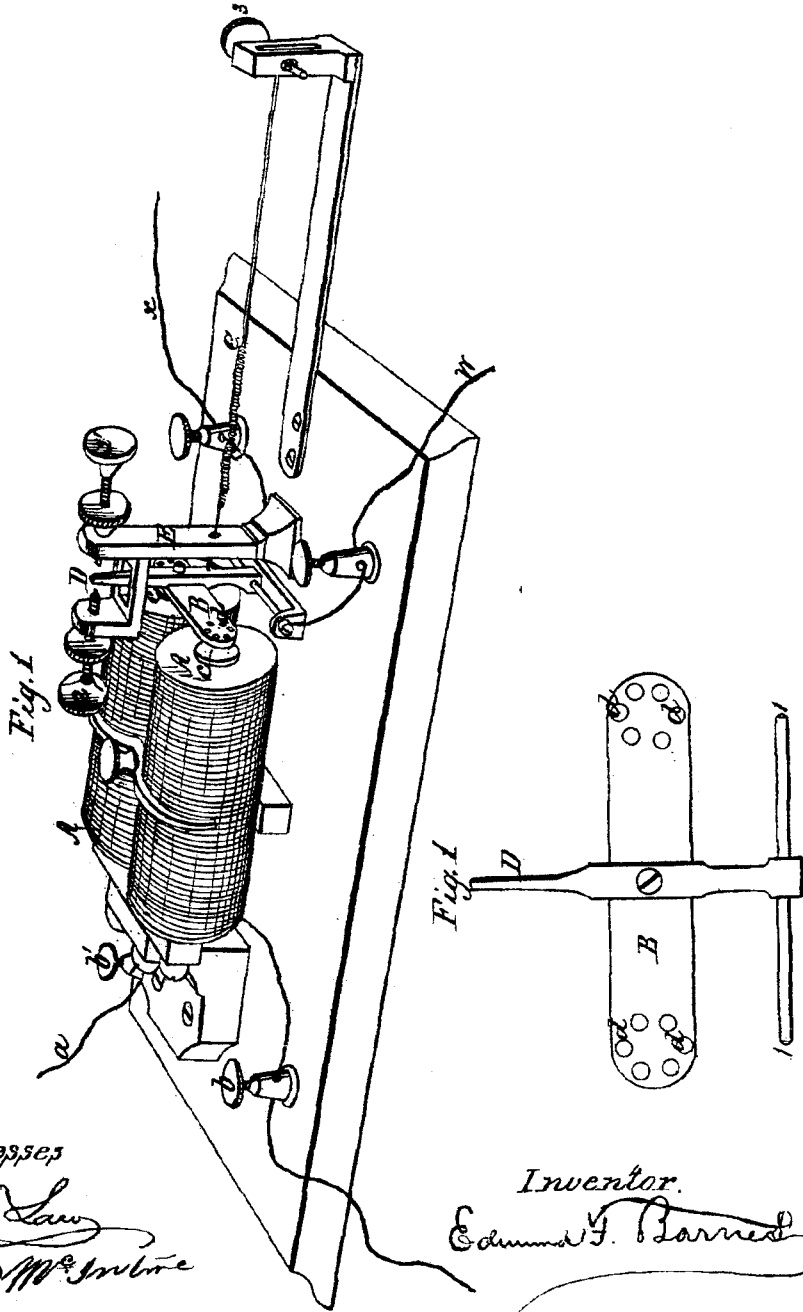


E. F. BARNES.

Telegraphic-Relay Instrument.

No. 20,930.

Patented July 20, 1858.



Witnesses  
*L. D. Saw*  
*Alfred M. Ingham*

Inventor.  
*Edmund F. Barnes*

# UNITED STATES PATENT OFFICE.

E. F. BARNES, OF BROOKLYN, NEW YORK.

IMPROVED COMBINATION OF ELECTRO AND PERMANENT MAGNETS TO RENDER TELEGRAPHING-MAGNETS EASY OF ADJUSTMENT.

Specification forming part of Letters Patent No. 20,930, dated July 20, 1858.

*To all whom it may concern:*

Be it known that I, EDMUND F. BARNES, of Brooklyn, county of Kings, and State of New York, have invented and applied to use certain new and useful improvements in apparatus for use in connection with telegraphic lines and machinery for more completely counteracting the effect of unusual quantities of atmospheric electricity in the working of telegraphic instruments, which apparatus I term a "Mutator;" and I do hereby declare that the following is a full, clear, and exact description thereof, reference being made to the accompanying drawings, and to the letters of reference marked thereon, and making a part of this specification.

Figure 1 is a perspective view of the mutator, the several parts being in their proper position with respect to each other. Fig. 2 is a detached view of the armature of the electro-magnet.

