, the magnet having the higher resistance develops the stronger magnetism, which magnetism is stronger in proportion as the resistance is higher than that of the other magnet. In other words, if the magnets E E′, when alone in the circuit, have a power, say, of four, their effect will be diminished to a power of one when magnets D D′ are let in, and the power of the latter will rise from zero to five.

The reed B is provided with spring contact-points *b b′*, arranged one on each side thereof, intermediate between the magnets and its supporting-post. When the reed is at rest these points are in contact with adjusting-screws *i i*, of binding-posts I I′. Fig. 1 shows the battery connections. The main line M L extends from the binding-screw G through the wire 1 to the reed-supporting post C; thence through the reed and its contact-point *b′* to the binding-screw I′; thence to the binding screw G′. The local circuit passes from the battery through the binding-post F by the wire L to the magnets D D′; thence by the wire L^1 through the reed-supporting post C, and the wire L^2 to the magnets E E′; thence by the wire L^3 to the binding-post F′. In addition to this a shunt-wire, S, passes from the binding-post F to the post 1, through the contact-point *b* to the reed and its supporting-post C, where it connects with the local circuit L^1 L^2.

The operation of the apparatus is as follows: When the local circuit is established the current does not pass through the magnets D D′ by the wire L, as it finds an easier passage through the shunt-wire S and contact-point *b*, vibrating reed B, post C, and wire L^2 to the magnets E E′; thence by the wire L^3 to the other pole of the local battery. The passage of this current develops in the latter magnet the power, say, of four, which is exerted upon the vibrating reed B, and draws it toward the poles of the magnets.

When the reed is moved a short distance in obedience to this impulse its movement causes the contact-point *b* to separate from the binding-screw *i*, when of course the current will no longer flow through the shunt-wire S, but passes from the post F through the wire L directly to the magnets D D′, and from thence through the wires L′ L² to the magnets E E′; thence through the wire L³ to the post F′, which connects with the other pole of the local battery. This raises the power of the magnets D D′ from zero to a power of five, while the other magnets drop from four to one. The result is, that the reed vibrates back toward the magnets D D′ with the same force that it did toward the other magnets—that is, a power of four each way. When the points *b i* come in contact again the magnets D D′ are cut out of the circuit by the establishment of the current through the shunt-wire S, and their power drops to zero, and the operation above described is repeated. This alternate opening and closing of the circuit takes place with a frequency equal to the rate per second sufficient to produce the fundamental tone of the vibrating reed. The main-line current is interrupted at every vibration of the reed by the separation of the contact-points *b′ i′;* consequently a series of impulses corresponding in number with the said vibrations will be transmitted to a suitable receiver and reproduced in a tone of corresponding pitch to that of the vibrating reed, as fully explained in sundry applications for Letters Patent of the United States for apparatus for transmitting musical impressions or sounds telegraphically, heretofore filed by me.

The advantages of my improvement are, that the impulses imparted to the vibrating reed, being alike on both sides, its center of vibration coincides with the axis of the reed when at rest. The isochronous vibration of the reed is thus preserved in its integrity, and, consequently, that of the electric waves or impulses generated by it, which are transmitted through the main line, which impulses determine those of the receiver, and the vibrating reed is prevented from being thrown out of tune with the receiver by variations in the battery-power, which variations are liable to occur in the ordinary method.

I claim—

1. The combination, substantially as hereinbefore set forth, of the vibrating electro-tome and magnets arranged on opposite sides thereof, of such relative capacity as to impart impulses of equal force at equal intervals upon each side of the vibrating electro-tome alternately, whereby its isochronous vibration is secured.

2. The combination, substantially as hereinbefore set forth, of the vibrating reed, its counterpoise-magnets, a local circuit, and the shunt wire, whereby the current is automatically changed to each set of magnets.

In testimony whereof, I have hereunto subscribed my name.

ELISHA GRAY.

Witnesses:
WM. J. PEYTON,
E. C. DAVIDSON.