R. K. BOYLE.

ELECTRO-MAGNETIC TELEGRAPH APPARATUS.

No. 186,453. Patented Jan. 23. 1877.

Fig. 1.

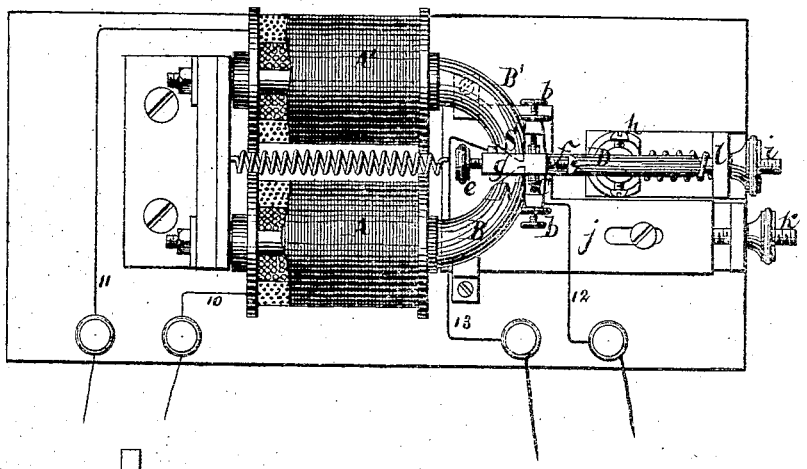


Fig. 3.

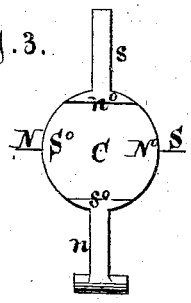
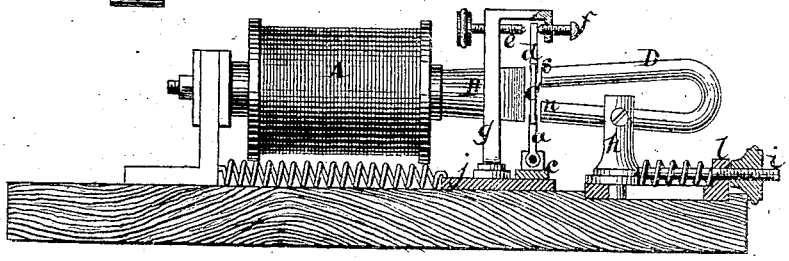


Fig. 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

ROBERT K. BOYLE, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRO-MAGNETIC TELEGRAPH APPARATUS.

Specification forming part of Letters Patent No. **186,453**, dated January 23, 1877; application filed June 6, 1876.

To all whom it may concern:

Be it known that I, ROBERT K. BOYLE, of the city, county, and State of New York, have invented a new and useful Improvement in Electro-Magnetic Telegraphs, which improvement is fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 represents a plan or top view. Fig. 2 is a sectional side view. Fig. 3 is a face view of the armature, illustrating the effect of the currents.

Similar letters indicate corresponding parts.

This invention consists in the combination, with an electro-magnet, and with a permanent magnet, of a soft-iron armature, which oscillates between the poles of the two magnets, and which, when attracted by the electro-magnet, closes a local circuit, the effect of the permanent magnet being to polarize the soft-iron armature, so that, when the electro-magnet is charged, said armature will be readily attracted, and when the circuit through the electro-magnet is broken the permanent magnet will retract the armature. The poles of the electro-magnet are brought close together opposite to the middle of the disk-shaped armature, so that comparatively little power is required to attract said armature.

Both the permanent magnet and the soft-iron armature are mounted on slides, which are provided with adjusting-screws, for the purpose of regulating the position of said parts in relation to each other and to the cores of the electro-magnet.

In the drawing, the letters A A′ designate the coils of an electro-magnet, the cores B B′ of which are curved at their outer ends, so that the poles N S of said electro-magnet come close together, as shown in Fig. 1. The coils A A′ are induction-coils, and they connect by wires 10 and 11 with the line-wire. Opposite to the poles of the electro-magnet is situated the armature C, which consists of a disk of soft iron secured to a rod, *a*, which swings between points *b*, secured in a standard, *c*.

From the upper part of the disk-shaped armature C extends a bar, *d*, which works between two screws, *e f*, secured in a standard, *g*. (See Fig. 2.) The screw *e* has a metallic tip, so that, when the bar *d* comes in contact with said screw, the standards *c* and *g* are brought in metallic connection. The tip of the screw *f* is of hard rubber or other insulating material, and if the bar *d* of the armature is thrown back against this tip the metallic connection between the standards *c* and *g* is broken. The standard *c* connects by a wire, 12, with one pole of a local battery, and the standard *g* connects by a wire, 13, with the other pole of said battery. The standards *c* and *g* are secured to a slide, *j*, of hard rubber or other insulating material, which can be adjusted by a set-screw, *k*, so that the position of the armature can be regulated.

Opposite to the disk-shaped armature C is situated a permanent magnet, D, which is secured in a standard, *h*. The poles *n s* of this permanent magnet are situated at right angles to those of the electro-magnet, as indicated in Fig. 3, and by the action of said permanent magnet the armature is drawn back against the insulated screw *f*. The standard *h* is mounted on a slide, *l*, which is subjected to the action of a set-screw, *i*, so that the position of the permanent magnet can be regulated at pleasure.

By the action of the permanent magnet the disk-shaped armature becomes polarized, and, if the electro-magnet is charged, the pole *n*° of the armature-disk, which is opposite to the south pole *s* of the permanent magnet, changes to the point N° opposite to south pole S of the electro-magnet, and the south pole *s*° of the armature-disk is repelled, and it requires but little power of the permanent magnet to cause the armature to fall back against the insulated screw *f*.

By this arrangement I am enabled to reduce the weight of the armature to such an extent that the instrument can be operated much more rapidly than the instrument provided with armatures of the usual form and construction.

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

1. The combination, with an electro-magnet, and with a permanent magnet, of a soft-iron armature, which oscillates between the poles of the two magnets, substantially in the man-

ner and for the purpose herein shown and described.

2. An electro-magnet, A A′, the cores B B′ of which are curved so as to bring their poles close together and opposite to each other, substantially as set forth.

3. The combination, with an electro-magnet, its armature, and with a permanent magnet, of slides *j l*, and set-screws *k i*, substantially as and for the purpose shown and described.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 5th day of June, 1876.

R. K. BOYLE. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.