The nature of my invention consists in so arranging and combining an electro and permanent magnet that the effect of such combination shall render it much less difficult to adjust the magnets of telegraphic instruments consequent upon the influence of atmospheric electricity or other disturbing causes.

The mutator consists of an electro-magnet, A, and a permanent magnet, B, which may be simply a flat magnet, as represented in the drawings, or which may be U-shaped or of any form preferred, and which acts as an armature to the electro-magnet. Such permanent magnet or armature B is suspended by points of screws 1 1, or otherwise supported, so that it will have easy motion backward and forward. This armature is caused to move in one direction by the magnetic force produced by charging the electro-magnet A—that is, when the direction of the electric current about the coils of the electro-magnet A is such as to produce polarity in such electro-magnet opposite to the polarity of the permanent magnet B, and is caused to move in the reverse direction by the force of the spring C, which causes such armature to recede from the electro-magnet when the electric current is sent in such a direction as to produce like polarity in such electro-magnets. The tension of such spring may be increased or diminished by turning the adjusting-screw 3.

Attached to the armature B is a bar, D, the end of which is between the two adjusting-screws 2 2' to regulate the movement of such armature. The points of one or the other of these screws (according to the direction in which the electric current is sent around the coils of the electro-magnet) is armed with platinum or other conducting substance, while the point of the other is armed with ivory or other non-conducting substance, so that the resident circuit of conductors may be alternately closed or broken for purposes connected with any telegraphic machine with which the mutator may be used.

The permanent magnet or armature B is made of hardened steel, having fixed in it at each end, or directly over the ends of the cores *c c* of the electro-magnet, a series or number of soft-iron plugs, *d d*, passing through such armature, and all located within a space not larger than the cores of the electro-magnet. Such soft-iron parts will, of course, be inductively magnetized by the permanent magnet; but as soft iron is more susceptible to the magnetic current than hardened steel, and as such soft iron parts of the armature are directly over the cores of the electro-magnet; they will be more quickly influenced or affected by any magnetic influence or current of the electro-magnet, and will thus render the action of the steel armature upon the electro-magnet more forcible than otherwise it would be, and therefore more certain with the feeble magnetic current induced in the main circuit of a telegraphic line than could be attained by the use either of a soft-iron armature or a permanent-magnet armature wholly of hardened steel. Hence by the combination and use of the permanent-magnet armature B with the electro-magnet A the disturbing effects of any atmospheric electricity or electrical discharge are almost wholly prevented, because, while the magnetic equilibrium of the soft-iron cores of the electro-magnet may be easily affected by the passage of such atmospheric electricity, the magnetic equilibrium of the permanent magnet or armature B will not be changed, because of the difficulty of disturbing the magnetic equilibrium in hardened steel. The effect of such combination of the electro and permanent magnets is therefore to materially lessen the necessity of adjustment, which would other-

wise be required by reason of the influence of atmospheric electricity or other disturbing causes.

The permanent-magnet armature B may also be made wholly of hardened steel without the soft-iron plugs above mentioned, and when so constructed its effect will be highly satisfactory, but its action will not be as certain as when furnished with such soft-iron plugs.

The particular arrangement of the permanent and electro magnets in respect to each other, as above described and as represented in the drawings, need not, however, be adopted, but any arrangement of the two to produce the same effects may be made use of—as, for instance, the permanent magnet may be stationary and the electro-magnet may vibrate, or the permanent and electro magnet coils may both be stationary and the cores of the electro-magnet may vibrate, or other changes of form may be adopted. To the vibrating part, however, whichever it may be, is to be attached the bar D, placed substantially as described, to regulate the movements of such vibrating part.

The two ends of the wire composing the coils of the electro-magnet are attached to the two binding-screws *b b'*, to the latter of which is also attached the wire of the main line, and from the other extends a wire to the circuit-

breaker or key of the registering-instrument, and thence a wire passes to the main battery, and from thence to the ground if at a terminal point. The wire *w* extends from the armature B to one pole of the resident magnet, and the wire *x* extends from the standard E in which is the screw 2' to one pole of the resident battery, from the other pole of which a wire extends and connects with the other pole of the resident magnet.

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

1. The combination and use, in a telegraphic line or in connection with telegraphic instruments, of the permanent magnet with the electro-magnet, arranged and connected substantially as and upon the principles above set forth, to prevent the disturbing effects of atmospheric electricity, &c., as described.

2. Constructing the permanent magnet B, when used substantially as described, as an armature of the electro-magnet, with soft iron inserted therein, substantially as set forth, to render its action more forcible in connection with the electro-magnet.

EDMUND F. BARNES.

Witnesses:

S. D. LAW,  
ALFRED McINTIRE.