2 Sheets—Sheet 1.

G. W. BEARDSLEE.

Magneto Electric Machine.

No. 26,557. Patented Dec. 27, 1859.

Fig. 1.

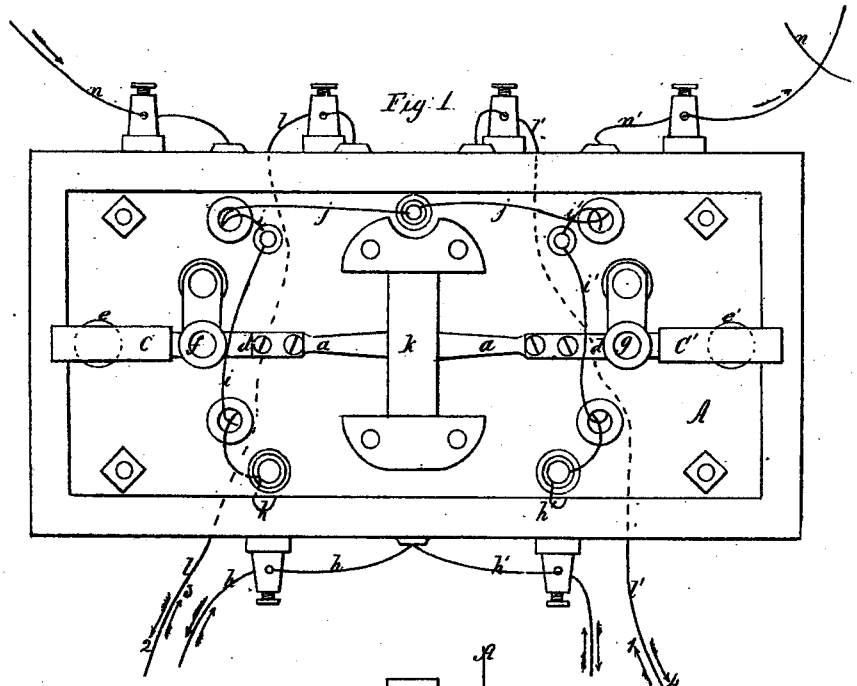
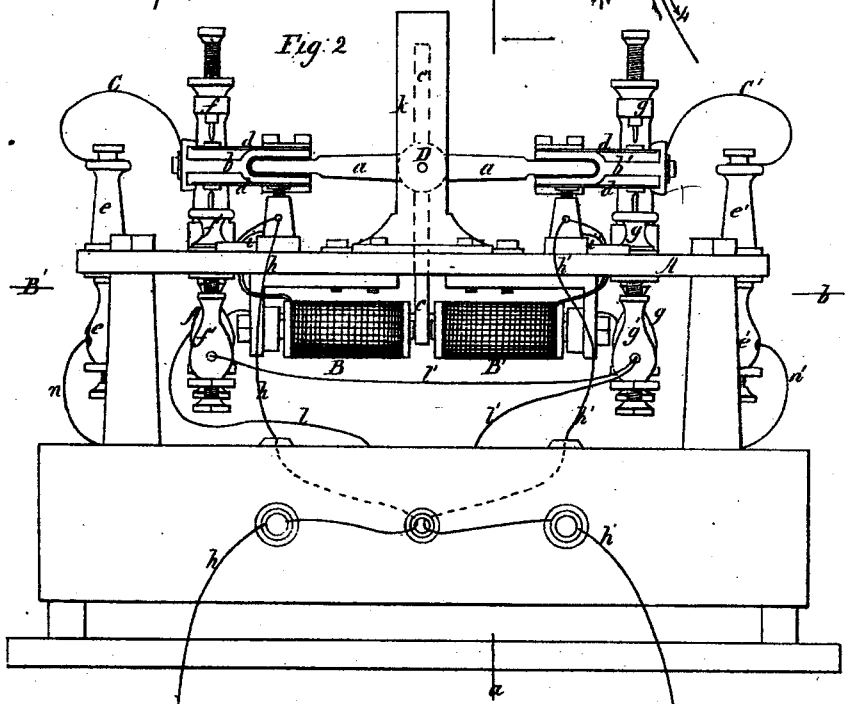


Fig. 2.



Witnesses;
Wm. H. Bishop
Peter De Lacy

Inventor;
Geo. W. Beardslee

2 Sheets—Sheet 2.

G. W. BEARDSLEE.

Magneto-Electric Machine.

No 26,557. Patented Dec. 27, 1859.

