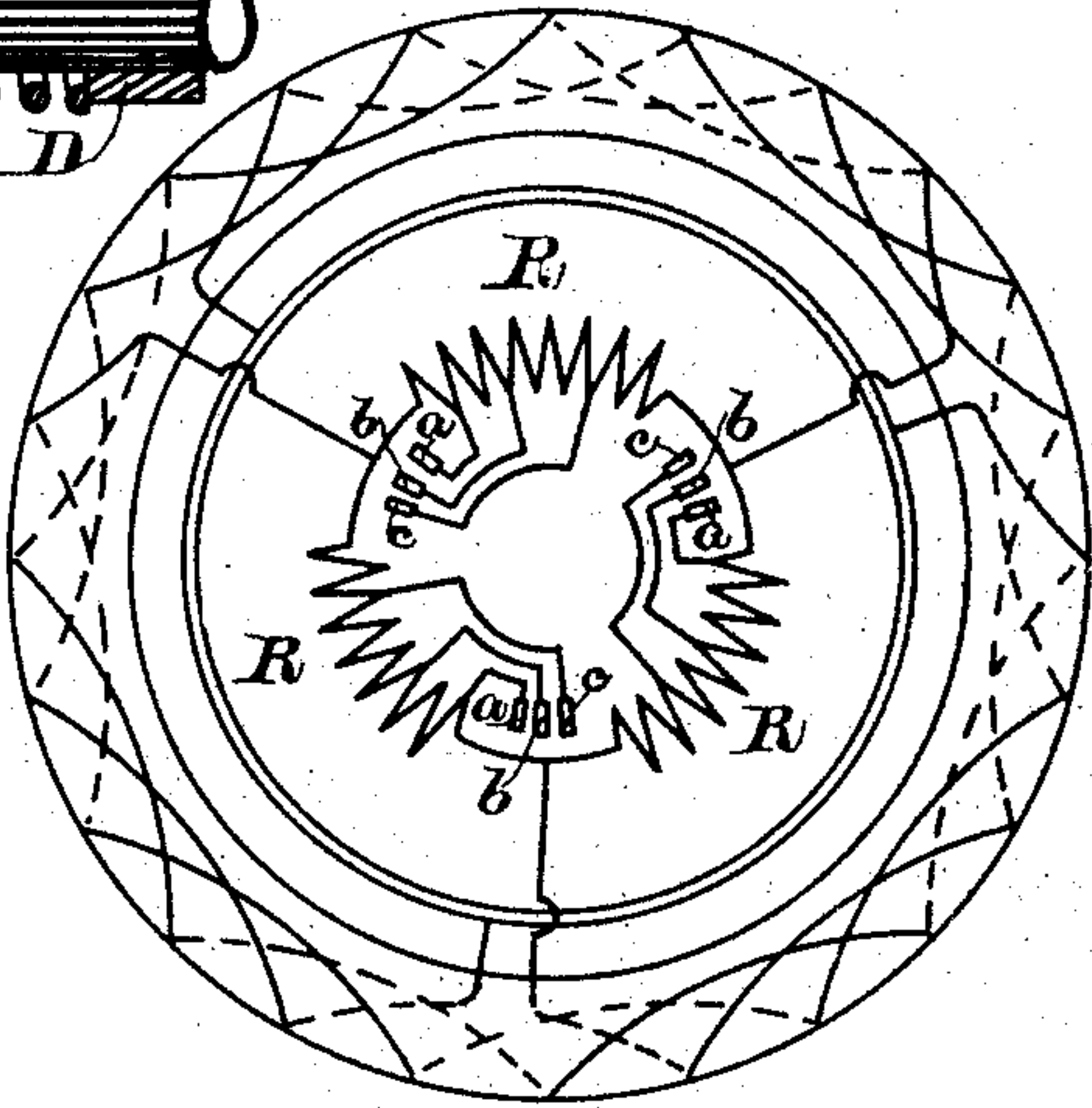
