L. T. LINDSEY.

ELECTROMAGNETIC MOTOR.

No. 102,562. Patented May 3, 1870.

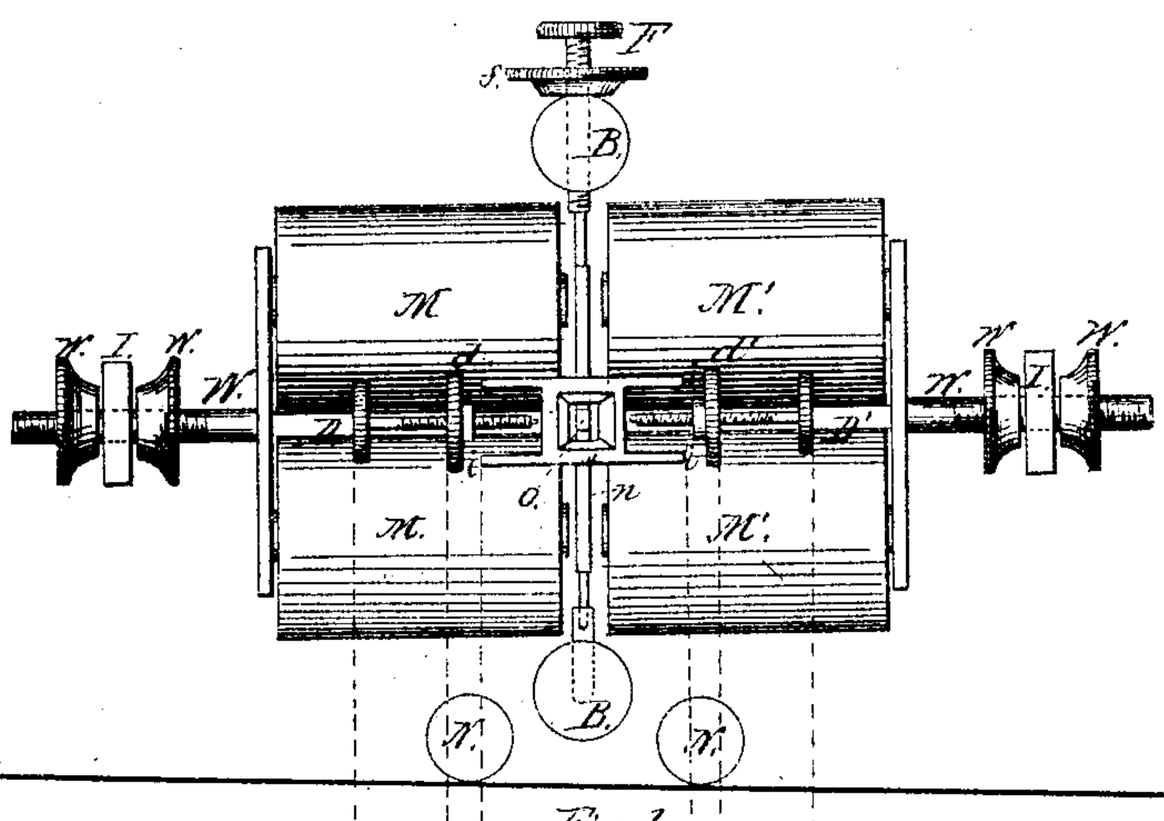

Fig. 1.

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United States Patent Office.

LANDY TUNSTALL LINDSEY, OF JACKSON, TENNESSEE.

Letters Patent No. 102,562, *dated May* 3, 1870.

IMPROVEMENT IN ELECTRO-MAGNETIC MOTORS.

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

To whom it may concern:

Be it known that I, LANDY TUNSTALL LINDSEY, of Jackson, in the county of Madison and State of Tennessee, have invented a new and improved Mode for the Mechanical Construction of my Electro-magnetic Motor, granted under Letters Patent No. 92,066, dated June 29, 1869; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters and figures of reference marked thereon.

Where the same reference letters or figures occur in the different drawings they represent the same parts, whether such parts be there shown in a vertical or horizontal position.

In the accompanying drawings—

Figure 1 is a horizontal view and plan, divested of such parts as are not necessary to show the operation and purposes of the improvement.

Figure 2 is a vertical projection, showing the form or outline and position of all the parts.

The parts indicated by reference letters may thus be traced:

M M′ are electro-magnets of the U-form.

