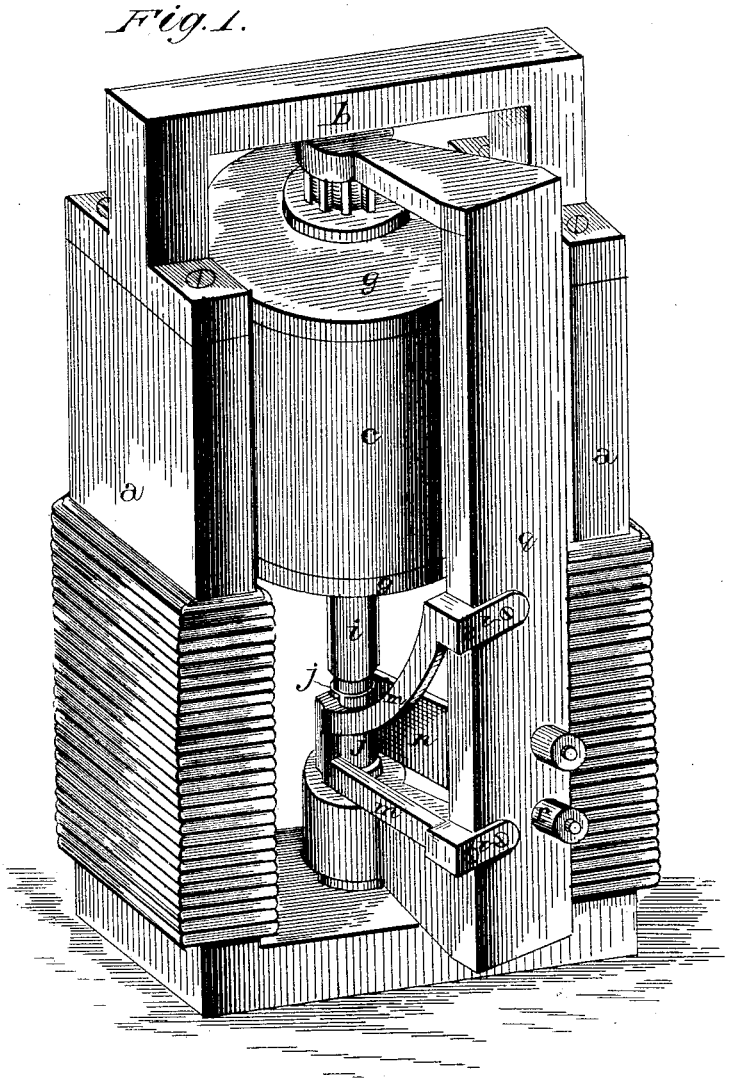
2 Sheets—Sheet 1.

L. G. WOOLLEY.

Electro-Magnetic Motor.

No. 219,422. **Patented Sept. 9, 1879.**

Fig. 1.



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W. S. D. Haines

Inventor
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per
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Atty

L. G. WOOLLEY.

Electro-Magnetic Motor.

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Fig. 2.

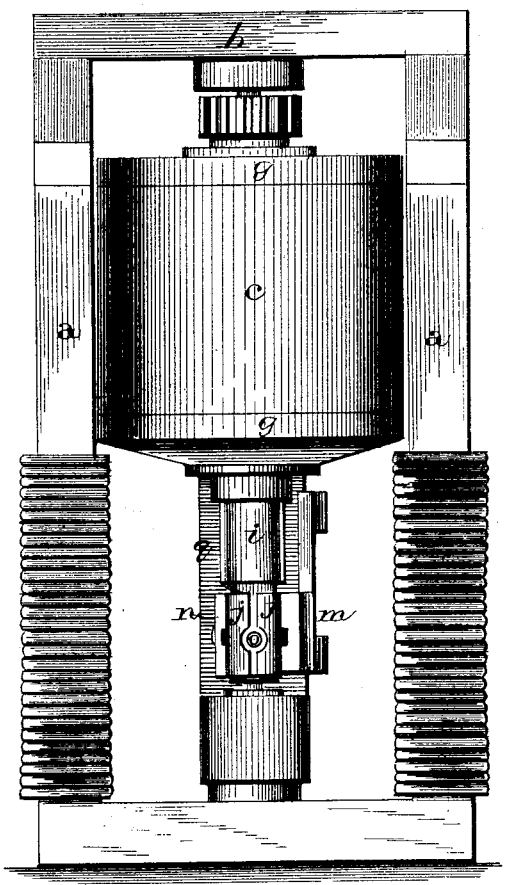


Fig. 3.

