

Thomas A. Edison.
Improvement in Electro-Magnets.

114657

PATENTED MAY 9 1871

Fig. 1.

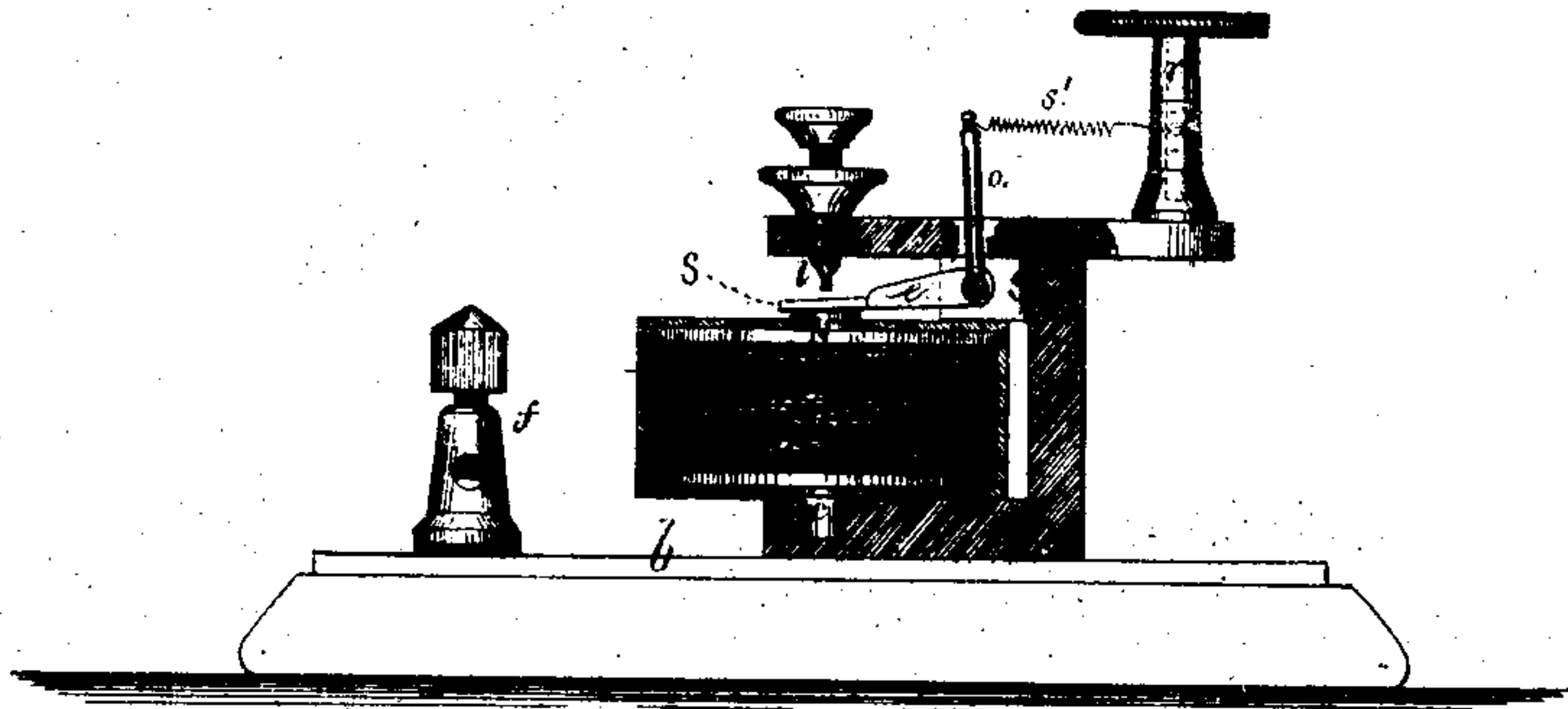
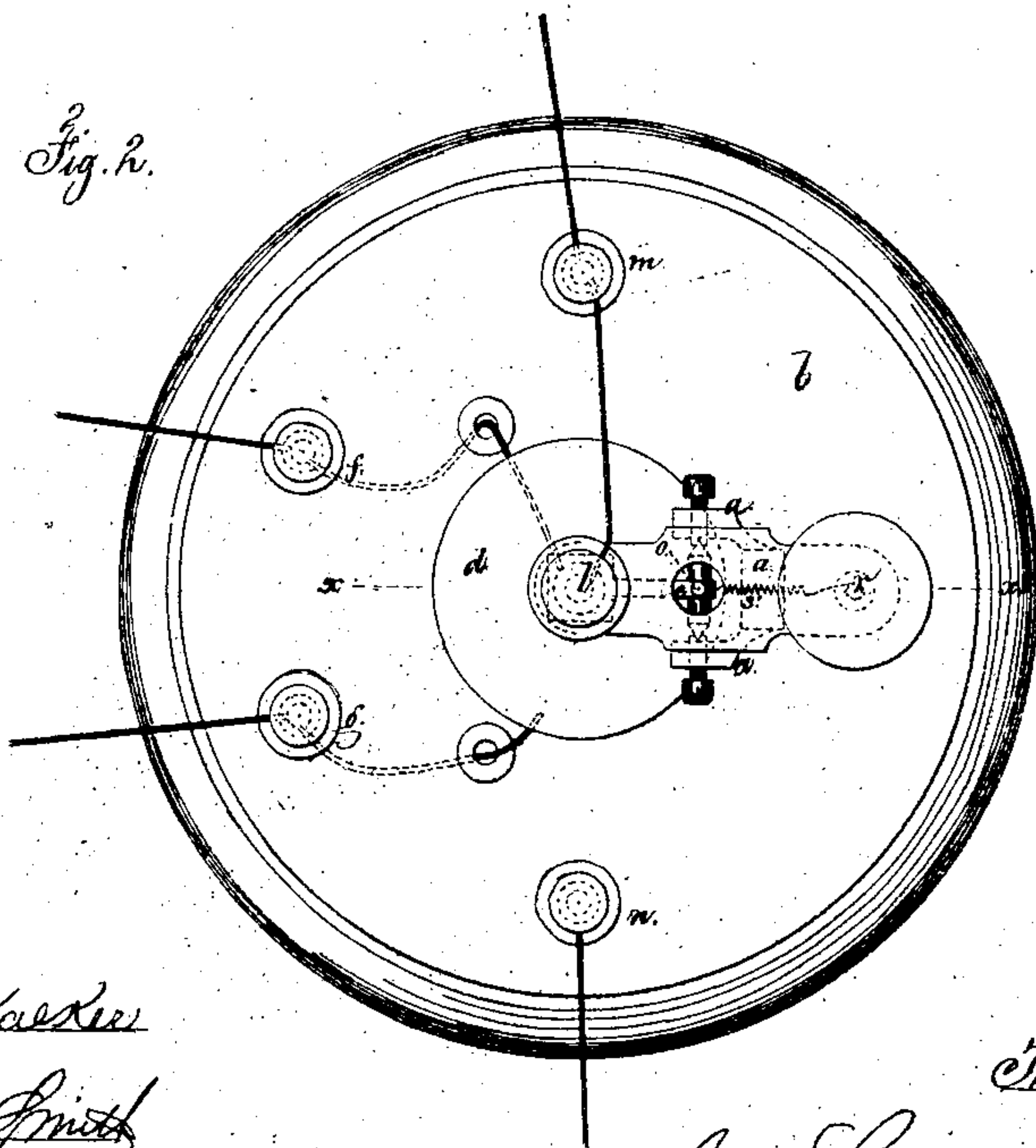