P P′ are supporting-frames for the magnets M M′.

D D′ are adjusting-screws held in the frames P P′.

d d′ are jam-nuts thereon.

N N′ are binding-screws and stands, for the reception of wires leading from the battery to the instrument.

i is a metal slide of the shape, in a horizontal position, as shown in fig. 1, and in a vertical position as shown in fig. 2.

It is held suspended in grooves, as shown by dotted outline, in the metal frame E, (see fig. 2.)

It has two broad surfaces, projecting therefrom downward, so as to face and extend below the adjusting-screws D D′, shown also in fig. 2.

E is a movable frame, having the metal slide *i* suspended therein, as above explained.

It moves in a vertical position up or down, so that the slide can be raised or lowered, the dotted outlines thereof, and those of the downward-projecting surfaces of the slide facing the screws D D′, serving to indicate the different positions they may be made to occupy when raised or lowered.

A is an adjusting-screw, working through a transverse bar, L, and has the frame E suspended from its lower extremity, by which means this frame, together with the slide therein, may be raised and lowered.

a is a jam-nut thereon, to secure it permanently when adjusted as desired.

H is one of two posts on which the transverse bar L rests, the other being diametrically opposite, and on the other side of the frame E.

e is a second and lower transverse bar, on which the posts H are supported.

The lower part of the frame E diverges and passes on either side of this bar, and when lowered to its fullest extent, rests thereon in a position somewhat like a saddle.

The bar *e* is supported upon the posts B, which extend from the base.

A full outline of one of these posts is shown in the vertical view, fig. 2, and a top view of the position occupied by both, shown in the plan, fig. 1.

The posts B support the lower transverse bar *e;* the bar *e* supports the posts H; the posts H support the upper transverse bar L. This completes the frame-work.

The adjusting-screw A passes through the bar L, and holds the frame E, with slide *i* therein, suspended on its lowermost point, whereby they can be raised or lowered, and also held securely in any desired position, by the aid of the jam-nut *a*.

O, fig. 2, is a dotted outline of a vertical lever, which is behind the posts B.

It is held suspended in adjustable pivot-screws between the posts B, and has an armature, *n*, in a right-angle position thereon, facing the poles of the magnets M M′.

A full outline of the armature *n*, as also a top view of the lever O, showing the position it occupies in the slide *i*, may be seen by reference to fig. 1.

F, fig. 1, is a pivot-screw, which assists to support the arbor of the lever O. It passes through the post B, and has a jam-nut, *f*, thereon.

I are back supporting-stands for the magnets M M′.

A pin, W, passes from each of these magnets through a loose aperture in the stands I, and has jam-nuts *w* thereon, on either side of the stands, by which means the magnets can be moved to or from the armature *n*.

In my electro-magnetic motor, patented June 29, 1869, it is therein shown that the flow of the current is directed or controlled through the respective magnets thereof, by the alternate vibration of the levers striking upon the points of adjusting-screws held in posts or other suitable supports, a lever and screw-point, when in contact, forming such a metallic connection as is necessary to insure the proper result, reference for further explanation being had thereto.

This improvement consists in dispensing with the use of a lever, as the representative of a connection, and substituting a metal slide instead, which shall represent the same connection, and perform the same office in this respect as the lever, the lever only being employed to drive it to a contact with a screw-point each time, when its own gravity will cause it to so remain until driven in the opposite direction.

Therefore my claim herein will consist in an improved manner of constructing the mechanical parts

of my electro-magnetic motor above referred to, by placing in each set which controls the connection therein, a metal slide, properly supported in a fixed or movable frame, so that it will present a flat surface to the points of the adjusting-screws on which the levers thereof strike, and can be driven to a contact with them by the stroke of the levers.

Also, of removing the connections therein shown, to extend to the levers respectively, and attaching said connections, in each instance, to the slide, only employing the levers to alternately drive the slide to a contact with an adjusting-screw.

In my electro-magnetic motor the lever represents one and an adjusting-screw another wire of a connection which their contact forms. In this improved method of constructing them the metal slide represents the same connection as therein represented by the lever, in each set, and the lever is only used as a motive-power to drive the slide to a contact with an adjusting-screw, and so complete a connection.

The object to be attained by this arrangement is to maintain the connection so formed unbroken after the lever has severed its contact, and is making a stroke in the opposite direction.

