

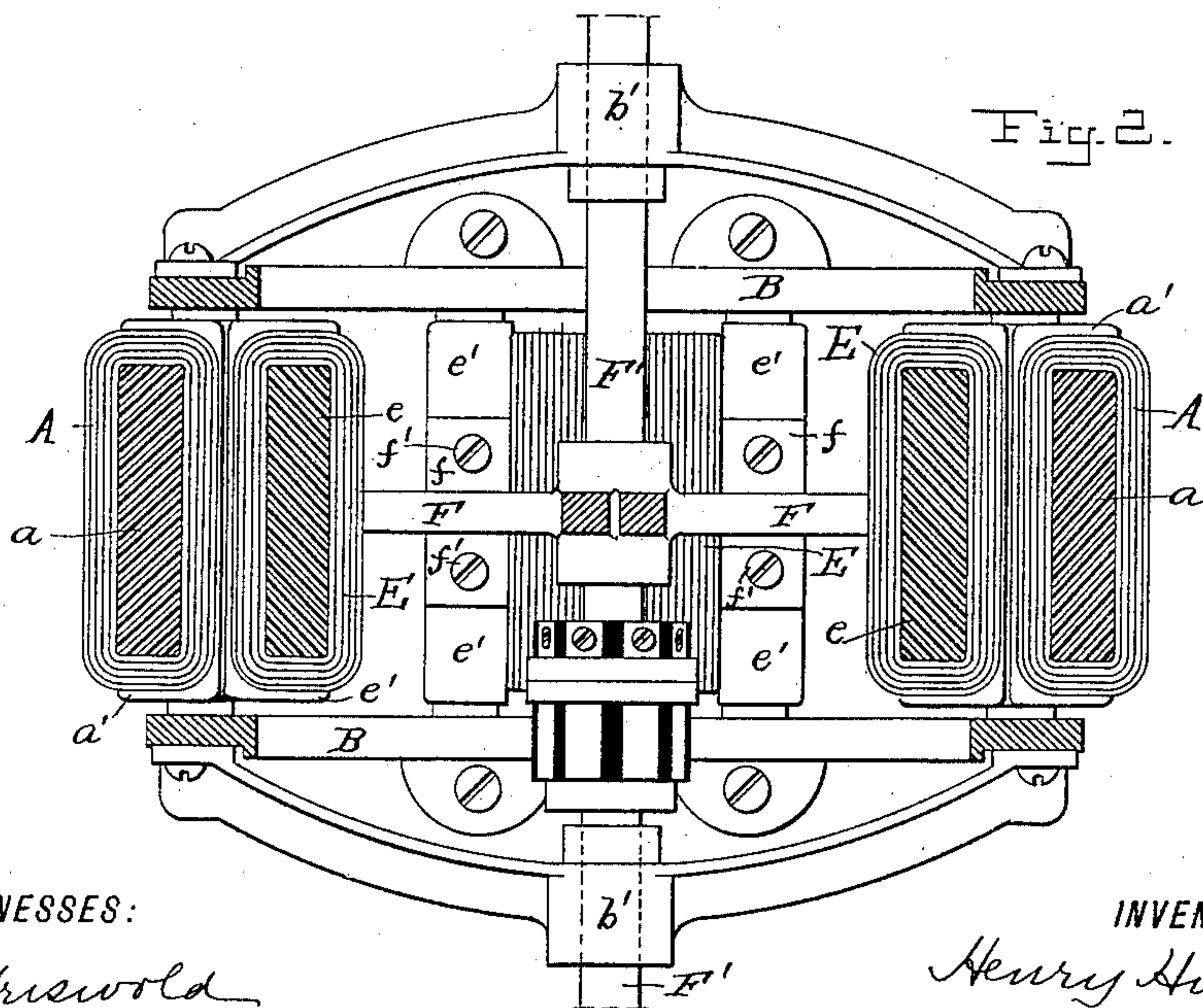
