No. 714,452. Patented Nov. 25, 1902.

L. CEREBOTANI.

POLARIZED ELECTROMAGNET.

(Application filed Apr. 25, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

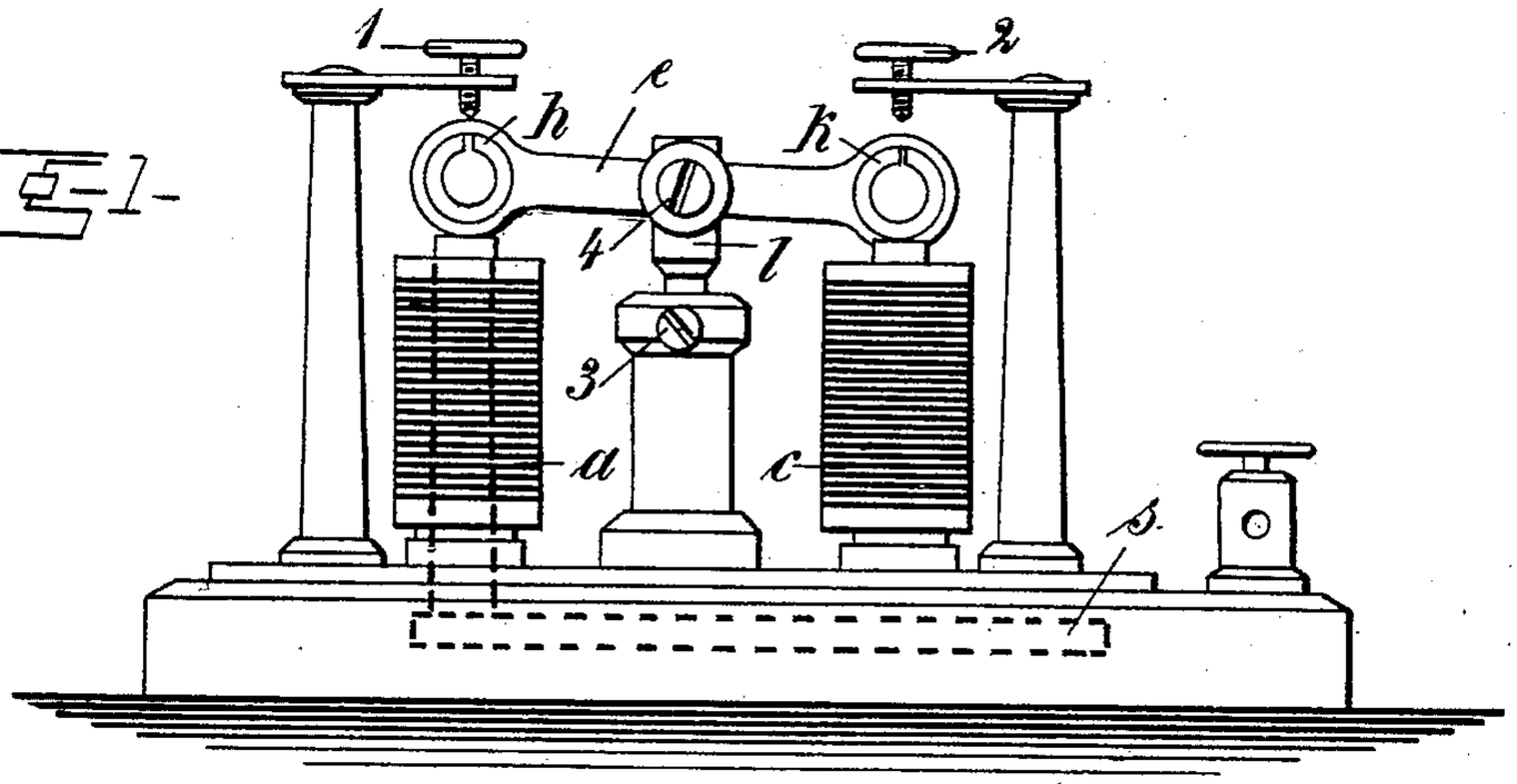

Fig. 2.

