3 Sheets--Sheet 1.

C. A. HUSSEY.

Electro-Magnetic Engines.

No. 166,527. Patented Aug. 10, 1875.

Fig: 1.

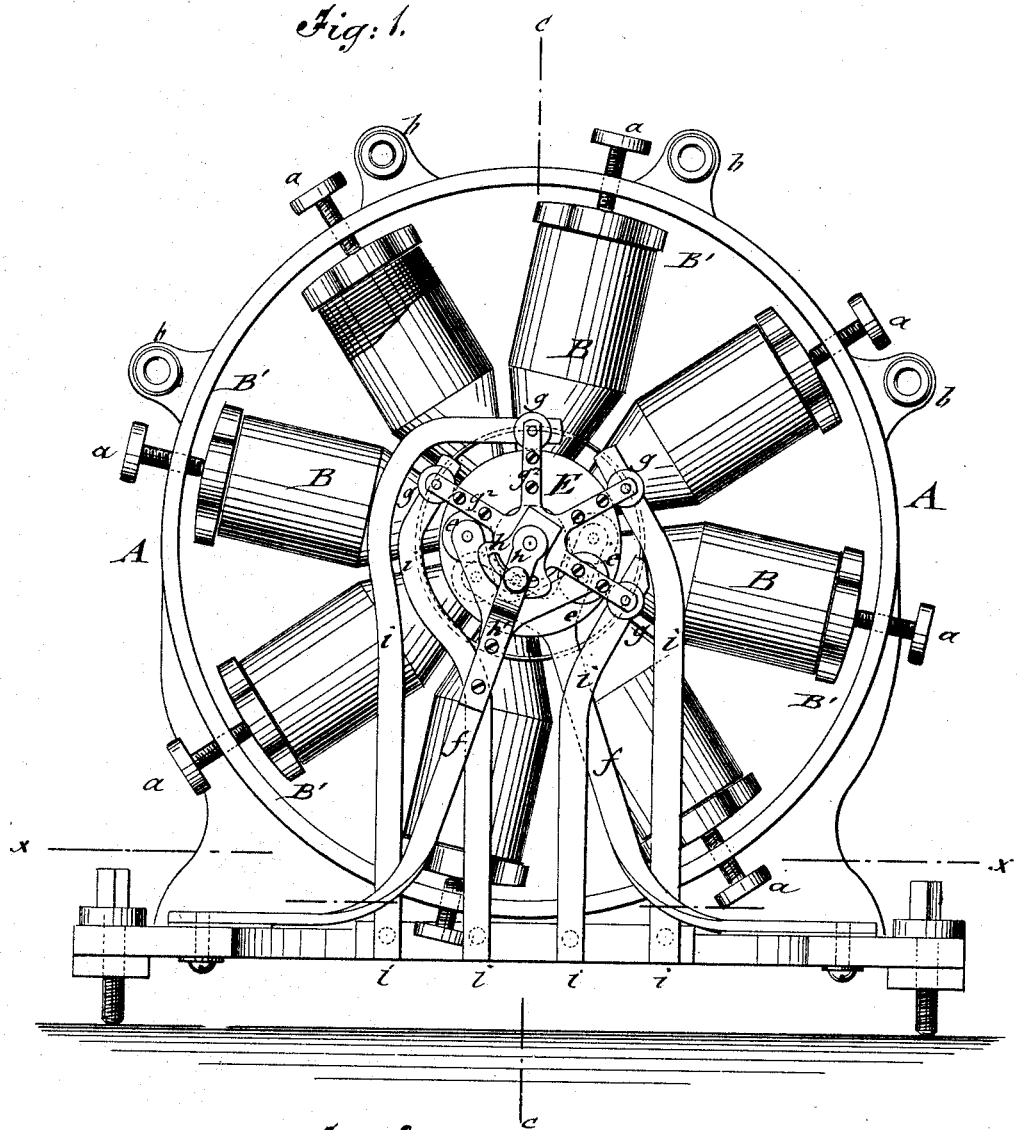

Fig: 2.

