(No Model.)

W. H. MARKLAND.

TELEGRAPHIC RECEIVING INSTRUMENT.

No. 260,306. Patented June 27, 1882.

Fig. 1.

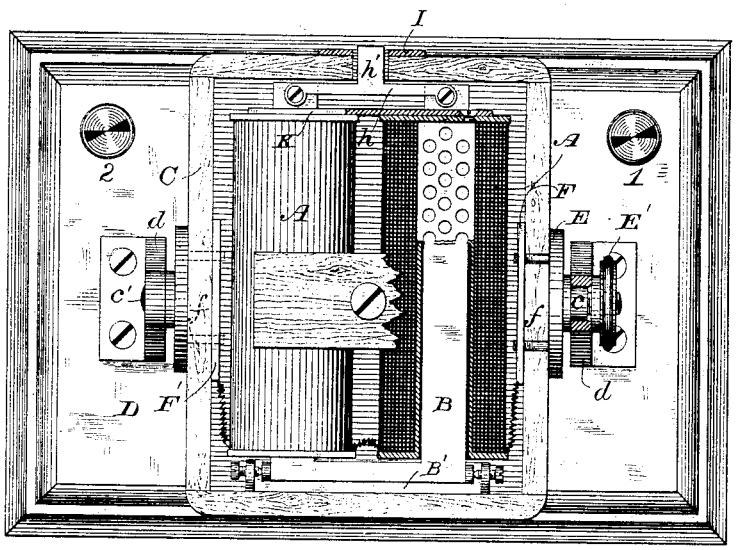


Fig. 4.

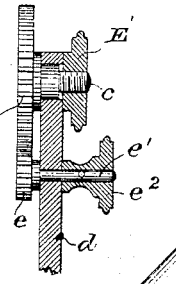
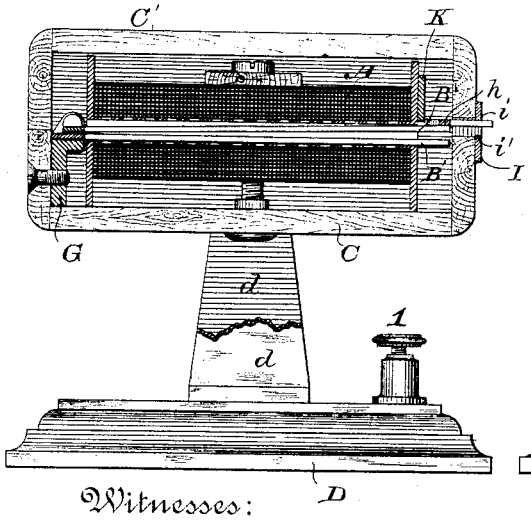


Fig. 3.

Fig. 2.



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TELEGRAPHIC RECEIVING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 260,306, dated June 27, 1882.

Application filed February 24, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. MARKLAND, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Telegraphic Receiving-Instruments, of which the following is a specification.

My invention relates to certain improvements in the construction of telegraphic receiving-instruments.

The object of my invention is to provide an instrument capable of being effectively operated by electric currents of moderate strength, and in a novel means of adjusting the same to the requirements of any telegraphic circuit.

In carrying out my invention I make use of the well-known law that magnetisms of like polarity tend to repel each other, and I apply this principle to two independent pieces of soft iron, constituting the core of an electro-magnet, which are simultaneously magnetized by the current traversing the coils or helices surrounding them.

My invention consists generally in constructing an electro-magnet with a longitudinally-divided core, each section being U-shaped. One of these sections is made stationary within the coils, and the other is pivoted at or near the connecting-yoke in a manner which permits its free ends or arms to vibrate toward and from the corresponding ends of the stationary section. I provide suitable stops or contact-points for limiting the movements of the movable portion of the core in each direction. The movements of the pivoted section of the core in one direction depend upon the force of gravity which causes the same to approach the stationary section, and in the other direction upon the mutual repulsion of the sections when similarly magnetized by a current of electricity traversing the coils surrounding the electro-magnet, as hereinafter more fully set forth.

