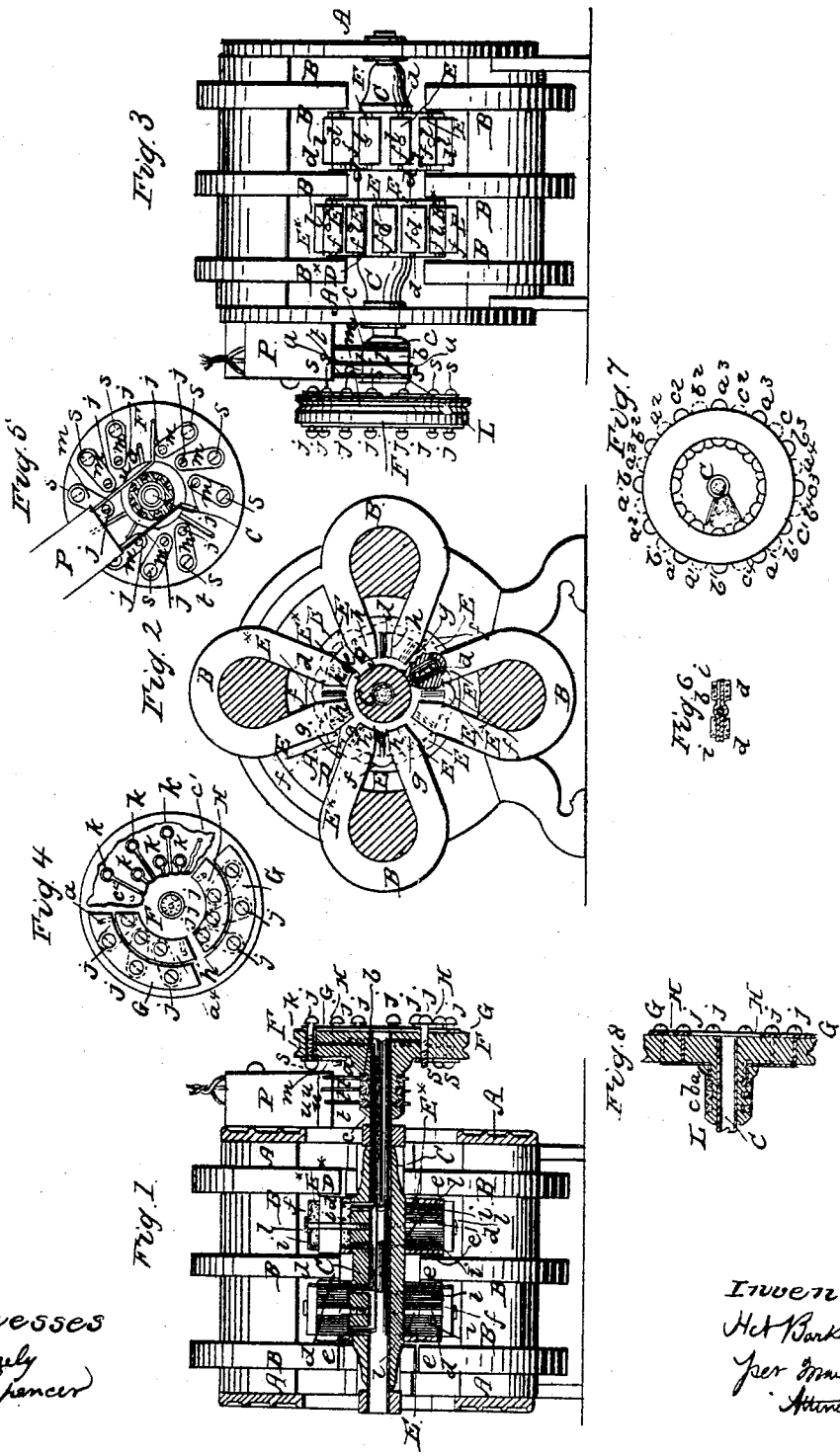
H. N. BAKER.

Magneto-Electric Machine.

No. 29,850. Patented Sept. 4, 1860.



