(No Model.) 2 Sheets—Sheet 1.

G. H. STOUT.

ELECTRIC MOTOR.

No. 338,622. Patented Mar. 23, 1886.

Fig. 1.

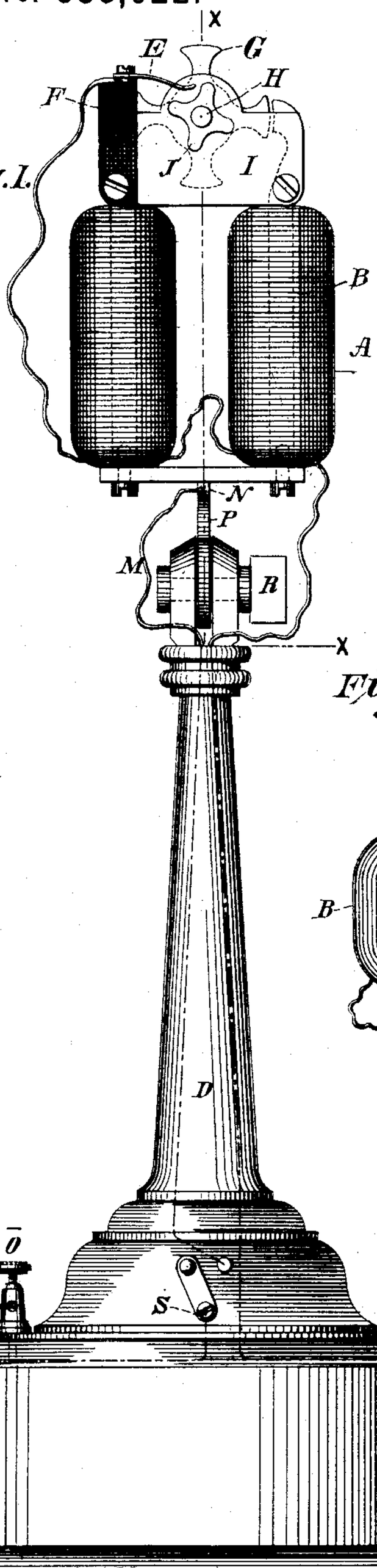


Fig. 2.

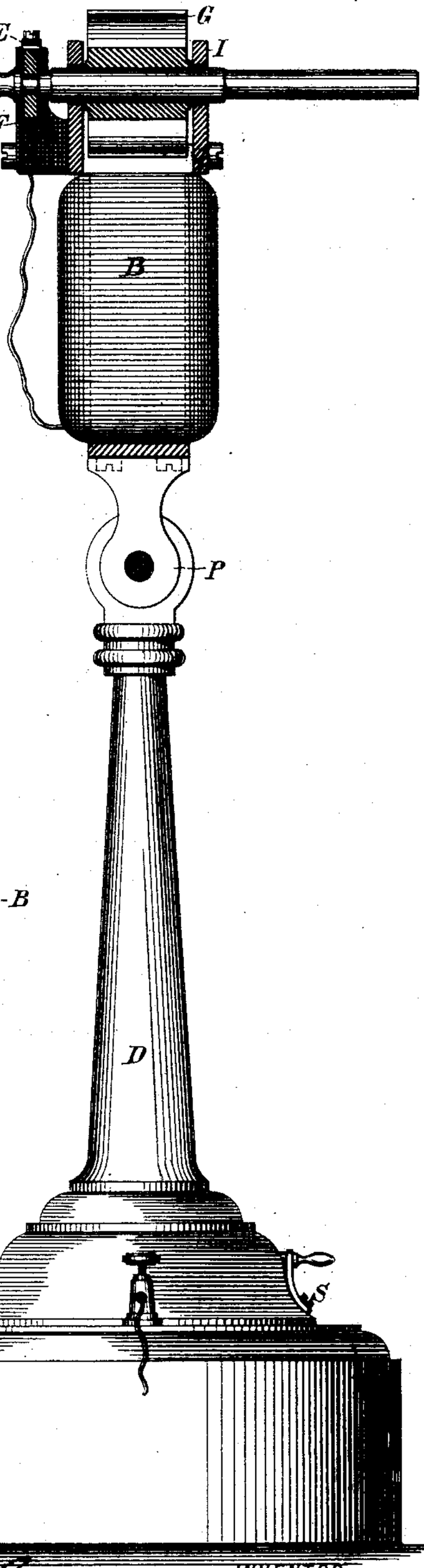
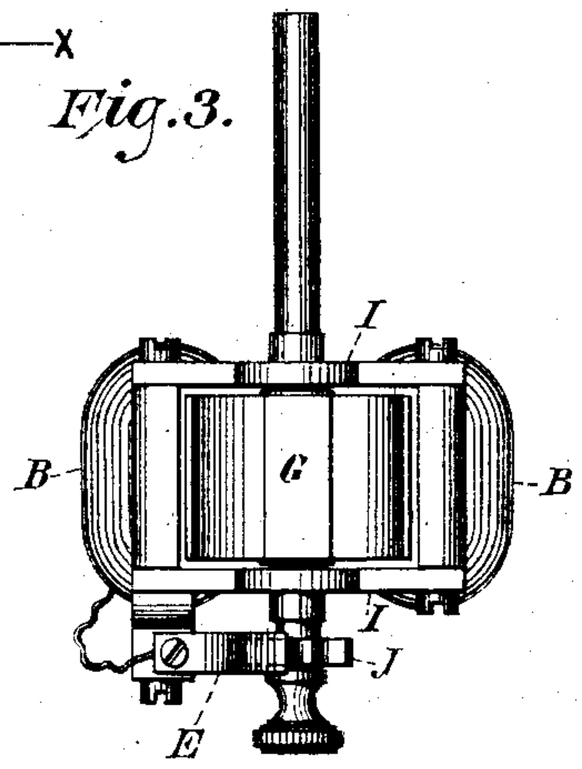


