A. COLEMAN.

Electro Magnet.

No. 14,711. Patented April 22, 1856.

Fig: 2.

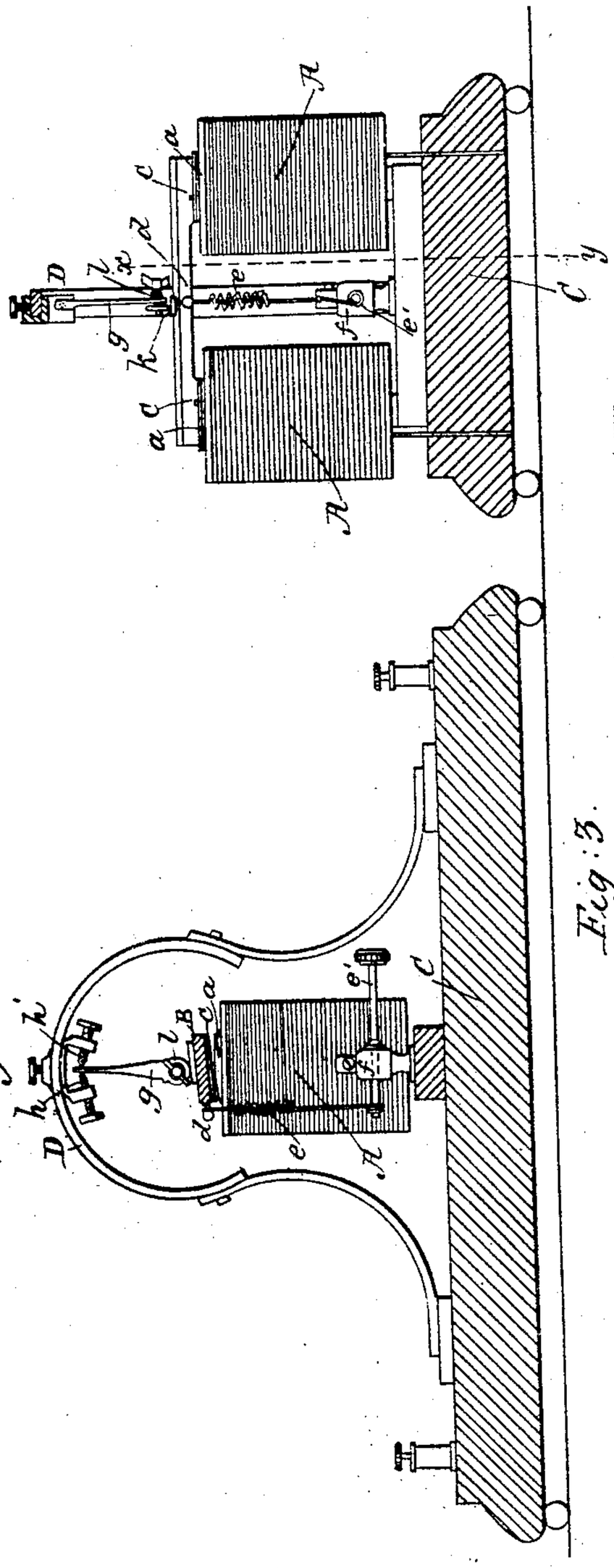
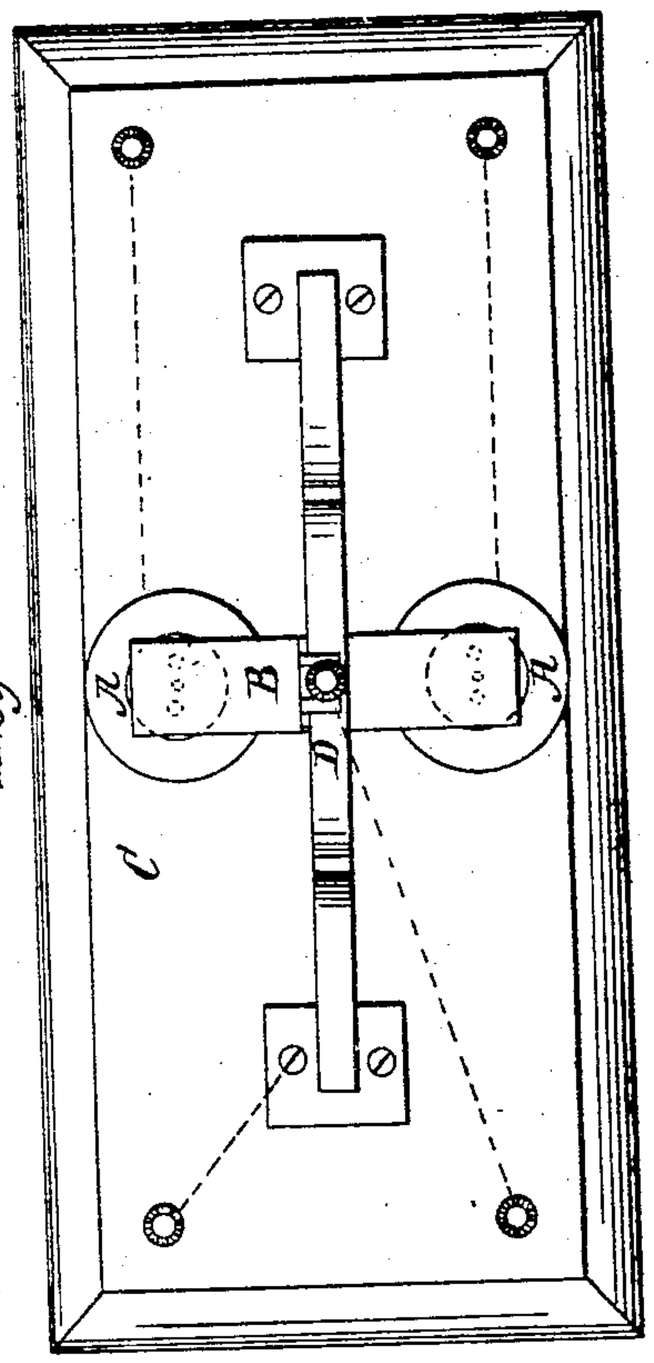


