

L. FINGER.  
ELECTROMAGNETIC MOTOR.

No. 105,663.

Patented July 26, 1870.

Fig. 1.

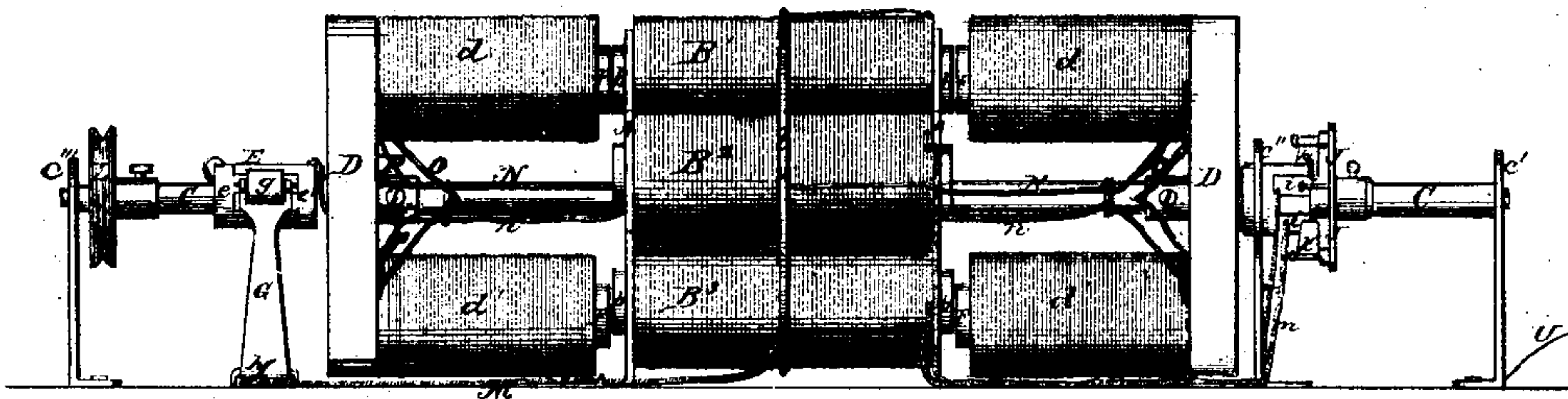


Fig. 7.