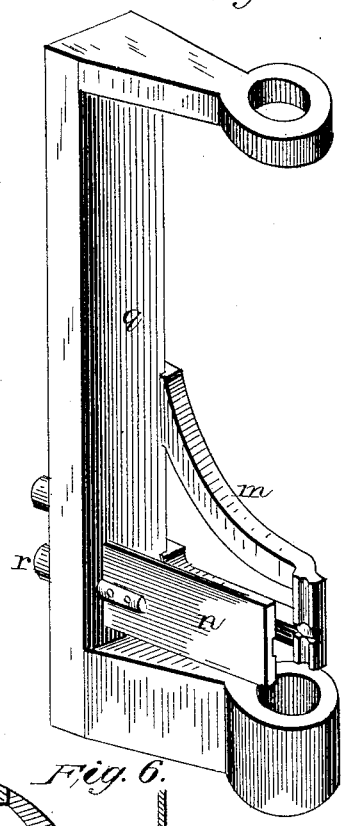


Fig. 4.

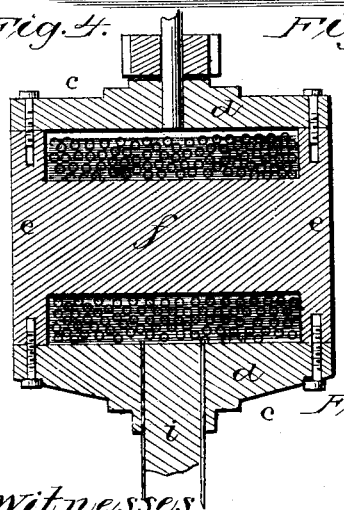


Fig. 5.

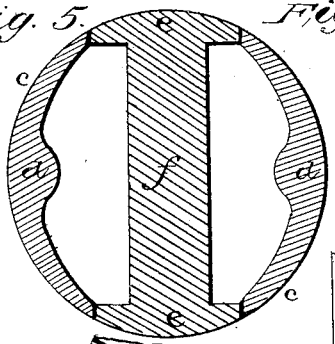


Fig. 6.

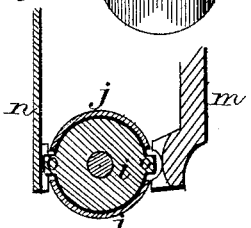


Fig. 7.

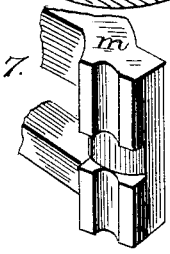
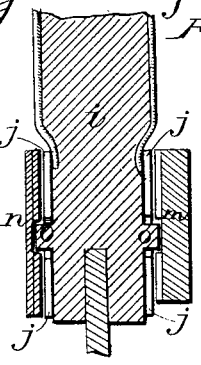


Fig. 8.



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UNITED STATES PATENT OFFICE.

LEONIDAS G. WOOLLEY, OF MENDON, MICHIGAN.

IMPROVEMENT IN ELECTRO-MAGNETIC MOTORS.

Specification forming part of Letters Patent No. **219,422**, dated September 9, 1879; application filed July 2, 1879.

To all whom it may concern:

Be it known that I, LEONIDAS G. WOOLLEY, of Mendon, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Electro-Magnetic Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in electro-magnetic engines; and it consists in the peculiar construction of the pole-changing devices, whereby the polarity in the rotating head is reversed at each half-revolution without burning, oxidizing, or destroying the shifter-pads.

It also consists in an adjustable pivoted lever having the pole-changing pads connected thereto, whereby the speed and power of the engine may be increased and decreased or the motion reversed at will.

Figure 1 is a perspective view of my engine. Fig. 2 is a side elevation of the same. Fig. 3 is a perspective of the pivoted adjustable lever. Figs. 4 and 5 are sections of the head, taken at right angles with each other. Figs. 6, 7, and 8 are enlarged views of the pole-changing devices.

a represents a U-shaped magnet, which may be either a permanent or an electro magnet. The two poles of this magnet are connected together by the non-magnetic cross-piece *b*, which acts as a bearing for the journal of the revolving head *c*. The head *c* has its sides formed of the two brass or other non-magnetic pieces *d* and the two heads *e* of the core *f*. The two pieces *d* serve not only to inclose and protect the helix, but to strengthen the head and fill up all spaces, so as to prevent any humming sound while the head is revolving. The two ends *g* of this head are screwed or otherwise removably fastened on, so that should the wire become burned, corroded, or otherwise cease to act, one or both ends can at once be taken off, so that the wire can be removed from the core and new wire put on.

In order to prevent the helix from becoming loosened or flying off, as it is very apt to do from the great centrifugal force, a head, *e*, is formed on each end of the core *f*, so as to hold the helix securely in place, and at the same time form a base, to which the two removable heads can be fastened.

