T. W. LIVINGSTON.

MAGNECTO ELECTRIC-MACHINES.

No. 175,361. Patented March 28, 1876.

Fig: 1.

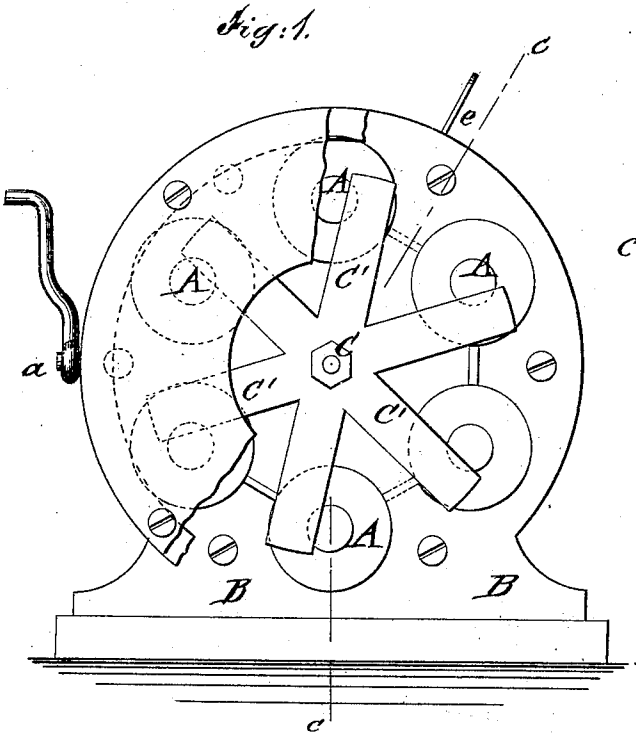


Fig: 2.

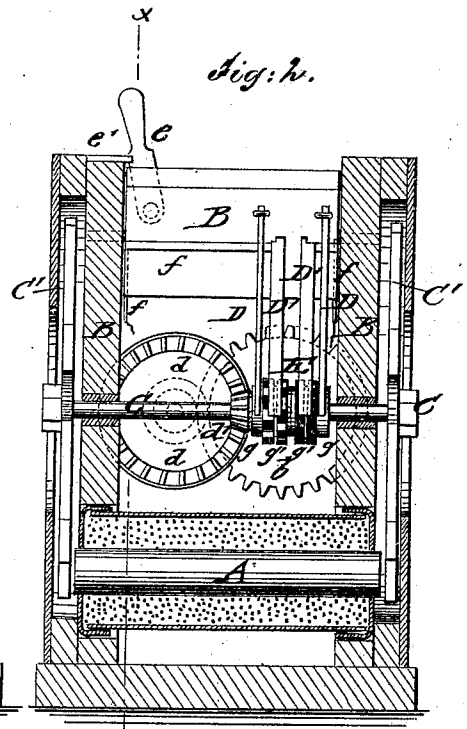


Fig: 3.

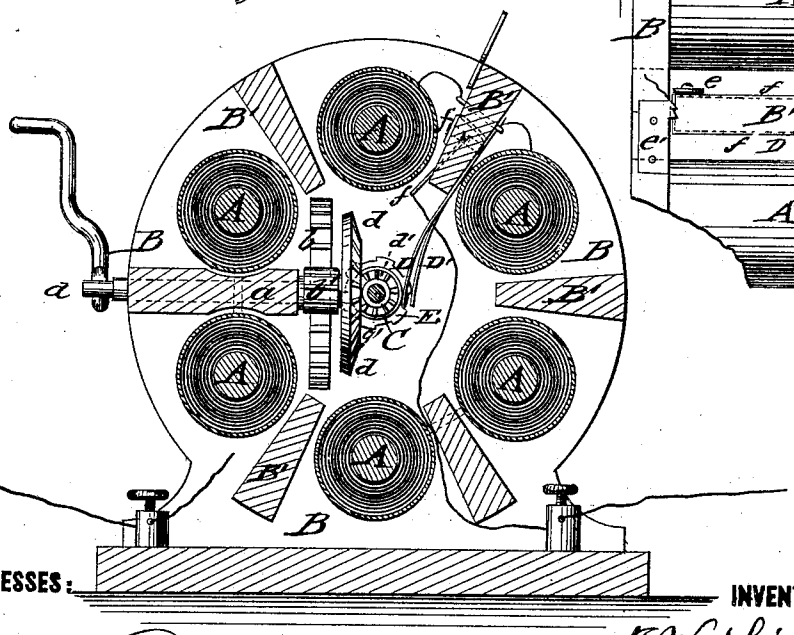
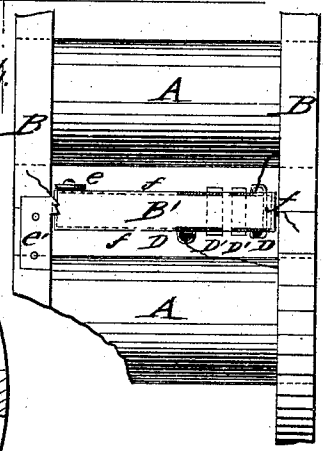


Fig: 4.



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THOMAS W. LIVINGSTON, OF AINSWORTH, IOWA.

IMPROVEMENT IN MAGNETO-ELECTRIC MACHINES.

Specification forming part of Letters Patent No. **175,361**, dated March 28, 1876; application filed October 29, 1875.

To all whom it may concern:

Be it known that I, THOMAS W. LIVINGSTON, of Ainsworth, in the county of Washington and State of Iowa, have invented a new and Improved Magneto-Electric Machine, of which the following is a specification:

In the accompanying drawing, Figure 1 represents a side elevation of my improved magneto-electric machine; Fig. 2, a vertical transverse section on line *c c*, Fig. 1; Fig. 3, a vertical longitudinal section on line *x x;* Fig. 2, and Fig. 4 a detail top view of the same, showing device for changing the current.