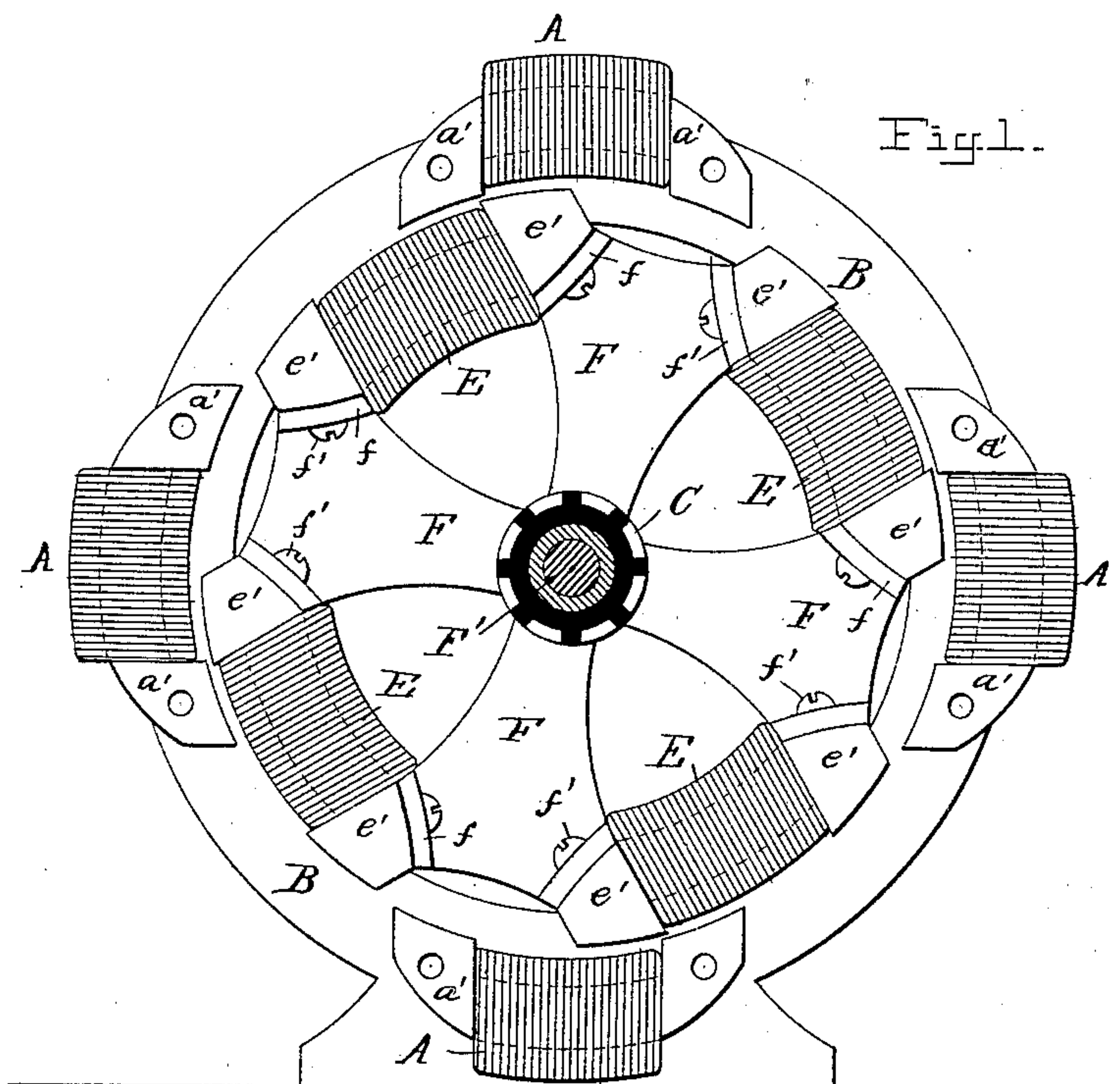
(No Model.)