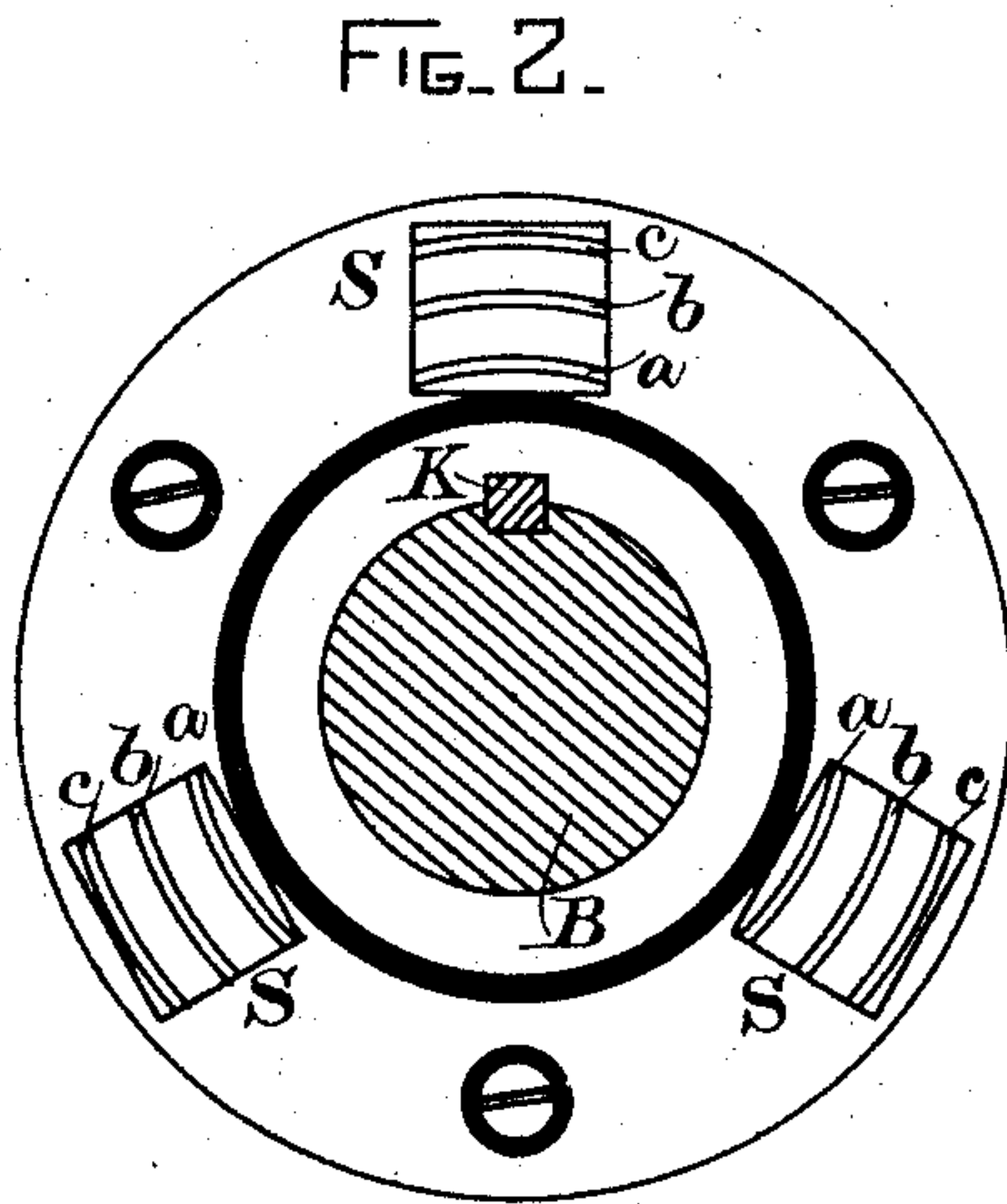