By employing the small sliding metal frame above referred to for this purpose, and having a hollow center sufficiently open therein to admit a partial vibration of the lever, when it is driven by the lever to a contact with an adjusting-screw, it will form the requisite connection by its contact therewith, and so remain by its own gravity, and preserve the connection unbroken, after the lever has commenced its stroke in the opposite direction, until this lever has traveled through the open portion of the frame of the slide, and struck the opposite side thereof, when it will be driven against, and form a connection by its contact with, the point opposite, simultaneously breaking loose from the point to which it had last previously been driven.

There are valuable advantages to be gained by this continuance of the connections in question beyond the time of a contact of either lever with a screw-point, which I will endeavor to explain.

By a reference to my patent above referred to, and careful examination of what I therein designate as the "closed-circuit system," it will be discovered that I inclose the magnets of one or both sets of the motor in the circuit of a local battery, which I close permanently. Each lever of the sets respectively is then held in a state of equilibrium, having an equal influence exerted on either side of its axis.

The counter-resistance which one magnet offers to the other of the same set is annulled by cutting the current off from a passage through its coils, which is done by the lever of the opposite set forming contact with an adjusting screw-point, leaving the other magnet of the first-mentioned set as the only one having power to attract the lever, with armature thereon, to its poles.

Two sets are therein shown as necessary to complete the instrument, the lever of each, by alternately striking upon adjusting-screw-points, likewise alternately cutting off the flow of the current through a magnet of the opposite set. The advantage to be gained by the substitution of metal slides, to represent and form the same connection each time, as would otherwise be done by the levers, can be here explained.

There is an instant of time, during each vibration of a lever, when it has broken its contact with that point against which it had last been resting, and has not yet reached the point opposite to which it is being attracted. The lever is therefore, at such a time, moving through a space between the two, and touching neither.

The avenues by which the current is admitted and excluded from the magnets of the opposite set are, at this time, both open, and the current freely traverses the coils of both magnets thereof. If there was a marked inequality in the strength of the two magnets of the opposite set at this instant, and the weaker one was holding the lever to a contact with a point, the moment the barrier to the entrance of the current into the coils of the stronger magnet was thus removed, when the vibrating lever is in the position between points, as above indicated, its strength would overcome that of the weaker magnet, and attract the lever thereto quicker than would be the case if it did not regain its strength until its regular alternate succession. In the "open-circuit system," as referred to in my patent, a *vice versa* effect ensues; that is, when the vibrating lever of a set is passing through the space between, and not in contact with either point, the poles of both magnets of the opposite set lose their magnetism entirely, as there is no current at all, at this instant, traversing the coils of those magnets.

The object of this metal slide is to provide a means whereby the same connection as made by the lever may be now made by the slide, and this lever, passing through an opening therein, during part of its vibration, drives the slide, each time it strikes a side thereof, to a contact with that point toward which it is moving, where the slide would so remain and preserve the connection there formed, after the lever which had driven it thereto had commenced its stroke in the opposite direction.

The breadth of the open space in the frame of a slide, through which the lever moves while the slide is at rest, being nearly the breadth of its stroke, and the slide being driven each time just far enough to break its contact with one point and make it with the other opposite, it can be readily seen that a lever, when traveling through a space in the frame of the slide, does not open both avenues for the current to gain ingress to or egress from the coils of the magnets of the opposite set (according to the system in use) until it has nearly completed its stroke, when it will strike and drive the slide to that point toward which it is moving, and this slide having meanwhile remained at rest, and preserved the connection to which it was last driven, no sooner breaks loose therefrom than it strikes and forms the connection opposite, causing the breaking of the connection on one side and formation on the other to be almost simultaneous.

The employment of such a slide for each set may then be claimed to prevent breaking that metallic contact and connection formed each time the lever of a set completes its stroke, and which will include a magnet of the opposite set in or exclude it from the circuit of a battery, according to the system employed, until the regular time for the alternate action of such magnet has arrived, without the aid of which such a result might ensue at an earlier period, and endanger the regularity of the vibration of the instrument, as hereinbefore explained.

By suspending the slide of that set which is used as the governor so that it can be raised and lowered, and having the upper extremity of the lever, where it passes into the open portion of the slide, to terminate in a short, sharp angle, the breadth of vibration of the lever may be gauged by raising or lowering the slide, the stroke being greatest when the slide is elevated, and least when lowered, just in proportion to the space filled in the slide by the breadth of the lever.

