(No Model.)

L. K. FULLER.
Electro Magnets.

No. 232,398. **Patented Sept. 21, 1880.**

Fig. 1.

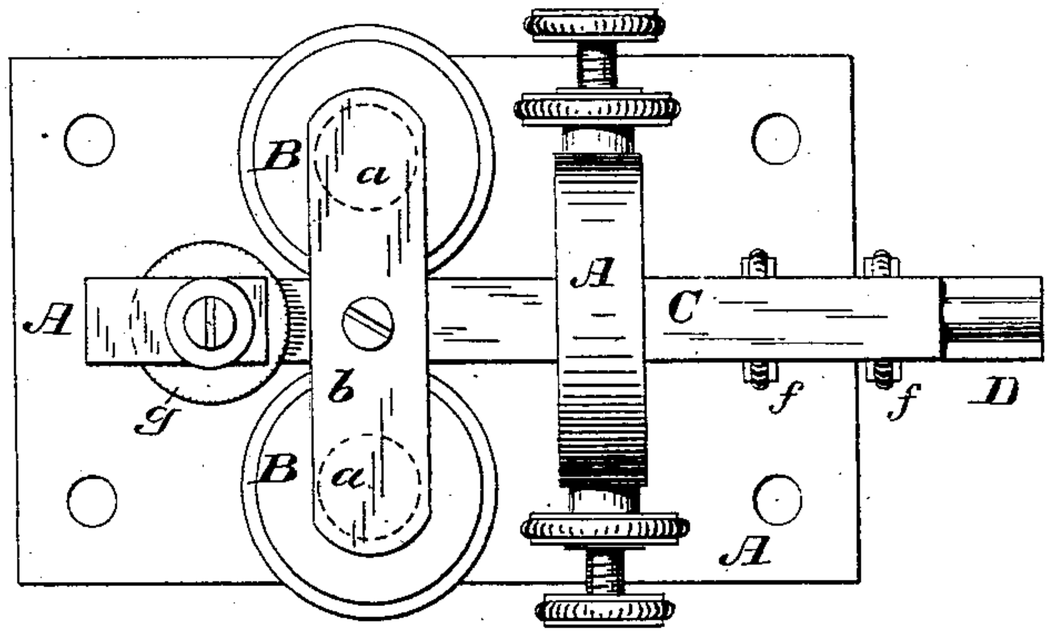


Fig. 2.

