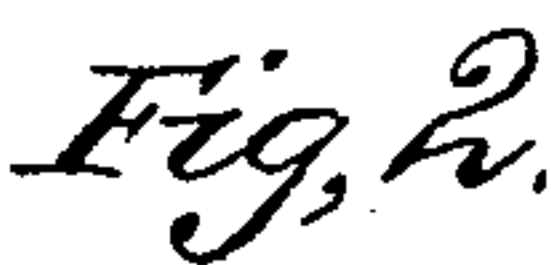
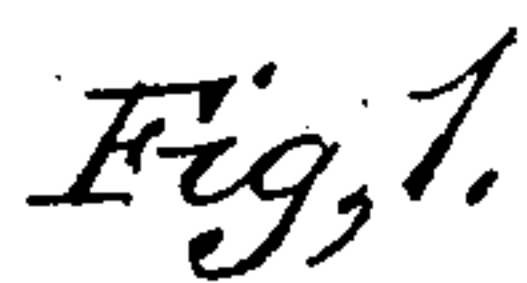


J. S. LAMAR.
Electro-Magnetic Motor.

No. 225,395.

Patented Mar. 9, 1880.



WITNESSES

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INVENTOR

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UNITED STATES PATENT OFFICE.

JAMES S. LAMAR, OF AUGUSTA, GEORGIA.

ELECTRO-MAGNETIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 225,395, dated March 9, 1880.

Application filed November 28, 1879.

To all whom it may concern:

Be it known that I, JAMES S. LAMAR, of Augusta, in the county of Richmond and State of Georgia, have invented a new and valuable
5 Improvement in Magnetic Motors; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this
10 specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a plan view of my invention, and Fig. 2 is a side view of same.

15 This invention has relation to magnetic motors; and it consists in the construction and novel combination, in connection with a wheel carrying a series of electro-magnets and a rim-support bearing two series of permanent mag-
20 nets, of a commutator on an independent shaft, and proportionately-toothed wheels connecting the commutator-shaft and wheel-shaft, of the combined brake and reverser having conducting ends arranged to throw the current by
25 its adjustment in opposite directions, of the crown-wheel on the main shaft, and starting-lever pivoted on an axis at right angles to that of the crown-wheel and engaging the teeth thereof, and of the ridged substituter arranged
30 upon rocking bearings and governed by a spring, all as hereinafter shown and described.

The wheel A, attached to the shaft B, is furnished with a series of electro-magnets, *e*, which are made fast to its periphery and ar-
35 ranged parallel with the shaft and equidistant from each other. Their helices are so connected that when an electrical current passes through them all the polarity of their several
40 cores will be alternate—that is, a positive pole will always be between two negatives and a negative between two positives.

The cores of the helices, which may be either solid or tubular, are furnished at their extremities with thin soft-iron attachments *b*, which
45 are preferably made either oblong or elliptical in facial outline, and through the center of their faces they are screwed or otherwise securely fastened to the poles of the electro-magnets. All of these are to be thus applied,
50 though only three are here exhibited.

The object of these attachments, which are placed with their longer diameter tangential

to the circle in which they move when the wheel revolves, is to extend the electro-magnetic poles both in front and rear.

On a circle of wood, C, surrounding said wheel A, permanent steel magnets *d* (in number equal to the number of electro-magnets) are so arranged in series on both sides that poles of different name always succeed each
60 other. In front of these permanent poles and between the two circular series the poles of the electro-magnets *e* revolve with the wheel A.

The commutator E, which may consist of two or four or any desired number of interlock-
65 ing insulated tongues or bars, but which in no case requires a large number, differs from the commutators in general use, first, in being placed not upon the main shaft, but upon a shaft of its own, which is geared to the main
70 shaft; secondly, in the mode by which the current is transmitted from the geared commutator to the helices on the motor-wheel. This is effected by means of two insulated metallic
75 bands, *i i'*, placed upon the main shaft and connected, respectively, with the initial and terminal wires of the series of helices, and also, by means of the rubbing-springs *h h'*, with the bands of the commutator.

Two central springs, *k k'*, which connect im-
80 mediately with the battery or other electric generator, press upon the tongues of the commutator in the usual way. The gearing is proportioned to the number of tongues on the
85 commutator, and also to the number of electro-magnets on the wheel, and the whole arrangement and adjustment are such as to secure reversal of the current when the helices
90 come in front of the poles of the permanent magnets.

By this device any definite number of reversals may be effected simply by increasing the relative speed of the commutator by means of the gears. It also insures with much greater
95 accuracy a more speedy reversal at the precise points desired.