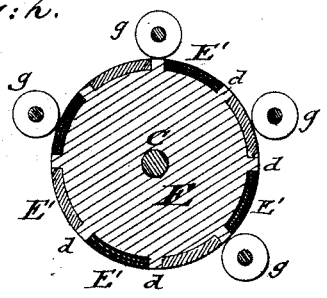

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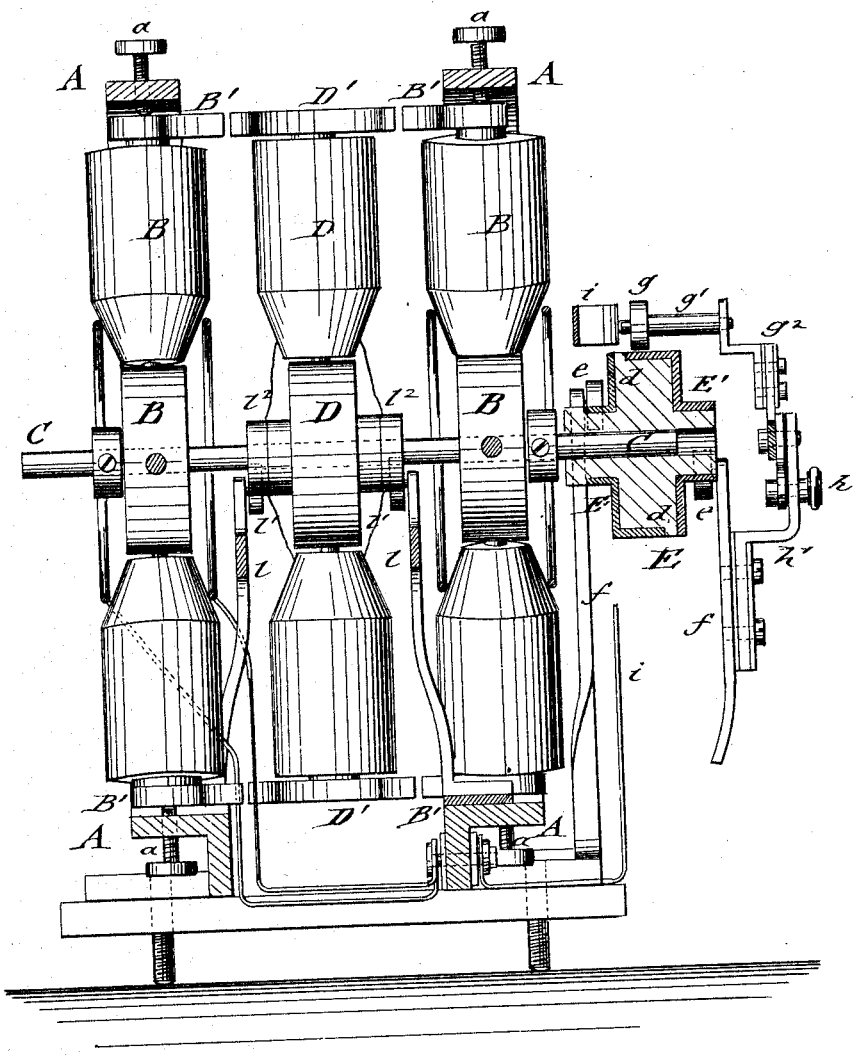
Fig: 3.



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3 Sheets--Sheet 3.

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Electro-Magnetic Engines.

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Fig: 4.