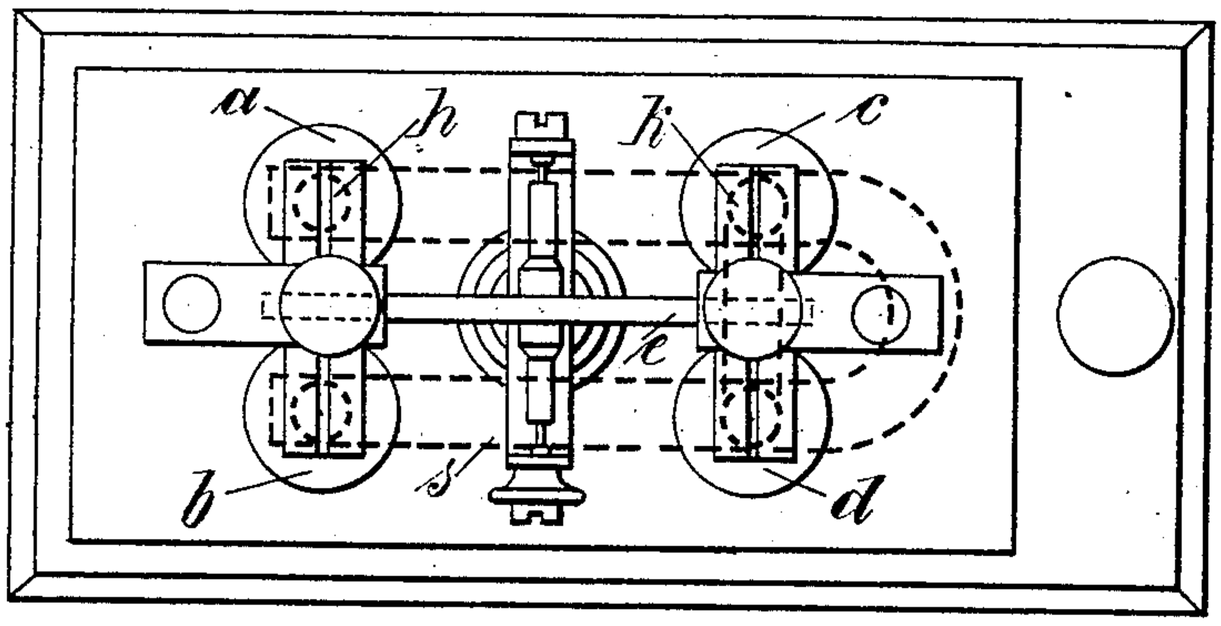

Fig. 3.