Fig: 1.

Fig: 3.



UNITED STATES PATENT OFFICE.

ANDREW COLEMAN, OF PERTH AMBOY, NEW JERSEY.

IMPROVEMENT IN RECEIVING-MAGNETS FOR TELEGRAPHS.

Specification forming part of Letters Patent No. **14,711**, dated April 22, 1856.

To all whom it may concern:

Be it known that I, ANDREW COLEMAN, of Perth Amboy, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Magnets; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of a receiving-magnet for combining the main and local circuits of a telegraph-line. Fig. 2 is another vertical section of the same at right angles to Fig. 1, in the line *x y*. Fig. 3 is a top of the same.

Similar letters of reference indicate corresponding parts in the several figures.

This invention, which is particularly adapted to receiving-magnets for combining the main and local circuits on telegraph-lines, though also applicable to other magnets, has for its object the compensation for the varying forces of the electric currents, thereby avoiding the necessity of any manual adjustment of the spring or its equivalent by which the armature is suspended.

It consists in constructing the armature in the form of or attaching it to a lever having its fulcrum variable under the influence of the variable magnetic force in such a manner that the spring or its equivalent is made to act with a force proportionate to the strength of the magnetic force.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A A is the magnet, which is placed upright, and has the faces of its poles *a a* both curved in the direction shown in Fig. 2.

B is the armature, which has its face of the same curved form as the faces of the poles of the magnet, and lies on the poles of the magnet, but has two narrow strips of brass let into its face, as shown at *c c* in Figs. 1 and 2, to form bearings and to keep the iron or steel from coming in contact with the poles. It also has two small brass pins; *m m*, (shown dotted in all the figures,) entering loosely into holes in the centers of the poles, to keep the armature from moving laterally off the magnet. The brass bearing-strips *c c* should project in the least possible degree from the face of the armature, in order to allow it to come as close as possible to the poles of the magnet without touching. The curved form of the faces of the poles of the magnet and of the armature allows the armature to rest only on one point or transverse line at a time, but it allows the armature to rock or roll to change this point, and hence to be converted into a lever with a changeable fulcrum, the point or line of bearing being the fulcrum.

On one side of the armature is a small stud, *d*, to which is attached one end of a light spiral spring, *e*, the other end of which is attached by a cord to a spindle, *e'*, working in a bearing, *f*, attached to the wooden base C, which supports the magnet.