Fig. 3.



WITNESSES

Gustave Dieterich

Fred Hueteroth

INVENTOR

George H. Stout

Foster Benjamin Attorney

(No Model.) 2 Sheets—Sheet 2.

G. H. STOUT.

ELECTRIC MOTOR.

No. 338,622. Patented Mar. 23, 1886.

Fig. 4.

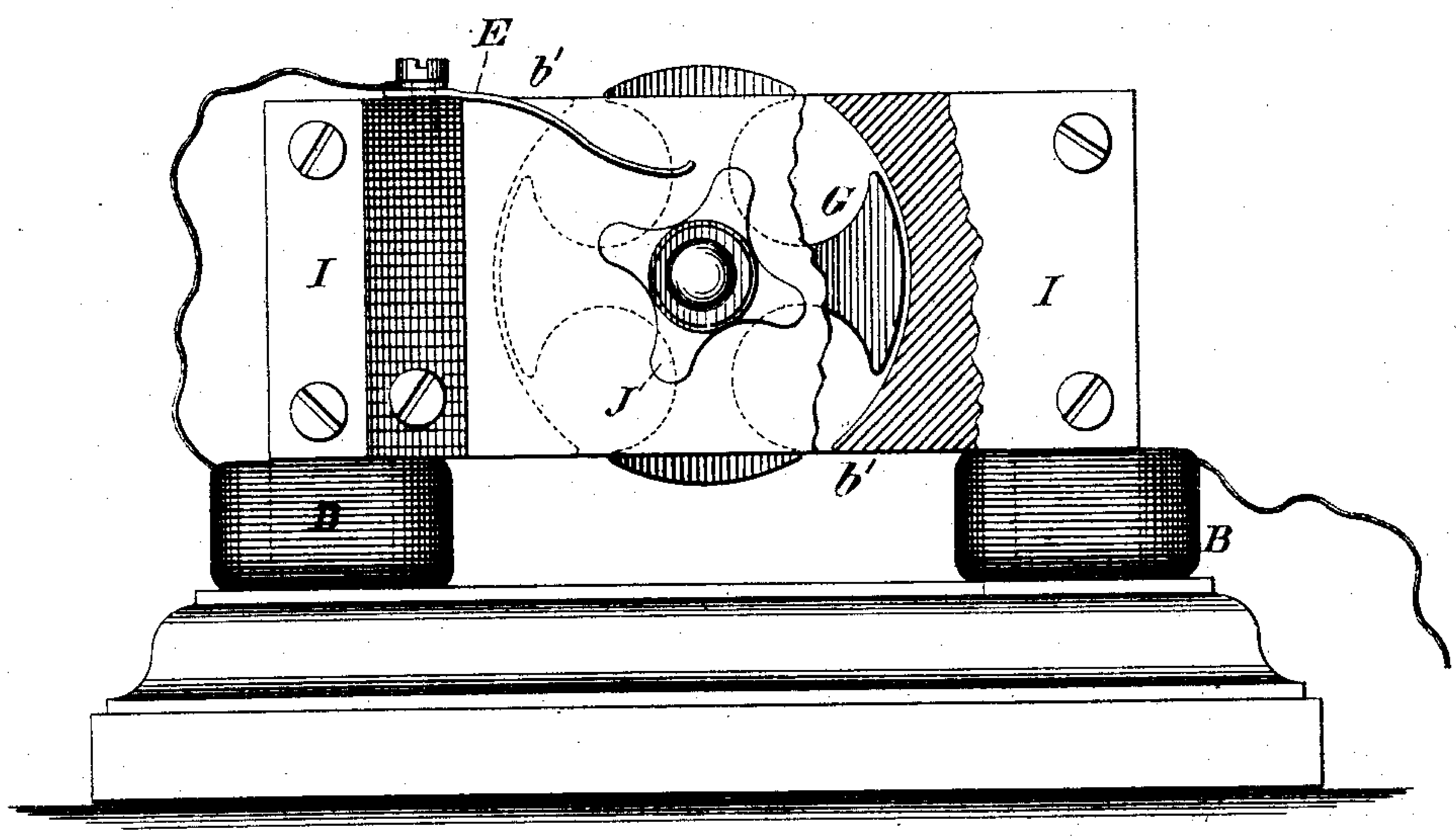


Fig. 7.

Fig. 5.