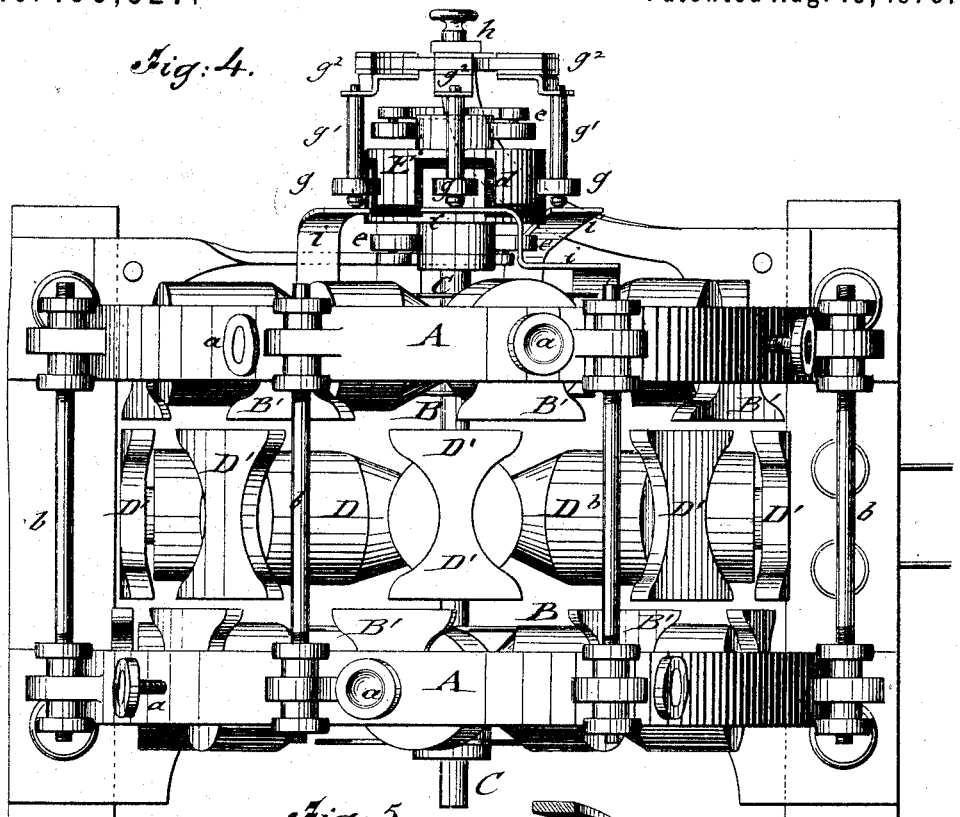
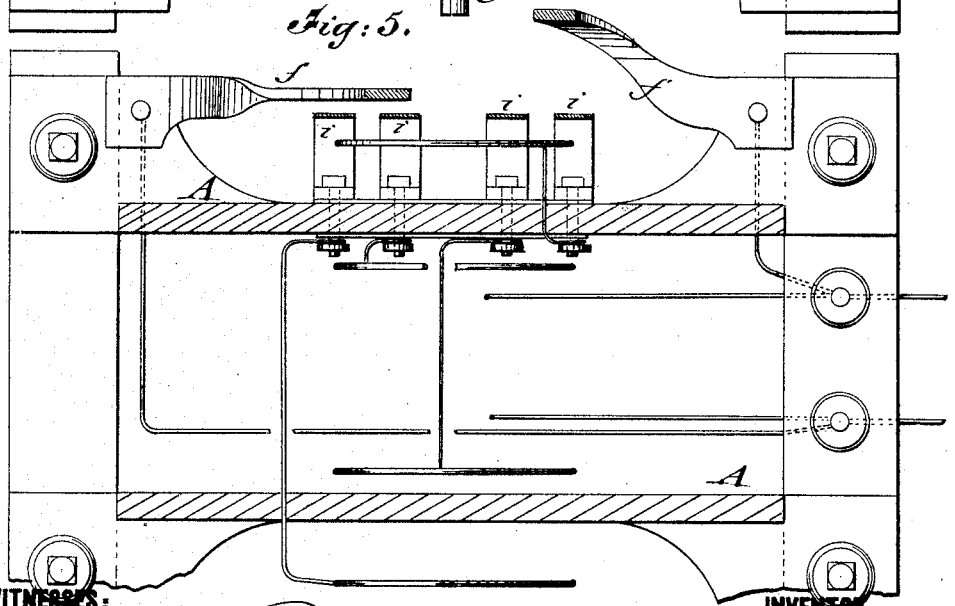


Fig: 5.