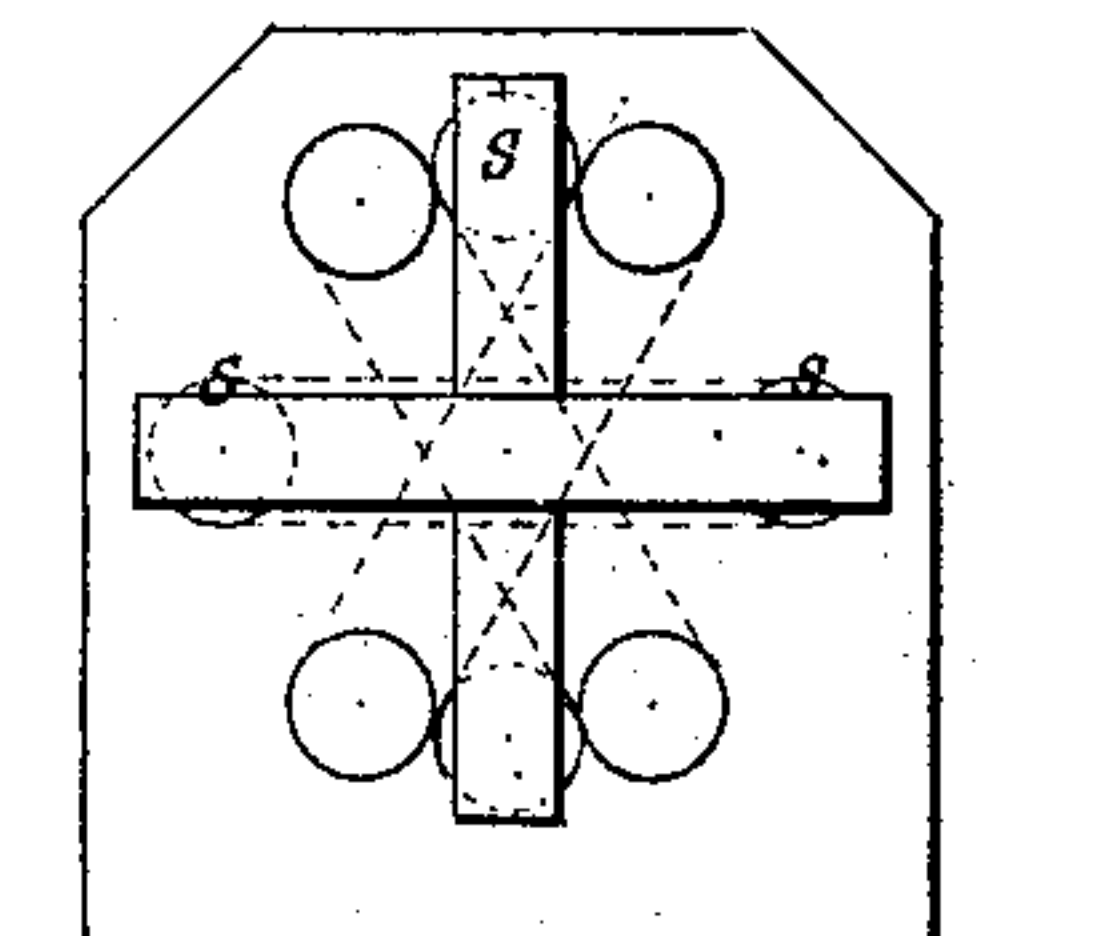


Fig. 2.