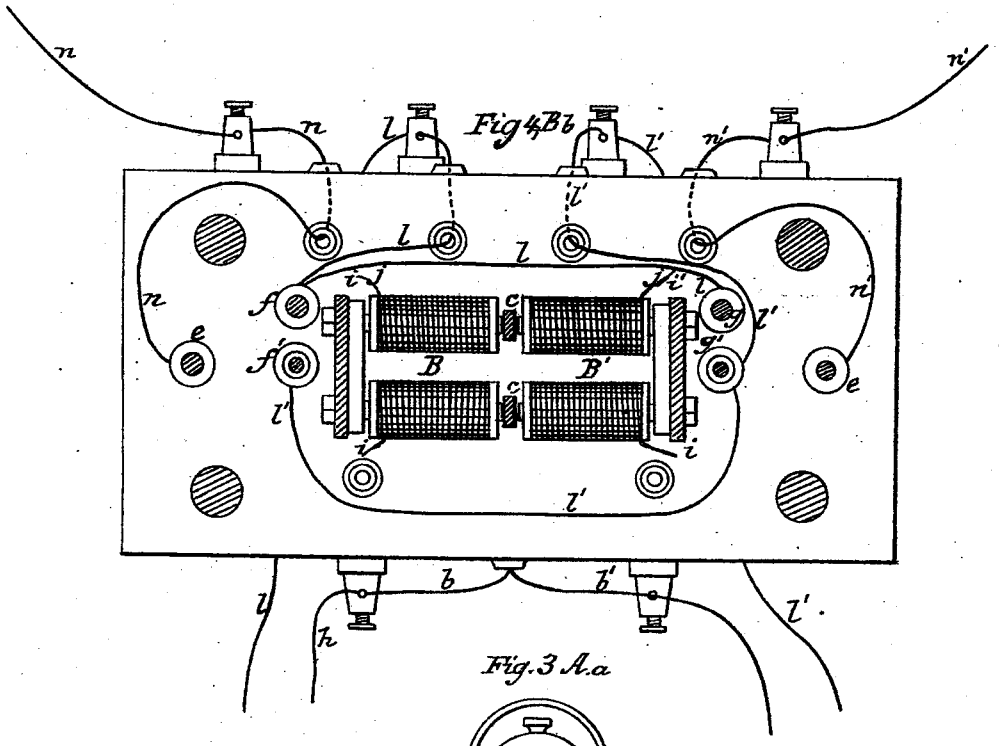
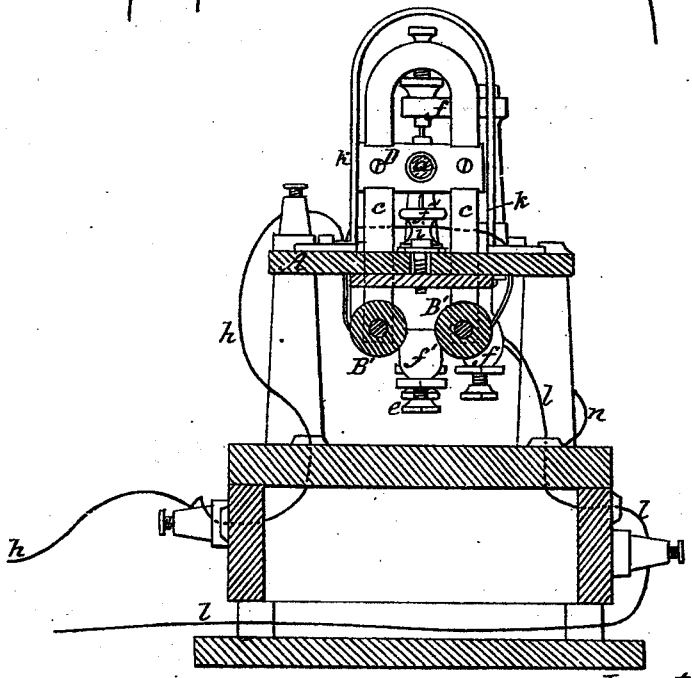


Fig. 3 A.a



Witnesses.
Wm H Bishop
Peter De Lacy

Inventor.
Geo W Beardslee.

UNITED STATES PATENT OFFICE.

GEORGE W. BEARDSLEE, OF FLUSHING, NEW YORK.

IMPROVED MAGNETO-ELECTRIC MACHINE.

Specification forming part of Letters Patent No. **26,557**, dated December 27, 1859.

To all whom it may concern:

Be it known that I, GEORGE W. BEARDSLEE, of the town of Flushing, College Point, in the county of Queens and State of New York, have invented certain new and useful Improvements in Magneto-Electric Machines, which I denominate a "Pole-Changer;" and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan; Fig. 2, a side elevation; Fig. 3, a cross vertical section taken on the line A *a* of Fig. 2, and Fig. 4 a horizontal section taken at the line B *b* of Fig. 2.