Fig. 2.



Witnesses,

Geo. S. Mackay

Chas. A. Smith

Thomas A. Edison

per Lemuel W. Serrell atty.

United States Patent Office.

THOMAS A. EDISON, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF
AND MARSHALL LEFFERTS, OF NEW YORK CITY.

Letters Patent No. 114,657, dated May 9, 1871.

IMPROVEMENT IN RELAY-MAGNETS FOR TELEGRAPH INSTRUMENTS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Electro-Magnets; and the following is declared to be a correct description thereof.

The object of this invention is to produce an electro-magnet that can be operated with great rapidity and accuracy, and capable of being used as a relay or repeater for a chemical telegraph operated by punched paper and a stilus or brush circuit-closer, or for a time-repeater in astronomical or other observatories, or for a relay or repeater to a Morse-telegraph instrument, or wherever great rapidity or accuracy of movement is required.

I make use of a soft-iron core to a short single-spool electro-magnet, and this is mounted upon one end of a permanent magnet, and the other end of said permanent magnet is near the core of the electro-magnet, and has a small hinged tongue, so that the tongue is attracted to the core by the polarity due to the induced magnetism of that core and tongue, and the coils of the helix are so wound as to make the core, by a pulsation, an electro-magnet of an opposite polarity to what it was by the induced magnetism.