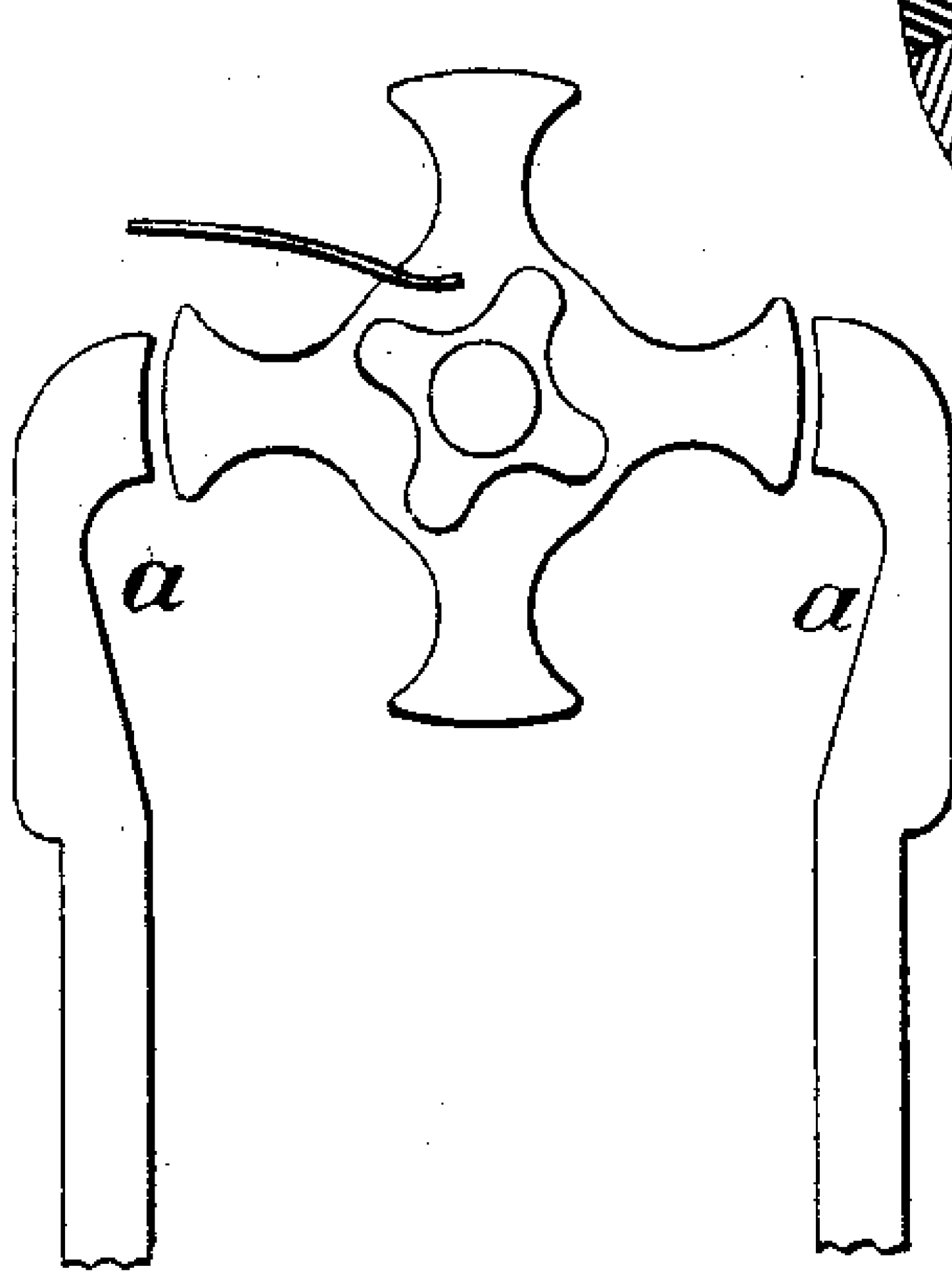