My invention further consists in certain details of construction relating more particularly to the method of effecting the adjustments.

In the accompanying drawings, Figure 1 is a plan view of my improved receiving-instrument, partly in section. Fig. 2 is a longitudinal section of the same, showing the construction of the cores of the electro-magnet; and Figs. 3 and 4 represent certain details of construction.

In the figures the apparatus is shown as applied to a main-line sounder designed for operation in connection with the well-known "Morse system;" but it is equally applicable to electro-magnetic receiving-instruments of any description, as will be readily understood by those skilled in the art.

Referring to the drawings, A represents the coil or coils of an electro-magnet, which is provided with a U-shaped core constructed in two parts or sections, B and B′, as hereinafter particularly described. The electro-magnet is preferably secured within a suitable box or case, C, which is provided with a removable lid or cover, C′. The inclosing-case is mounted at a suitable distance above the supporting-base D upon two trunnions, *c* and *c′*, projecting from opposite sides of the case and turning in suitable bearings in the standards *d* and *d′*. The angular position of the case C and its inclosed electro-magnet is regulated and controlled by means of a toothed wheel, E, fixed upon the trunnion *c*, which engages with a pinion, *e*, mounted upon an arbor, *e′*, and adapted to be turned by means of a milled head, e^2.

A check-nut, E′, is provided at the end of the trunnion *c*, which bears against the standard *d* and binds the case securely in any required angular position in which it may be placed. The wheel E is preferably provided with teeth upon one-half of its periphery only, thus allowing it to be turned through an angle of not more than one hundred and eighty degrees. This latter, however, is not a necessary construction nor essential feature of my invention.

The coils A of the electro-magnet are of insulated wire wound in the usual manner, the opposite terminals being preferably soldered to the metallic plates F and F′, respectively, which serve to hold the lid C′ in position, and which are placed in electrical connection with the trunnions *c* and *c′* by means of the screws *f*. The electrical connections are continued from the respective trunnions *c* and *c′*, through

the standards *d* and *d'*, to the binding-posts 1 and 2. This method of disposing of the terminals of the coils is preferred, as thereby the fine wires are entirely inclosed and are not liable to be broken or twisted off.

The core of the electro-magnet consists, as hereinbefore stated, of two parallel U-shaped sections, B and B'. The projecting arms or cores of each section are preferably of rectangular section, having a breadth several times greater than their thickness.

The cores may be constructed separately, and afterward united by a yoke or heel-piece in the usual way, but are preferably formed from a single piece of soft iron.

The stationary core-section B' is rigidly attached by its yoke to a supporting-frame, G, which is fastened to the case C by screws or other suitable means. The movable core-section B is pivoted at its angles to the same supporting-frame, G, and both sections are preferably made to project a little beyond the ends of the coils A.

To the free ends of the pivoted core-section B is secured a plate, *h*, of brass or other non-magnetic material, provided with a projection, *h'*, preferably extending outside the case C, as shown in the drawings, passing through an aperture in a metallic plate, I, which is mounted upon and preferably rigidly secured to the exterior of the case C.

The plate I is provided with two inwardly-projecting points, *i i'*, against which the projection *h'* will strike when the pivoted core-section is caused to vibrate, thereby producing sounds which may be interpreted by a skilled operator in a well-known manner.

The longitudinal openings within the bobbins or coils A, through which the cores B B' extend, are preferably rectangular in form, and of a sectional area sufficient to permit of the necessary vibration of the free ends of the core-section B to and from the corresponding ends of the core-section B'.

Mounted upon the upper ends of the coils A A, at one side of and just beyond the range of movement of the core-section B, is secured a plate of soft iron, K, (see Fig. 2,) which, although at no time in actual magnetic contact with the poles of the magnet, serves to attract the free ends of the section B toward itself whenever they are magnetized by a current traversing the coils.