Instead of running the shaft *i* through the head and core, and thus taking up valuable space, the end of the shaft is here attached directly to one of the ends of the head, so as to leave the whole length of the core free, as shown in Fig. 4. By this means a greater length of wire can be wrapped in a given space, and thus the power of the engine increased.

The end of the shaft away from the head may either be provided with a pivot, as shown in Fig. 8, or the end of the shaft may rest directly in a recess in magnet *a*, as may be preferred.

To the shaft are secured the two insulated pads *j*, and between their separated ends are secured to the shaft the two studs or projections *o*, or other equivalent devices. To each of the pads *j* are connected the one end of the wire that is wrapped around the core in the usual manner. The studs *o* serve to squarely lift the shifter *m* from contact with the pad, for the purpose of entirely relieving the engine of electricity just before the polarity of the rotating magnet or head is reversed.

There are two pole-changers, the one, *n*, being always in contact with the pads, while one, *m*, is raised squarely outward at its free end by the studs or projections at each half-revolution of the shaft. When the pole-changer *m* is raised the circuit is broken, and remains so until the stud allows the pole-changer to again descend squarely upon the next pad, when the current is reversed for the purpose of changing the polarity of the revolving magnet in the head, so that the ends of the revolving magnets will be alternately attracted and repelled by the poles of the magnet *a*. The end of the pole-changer *n* is grooved out or cut away, as seen in Fig. 6, so that the studs do not affect it in any manner as the shaft revolves.

The two pole-changers *m n* are rigidly secured to the adjustable pivoted lever *q*, which is pivoted at both of its ends, so as to brace and strengthen it and cause it to move evenly and truly, and thus always hold the two pole-changers squarely upon the pads, and to lift the one, *m*, squarely off and bring it as squarely back

in contact with the pad. By making the pole-changer *m* of considerable width at its end where it comes in contact with the pad, and then having it lift squarely off and on, there is no small point to burn when the circuit is broken.

The end of the pole-changer *m* which comes in contact with the pads contains a sufficient area of surface to allow the current to equally distribute itself, and thereby prevent combustion and destruction of the parts.

By breaking the current in the above manner the parts which make contact or break the current always clean themselves, and never become dirty, oxidized, or foul in any manner.

The form of the pole-changer *m* is shown in Figs. 1 and 3, and it is fastened to the pivoted lever by the springs *v*, which allow the inner end of the pole-changer to be easily lifted squarely from the pad by the studs on the shaft.

By combining the pole-changing and circuit-breaking devices in the above manner my engine will run steadily as long as battery-power is applied, while in other motors where the circuit-breaker is independent of the pole-changer pads or pole-changer the current-breaker becomes dirty or foul, and after a few hours the power of the engine will be decreased, and finally stop altogether.

The pole-changer *n* forms a part of the binding-post *r*, which is properly insulated and securely fastened to the adjustable lever *q*. The current enters the revolving head through the binding-post *r* and pole-changer *n*, passes through one of the pads, which is properly insulated from the shaft, and to which is connected one end of the helix surrounding the revolving-magnet core, from thence through the revolving helix to the opposite shifter-pad, which is also insulated from the shaft, and to which is connected the opposite end of the revolving helix, from thence through the pole-changer *m* to the adjustable lever *q*, and through the lever to the other binding-post.

By having the two pole-changers secured to the pivoted adjustable lever *q* the lever can be moved from side to side, so as to bring the end of the pole-changer *m* against the studs at such a point that the polarity of the revolving head can be reversed either before the full power of the poles of the magnet *a* has been brought to bear upon the revolving magnet, and thus decrease the power and speed of the engine; or the polarity can be changed after the full power has been exerted, and just at a time when the repulsion will exert its greatest force. By this means I am enabled to change the pole-changers into a position where they will cause the engine to revolve very slowly, moderately slow, or very rapidly, as may be desired; and thus I have the speed and power of the engine under the most perfect control.

Where the engine is to be applied to running sewing-machines or other light machinery the lever *q* may be connected to a treadle or other equivalent device, so that it can be readily shifted back and forth.

Having thus described my invention, I claim—

1. The combination, in an electro-magnetic engine, of the removable ends *g*, core *f*, having the heads *e*, and non-magnetic pieces *d*, substantially as shown.

2. The shifter *m*, in combination with the springs *v* and lever *q*, substantially as specified.

3. In an electro-magnetic engine, the combination of the revolving head *c*, shaft *i*, having the insulated pads *j* secured thereto, lever *q*, pole-changers *m n*, and springs *v*, substantially as set forth.

4. In an electro-magnetic engine, a shifter or pole-changing device, *m*, in combination with a mechanism for lifting the end of the shifter just before the current is reversed, substantially as specified.

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of July, 1879.

LEONIDAS G. WOOLLEY.

Witnesses:
W. S. D. HAINES,
CHAS. W. HANDY.