The wheel reverser and brake F is a small block of wood fitted with metallic ends *l l'*, which project slightly below the wood and rest respectively upon two parallel electrical
100 conductors which extend beneath them and connect with the central springs of the commutator. The block F turns upon a bolt which passes through it into the solid insulat-

ing material filling the space between the electrical conductors. A coiled spring between the head of the bolt and the block keeps the metallic ends in close contact with the conductors. Said metallic ends are also constantly pressed by springs $m m'$, which are connected, respectively, with the positive and negative poles of the electrical generator. Hence by shifting the ends of the block from one of the underlying conductors to the other the current in the helices is reversed and the entire magnetic influence of the motor is converted into a brake, which first arrests and then reverses the motion of the wheel.

The starter G is a device for starting the machine by overcoming, through mechanical means, the influence of the permanent magnets upon the cores when the machine is at rest. It consists of the crown-wheel H upon the end of the shaft B , with the lever K so arranged that when its longer arm is moved in either direction its shorter arm will engage with a cog of the crown-wheel, and so move the motor-wheel. As a very small movement is all that is needed, just enough to enable the current which may be circulating through the commutator to reach the helices, the lever may be so pivoted as to give any desired amount of mechanical advantage. The crown-wheel is also fitted to carry a cord or band, and may be used as a driver.

The current-substituter N consists of an oblong block of wood hinged in the center so as to move up and down, and finished above the hinge-bolt in the form of a ridge to receive the constant pressure of the spring o . Binding-posts $p p' p'' p'''$ are inserted in the four corners of the block immediately over two parallel conducting-bars, $g g'$, with which they are in contact when depressed and out of contact when elevated. The said bars are connected with the springs of the reverser by wires passing under the base. The two binding-posts at one end of the block are to receive the wires from the positive and negative poles of a battery or other electric generator, and those at the other may receive similar wires from another. Hence by depressing the up end of the block one current may be substituted for the other without arresting the motion of the motor-wheel, while the spring o keeps the posts of the down end in close contact with the conducting-bars.

The operation of my machine is as follows:

When a current from a battery or other source is transmitted through the commutator, the machine being at rest, it does not materially affect the helices, because in this condition the central springs of the commutator press upon two of the tongues at once. By means of the starter this condition is overcome, and the circuit is completed through the helices, magnetizing the cores and giving them a polarity opposite to that of the permanent steel magnets next in front of them and the same as that of the magnets next behind them. Hence they are at the same time driven and

attracted forward. When they reach the next succeeding poles their own polarity is reversed by the commutator, when they are again driven and attracted forward, and so on perpetually.

The speed is to be regulated by a centrifugal governor of any suitable pattern, arranged to break the electrical circuit at the maximum velocity desired.

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

1. The combination, with a wheel carrying a series of electro-magnets peripherally arranged with their cores parallel with the wheel-shaft and their helices connected by wires, a circular support provided with a double series of permanent magnets uniformly spaced and arranged for alternate recurrence, an independent shafted or journaled commutator, and proportionately-toothed gearing connecting the shafts of the commutator and electro-magnet wheel, of insulated metallic bands on the main shaft, connected the one with the initial and the other with the terminal wires of the series of electro-magnets, and with the bands of the commutator by conducting-strips, and conducting-strips $k k'$, pressing upon the tongues of the commutator and connecting with the electric supply, substantially as specified.

2. The combination of a wheel carrying a series of electro-magnets connected to each other and by initial and terminal wires of the series to conductors on the main shaft, an independent rotating commutator, a double set of permanent magnets arranged on a frame for alternate recurrence, proportionately-toothed gearing connecting the shafts of the commutator and electro-magnet wheel, conducting-strips connecting the conductors on the main shaft and the bands of the commutator, and conducting-strips pressing on the tongues of the commutator and leading to the electric supply, substantially as specified.

3. The combination, with two conducting-strips, $h h'$, of the reversible piece F , having conducting ends adapted to be shifted upon said conducting-strips, and springs $m m'$, connected with the poles of the electric supply and arranged to press against the conducting ends of said reversible piece in its different positions, substantially as specified.

4. The combination, with the shaft of the motor-wheel, of a crown-wheel, H , and a lever, K , pivoted on an axis at right angles to the motor-wheel shaft and arranged to turn the same by engaging with the teeth of the crown-wheel, substantially as specified.

5. The combined brake and reverser F , arranged to throw the current by its adjustment in opposite directions, the metallic conductors $k k'$, bearing against the commutator and brake, and the conductors $h h'$, bearing against insulated bands $i i'$ on the main shaft, combined with a wheel upon the said shaft carrying a connected series of electro-magnets, wires leading from said bands to the terminal and

initial electro-magnets of the series, and a rim or support carrying a double set of fixed magnets arranged for alternate recurrence, substantially as specified.

- 5 6. The rocking substituter having a central ridge, and a governing-spring adapted to bear on said ridge and press either end of said substituter down to the conductors, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

JAMES S. LAMAR.

Witnesses:

PHIL. C. MASI,
F. J. MASI.