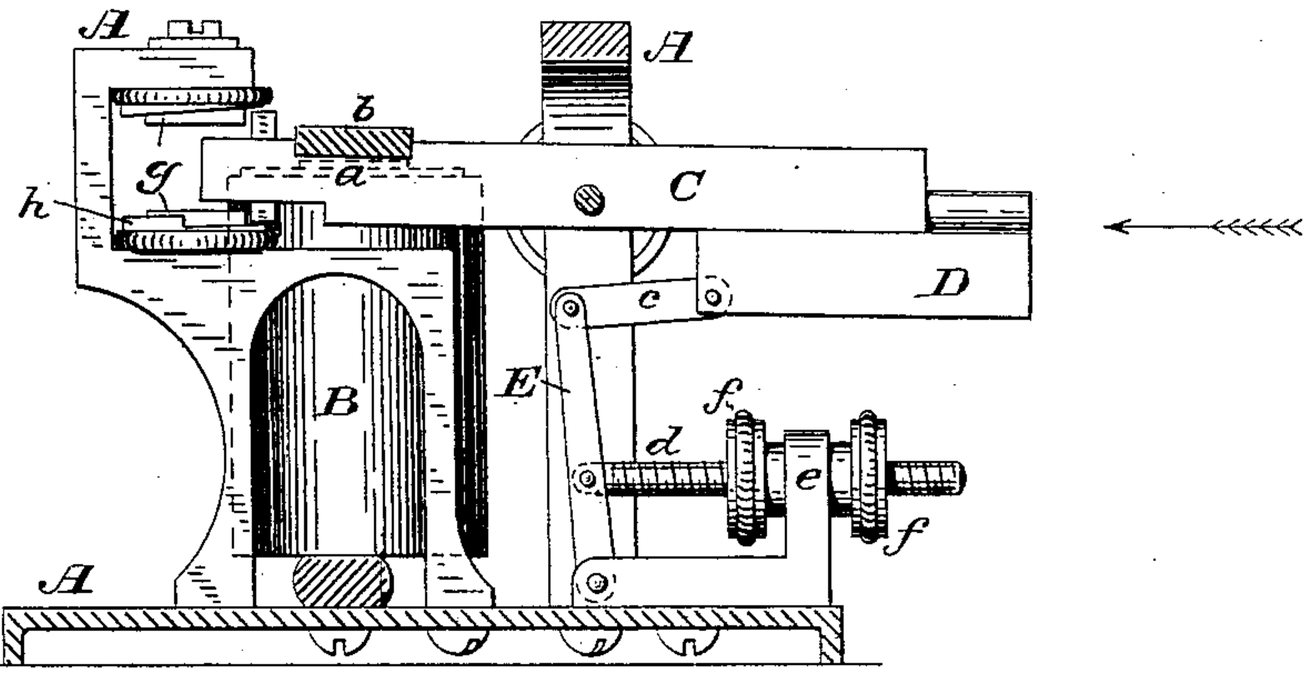


Fig. 6.

Fig. 5.

Fig. 8.

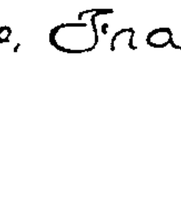
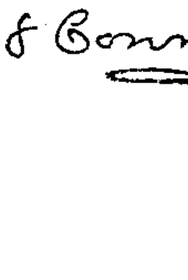


Fig. 4.



ATTEST:

E. B. Bolton

Jos. H. Smithorne.

INVENTOR:

Levi K. Fuller,

By his Attorneys,

Burke, Fraser & Bonnell

UNITED STATES PATENT OFFICE.

LEVI K. FULLER, OF BRATTLEBOROUGH, VERMONT.

ELECTRO-MAGNET.

SPECIFICATION forming part of Letters Patent No. 232,398, dated September 21, 1880.

Application filed August 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, LEVI K. FULLER, a citizen of the United States, residing at Brattleborough, in the county of Windham and State of Vermont, have invented certain Improvements in Electro-Magnets for Telegraphic and other Purposes, of which the following is a specification.

My invention relates chiefly to electro-magnets employing a weight to perform the retractile movement of the armature; and it has for its principal object to effect the adjustment of the leverage exerted by the weight without the necessity of stopping the vibration of the armature.

It also relates to the adjustment of the play of the armature of an electro-maguet and of the approach of the armature to the core of the magnet.

In the accompanying drawings, Figure 1 is a plan view of the preferred form of my magnet, designed especially for use as a telegraph-sounder. Fig. 2 is a side elevation of the same, partly in vertical section, on the line *x x* in Fig. 1. Fig. 3 is an end view of the armature-lever and counter-weight, as indicated by the arrow *y* in Fig. 2. Fig. 4 shows one of the buttons for adjusting the play of the armature in plan and edge view. Fig. 5 is a vertical longitudinal section of a modified form of my magnet, and Fig. 6 is a detached plan view of one of the adjusting-buttons employed therein.

A is the fixed frame-work, on which the essential parts of the device are mounted. B is the electro-magnet proper, consisting of the soft-iron core, with its poles *a a* and the surrounding coils of wire, all constructed as usual. C is the armature-lever, bearing the armature *b*, which is attached thereto in any usual manner; and D is the retracting-weight, so hung upon or connected to the lever C as to give the armature *b* a normal tendency to move away from the poles *a a*.

So far as described there is no essential novelty in the device.

Heretofore the arm of the lever C bearing the weight has been screw-threaded, and the weight D has been in the form of a nut, adjustable upon the lever by being rotated thereon, and thereby screwed toward or from its fulcrum. The weight has also been connected in other ways; but by all the methods heretofore adopted it has been necessary to stop the vibrations of the lever in order to adjust the weight upon it, since the weight was retained in place by direct connection with the lever, as by being screwed onto the same.

For telegraphic and some other purposes it is necessary that the retractile force exerted on the armature of an electro-magnet be adjusted while the armature is vibrating. This adjustment is very readily effected when a spring is used as the retractile force, but has not, so far as I am aware, been accomplished with a weight prior to my present invention.

My invention consists in so mounting the weight upon the lever that it can be slid longitudinally thereon, and so connecting it with an adjustable but normally-stationary part that the position of that part determines its position on the lever, while its connection therewith does not interfere with the vibration of the lever or prevent the weight from acting with its full force to draw the lever down.