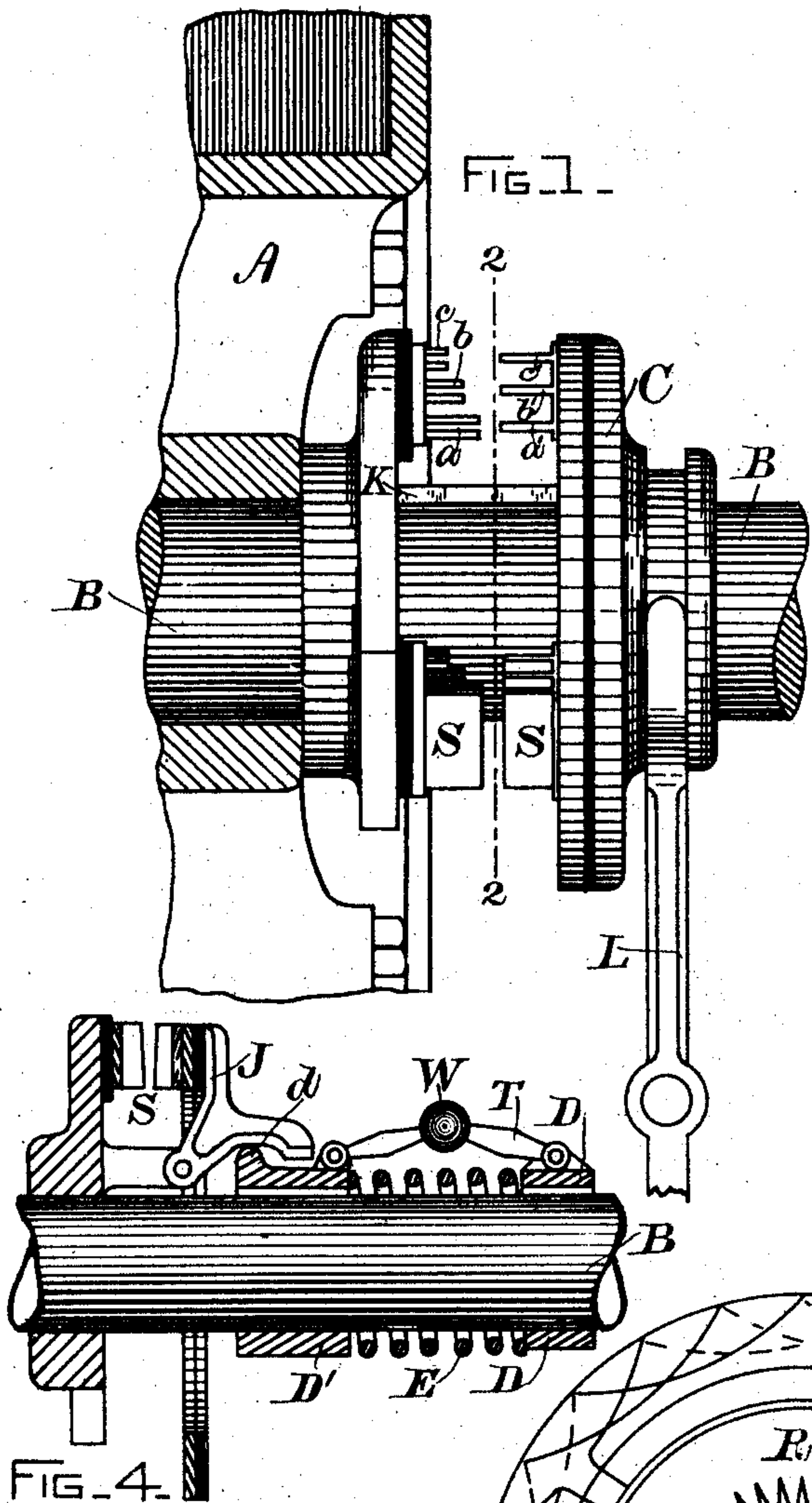