2 Sheets—Sheet 1.

H. HUMBERT.  
ELECTRIC MOTOR.

No. 432,707.

Patented July 22, 1890.



WITNESSES:

*E. J. Griswold*  
*John Revell*

INVENTOR

*Henry Humbert*

BY

*Howson and Howson*  
his ATTORNEYS

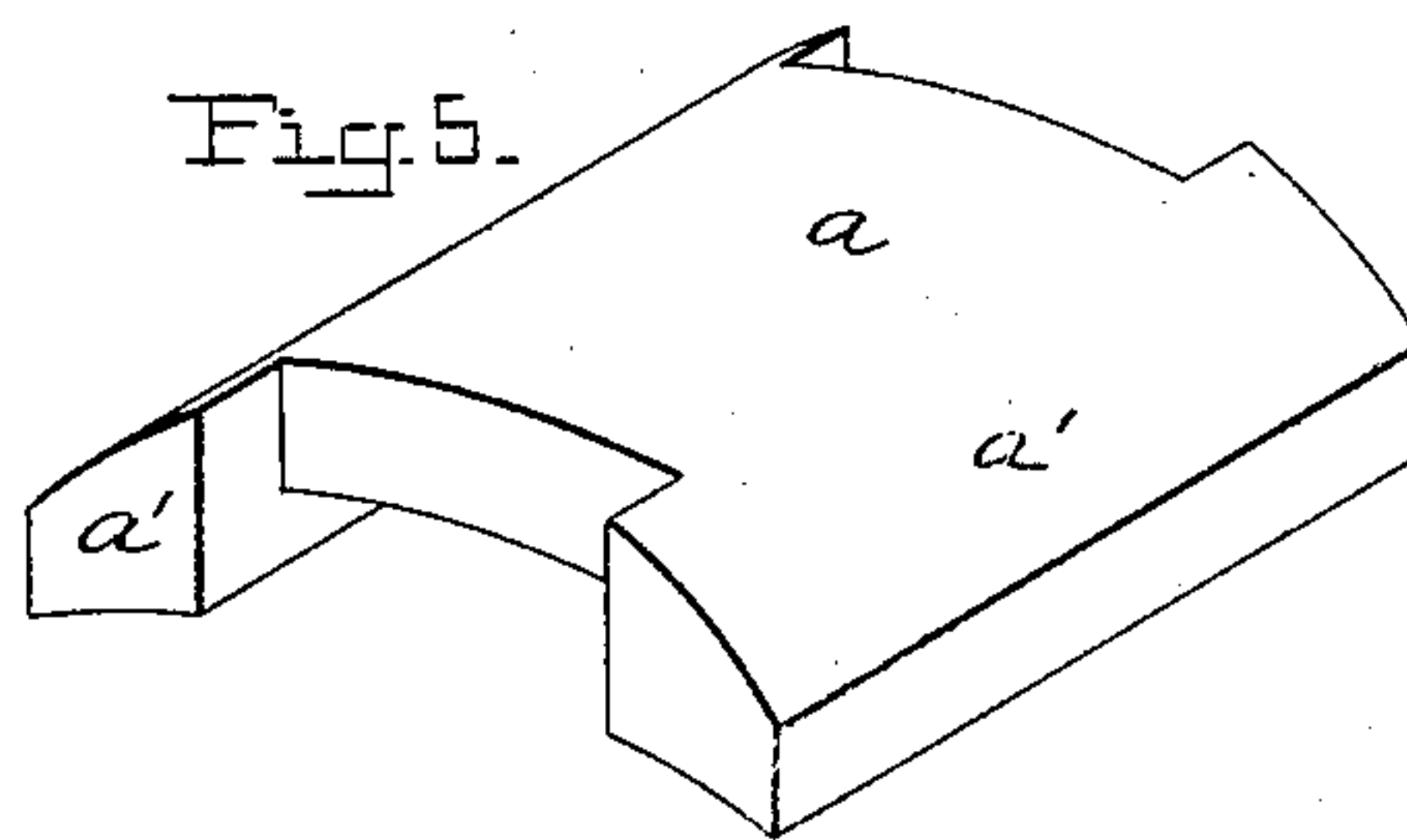
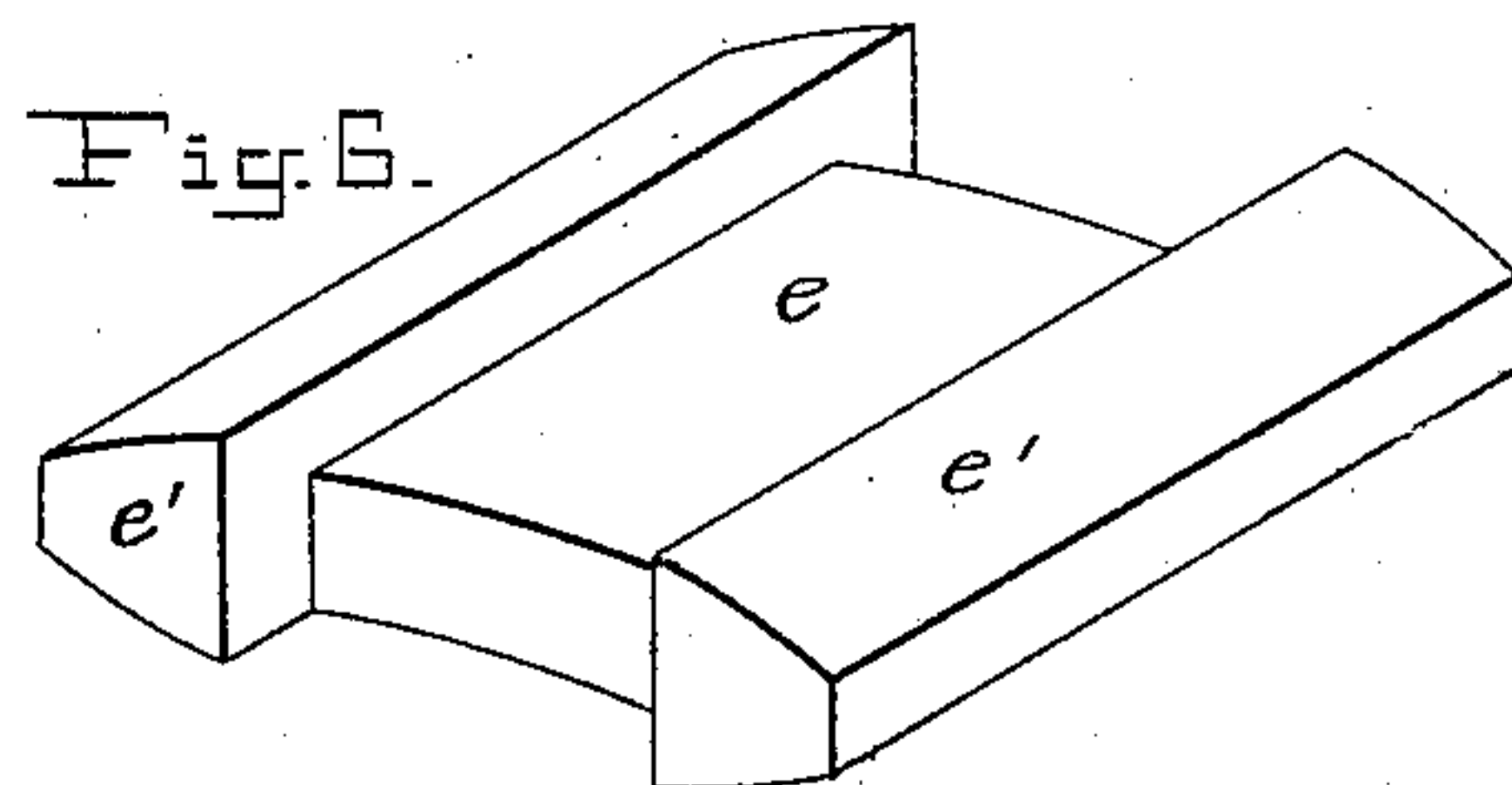