The attraction from the induced magnetism is almost counterbalanced by a spring, hence the slightest current of electricity that will neutralize the induced magnetism will produce a motion of the tongue and close or break a secondary local relay, or other electrical circuit, and the core being very short and the connections direct, the magnet frees itself rapidly and can be operated by the most minute pulsation.

In the drawing—

Figure 1 is a vertical section of the instrument at the line *xx* of fig. 2, which is a plan of said instrument.

The permanent magnet *a* is sustained upon the bed *b*, and is magnetized so that one end of it is a north polarity and the other south. They are marked N. S.

Upon the pole N of the permanent magnet *a* is a soft-iron core, *c*, surrounded by a helix, *d*, and this helix is wound in such a manner and so connected to the insulated binding-screws *f g* that the pulsation of electricity will make the soft-iron core *c* of a different polarity from what it is by the induced current, so that if the core *c* is upon the north pole of *a* then the induced current will make the core *c* a magnet of northern polarity, and the pulsation of electricity in the helix will neutralize that induced magnetism, making or tending to make the soft-iron core an electro-magnet of southern polarity.

At the end *s* of the magnet *a* a small iron tongue, *e*, is hinged, so as to vibrate with the moving end over

the core *c*, and to this tongue a spring is applied and made adjustable in any suitable manner.

I have shown the arm *o*, spring *s'*, and adjusting-rod *r*, and the power of the spring is adjusted so as not to be sufficient to raise the tongue *e*, the attraction between *e* and *c*, from induced magnetism, being just sufficient to keep the parts *e* and *c* in contact.

Above the tongue *e* is an adjustable circuit-closer, *l*, that is insulated and connected to the binding-screw *m*, and the tongue *e* is connected through the magnet *a* and base *b* with the other binding-screw *m*.

A primary circuit is connected with the binders *f* and *g*, and, where a local or secondary circuit or relay is operated by this device, the wires thereof are connected to *m* and *n*, and the said local or secondary circuit is closed by the rising of the tongue *e*, when the pulsation through *f*, *g*, and *d* sufficiently neutralizes the induced magnetism in *c* and *e* to allow the spring to separate them.

In consequence of using a short single helix, with short connections and a short tongue, having but a small movement, there is nothing to interfere with the movement being very rapid, and the circuit-closer of the local or secondary circuit being immediately over the electro-magnet, there is no loss of time or motion in making the connections of the secondary circuit.

The electro-magnet operates to repel the tongue *e* at the time the tongue is in contact; hence, there being no intervening space, the magnetic action is more instantaneous than it would be if a space intervened, as with an ordinary armature.

In consequence of the features aforesaid all acting to promote rapidity of action, this electro-magnet is capable of repeating with a secondary or relay-circuit the pulsations given by punched paper drawn through a transmitting-machine at ordinary rate, and to properly proportion the dots, dashes, and spaces; and this speed and accuracy of movement are available for other purposes in electrical appliances.

I do not claim a magnet with a single helix and core, neither do I claim a polarized magnet in which a permanent magnet and tongue are employed. I have discovered that, in order to obtain a rapid electro-magnet that is adapted to a relay or repeater in automatic telegraphs, the vibrating tongue must, in a normal position, remain in contact with the core by induced magnetism and be repelled by the electro-magnetism, or else the space intervening between the core and tongue will interfere with the rapidity of action, and the electro-magnet must not be more than an inch in length to free itself of the electrical pulsation with sufficient rapidity, and the tongue, swinging upon an axis at right angles to the core of the electro-

magnet, the said tongue will vibrate in the line of the magnetic action, and more rapidly than the polarized magnets, in which the tongue swings on an axis parallel to the core of the electro-magnet.

I claim as my invention—

1. A permanent magnet, an electro-magnet, and a vibrating tongue, arranged substantially as set forth, so that the tongue will be repelled from its contact with the core of the electro-magnet by the electric pulsation, substantially as specified.

2. An electro-magnet of less than an inch in length, with a permanent magnet and swinging tongue to

make and break the circuit in an automatic telegraph, substantially as and for the purposes set forth.

3. The electro-magnet, permanent magnet, and a tongue that swings toward and from the end of the core of the electro-magnet upon an axis at right angles to such core, as and for the purposes set forth.

Dated September 6, 1870.

T. A. EDISON.

Witnesses:

CHAS. H. SMITH,
GEO. T. PINCKNEY.