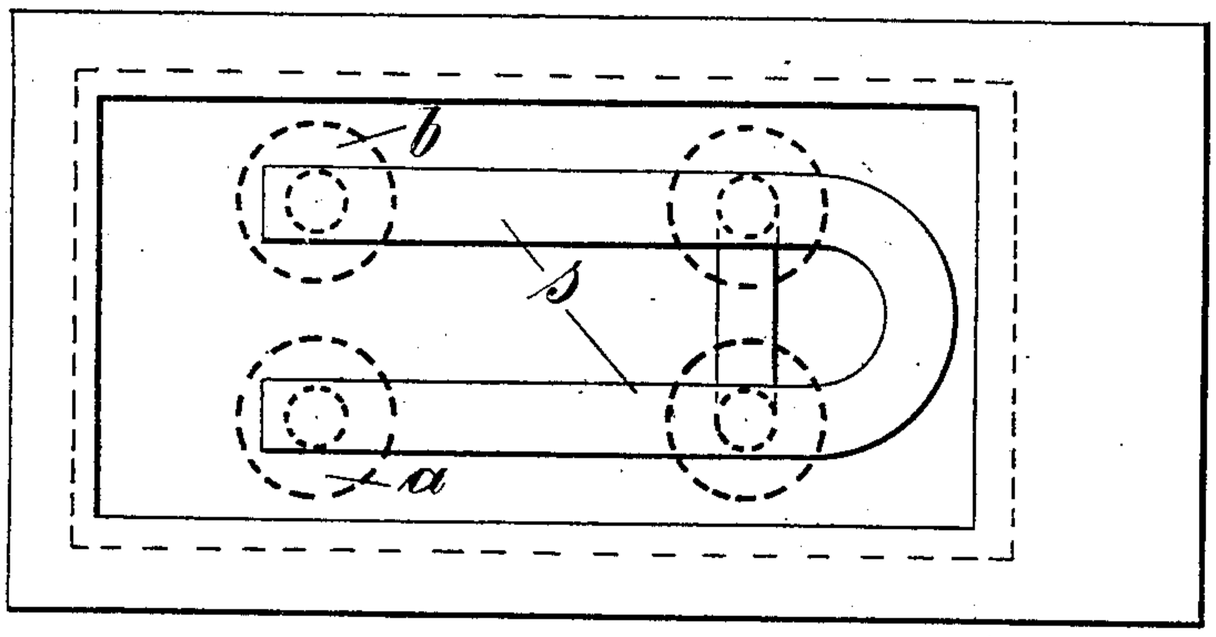

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FIG. 4.

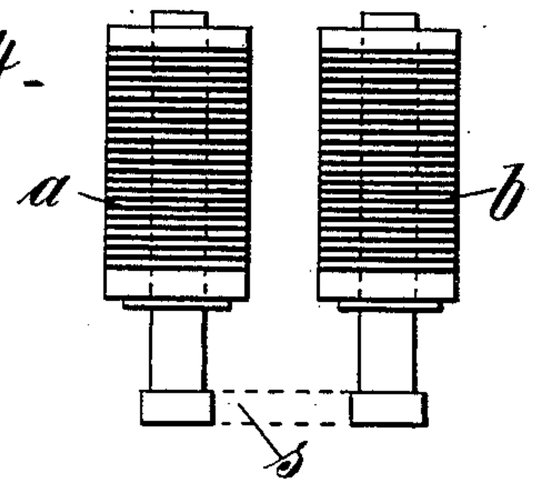


FIG. 5.

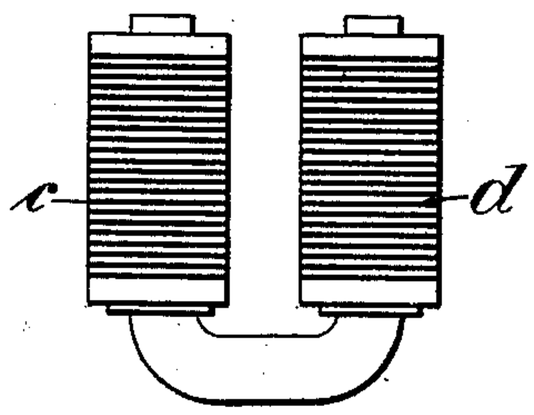
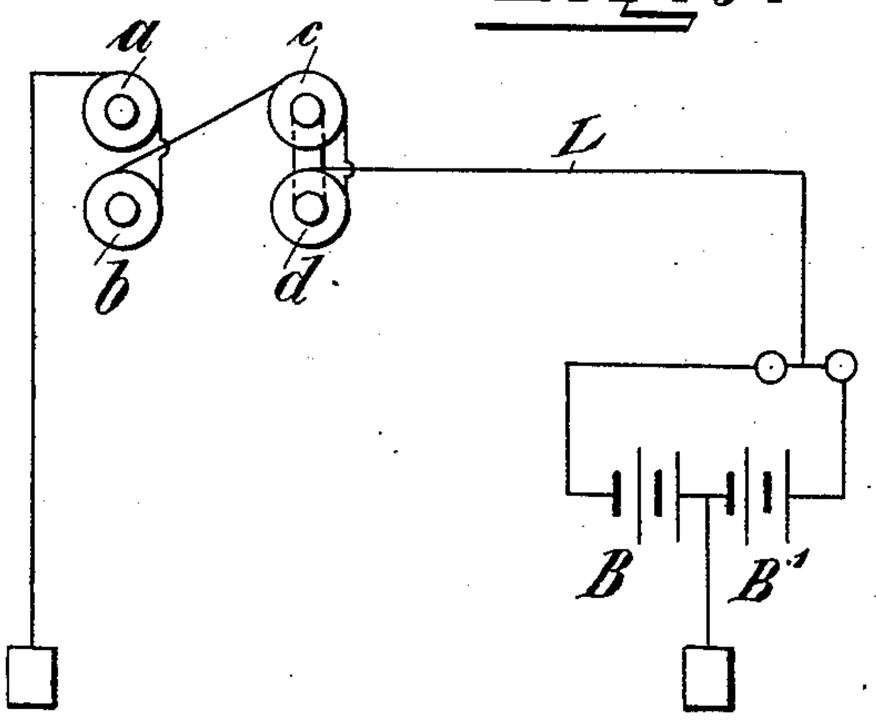