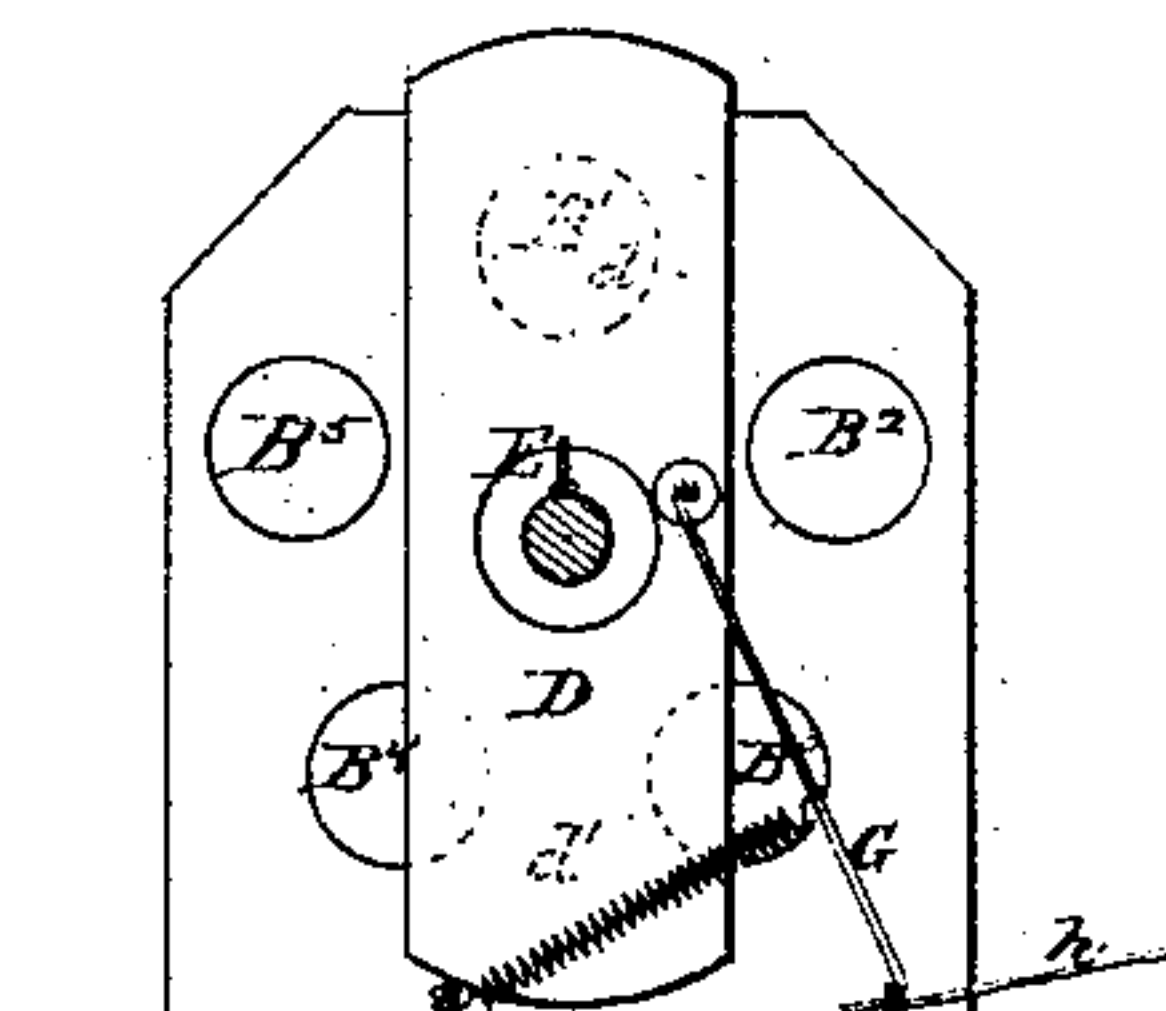


Fig. 6.

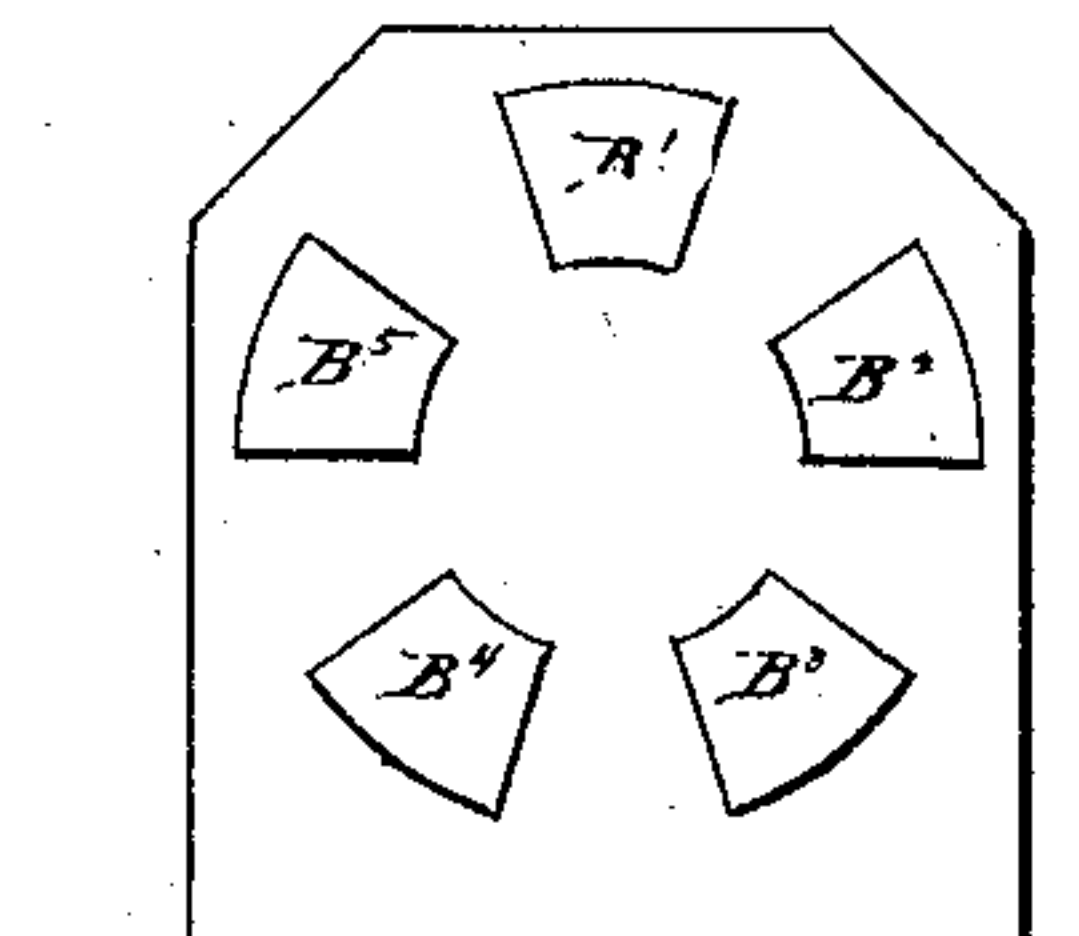


Fig. 4.