The same letters indicate like parts in all the figures.

My said invention relates to a mechanism for changing the direction of the currents which are delivered from and returned to a magneto-electric machine, and which are induced alternately in opposite directions, and thereby to cause them to pass to and through a conductor in one and the same direction, as if induced by a galvanic battery; and my invention consists in the employment of two oppositely-vibrating conductors insulated from each other, simultaneously operated by the alternately-reversed currents from a magneto-electric machine, which conductors vibrate between two sets of conductors, each set of which is connected with one of the terminal wires of a magneto-electric machine, so that each vibration shall break the connection between one of the vibrating conductors and one of the terminal wires and establish the connection with the other terminal wire of the machine, and vice versa with the other vibrating conductor, and connecting the said vibrating conductors with other terminal wires to be used for transmitting the current to be used, whether in a solution for electroplating or for any other purpose for which and in the same manner in which a current excited by a battery is generally used, and then returning such current to the magneto-electric machine, by means of which mode of operation the currents, coming from the machine alternately in opposite directions, are delivered to one of the vibrating conductors alternately from one and then from the other terminal wire of the magneto-electric machine, and all of them delivered from such vibrating conductor to the terminal wire of the pole-changer connected therewith, and hence in the same direction, and returned by the other terminal wire to the other vibrating conductor, to be returned to the magneto-electric machine alternately along one and then along the other of its terminals.

In the accompanying drawings, A is the bed, and B B′ two pairs of helices connected with one or more helices of a magneto-electric machine. The outside wire, *h*, of one of the two coils B B is to be connected in any well-known manner with one of the terminal wires of one or more helices of a magneto-electric machine, and the inside wire, *i*, of the helices B is connected with the inside wire of the other B, and then the last-named helix B is connected with one of the helices B′ by the outside wire, *j*, and the inside wire, *i′*, of the two helices B′ B′. To complete the circuit, the outside wire of the latter helix B′ is connected with the other terminal wire, *h′*, of any one or more helices of the machine. By reason of these connections the armatures or cores of these helices are rendered magnetic with the poles alternately changed, as in the magneto-electric machine. The armatures or cores of these helices are separated, as represented, and in the space between them hang the poles of a permanent magnet, *c c*. This magnet is suspended, pendulum-like, to an arbor, D, the journals or pivots of which work in suitable boxes in standards *k k*. As the poles are alternately changed in the armatures or cores of the helices, this magnet *c* will be alternately attracted and repelled, and by that means will be vibrated as rapidly as the poles are changed.

The arbor D carries a lever, *a a*, to the ends of which are attached two metallic conductors, *b b′*, carefully insulated, so that the currents shall not pass from these conductors along the lever.

Each conductor is provided at top and bottom with a metallic spring, *d*, which is prevented, by a bridle or check, from springing out beyond a certain extent, but which can yield toward the conductors *b b′* to the extent of the vibration, and above and below the springs *d d* are placed the points or screws tapped in standards *f f′* and *g g′*; and the screws are so adjusted that when the spring on top of one conductor *b* is in contact with its corresponding screw the other is not, so that the vibration of the magnet *c* alternately

effects and breaks this contact, and so with the spring *d d* under the conductors with reference to the screws in the standards *f f'*.

The sole purpose of the springs is to ease off the shocks of the alternate contacts and to cause the contacts to continue longer. I prefer to make the springs of silver and to tip the screws with platina.

The metallic standards *f f'* and *g g'* pass through the bed of the machine, and below the bed they are formed each with an eye and set-screw for the convenience of inserting and removing the conducting-wires; and, again, the conductors *b b'* carry springs C C', the opposite ends of which are connected with metallic standards *e e'*, which, like the other standards, *f f'* and *g g'*, pass through the bed and are formed for the reception of conducting-wires. Instead, the conductors *b b'* may carry bent wires dipping in mercury-cups in the upper ends of the standards *e e*, as the object is to maintain the contact during the vibrations of the conductors.

It may be well to observe that all the standards should be insulated from each other and from all other parts of the machine.

The terminal wire *l* (or wires from any desired number of helices) of the magneto-electric machine is connected with both of the standards *f g*, and the other terminal wire, *l'*, from the other helices is in like manner connected with the standards *g' f'*.

To the standards *e e'*, which may be termed the "terminal conductors of the pole-changer," are attached conducting-wires *n n'*, to carry the current of electricity wherever wanted, such as a vessel containing a solution for electroplating or for any purpose to which a battery-current can be applied. When these two wires *n n'* are connected by any medium which is a conductor, the electric currents induced by the machine, and which are there induced in opposite directions, will be so changed by the pole-changer as to pass through the terminal conductors *e e'* and wires *n n'* always in the same direction.