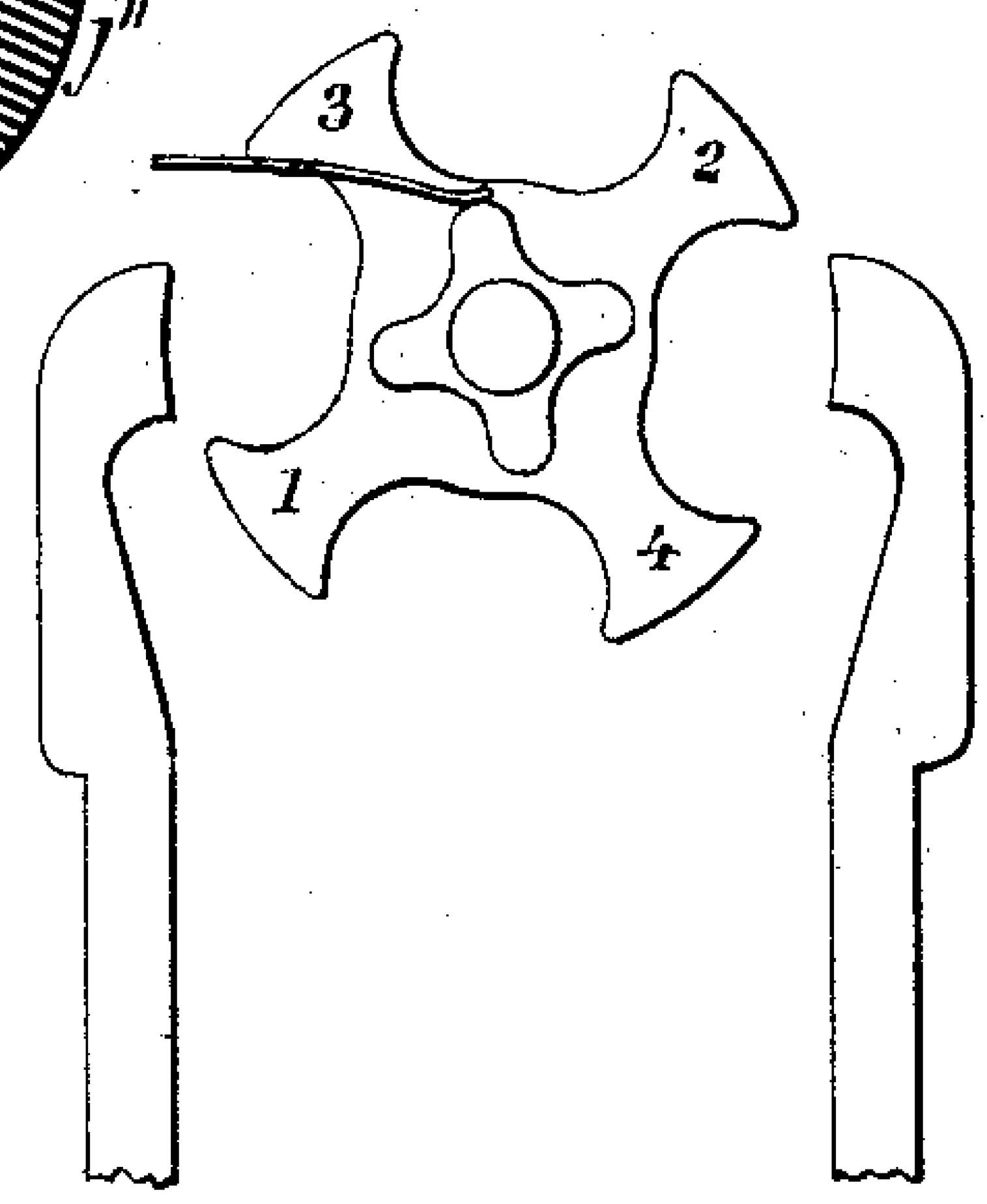