Fig. 5.

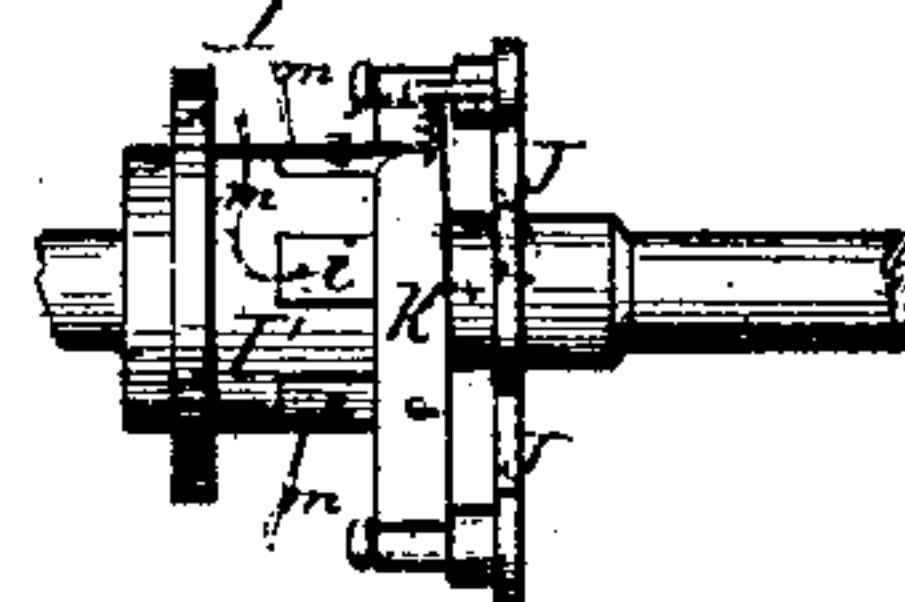
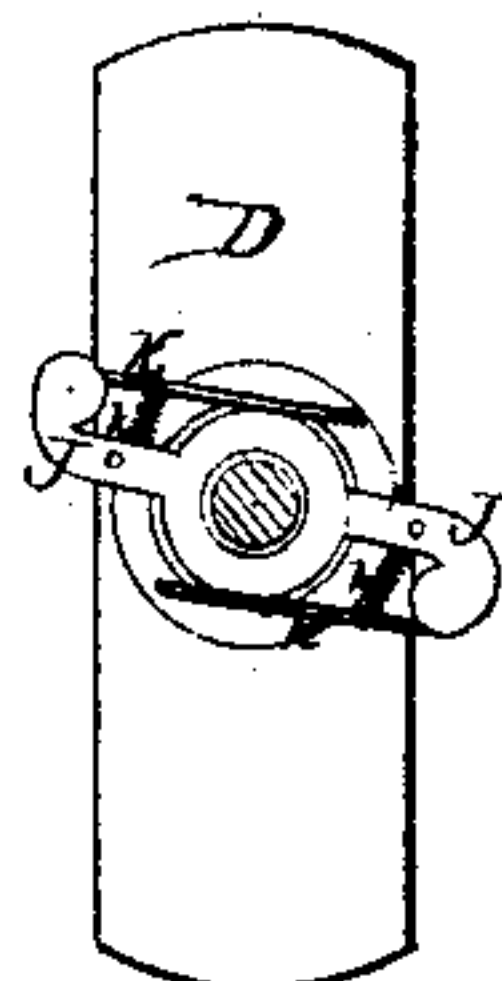


Fig. 3.



Witnesses.  
Charles F. Brown.  
Joseph A. Galt.

Inventor.  
Louis Finger.  
by Samuel D. Wright.  
Atty.

# United States Patent Office.

LOUIS FINGER, OF CAMBRIDGE, MASSACHUSETTS.

Letters Patent No. 105,663, dated July 26, 1870.