Similar letters of reference indicate corresponding parts.

My invention relates to an improved magneto-electric machine of very compact size, that is designed to take the place of galvanic batteries for electro-medical purposes, being so arranged that the same is not liable to get out of order, and capable of being applied for different purposes in which electric currents are required.

The machine allows of the nicest adjustment, producing weaker and stronger currents, according as the person can bear the shocks.

The invention consists of straight magnets with alternating polarities, and wire coils wound in one direction, combined with a revolving-shaft having at both ends as many radial arms as there are magnets, the shaft being provided with a commutator in connection with conducting-springs, attached to a pivoted lateral block set by a lever into a notched plate for producing currents of uniform or reversed polarities.

In the drawing, A A are cylindrical magnets, of which any suitable even number may be employed, six being shown in the drawing, which are supported on disk-shaped standards B, braced by lateral pieces B′. The magnets A are placed with alternating poles into the supporting standards or frame B, and are provided with coils wound in one direction throughout all the coils. A central shaft, *c*, with as many radial iron arms *c′* at both ends as there are magnets, is revolved by gear connection with crank-shafts *a*, that pass radially through one of the lateral pieces of frame B, one having a larger cog-wheel, *b*, that gears with a smaller wheel, *b′*, of the second shaft, which gears again by a bevel-wheel, *d*, with a pinion, *d′*, of the main shaft C. By revolving the crank-shaft, gearing directly with the pinion of the main shaft, the speed of the same is slower than when the crank shaft with the larger cog-wheel is revolved which imparts a greater speed to the central shaft and radial arms. The coils are connected at the ends by metal caps and strips, or in other suitable manner, and the wire ends of the whole series attached to springs D, which are applied to one of the lateral top pieces B′ of frame B, and extended to the interior of the machine to form contact with a commutator, E, arranged on an insulating-sleeve of the central shaft.

The top piece B′ is pivoted to the side standards for the purpose of swinging in the frame being set by a pivoted lever-handle, *e*, that locks into a notched plate, *e′*.

The top piece B′ is further provided between the coil-connecting springs D with two conducting-springs, D′, which are made of greater width than the outer springs D, and placed in metallic contact with insulated conducting-strips *f*, that communicate by connecting-wires with the electrodes or other places to which the current is to be applied. The outer springs D form contact with outer steel rings *g*, of the commutator E, while each of the broader middle springs D′ forms alternately contact with two toothed wheels, *g′*, which are provided with as many teeth as there are magnets. The toothed wheels *g′* are placed in such a manner on the shaft that the tooth of one is intermediately between two teeth of the adjoining wheel, so that each conductor-spring D′ forms twice as many contacts therewith as there are magnets. One of the outer rings, *g*, is furthermore placed in metallic connection with one wheel, *g′*, of each set, the opposite outer ring being connected to the two remaining wheels of each set.

When the radial arms are revolved by turning either one of the crank-shafts, currents of opposite directions are induced in the coils of the magnets—one when the arms approach the magnets and one when they recede from the same—producing thus, with

six magnets, twelve currents of alternating polarities at each revolution of the shaft. The currents of opposite direction may be reversed by the commutator, so that a constant current in one direction is obtained, which may be applied for telegraphing and other purposes; or alternating currents, with shocks of varying strength, may be produced by setting the commutator to interrupt the current at the points of greatest intensity.

When the lever is set into the farthest notch of the plate e', the top block B′ is thrown with the springs against the commutator E, the broader springs D′ connecting with the teeth of the outer wheels g', so that the current induced by the approach of the arms to the magnet ends passes from the coils over one of the outer springs, D, to its ring, then by the adjoining wheel to the spring D′, and then over the conducting-strip to the electrodes and back over the other spring, D′, to its wheel, and over the adjoining ring, and the opposite outer spring D, to the other coil end. The current induced by the receding of the arms from the magnets, being in opposite direction to the former, passes in reversed direction over the springs, but, as the position of the same has been changed simultaneously by the forward motion of the shaft for one-twelfth part of its revolution, contact with the inner wheels g' is formed, and the current thereby reversed when the arms are exactly opposite the magnets, and when they are half-way between the same, currents of equal direction being thus sent over the conducting strips and wires. By setting the lever of the pivot-block into the first notch, the position of the springs on the wheels will be changed in such a manner that the reversion of the induction-currents takes place at the time when the arms pass from their position in front of the magnets, and again when they are just approaching the front. This produces the interruption and reversion of the current at the point of its greatest intensity, and thereby the severest shocks admitting the application of the engine by varying the speed of the arms, with greater or lesser force to medical purposes. By throwing the top block still further back so that the springs are detached from the commutator a direct connection is made between the springs D, and the conductor-strips f, cutting out the springs D′, and producing thereby the direct unmodified currents of the machine.

I am aware that magneto-electric machines in which the coils are placed on the arms, revolving in front of stationary magnets, are well known, while in my machine the coils are placed on the stationary magnets, and the arms merely revolved in front of the same, which utilizes the power of induction of the magnets to a greater extent, as no loss is occasioned by the revolving armatures, as in the present machines.

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

1. The combination of the revolving armature carrying main shaft, having bevel-pinion, with two crank-shafts placed at right angles thereto, and connected by gear-wheels, to produce greater or lesser speed of the main shaft, substantially as specified.

2. The revolving main shaft having insulated commutator, in combination with coil-connecting and current-conducting springs attached to a lateral pivot-block of the frame, to adjust springs for producing currents of uniform or opposite direction, or interrupt entirely contact with commutator, as and for the purposes described.

THOMAS W. LIVINGSTON.

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