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UNITED STATES PATENT OFFICE.

CHARLES A. HUSSEY, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRO-MAGNETIC ENGINES.

Specification forming part of Letters Patent No. **166,527**, dated August 10, 1875; application filed May 15, 1875.

To all whom it may concern:

Be it known that I, CHARLES A. HUSSEY, of the city, county, and State of New York, have invented a new and Improved Electro-Magnetic Engine, of which the following is a specification:

In the accompanying drawing, Figure 1 represents a side elevation of my improved electro-magnetic engine; Fig. 2, a vertical detail section of the commutator and adjustable reversing contact-wheels; Fig. 3, a vertical transverse section of the engine on the line *c c*, Fig. 1; Fig. 4, a plan view; and Fig. 5, a horizontal section of the same on line *x x*, Fig. 1, showing distribution of electric current.

Similar letters of reference indicate corresponding parts.

My invention relates to an improved electro-magnetic engine for running sewing-machines and other light machinery, by which the induction-currents of the magnets and sparks at the commutator are entirely avoided, and a more perfect utilization of the battery-current is produced.

The invention will first be described in connection with drawing, and then pointed out in the claims.

In the drawing, A represents the supporting ring-shaped frame of the outer stationary magnets B, which are secured therein by suitable set-screws *a*, their circular core-sections being centrally perforated to form the bearings for the driving-shaft C of the engine. Each magnet B is constructed with a suitable but even number of radially-extending arms, of which eight are shown in the drawing. The arms are provided with widening ends B′, of T shape, at right angles thereto, which face toward the inside. The relative position of the stationary magnets is arranged in such a manner that the arms and T ends of the same are alternating—that is, that the T ends of one magnet are opposite the intermediate spaces between two adjoining T ends of the other magnet. The distance between the outer extremities of two adjoining T ends is somewhat less than the face width of the same. Lateral brace-rods *b* stiffen the ring-frame and the stationary magnets, whose base part is secured to a suitable support by fastening screw-bolts or otherwise. The arms of the magnets are wound with coils of insulated wire in the usual manner. A third magnet, D, is keyed centrally between the outer magnets to shaft C, and constructed with a corresponding number of radial arms and coils. The outer pole ends D′ are placed at right angles to the arms and widened symmetrically from the center in the shape of a double T, with face width equal to those of the outer pole ends B′, so as to lap across the distance from one pole end to the adjoining one of the outer magnets. The pole ends D′ of the interior magnets pass closely to the alternating pole ends B′ of the outer magnets, to be alternately acted upon by the same. A commutator, E, is applied to one of the projecting ends of shaft C, and formed of two outer sections, E′, that are separated by a narrow meandering insulated layer or band, *d′*, as shown clearly in the plan view, Fig. 4. The cylindrical commutator E has front and rear extensions or hubs of smaller diameter, which serve to form the connection with the battery-wires by revolving contact-pulleys *e* and supporting-posts *f*, while the outer divided circumference of the commutator forms contact with four revolving wheels, *g*, that turn on shafts g^1 attached to a supporting-frame, g^2, which is connected adjustably by slot and clamp screw *h* with a supporting-post, *h′*, of the outer post *f*. The battery-current may, however, be conveyed to the commutator through the shaft, and the contact-wheels of the hubs be dispensed with. The adjustable frame g^2 is insulated from the lower carrying-post *h′*, so that no current can pass from one to the other. Each of the outer contact-wheels *g* is connected by suitable contact-springs *i* to the base of frame A, and thence by connecting-wires to the coils on the arms of the outer magnets, two of the contact-wheels *g* forming the circuit with the coils of one, the two remaining with the coils of the other magnet B, as shown in Figs. 3 and 5. The coils of the central magnet D are placed in direct circuit with the battery-wires by posts *l*, contact-rollers l^1, and fixed insulating-cylinders l^2, of shaft C, an uninterrupted current being thus supplied to the coils of the revolving inner magnet as long as the battery-circuit is closed. When the battery-wires are