Fig. 6.



WITNESSES
Gustave Dieterich
Fred Huetwohl

George H. Stout
INVENTOR
Geo. H. Benjamin
Attorney.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

GEORGE H. STOUT, OF CHAPEL HILL, NEW JERSEY.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 338,622, dated March 23, 1886.

Application filed June 20, 1885. Serial No. 169,328. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. STOUT, of Chapel Hill, county of Monmouth, in the State of New Jersey, have invented a new and useful Improvement in Electric Motors, of which the following is a specification.

My invention relates to an electric motor comprising an electro-magnet, between the polar extensions of which is located a rotary armature made from soft iron, provided with radial arms and suitably supported on non-magnetic bearings, and having arranged upon the armature-shaft a contact-maker of the same general form, or provided with a number of contact-points corresponding to the number of arms of the armature, and which are adapted to make and break contact with a spring-brush suitably mounted upon an insulating-support arranged upon one side of an electro-magnet and electrically connected to one end of the coil of wire which forms the helix of the electro-magnet, the other end of this coil being connected to the source of electric energy.

The features peculiar to this motor, and those to which I wish to call especial attention, are, that the armature is located between and in the axial line of the poles, and therefore in the most effective position, but a single contact-brush is required, and that the soft iron of the armature and the core of the electro-magnet form part of the path of the electric current through the motor, the core of the electro-magnet being connected through an intermediate wire with the source of electric energy. The arms or points of contact of the contact-maker are set slightly in advance of those of the armature, and thus when a current is transmitted through the motor it excites the field-poles of the electro-magnet, which act inductively upon the armature-arms and attract or repel them, according to their position relative to the poles, and thus rotary motion is induced in the armature.

In the accompanying drawings, which illustrate my invention, similar letters of reference indicate like parts.

Figure 1 is a front elevation of a small motor arranged according to my invention mounted upon a stand, and of the size specially designed for the operation of fans or mechanical toys. Fig. 2 is a side elevation of the electro-magnet and stand, the armature and its supports shown in vertical section taken on the line *x x* of Fig. 1. Fig. 3 is a plan view. Fig. 4 is a front elevation of a motor as designed for heavy work, a part of the face-plate broken away to show armature and its relation to the pole-pieces. Figs. 5 and 6 are diagrammatic views illustrative of the relation of the points on the contact-maker to the arms of the armature and to the contact-spring, and respectively shown with the contact broken and the contact made. Fig. 7 is a vertical section showing a modification of the contact-maker, and the spaces between the arms filled with a non-conducting material.

In the drawings, A indicates an electro-magnet, which may have a general horseshoe form, as shown in Figs. 1, 2, and 3, or as arranged in Fig. 4, or such other form as shall be found convenient in practice, the polar extensions or ends of the magnet being arranged oppositely to each other.

B is the magnet coil or helix of insulated wire wound upon the soft-iron core of the magnet in the usual manner, to produce poles of opposite polarity. One end of the coil B is connected directly with the source of electric energy, or through a suitable binding-post arranged in the base of the standard D. The other end of this coil, after forming the helices, is connected to a piece of spring-brass, E, suitably mounted on a non-conducting support, F, arranged upon one side of the electro-magnet.

The armature G is of soft iron, and is provided with radial arms, which are thicker at their ends and curved inward to where they are united to the hub, which is mounted upon a shaft, H, that has its bearings in the non-magnetic plates I, secured on each side of the ends of the magnet.

The arrangement of the armature relative to the polar extensions is such in Figs. 1, 2, 3, 5, and 6 that when two of the arms of the armature occupy a horizontal position the upper surface of these arms will be level with the top of the poles.