Witnesses
J. W. Lowrey
R. F. Spencer

Inventor
H. N. Baker
per Munn & Co
Attorneys

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY N. BAKER, OF BINGHAMTON, NEW YORK.

IMPROVED ELECTRO-MAGNETIC APPARATUS.

Specification forming part of Letters Patent No. **29,850**, dated September 4, 1860.

To all whom it may concern:

Be it known that I, HENRY N. BAKER, of Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Magneto-Electric Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of a machine with my improvements in a plane parallel with its axis of rotation. Fig. 2 is a vertical section of the same in a plane at right angles to Fig. 1. Fig. 3 is an elevation of the machine, having one row of magnets and their supporting-bar omitted to expose the wheels of helices. Fig. 4 is a face view of the intensity-regulator, with part of its exterior broken away to show the internal arrangement of its parts. Fig. 5 exhibits a back view of the intensity-regulator and a section of the pole-charger. Fig. 6 is a section of one of the helices. Figs. 7 and 8 will be hereinafter described.

Similar letters of reference indicate corresponding parts where they occur in the several figures.

My improvements are, for the most part, applicable to either of the two common forms of magneto-electric machines heretofore constructed—viz., that which consists of one or more series of helices composed of covered copper wire coiled round cores of soft iron, applied to rotate between or near the poles of one or more series of stationary permanent magnets, and that which is composed of one or more series of permanent magnets applied to rotate near one or more series of stationary helices; but all my improvements are applicable to machines of the first-mentioned forms, which is the form represented in the accompanying drawings.

My first improvement consists in the employment of a number of helices in each wheel or circular series proportioned to the number of magnetic poles in each circular series of magnets as three to two, for the purpose of making the attractive force of the magnets always counterbalance the retarding or holding-back force.

My second improvement consists in the arrangement of the helices of two or more wheels or circular series in a spiral relation to each other—that is to say, so that in a machine having two wheels or circular series of helices each helix of either wheel or circular series is in a line midway between the lines of two helices of the other wheel, and that in a machine having more than two wheels or series of helices the helices of the several wheels or series are arranged in regular succession at a distance in advance of each other equal to the distance between those of each wheel or series divided by the number of wheels or series in the machine, the object of such arrangement being to bring the helices of the several series alternately or successively within the influence of the magnets, and so make the influence of the magnets more nearly continuous or less interrupted.

My third improvement consists in the construction of the helices with thin, flat cores arranged radially to the center of the wheel or circular series.

My fourth improvement consists in an intensity-regulator of novel character, by which the quality of the current can be readily varied from high to low intensity, to adapt it to the particular duty required.

My fifth improvement consists in the arrangement of the terminal wires of the helices to pass through the hollow rotary main shaft of the machine on their way to the intensity-regulator and pole-changer.

To enable others skilled in the art to apply my improvements I will proceed to describe them with reference to the drawings.

A A are two standards of iron or other material, which constitute the framing of the machine, having secured between them the stationary permanent magnets B B, of which there are twelve arranged in three circles, four in each circle, at equal distances from each other, those of either circle being directly opposite those of the two other circles.

C is the main shaft, working in bearings in the standards A A, in the center of the circular series of magnets, and having secured to it two wheels, D D*, in each of which there are twelve helices, E E or E* E*, arranged at equal distances apart, making the proportion of helices in each wheel (twelve) to the number of poles (eight) in each circular series of magnets as three to two. The spiral arrangements of these

helices in the two wheels with reference to each other is illustrated in Figs. 2 and 3, in both of which figures it is shown that the helices E E of the one wheel are opposite to the middle of the spaces between the helices E* E* of the other wheel, and vice versa. The core *d* of each of these helices is composed, as shown in Figs. 2, 3, and 6, but most clearly in the last-mentioned figure, of two pieces of thin, flat, soft iron, either hoop-iron or thin, flat bar-iron, swaged in the center to form a cavity for the reception of a screw-bolt, *l*, by which the helix is attached to the wheel. The core thus formed has the covered coppered wire *i* wound round it in such a manner as to leave the central cavity clear for the insertion of the screw-bolt *l*, and to leave a portion of the core at each end naked, to be inserted in radial grooves formed in two circular face-plates, *e e*, which are secured to the sides of each wheel, and which hold the helices with the centers of their cores radial to the center of the shaft C and of the circular series of magnets. The screw-bolts *l l* secure the helices in their places in the wheels by means of a metal cap, *f*, applied to the outside of each helix, the bolts passing through the said caps, as shown in Fig. 1, where one of the said caps is shown in section.