applied to the clamp-screws of the engine the current is split, forming a direct circuit in the coils of the revolving magnet, and an indirect and more circuitous one through the commutator to the coils of the outer stationary magnets. The revolving commutator being divided by the insulating-band into alternating positive and negative sections, forms rapidly changing, alternating contact with the revolving wheels. The number of alternating commutator sections corresponds with the number of magnet-arms, so as to produce at each passage of the respective pair of contact-wheels over the dividing insulating-band the reversing of the current in the coils of the outer magnets, and consequently the reversal of the polarity of the pole ends of the same. The effect of the reversal of polarity on the pole ends of the revolving central magnet is the continuous attraction and repulsion of the pole ends without any induction-currents and neutral points.

The positive pole end of the revolving magnet is attracted at one side by the negative pole end of one of the outer magnets, and at the opposite end at the same time repulsed by the reversal of the current in the pole of the opposite magnet. When one side of a positive-pole end of the central electro-magnet faces fully the negative pole of an outer magnet, the outer face fills up the intermediate space between the pole ends of the opposite magnet, being then attracted by the negative polarity of the adjoining pole end and by the simultaneous reversal of the polarity of the other magnet repulsed at the opposite side, so that the position of the central pole is changed to face the pole of the latter magnet, and lap over the intermediate space between the poles of the former magnet.

The reversal of polarity by the change of the direction of the current produces, in this position of the pole, the effect already described, which is exactly the same, but with opposite polarities, as regards the negative poles of the central magnet, so that throughout the same, by the alternating attraction and repulsion by the co-operating pole ends of the stationary magnets, the central magnet is rapidly revolved. The formation of induced currents is prevented by the lapping over of the T-shaped pole ends across the space between two adjoining pole ends of the outer magnets, as the adjoining pole end begins to assert its influence before the other pole end is entirely passed. But even in case induction-currents should be formed, they would serve, by reversing the current in the side poles, to assist, instead of detract from, the magnetic force by being in the same direction as the primary current, so as to be fully utilized.

The neutral points formed by the full facing of the inner and outer pole ends at the moment of the reversing of the current by the commutator are overcome by the action of the alternating pole ends of the opposite magnets. As the magnets are parallel to each other, they are entirely within the magnetic field, by which the speed of the revolving magnet is accelerated, which is not the case in electro-magnetic engines in which the magnets are not in the magnetic field, so as to interfere in some degree with each other. The non-formation of induced currents avoids sparks or heating of the commutator, which has hitherto been one of the most objectionable features of similar engines. The power of the engine may be increased by enlargement of the magnets, or by arranging more than one revolving wheel on the central driving-shaft, and providing the corresponding additional number of stationary magnets.

The speed of the revolving magnet may be regulated by adjusting the contact-wheels of the commutator, which serve also for reversing the same by changing the wheels to opposite pole-sections on the commutator. The highest speed of the engine is obtained when the contact-wheels are so adjusted on the commutator that the reversing of the current in the stationary magnets is accomplished at the moment of full-facing of the pole ends of the inner and outer magnets, the speed being more or less decreased by setting the wheels so that the reversing takes place before the most favorable position of the pole ends is obtained. As the main parts of the engine may be cast, and as no very expensive devices are employed, the engine may be furnished at a very reasonable price, being, on account of the complete utilization of the current, more economical and advantageous than the electro-magnetic engines at present in use.

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

1. In electro-magnetic engines, the stationary magnets having radial arms with T-shaped ends, being arranged in alternating position, so that the pole ends of one face the intermediate space between the pole ends of the other, for the purpose set forth.

2. The outer stationary magnets having widening pole ends of T shape at right angles to the arms, substantially as described.

3. The central revolving magnet provided with widening pole ends of double T shape at right angles to the radial arms of the same, as set forth.

4. The stationary and revolving magnets having radial arms and widening pole ends whose face-width is somewhat larger than the distance between two adjoining pole extremities, so as to lap on the pole ends across the intermediate space, substantially as described.

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Witnesses:

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