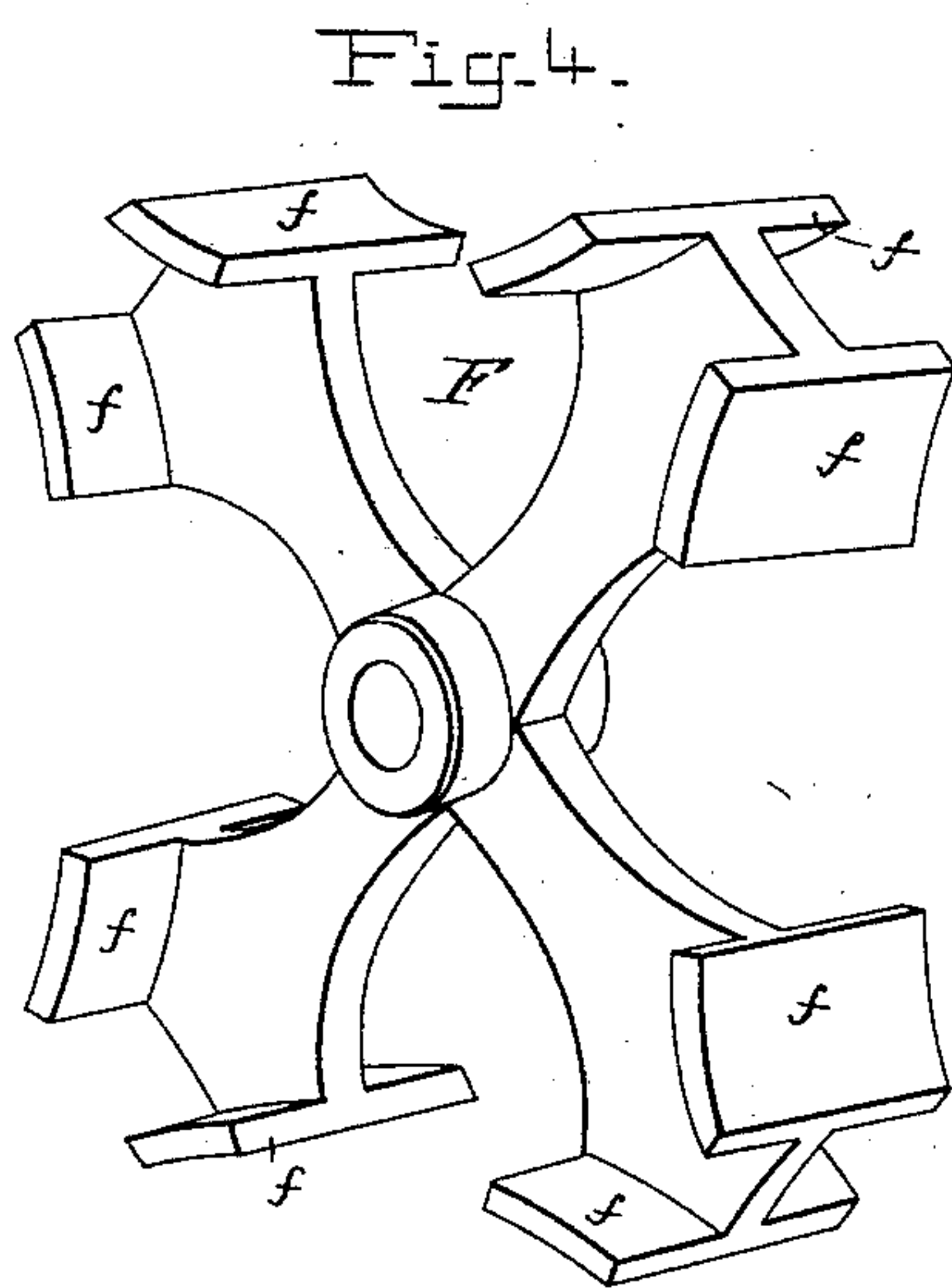
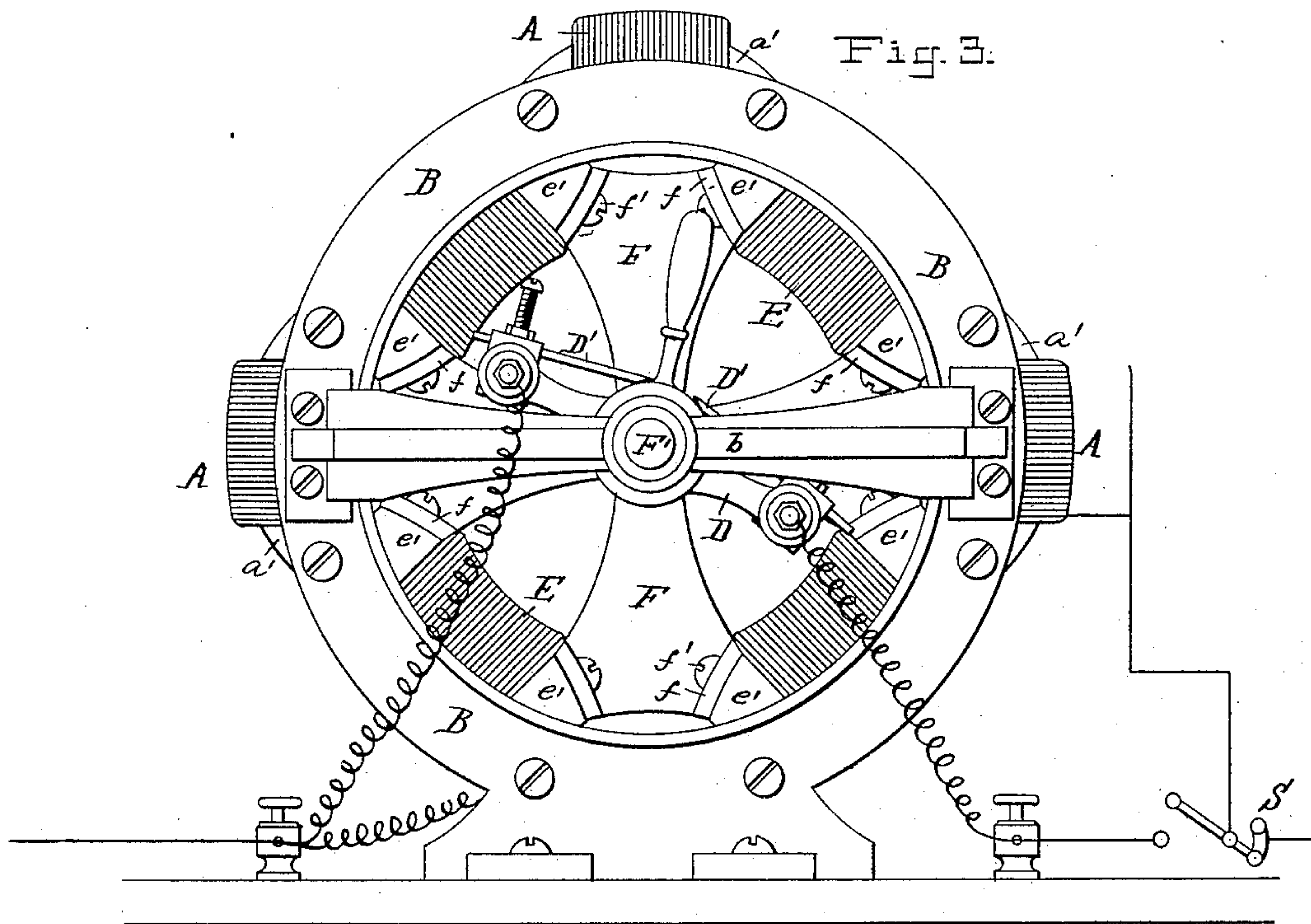
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2 Sheets—Sheet 2.