The manner in which the ends or poles of the magnets are tapered to make their edges parallel with the edges of the cores of the helices as the latter pass them in their revolution is shown at *g h* in Fig. 2.

In the construction of the magnets care should also be taken that the width of the spaces between the tapered ends or poles of each magnet and the width of the spaces between the several magnets in the same circular series should be equal to half the width of the tapered ends or poles, as shown in Fig. 2.

By proportioning the number of helices in each wheel to the number of poles of the magnets in each circular series, and constructing the helices and magnets as described, only one-third of the helices in each wheel or circular series are acted upon in the same degree at the same time, but the strongest electric impulses from one-third of the helices fill the conducting-wire at the same instant that the impulses are weakest from another third, and at rest in the remaining third of that wheel or series, and as by the spiral arrangement of the helices of the two wheels the helices of one and those of the other are brought alternately within the magnetic influences, the electric impulses therefrom alternate in a corresponding manner.

The features of my invention combine to produce a more constant current than has been heretofore produced by magneto-electric machine. The proportionate numbers of the helices and poles of the magnets, and the construction and arrangement of the helices, and of the ends or poles of the magnets in each wheel or series, causes the magnets to be armed in whatever position the rotation of the wheel may be stopped.

The intensity-regulator consists of a wheel, F, of non-conducting material, which is secured to and rotates with the shaft, and which may be made to constitute the driving-pulley. Upon the outer face of this wheel there are secured three pairs of arc-formed plates, G H, of good conducting metal. Only two pairs of these plates are represented in the face view of the wheel, (shown in Fig. 1,) as part of the said wheel is supposed to be broken away to expose the internal arrangement of wires; but the plates constituting the pair which has been omitted are arranged one within the other in the same manner as the two pairs represented. The three outer arcs, G, have connected with them one set of the terminal wires—that is to say, all those constituting the positive poles or all those constituting the negative poles of the helices, and the three inner arcs, H, have connected with them the other set of the terminal wires, the said wires all passing through the shaft C, which, as has been hereinbefore stated, I make hollow for the purpose.

To avoid an inconvenient multiplicity of connections with the plates G and H, I connect the terminal wires of each two corresponding helices in the two wheels in pairs before leading them through the hollow shaft to the regulator, as shown in Fig. 1, thus requiring in the machine represented only twenty-four connections with the plates G H, instead of forty-eight, as would be necessary were each helix connected independently. By the two corresponding helices of the two wheels I mean the two which, by reason of their arrangement and the arrangement of the magnets, have their currents elicited simultaneously in the same direction.

I divide the helices of each wheel into as many series of threes as there are magnets in each circle, making four series in each wheel in the machine represented. This division is illustrated by the diagram, Fig. 7, which represents the helices of the two wheels in different colors, and in which those of one series in each wheel are marked a' b' c', those of the second a^2 b^2 c^2, those of the third a^3 b^3 c^3, and those of the fourth a^4 b^4 c^4. The helix a' of one wheel corresponds with a' of the other wheel, and the corresponding helices are in all instances marked with the same letter on the two wheels. This diagram shows the connection between the two a' a'. The terminal wires of all the helices marked with the letter *a* lead to one pair of plates G H; the wires of all those marked with the letter *b* to another pair of plates G H, and the wires of all those marked with the letter *c* to the third pair of plates.

The terminal wire constituting the positive pole of one pair of helices and that constituting the negative pole of another pair of helices are connected directly with the two plates G H by soldering, as shown at a' a^4 and b' b^4 in Fig. 4; but the wires of the other helices are con-

nected to the said plates by metal screws *j j*, which pass through the wheel F and fit metal nuts or rings *k k*, which are soldered to the ends of the wires and inclosed within the wheels, the said screws all having heads at their outer ends.