FIG. 6.



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UNITED STATES PATENT OFFICE.

LUIGI CEREBOTANI, OF MUNICH, GERMANY.

POLARIZED ELECTROMAGNET.

SPECIFICATION forming part of Letters Patent No. 714,452, dated November 25, 1902.

Application filed April 25, 1902. Serial No. 104,662. (No model.)

To all whom it may concern:

Be it known that I, LUIGI CEREBOTANI, a subject of the King of Bavaria, residing at Munich, in the Kingdom of Bavaria, in the German Empire, have invented new and useful Improvements in Polarized Electromagnets, of which the following is a specification.

The subject of the present invention is an electromagnet responding only to one kind of current, (positive or negative.) This electromagnet differs from other polarized electromagnets for the same purpose, inasmuch as the response is absolutely reliable—that is to say, the armature oscillates with perfect certainty whether the oscillations serve to perform mechanical work or to close a local circuit performing such work. The new electromagnet further differs from previous similar constructions in that the increase of current strength in no way influences the effect of the response of the magnet. The present electromagnet is in no way limited in its action, and its force of attraction and repulsion, even with the most rapid current impulses, is considerably stronger than is the case with other electromagnets.

The polarization of the new electromagnet is not effected by means of a local current, but by a steel magnet. The manner of operation, therefore, is essentially different, and the forces of attraction and repulsion are thereby considerably increased. The operation is such that the mechanical effect is to a certain extent intensified.

One construction of the new electromagnet is illustrated by the annexed drawings, in which—

Figure 1 shows a side elevation, Fig. 2 a plan view, and Fig. 3 an under side view, of the new electromagnet. Figs. 4 and 5 show front views of the electromagnets employed. Fig. 6 is a diagram showing the course of the current.

The new polarized electromagnetic device consists of two bobbins *c d*, with a soft-iron horseshoe-core, (see Fig. 5,) and of two bobbins *a b*, each having a soft-iron core, (see Fig. 4;) furthermore, of a steel magnet *s*, (see Figs. 1, 2, and 3,) the poles of which correspond to the ends of the last-named iron cores, and, finally, of a double armature *h k*, Figs. 1 and 2, in connection with a cross-bar *e*, pivotally mounted in a bearing *l*.