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E. J. Griswold  
John Revell

INVENTOR

Henry Humbert  
BY  
Horace and Henry  
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# UNITED STATES PATENT OFFICE.

HENRY HUMBERT, OF BROOKLYN, NEW YORK.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 432,707, dated July 22, 1890.

Application filed February 5, 1890. Serial No. 339,357. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY HUMBERT, a citizen of the United States, and a resident of Brooklyn, Kings county, State of New York, have invented certain Improvements in Electric Motors, of which the following is a specification.

The object of my invention is to produce an electric motor which will be simple and inexpensive in construction and be easily repaired.

In the accompanying drawings, Figure 1 is a vertical section of my improved electric motor with one of the side frames and the brush-holder and brushes removed. Fig. 2 is a sectional plan view with the brushes and brush-holder removed. Fig. 3 is a side view of the motor. Fig. 4 is a perspective view of the wheel or spider on which the electro-magnets of the armature are to be mounted. Fig. 5 is a perspective view of the core of one of the field-magnets. Fig. 6 is a perspective view of one of the cores of the armature-magnets.

My electric motor is of that general type in which the armature and the field magnets are arranged in a ring form, one within the other, and with the axes of the electro-magnets lying in the plane of rotation of the armature. In the present instance I have shown the outer ring of the electro-magnets as stationary and constituting the field-magnets, while the inner ring of the electro-magnets constitutes the rotating armature; but it will be understood that this arrangement may be reversed without departing from my invention. I have also shown the field-magnets as consisting of four electro-magnets and the armature as provided with an equal number; but I do not wish to restrict myself to any specific number of these parts. Whatever the number of electro-magnets for the field or for the armature, however, I make the several electro-magnets for the field alike and interchangeable, and in the same way I make the several electro-magnets for the armature alike and interchangeable.

A A are the electro-magnets for the field, and, as shown in Fig. 5, the core *a* of each electro-magnet is made on a slight curve and carries at opposite ends the enlarged pole-pieces *a'*. On the core between the pole-pieces are wound the coils. These electro-

magnets are arranged between and are bolted to the two side frames B B of the machine, the bolts being screwed into the large pole-pieces, as will be readily understood. These several electro-magnets are so spaced from each other that the adjacent polar faces of any two electro-magnets will be at a distance apart about equal to the distance between the two polar faces of each electro-magnet. The side frames, which are mounted on a suitable base, are of a non-magnetic material, so that the several electro-magnets for the field are magnetically independent of each other. The coils of the several electro-magnets of the field may be connected up in any suitable way.