As shown in Fig. 3, the weight D slides upon or in longitudinal guides formed upon the lever C.

E in Figs. 1, 2, and 5 is the adjustable part whose position determines the adjustment of the weight, and *c* is the part by which it is connected thereto, which is shown as a link or connecting-bar.

I will first describe the construction shown in Figs. 1, 2, and 3.

The part E is in the form of a lever suitably fulcrumed to the frame or base A, jointed to the link *c* at one portion, and connected to an adjusting-screw, *d*, at another. The screw *d* passes through a bearing, *e*, forming part of the frame A, and bears two nuts, *f f*, arranged on opposite sides of the bearing, by turning which the screw is propelled longitudinally in one direction or the other, and its movement is communicated to the lever E, whose portion, which is jointed to the link *c*, is moved toward or from the weight-bearing end of the lever C, and by such movement slides the weight out or in upon the said lever. As the end of the lever E is arranged near the fulcrum of the armature-lever C the movement or vibration of the latter does not shift the weight thereupon materially, and the

weight may be adjusted toward or from the fulcrum of the lever during the vibration of the latter.

In Fig. 5 the lever C is shown as an elbow-lever, the horizontal arm bearing the weight D, and the adjustable part E is shown as a longitudinally-sliding screw working within a rotatable female screw, *d*, formed with a milled head and having a bearing in the frame A at *e*. The screw E is kept from revolving by means of its connection with the link *c*, or by other suitable means, so that by the rotation of the screw *d* it may be propelled forward or backward. The screw E is arranged substantially in line with the horizontal arm of the lever C, on the opposite side of its fulcrum from the weight D. The range of vibration of the lever C is so limited that this alignment is never materially destroyed by the position of the lever, so that at any time the weight may be slid toward or from the fulcrum by turning the screw *d*.

To adjust the play of the lever C and regulate the closeness of approach of the armature *b* to the poles *a a*, I employ buttons *g g* in place of the ordinary screws. Each of these buttons has an inclined or spiral face, against which some portion of the lever C abuts, and each is pivoted at its center to some part of the frame A, and provided with a milled edge, whereby it may be grasped and turned. The inclined face is in the nature of a curved wedge, and may be arranged upon either the flat face or the edge of the button, the former construction being shown in Figs. 1 to 4 and the latter in Figs. 5 and 6. One button (lettered also *h*) is arranged to limit the approach of the armature to the poles of the magnet, and the other button is arranged to limit the movement of the armature away therefrom. The lever C is provided with suitable shoulders or contact-points, oppositely arranged to abut against the spiral surfaces of the opposite buttons. In these buttons the entire range of adjustment is comprehended in a single revolution, so that the adjustment, while accurate, can be very quickly made. They take less room than screws, and are consequently less in the way, and permit the instrument to be more compactly made.

I claim as my invention—

1. An electro-magnet the armature of which is retracted by a weight borne by the armature-lever, and adjustable thereon toward or from the fulcrum thereof by connection with an additional adjustable part, whereby the retractile effect of the weight may be adjusted without interfering with the vibrations of the armature-lever, substantially as set forth.

2. The combination of the electro-magnet B, armature-lever C, bearing armature *b*, and retracting-weight D, mounted on said lever, adapted to slide freely thereon toward and from its fulcrum, and connected to a normally-stationary part, E, which is capable of adjustment in a direction substantially parallel to the portion of the lever C upon which the weight slides, substantially as set forth.

3. The combination of the magnet B, armature *b*, armature-lever C, retracting-weight D, borne by and sliding on the armature-lever, link *c*, and normally-stationary part E, which is capable of adjustment in a direction substantially in a line with the direction of the sliding movement of the weight, substantially as set forth.

4. The combination of the magnet B, armature *b*, armature-lever C, retracting-weight D, borne by and sliding on the armature-lever, link *c*, adjustable lever E, screw *d*, fixed bearing *e*, and adjusting-nuts *f f*, substantially as set forth.

5. The combination, with the magnet B, armature *b*, and armature-lever C, of an adjusting-button, *g*, formed with a spiral working face or circular wedge, against which some shoulder or contact-point on the lever strikes, and capable of rotation, that one portion or another of this face may be brought opposite said contact-point, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LEVI K. FULLER.

Witnesses:
J. E. HALL,
W. H. CHILDS.