Having thus described the construction of my improved instrument, I will now proceed to explain the operation, which is as follows: If we assume the angular position of the electro-magnet to be so adjusted by means of the mechanism provided for the purpose that the effect of the attraction of gravity is sufficient to normally maintain the free ends of the vibrating core-section B in proximity to the fixed section, with the projection *h'* resting against the stop *i'*, then, if a current of electricity be transmitted through the magnetizing-coils, the neighboring ends of the respective core-sections will be magnetized with like polarity and will repel each other. The projection *h'* will be thrown upward against the projection *i* of the plate I, which forms a stop and serves in lieu of the ordinary sounding-post used in instruments of this character. When the current is interrupted the pivoted core-section will resume its former position by the influence of gravity, the projection *h'* striking against the stop *i'*.

The soft-iron plate K is employed for the purpose of rendering the action more reliable and the instrument capable of responding to more feeble currents. That this result will be effected is evident from the fact that the magnetism generated in the core-sections causes them to repel each other, while the movable section will at the same time exert an attraction upon the soft-iron plate, causing it to be drawn toward the latter, and thus overcoming a greater opposing force than would be possible if the repellent action alone were relied upon. The plate K is not in magnetic contact with either core-section, but is dependent for its magnetization upon induction from the core. By thus detaching the plate from the cores a more rapid magnetic charge and discharge of the same are obtained, and hence a greater rapidity in the operation of the instrument.

It is evident that the precise amount of force exerted by gravity upon the pivoted core-section may be nicely adjusted by turning the adjusting-screw to the right or left, and when the instrument is once placed in the required position the check-nut may be tightened to hold the case firmly.

In practice I have found it desirable to construct the coils of the electro-magnets of a resistance and size dependent upon the character of the circuit in which they are to be employed, the relative size and number of convolutions of wire most desirable under given conditions being determined by experiment or calculation.

It is evident that the sounding-plate I and the soft-iron plate K may be made adjustable, if desired; but I prefer to mount each of these permanently in its required position, as all necessary adjustment may be obtained by means of the screw e^2. The distance between the soft-iron plate K and the core ends should, however, be made to conform in every case to the requirements of the circuit upon which it is to be employed.

I have also found in practice that best results are obtained if the weight of iron contained in the plate K is nearly equal to that contained in one arm of the movable core-section, for the reason that the attraction between the plate and the core-section is to a certain degree dependent upon their relative masses.

I am aware that it is not new to construct an electro-magnet with one arm of its core divided and having a pivoted section thereof actuated by means of a polar extension from the other arm.

I claim as my invention—

1. In a telegraphic receiving-instrument, the combination, substantially as hereinbefore set forth, of an electro-magnet provided with a soft-iron core constructed in two sections, one stationary and the other pivoted and free to vibrate, and an independent stationary soft-iron plate within the magnetic field of said pivoted section, but out of magnetic contact therewith.

2. In a telegraphic receiving-instrument, the combination, substantially as hereinbefore set forth, of an electro-magnet provided with a U-shaped soft-iron core constructed in two sections, one stationary and the other pivoted and free to vibrate, and a non-magnetic plate uniting the free ends of said movable section.

3. In a telegraphic receiving-instrument, the combination, substantially as hereinbefore set forth, of an electro-magnet provided with a U-shaped soft-iron core constructed in two sections, one stationary and the other pivoted and free to vibrate, a non-magnetic plate uniting the free ends of said movable section and provided with a projecting lip, and a stop for arresting the motion of said pivoted section.

4. In a telegraphic receiving-instrument, the combination, substantially as hereinbefore set forth, of an electro-magnet provided with a soft-iron core constructed in two sections, one stationary and one pivoted and free to vibrate, an independent stationary soft-iron plate within the magnetic field of said pivoted section, but out of magnetic contact therewith, and a stop for limiting the motion of said pivoted section.

5. In a telegraphic receiving-instrument, the combination, substantially as hereinbefore set forth, of an electro-magnet having a soft-iron core constructed in two sections, one stationary and the other pivoted and free to vibrate, an independent stationary soft-iron plate within the magnetic field of said pivoted section, but out of magnetic contact therewith, and means, substantially such as described, for controlling the angular position of said electro-magnet.

In testimony whereof I have hereunto subscribed my name this 23d day of February, A. D. 1882.

WM. H. MARKLAND.

Witnesses:
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