## IMPROVEMENT IN ELECTRO-MAGNETIC MOTORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, LOUIS FINGER, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improved Electro-magnetic Motor; 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 accompanying drawing and letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a side elevation;

Figures 2, 3, 4, and 5 are views of parts in detail; and.

Figures 6 and 7, views of modifications of the same.

The object of this invention is—

First, to produce a practical electro-magnetic motor, and

Second, to produce means by which the opposite poles of an electro-magnet may be utilized, so that they will transmit a continuous current for motive power.

This invention consists of a series of soft iron rods arranged in suitable supports in a circular manner, and parallel with each other, provided with helices, and having projecting ends of such sizes as to leave spaces between said ends of exactly the width of the same.

It also consists of two pairs of similar rods, one pair, at each end of the series of rods, mounted on a revolving shaft, having ends corresponding to those of the stationary rods, and so arranged that, when two of the ends of the revolving rods cover the ends of two of the stationary rods, the other two revolving rods cover spaces between two of the stationary rods, the whole being suitably attached to the poles of a battery, while, by current-changing devices on the shaft, the ends, of the stationary and revolving rods are made to alternately attract and lose their attraction, in such manner as to cause the shaft to revolve and impart motion, as desired. The details of construction and method of operation will be more fully described hereafter.

In the drawing—

A A represent standards of brass or other suitable material, which are provided with five holes arranged in a circle.

These holes are made sufficiently large to hold the projecting ends *b* of the stationary iron rods *B*<sup>1</sup> *B*<sup>2</sup> *B*<sup>3</sup> *B*<sup>4</sup> *B*<sup>5</sup>, which are covered with wire helices in the usual manner.

C represents a shaft, which runs parallel with the rods *B*, through the center of standards *A*, and is supported by the standards *c* *c*" *c*".

On the shaft *C*, at an equal distance on each side from rods *B*, are the arms *D*, to which are attached the rods *d* *d'*, which are of the same form as the rods

*B*, and provided with helices and projecting ends *F*, and so arranged that, when the two rods *d* are in line with any one of the rods *B*<sup>1</sup>, &c., the rods *d* will be directly between the ends of two of the rods *B*<sup>1</sup>, &c.

E represents a commutator or current-changer, of conducting metal, on the shaft *C*, near the standard *c*", which cylinder is insulated from said shaft by rubber or other suitable material, and is composed of two parts *e* *e'*, which are insulated from each other by the filling, as shown.

The parts *e* *e'* are provided with the projections *f*, which fit into each other, and are each one-tenth of the circumference of the cylinder.

G represents a pivoted standard, the upper end of which is provided with a friction-roller, *g*, which is caused, by the spring *H*, to bear upon the surface of the cylinder *E*.

The standard *G* is connected, by the wire *h*, with one of the holes of a battery.

I represents a commutator of wood, ivory, or other insulating material, rigidly attached to the bearing *c*", the shaft *C* passing through the same.

Said commutator is provided with five metal plates, *i*, each of which is one-tenth of the circumference of the same, leaving a similar space of insulating material between each plate.

J J represent curved arms, which are attached to shaft *C* near commutator *I*, and project from opposite sides of the same.

To the shafts *J* are pivoted the metal strips *K*, which are caused by the springs *k* *k* to bear upon the periphery of the commutator *I*.

L represents a pulley for transferring the motion obtained.

Each of the helices of the rods *B*<sup>1</sup>, *B*<sup>2</sup>, *B*<sup>3</sup>, &c., is connected by the wire *l*, which passes around the whole and is connected by the wire *M* with one of the poles of the battery, while the rods *B*<sup>1</sup>, *B*<sup>2</sup>, *B*<sup>3</sup>, &c., are connected with the plates *i* by the wires *m*.

The part *e* of the cylinder *E* is connected to the helices of rods *d* by the wires *N* *P*, and *e'* is connected to the rods *d'* by the wires *n* *p*.

The rods *d* *d'* are connected to each other and to the shaft *C* by the wires *O*.

The ends of rods *B*<sup>1</sup> *B*<sup>2</sup>, &c., and those of rods *d* *d'* may be of the form shown in fig. 6 instead of circular, by which form a greater amount of attracting surface is obtained, and the spaces between are of the same form as the ends.