The electro-magnets E of the armature have their cores *e* slightly curved, as shown in Fig. 6, to correspond with the curve of the field-magnets, and they have enlarged pole-pieces *e'*. The several electro-magnets E are carried by a wheel or spider F, and for convenience the enlarged pole-pieces are availed of to secure the electro-magnets to the wheel or spider by means of bolts *f'* passing through flanges *f* on the spider from the inside and into the pole-pieces. As shown in the drawings, the spider consists of a series of radial arms, each with two laterally-projecting flanges *f*, to which the electro-magnets are to be fitted, and these flanges are so arranged with reference to each other that the electro-magnets will be spaced from each other in the same manner as the magnets of the field are spaced from each other.

From the foregoing it will be seen that the several electro-magnets of the armature are interchangeable like the electro-magnets of the field, so that they may be kept in stock for the various sizes of machines, and in consequence machines cannot only be very economically and quickly built, can be readily repaired without removing any part but that which is to be replaced.

The wheel or spider F, on which the armature-magnets are mounted, is made of non-magnetic material, so that the several electro-magnets E are magnetically independent of one another. By thus separating the several armature-magnets from each other the trouble arising from eddy-currents is in moderate-sized machines sufficiently avoided to make it unnecessary to laminate the cores.



Any desired style or construction of commutator C may be employed, and the coils may be connected up in any convenient way. The brush-holder D also and the brushes D' are shown simply for the sake of illustration, and I do not wish to restrict myself to the particular forms thereof shown. The axis F' of the armature is mounted in suitable bearings in the cross-pieces b' in the frame, as illustrated in Figs. 2 and 3.

The armature-coils may be connected up either in series or in shunt with the field-magnet coils, and in Fig. 3 they are shown as connected up in shunt. In either case I combine therewith a switch S of such a character that when it is desired to stop the motor the armature-coils may be thrown out of circuit first, leaving the field-magnet coils or some of them in circuit, so that these field-magnet coils which are left in circuit for the moment may act as magnetic brakes to assist in quickly stopping the machine. Then by the further movement of the switch the whole machine may be thrown out of circuit.

Although I have described my machine simply as an electric motor, it will be readily understood that it may be used as a dynamo-electric machine also.

I am aware that it has been proposed to make electric generators or motors with armatures built up of electro-magnets with their axes in the plane of rotation of the armature and forming a complete ring, the electro-magnets having their adjacent pole-pieces of like polarity, but separated by strips of non-magnetic material. I have ascertained by experiment, however, that not only would such a motor be somewhat more expensive to build, but it would also give less power under like conditions than a motor constructed in accordance with my invention—that is, with an armature having the electro-magnets with their adjacent polar faces of different polarity and spaced apart from each other a distance equal to the space between the two polar faces of each magnet.

I claim as my invention—

1. An electric motor having field-magnets and provided with an armature consisting of a wheel or spider carrying a series of electro-magnets with their axes lying in the plane of rotation of the armature, the adjacent polar faces of any two electro-magnets of the armature being spaced apart from each other a distance about equal to the space between the two polar faces of each magnet, all substantially as described.

2. The combination of the non-magnetic side frames and electro-magnets bolted between them and spaced apart from each other a distance about equal to the space between the polar faces of each magnet with an armature composed of a wheel or spider carrying a series of electro-magnets similarly spaced from each other, the magnets of the field and armature having their axes in the plane of rotation of the armature.

3. An electric motor having field-magnets and provided with an armature consisting of a wheel or spider having flanges, a series of electro-magnets having their axes in the plane of rotation and fitted to the flanges of the wheel or spider, and securing-bolts passing through the flanges from the inside into the polar pieces, all substantially as specified.

4. An electric motor having field-magnets and provided with an armature consisting of a wheel or spider having radial arms, each with two laterally-projecting flanges, a series of electro-magnets having their axes in the plane of rotation and fitted to the said flanges of the wheel or spider, and securing-bolts therefor, all substantially as described.

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

HENRY HUMBERT.

Witnesses:

EDITH J. GRISWOLD,  
GEORGE BAUMANN.