The plates G H have holes large enough to allow the bodies of these screws *j j* to pass through them without contact.

On the inside face of the wheel there are secured metal coupling-straps *m m*, to connect the opposite screws in the positive and negative arcs, and thereby to connect the helices with which those screws are connected when desired. These coupling-straps are so situated as to be each within the reach of two screws of opposite polarity. The screws which pass through the inner plates, H H, screw through the coupling-straps, and are always in contact with them; but those which screw through the plates G G have the holes provided for them in the coupling-straps large enough for them to pass through without touching the straps; but the latter screws have metal nuts or collars *s s* at their rear ends, as shown at the top of the wheel F in Fig. 1, which may be brought into contact with the straps by screwing them out to bring their heads clear of the plates G G.

The plates G and H are connected with the pole-changer, each by a single wire, *r*, running through and down the back of the wheel F, as shown in Fig. 5, and also in the separate section of the pole-changer shown in Fig. 8.

The operation of the intensity-regulator is as follows: When it is desired to produce a current of low intensity the screws *j j* are all screwed into the wheel F to bring their heads into contact with the plates G H, and thus all terminal wires from the helices are brought into direct communication with the pole-changer, producing the same effect as connecting all the negative poles of a series of galvanic cups together and all the positive poles together. When it is desired to produce a current of high intensity the screws are all screwed out from the wheel to bring their heads clear of the plates G H and bring the collars *s s* into contact with the coupling-straps *m m*, and thus make a connection between the screws of the negative plates G G or H H with those of the positive ones and a consequent connection between the negative terminal wires of the helices with the positive terminal wires of their fellow helices, and producing the same effect as connecting the negative wire of each cup with the positive wire of the next cup of a galvanic series.

In order to produce the very lowest intensity of which the machine is capable, it is obvious that the helices should be separately connected with the plates G G and H H, and not connected in pairs, as hereinbefore described, with reference to Figs. 1 and 7.

The pole-changer L is made of three broken rings, x' x^2 x^3, or rings divided into alternating sections of conducting and non-conducting material, two sections of conducting material in each ring to each of the four series of helices hereinbefore described, making eight sections of conducting material in each ring. The two plates G and H with which all the helices marked with the letter *a* in Fig. 1 are connected, with one ring (marked *a* in Fig. 8,) which thus receives all the currents from those helices, and in like manner all the helices marked with the letter *b* are connected by another pair of plates G H, with the second ring, (marked in Fig. 8 with the corresponding letter,) and all marked with the letter *c* are connected by the third pair of plates G H with the third ring, (marked *c*.)

From each of the rings *a b c* of the pole-changer L there leads off to a fixed block, P, of wood two brake-like conductors, *t u*, one positive and the other negative, bearing upon the rings at nearly opposite points. The three positive conductors *t t t* are all connected together, and the three negative conductors are all connected together. I thus collect all the currents and electric impulses with the least possible break or interruption, for before the connection of the conducting-wire with the ring *a* of the pole-changer is broken by the intervention of the section of non-conducting material a connection is made with the *b* ring, and before that is broken a connection is made with the *c* ring, and thus a continuous current is insured.

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

1. The employment, in a magneto-electric machine, of a number of helices in each wheel or circular series proportioned to the number of magnetic poles in each circular series of magnets, as herein described, for the purpose specified.

2. The arrangement of the helices of two or more wheels in spiral relation to each other, as and for the purpose herein set forth.

3. The construction of the helices with thin, flat cores, arranged radially to the center of motion, substantially as and for the purpose herein specified.

4. The intensity-regulator consisting of the wheel F, plates G G, coupling-straps *m m*, and screws *j j*, or their equivalents, combined substantially as herein described.

5. Arranging the terminal wires of the helices to pass through the hollow rotary main shaft on their way to the intensity-regulator and pole-changer, substantially as herein described.

HENRY N. BAKER.

Witnesses:
A. T. ROYERS,
WM. W. MERSEREM.