U represents the wire from the opposite pole of the battery, which wire is attached to standards *c'*, and completes the circuit through the whole apparatus.

Fig. 6 shows a modification of my invention, in which three pairs of rods are substituted for the rods *B*<sup>1</sup> *B*<sup>2</sup>, &c., each pair being connected at one end,



leaving but one projecting end to each rod, and two similar pairs, S, mounted on the shaft at right angles with each other, so that, when one of the pairs S covers one of the stationary pairs, the other pair S covers the space between the two remaining stationary pairs.

#### Operation.

It will be seen that the part *e* of the commutator E is connected by the wires N and P with the rods *d d*; consequently when brought in connection with the wire *h*, by the contact of the roller *g* with one of its projections *f*, it causes both rods *d* to become magnets.

Suppose the rods *d* to be between rods B<sup>1</sup> and B<sup>5</sup>, and the rods *d'* covering rod B<sup>3</sup>. The rod B<sup>1</sup>, being in connection with the wire *h*, is also a magnet with north and south poles, and the adjacent poles of magnets or rods *d d* and B<sup>1</sup> being opposite, attract each other and cause the shaft to revolve until the rods *d* assume the position shown in fig. 1, when the ends of rods *d* cover the ends of rod B<sup>1</sup>, and the ends of rods *d'* are directly between rods B<sup>3</sup> and B<sup>4</sup>. This motion will cause one of the projections *f* of part *e* of commutator E to come in contact with roller *g* and wire *h*, which being connected by wire *n* with the rods *d' d'* will cause them to become magnets, while the rods *d d* will become insulated. Meanwhile, one of the strips K, on arms J, comes in contact with that one of the plates *i* which is connected by wire *m* with rod B<sup>4</sup>, and causes the same to become a magnet, which attracts the rods *d' d'*, which, as before described, are already magnetized, and causes the shaft C to make another part revolution; until rods *d'* are in line with B<sup>4</sup>, and rods *d* are between B<sup>1</sup> and B<sup>2</sup>; this will cause the part *e* of the commutator E to again come in contact with roller *g*, and cause the rods *d* to become magnets, while rods *d'* are insulated, and the plate *i*, which is connected to rod B<sup>2</sup>, comes in contact with one of the strips *k*, while the other strip comes in contact with the insulating surface of the commutator, and breaks the connection with rod B<sup>4</sup>, which ceases to attract rod *d'*, while rod B<sup>2</sup> attracts rods *d*. The shaft C is thus

caused to make another part revolution, which brings the roller *g* into contact with part *e'* of commutator E, and the operation is continued, the rods *d* and *d'* being alternately made magnets and attracted in succession by each of the rods B<sup>1</sup>, B<sup>2</sup>, B<sup>3</sup>, &c.

I do not confine myself to the precise number of rods described, as any suitable number may be used.

It is well known with what rapidity an electro-magnet can acquire and lose its magnetism, and it will be evident that, with this instrument, a high degree of velocity may be imparted to shaft C with a considerable degree of power, it being well adapted to the moving of panoramas, &c.

In case single bar magnets, as shown in fig. 1, are employed, the number of rods B must be an odd number, in order that two of the rods *d d'* may be opposite a vacant space, when the other two cover the ends of one of the rods B<sup>1</sup>, &c., as before described.

If desired, the rods B may be made to revolve, and the rods *b b'* be stationary, the effect being the same.

Having thus fully described my invention,

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The described arrangement of rods B<sup>1</sup> B<sup>2</sup> B<sup>3</sup> B<sup>4</sup> B<sup>5</sup>, with relation to rods *d d' d'*, by means of which, when two or more of the latter cover the ends of one or more of the former, the remaining two of the latter cover spaces between two others of the former, substantially as described.

2. The motor described, consisting substantially of rods B<sup>1</sup> B<sup>2</sup> B<sup>3</sup> B<sup>4</sup> B<sup>5</sup>, and *d d'*, and commutators E I, all arranged and operating substantially as set forth.

3. The form of ends of rods B<sup>1</sup>, B<sup>2</sup>, B<sup>3</sup>, &c., and *d d'*, shown in fig. 6, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS FINGER.

Witnesses:

CARROLL D. WRIGHT,  
CHARLES F. BROWN.