To the top of the armature is attached the finger *g*, by which the local circuit is opened and closed, the said finger playing between the points of two screw, *h h'*, above, the circuit being broken when the finger is in contact with the screw *h*, which is insulated and closed when the finger is in contact with the screw *h'*, the circuit being made, as shown by the dotted lines at the left hand of Fig. 3, from the screw *i* to the magnet, thence through the armature and finger *g*, through the screw *h'* and the arched frame D, which carries it, and thence to the screw *j*. The finger *g* is pivoted to a small stand, *k*, secured to the top of the armature, and sufficient friction is produced between the stand and the finger by means of a screw and nut on the pivot and a small spring upon which the nut acts, as shown at *l*, Figs. 1 and 2, to overcome the inertia of the finger and cause it to move with the armature until it is arrested by either of the screws *h h'*, after which it allows the armature to move independently of it.

When the main circuit is open the spring, acting upon the armature, causes its bearing to be on or somewhere near the edge of the armature nearest to the spring, and the spring exerts only just force enough to balance the weight of the armature; but when the circuit is closed the attraction of the magnet draws down the armature and brings the fulcrum nearer to the center of the armature, according to the degree of magnetic force, and moves the finger *g* from the screw *h* to the screw *h'*. When the magnetic force is great the fulcrum will be near the center of the armature, in which con-

dition it will be understood that the effect of the force acting in opposition to the spring will be comparatively slight, owing to the force acting on the armature on both sides of the fulcrum, while at the same time the force of the spring will be comparatively great, owing to the distance from the fulcrum to the spring. When the magnetic force is lighter the spring will tilt up the armature and bring its bearing nearer to the spring, increasing the effect of the magnetic force acting in opposition to the spring, and reducing the effective force of the spring. In this way the variable magnetic force is always balanced by the effective force of the spring, and manual adjustment of the armature is unnecessary to compensate for variation, and though I have provided the spindle for the purpose of adjusting the force of the spring, such adjustment, when once set, will not require to be varied.

This method of compensating for the varying magnetic force will overcome what is the greatest, if not the only source of trouble, in telegraphing with the Morse telegraph—viz., the difficulty of adjusting the armature of the receiving-magnet. It also obviates the liability of the armature to fail to be drawn back by the spring when the main circuit is broken, which is a very common occurrence with the ordinary magnet, in which, by reason of the slight movement of the armature, the force of the spring may be assumed to be constant, especially after the magnetic current has been unusually strong, which makes it seem as though enough magnetism must remain in the magnet after the opening of the circuit. This can never be the case when my invention is employed, as after the strongest current the spring exerts the greatest force, which must be much more than sufficient to overcome the force of the magnetism remaining (if any can remain) in the magnet.

I do not propose to limit the application of my invention to receiving-magnets for telegraphs, but to apply it wherever it is desirable to compensate for variations of magnetic force.

It is proper to observe that there may be other methods of arranging the maguet and armature, and that the armature, instead of being itself a lever having its fulcrum on the faces of the magnet, may be attached to a variable lever having its fulcrum on any suitable surface. I have tried some other methods of arrangement, and have only shown that represented in the drawings as being in some respects the most simple and convenient.

I do not limit myself to the use of any particular curve for the faces of the magnet and armature, as in practice the curve admits of considerable variation, though to make the compensation theoretically perfect the curve should be calculated with a view to the ratios of increase of the force of attraction as the faces approach each other.

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

So constructing or arranging the armature and applying the spring *e*, or its equivalent, substantially as herein described, that the armature constitutes the whole or part of a variable lever, which causes the effective force of the spring or its equivalent to increase or diminish as the magnetic force becomes greater or less, when this is combined with the so applying the finger *g*, by which the local circuit is opened and closed, that the said finger is caused to move with the armature by friction only, or its equivalent, and, after having moved the slight distance necessary to open or close the circuit, leaves the armature free to move as far as necessary independently of it, substantially as herein described, thereby obviating the necessity of manual adjustment of the armature to compensate for variations of magnetic force.

ANDREW COLEMAN.

Witnesses:
JOHN HALL,
JAMES M. MARTIN.