For regulating the magnetic effects screws 1 2 3 4 are provided according to the particular purpose in view and the current strength employed. The coils of all the bobbins *a b c d* are contained in the line-circuit L, Fig. 6. If, therefore, the line-current L flows, for instance, from the pole of a battery B or B′, it will pass through *d*, *c*, *b*, and *a* to the other pole or to earth. If now no current passes through the line-circuit, the steel magnet *s* alone acts. The cores in *a b* are likewise magnetic, and the armature *h* is attracted—*i. e.*, the cross-bar *e* will tip toward *a b*. If next a current flows from B or B′, it is either such as to magnetize the cores *a b* with the same kind of magnetism as the steel magnet or with the opposite kind. In the first case the magnetic force of current and steel magnet is aggregated, and should the sum result in a force greater than that which is generated in the magnet-pair *c d* by the same current the armature *h* will remain attracted. In the second case, on the other hand, the magnetic force at *a b* will be eliminated or diminished, so that the magnetic force at *c d* due to the current is in any case the greater one, wherefore the armature *k* will be attracted—that is, the cross-bar *e* will tilt toward *c d*.

In order that the aggregated force in the first instance above referred to may result in a sum which independent of the precise strength of the line-current, or at any rate until the latter is of very great strength, is greater than the strength exerted at the magnet-pair *c d* due to the same current, the coils are so wound that there are fewer turns of wire on *c d* than on the other pair *a b*. The necessity for this is the different magnetic effect at the two electromagnets, were the number of coils the same on both bobbins, since the effect would then be far greater at *c d*, where the iron core is common to both bobbins *c* and *d* than at *a b*, where there are two separate cores. In this case the electromagnetism at *c d* would readily predominate on the passage of a current, even producing at *a b* magnetism of the kind which would add to the effect of the force of the steel magnet. To overcome this drawback, the unlike

number of coils is adopted, and from this arrangement it follows: First, with this apparatus the smallest current through *c d* and *a b* causing a magnet effect of the opposite kind to that caused by the steel magnet *s* results in tipping of the cross-bar *e*—*i. e.*, attraction of the armature *k*—toward the side *c d*, for it is well known that thereby the effect of the steel magnet *s* at *a b* (however strong *s* may be) becomes zero. Thus all strengths of such a current—*i. e.*, of the same direction—cause tilting of *e*—*i. e.*, response of *c d*—since the magnetic effect at *a b* resulting from the current can in any case only be one sensibly diminished by the opposing action of *s*, while at the electromagnet *c d* it is in no way decreased. Second. A current producing a magnetic effect at *a b* of the same kind as *s* causes, when the strength is zero or is exceptionally high, tipping of the bar *e*—that is, attraction toward *c d*. Third. The electromagnetic device is such that the cross-bar *e* only tips in response to one kind of current—for instance, positive—of the smallest up to the greatest strength, so that either a mechanical effect or closing of a local circuit may be produced, while the same cross-bar remains unaffected by currents of opposite kind.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A polarized electromagnetic device, comprising a permanent horseshoe-magnet, an electromagnetic pair the cores of which correspond to the poles of the said permanent magnet, a horseshoe-electromagnet, the coils of both electromagnetic pairs being wound in series, and a double-armed pivotal lever-armature for said electromagnetic pairs, all substantially as described.

2. A polarized electromagnetic device, comprising a permanent horseshoe-magnet, an electromagnetic pair the cores of which correspond to the poles of the said permanent magnet, a horseshoe-electromagnet, the coils of both electromagnetic pairs being wound in series, the first-named pair having a larger number of coils than the horseshoe-electromagnet, and a double-armed pivotal lever-armature for said electromagnetic pairs, all substantially as described.

3. A polarized electromagnetic device, comprising a permanent horseshoe-magnet, an electromagnetic pair the cores of which correspond to the poles of the said permanent magnet, a horseshoe-electromagnet, the coils of both electromagnetic pairs being wound in series, the first-named pair having a larger number of coils than the horseshoe-electromagnet, a double-armed pivotal lever-armature for said electromagnetic pairs and means for controlling the oscillations of the lever-armature, all substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LUIGI CEREBOTANI.

Witnesses:
GEBHART BERNHARD,
H. R. MCGINNIS.