The result above indicated is produced by the mode of operation of the pole-changer, which is as follows, viz: When a current passes from the magneto-electric machine along the conducting-wire *h*, magnetism will be induced in the armatures or cores of the helices B B, and by reason of the connection of the wires the inner extremity of one will be a north and the other a south pole, while in the opposite helices they will be the reverse, and in consequence the magnet *c* will be carried by the joint forces of attraction and repulsion toward the pair of helices B B. At the same time a like current passes along the terminal wire *l'*, which is connected with the standards *f' g'*. The movement of the magnet *c* just described by the mechanical connections brought down the conductor *b'* onto the point of the screw of the standard *g'* and separated the other conductor, *b*, from the standard *f'* and put it in connection with the screw of the standard *f*. Now, it will be observed that the current induced in the terminal wire *l'* and traveling from the machine, as indicated by the arrow 1, passes up the standard *g'* into the conductor *b'*, and, not being able to pass along the lever *a* by reason of the insulation, it passes through the conductor *b'*, along the spring C', down the standard *e'* to the terminal wire *n'* of the pole-changer, thence through the medium on which it is to act (such as a vat containing a solution) to the opposite terminal wire, *n*, up the standard *e* and spring C to the other conductor, *b*, on the other end of the lever *a*, which is in contact with the screw of the standard *f*, and along this to the other terminal wire, *l*, and along that wire in the direction of the arrow 2 back to the machine. The moment the magnets of the magneto-electric machine pass the neutral point between the helices—that is to say, when the magnets are midway between the helices—the current is reversed and passes from the machine along the terminal wire *l* in the direction of the arrow 3, and at the same instant of time passes along the terminal wire *h*, reversing the polarity of the armatures or cores of the helices B B and B' B' and moving the magnet *c* to the opposite side, which separates the conductor *b* on the lever *a* from contact with the screw of the standard *f* and puts the other conductor, *b'*, at the other end of the lever *a* in contact with the screw of the standard *g*, at the same time separating this conductor *b'* from the screw of the standard *g'* and putting the opposite conductor, *b*, in connection with the screw of the standard *f'*. The reversed current, passing along the terminal wire *l* in the direction of the arrow 3, passes up the standard *g*; but the connection between the screw of *g'* and the conductor *b'* having been broken by the vibration of the magnet *c*, the current can go no farther in that direction, but passes from the standard *g* through the conductor *b'*, along the spring C' to the standard *e'*, to and along the terminal wire *n'* of the pole-changer in the same direction as before, and thence through the medium in which it is to act to and along the other terminal, *n*, up to the standard *e*, through the spring C, and along this to the conductor *b*, which, being in contact with the screw of the standard *f'*, passes down this standard to and along the terminal wire *l'*, in the direction of the arrow 4, back to the machine, and although this returning current is in connection with and can pass up the standard *f*, it cannot go beyond, because for the time being the contact with the conductor *b* is broken. In this way it will be seen that, although the current from the machine alternately travels in opposite directions by means of this mechanism, the whole of it is carried through the medium in which it is desired to act, and at all times in the same direction as if induced or excited by a battery.

The use of springs for maintaining the contact with the standards *e e'*, I prefer; but it will be obvious that wires dipping in mercury

cups or other movable joints which will maintain a metallic or conducting contact may be substituted; and the standards *e e'* themselves may be substituted by other means of forming the connection between the terminal wires of the pole-changer and the vibrating conductors *b b'*, and so with the other standards, for which other equivalent means of holding metallic conductors in proper relation to the vibrating conductors *b b'* may be used; and it will be obvious that, instead of vibrating the conductors *b b'* and having the two series of conductors from the terminals of the magneto-electric machine stationary, these parts may be inverted by making the former stationary and the latter vibratory; and although I have described the vibratory conductors as being operated at the proper periods by two pairs of helices acting on to vibrate a magnet, I do not wish to limit myself to the use of this, as the same kind of result, although not so good, in my judgment, may be obtained by any of the well-known modes of vibrating an armature by an electro-magnet.

I have not described my said invention as being attached to the frame of a magneto-electric machine, as it can be used either attached to or at any distance from such machine, so long as the two are connected by conductors in the manner described.

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

The mode of operation of the pole-changer by which the current is made to travel in the same direction, substantially as described.

GEO. W. BEARDSLEE.

Witnesses:
ANDREW DE LACY,
WM. H. BISHOP.