It will be observed that the polar ends just below their extremities are slightly curved outward or cut away, as at *a a*, Fig. 5, the

object of this being to concentrate the magnetism or acting force directly on the ends of the magnet.

In the drawings, Fig. 4, the armature is shown arranged directly in the center or in the axis of the polar extremities, which are curved, as at b' b', to correspond to the shape of the outer surface of the arms of the armature.

I wish it understood that I do not limit myself to any particular shape of the field-magnet poles or the armature-arms, as many changes can be made in the form of those shown in the drawings without departing from the intent of my invention.

Arranged upon the same shaft that carries the armature, and at the side at which the contact brush or spring is located, I place a contact-maker, S, also of soft iron, having the same general form or provided with a number of contact-points, j', corresponding to the number of arms of the armature. Thus the contact-maker may have the form shown in Figs. 4, 5, and 6, or as shown in Fig. 7, where the space between the arms j' is filled in with some non-conducting material, j''—such as hard rubber or vulcanite—the object being to cause the brush E to work more smoothly over the contact-maker, or to allow of the brush being made of a bundle of fine wires. The contact brush or spring bears upon the extremity of and is pressed upward by the arms of the contact-maker as they successively come into position. The arms of the contact-maker are set, as shown in the drawings, in advance of those of the armature, the required lead being generally about thirty-five degrees. The relation between the arms of the contact-maker and the armature is such that the arms of the armature, which are at ninety degrees from each other, will be unequally distant from the polar extensions when contact is made between the contact-maker and the brush.

In the diagram, Fig. 6, the arms 1 2 are shown approaching the poles and the arms 3 4 receding therefrom. The arms 1 2 are the nearer, and hence are inductively acted upon when contact is made between the spring-brush and the contact-maker, and an impulse is given. As the arms approach the poles or attain a horizontal position, the spring-brush leaves the point of contact of the contact-maker, as shown in Fig. 5, and the momentum of the armature brings the next two arms into the position to be acted upon.

In the drawings, Figs. 1 and 2, I have shown a small motor—such as is designed for operating a fan or small toys—mounted by a pivoted connection, P, and thumb-screw R on top of the standard D, and in the base of the standard I arrange a switch, as at S. By this arrangement the motor can be given any desired inclination. The course of the current through the motor is from the positive binding-post through the helices on the magnet to the spring-brush, to contact-maker, thence through the body of the armature and through the non-magnetic bearings to and through the core of the magnet, and thence by the wire M, which is soldered or otherwise electrically connected to the magnet at N, and out at negative binding-post O.

It will thus be seen that the path of the current is through the iron of the armature and the core of the electro-magnet, and when contact is made between the spring-brush and the contact-maker the magnet is excited, and the two arms of the armature nearest to the poles are inductively acted upon and are attracted, and after having passed the horizontal position are repelled, the reversal taking place as the next pair of arms come into the field of attraction or point of impulse. Rotary motion is thus imparted to the armature, and a considerable speed is obtained and power to do work realized. The "energy," so to speak, is imparted to the motor by a series of rapidly-succeeding impulses, and as the force is a continuing one accelerated rotary motion is the result.

I have described but a single contact-brush as being arranged upon the motor. It will be readily understood that two brushes may be arranged oppositely to each other, whereby, by means of a suitable switch, one or the other of the brushes may be thrown into the circuit, and thus allow the direction of rotation of the armature to be reversed.

I claim as my invention—

1. The combination, in an electric motor, of the magnet A, provided with the outwardly-curved polar extensions a a, the armature G, provided with radial arms and located and rotated in the axial line between said polar extensions, the contact-maker J, and spring-brush E, bearing on said contact-maker, substantially as described.

2. In an electric motor, the combination of the electro-magnet A, provided with the polar extremities a a, an armature, G, provided with radial arms, the outer ends of which are curved to correspond to the concavities of the polar extremities of the electro-magnet between which they rotate, a contact-maker provided with contact-points corresponding in number to the arms of the armature, and one or more contact-brushes, substantially as described.

In testimony whereof I have hereunto subscribed my name this 12th day of June, A. D. 1885.

GEORGE H. STOUT.

Witnesses:
WM. H. MEADOWCROFT,
GEO. H. BENJAMIN.