There are other advantages to be gained by the use of a metal slide, arranged and propelled as above described, which lead me to claim its application in general for the purpose of making and breaking connections. I can, by its use, obtain a vibratory motion from the lever of a single set of my motor, dispensing with the other set entirely.

In my patented motor, hereinbefore alluded to, one magnet of a set is always required to retain its

strength, and by its influence thus hold a lever to a contact with an adjusting-screw, so that the connection there maintained will direct or control the flow of the current through a magnet of the opposite set, and cause the lever thereof to vibrate in response thereto.

As it is shown therein that magnetic attraction is required to hold the lever to a contact with a screw-point, and thus preserve the connection necessary to actuate the movement of the lever of the opposite set, it follows that if the metal slide can be driven to a point where it will form the requisite connection necessary to preserve the influence in a magnet until it attracts a lever thereto, its own gravity will insure its remaining there without the aid of any magnetism whatever, as is necessary in the first-mentioned case. This, I claim, can be done by the use of a slide, having suitable connections therewith, and the use of a magnet, to preserve the connection, obviated. The slide, in such an instance, must, when in contact with an adjusting screw-point on one side, be isolated from the point opposite by the least possible space, so that when the lever strikes and drives the slide against a screw-point on one side, it will simultaneously break it loose from its contact with the point opposite, to which it had last been driven. The lever will in every instance, when it has completed its stroke, drive the slide to that point toward which it is moving. The contact which will then be formed will cut off the current of the battery from the coils of the magnet which had just attracted the lever thereto, and the slide breaking its contact simultaneously with the point opposite will admit the current throught the coils of the magnet on that side, causing the lever to be attracted, and return in that direction, when a repetition of the above effect will be again produced, and so continue unintermittingly.

These connections may be thus traced:

Each magnet has two terminal wires. A terminal wire of the magnet M is united with a terminal wire of the magnet M′, and a wire leads from their junction to and connects with the post B. This places each magnet in metallic communication with the slide *e*, through the metal posts B, and the superstructure held thereon, in which the slide is supported. The remaining terminal wire of magnet M first connects with adjusting-screw D, through the metal frame which holds it, and proceeds thence to binding-screw-stand N, where it unites with a wire therein, leading from one pole of the battery. The remaining terminal wire of magnet M′ first connects with adjusting-screw D′, through the metal frame which holds it, and proceeds thence to binding-screw N′, where it unites with a wire therein, leading from the other pole of the battery. This completes the requisite connections, so that both magnets M M′ are included in the circuit of the battery. The movement of the lever alternately cuts off the current from a passage through the coils of the magnets M M′, respectively, each time it drives the slide to a contact with the adjusting-screws D D′, leaving only one magnet of the set with any magnetism therein, which will always attract the lever to its poles. Each time the lever is so attracted it will drive the slide to a contact with a screw-point, just as it completes its stroke. The result of this action will be to cut off the current from that magnet which had just attracted the lever thereto, and simultaneously admit it to the coils of the magnet opposite, the lever returning at once, in consequence thereof, to the poles of the last-mentioned magnet, the same effect being repeated at each stroke, and the vibration of the lever thus continued automatically without ceasing.

My invention having been described, and the purposes for which it is intended set forth,

What I claim, and wish to be secured in by Letters Patent, is—

1. The arrangement of a metal slide, *i*, properly supported in a fixed or movable frame, E, between adjusting screw-points D D′, on which to successively strike, when driven in either direction by a lever, O, that is caused to vibrate by the alternate action of two magnets, which successively control an armature fixed thereon, either screw-point, when in contact with the slide, representing such a connection as it may be desirable for it to form.

2. The introduction of such connections as will insure an automatic and unintermitting motion of the lever O, by joining together a terminal wire from each of the magnets M M′, and extending a wire-connection from their junction to, and connecting it with, one of the posts B, thereby establishing metallic communication between these magnets and the slide *i;* extending the remaining terminal wire of magnet M, *via* and connecting it with adjusting-screw D, to binding-screw N, where it unites with one pole of a battery; extending the remaining terminal wire of magnet M′, *via* and connecting it with adjusting-screw D′, to binding-screw N′, where it unites with the other pole of a battery, thus completing the metallic circuit of the battery, and including the coils of both magnets therein, the alternations of the current through the coils of the magnets, and their successive effect in attracting the lever thereto, being accomplished as hereinbefore described, and for the purposes set forth.

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Witnesses:

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