(No Model.)

L. BELL.
MULTIPHASE MOTOR.

No. 505,505.

Patented Sept. 26, 1893.



WITNESSES -
a. F. Macdonald.
H. J. Livermore

INVENTOR-
Louis Bell by
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Attys.

UNITED STATES PATENT OFFICE.

LOUIS BELL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE GENERAL
ELECTRIC COMPANY, OF SAME PLACE.

MULTIPHASE MOTOR.

SPECIFICATION forming part of Letters Patent No. 505,505, dated September 26, 1893.

Application filed June 14, 1893. Serial No. 477,512. (No model.)

To all whom it may concern:

Be it known that I, LOUIS BELL, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Multiphase Motors, of which the following is a specification.

My invention relates to electric motors of the alternating-current type in which the secondary member is provided with a closed-circuited induced winding.

The object of my invention is to secure a good starting torque by means of resistance in said closed-circuited winding, and to attain moreover the best running conditions by cutting out this resistance step by step as synchronizing speed is approached. Furthermore the use of brushes or rubbing contacts, which has heretofore been necessitated when the secondary member forms the revolving part of the motor is obviated, since the resistance and cut-out device are carried by and revoluble with the said secondary member. Such an arrangement is similar in many respects to that described in my application, Serial No. 450,955, filed November 4, 1892, and the present application is for an improvement upon the one described, its claims being understood to be limited by the broader ones of my prior application.

My invention is applicable to armatures of the kind above mentioned when used with a magnetic field produced by either single or plural phase alternating currents.

In the accompanying drawings, which show an embodiment of my invention, Figure 1 is a side elevation partly in section of an improved switching mechanism adapted to the operation of my invention. Fig. 2 is a section upon the line 2, 2, of Fig. 1, looking to the left. Fig. 3 is a diagram of the connections, and Fig. 4 is a side elevation partly in section of an automatic switching apparatus which I may employ.

Referring by letter, A is a closed circuited armature as there shown, carried upon the shaft B and wound and otherwise constructed in any ordinary and well known manner. At the terminals of the coils I insert resistances R, R, R, which resistances I divide into sec-

tions; and for each section I provide a switching or short-circuiting contact, preferably of the knife-blade variety. These switches S, S, S, are illustrated in Figs. 1, 2 and 3 where *a, b, c* are the switch-blade contacts. The resistances and one set of contacts adapted to short-circuit them are carried by the armature and revolve with it; the short-circuiting blades entering between the two blades shown at *a, b, c*, are indicated by *a', b', c'* and are carried upon a disk C which is carefully insulated, as indicated in Fig. 1; this disk is provided with a key-way making a working fit on a feather-key, which secures the armature to its shaft, and it may be thrown backward or forward by means of the lever L. As thus constructed the mechanism is adapted to manual operation only and is worked as follows: Upon starting the motor all the resistances R, R, R are left in circuit, the switch-blades *a', b', c'*, being withdrawn from the short circuiting contacts *a, b, c*; as the speed rises a part of each resistance is cut out by moving the lever L thus sliding the disk C upon the shaft with which it revolves and inserting switch contact *a'* between the blades of the contact *a*, thus short circuiting a part of the resistance; the speed rising still further, the operation is repeated with contacts *b, c*, until all the resistance is short circuited and the arrangement runs at its normal speed. I may however, operate the resistances automatically and successively as the speed rises by the apparatus illustrated in a simple form in Fig. 4. Therein B is the armature shaft to which is secured a collar D and upon which slides another collar D' making a working fit. Between the two collars is a spring E, and they are further connected by the toggle T provided with a small weight W. Upon the sliding collar D' is a cam surface *d* operating upon the under surface of the bell-crank J, one of which cranks may be provided for each of the switching mechanisms S shown in the other figures of the drawings. The application of this device will be readily understood from its description and is briefly thus: As the speed in the armature rises, centrifugal action drives the weight W outward and the toggle T draws the sliding collar D' toward the fixed

collar D against the force of the spring E, causing the cam surface *d* to operate the bell-crank J and close the switch contacts at S.

Having thus described my invention, what I claim as new, and wish to protect by Letters Patent of the United States, is—

1. In an electric motor of the inductive type, the combination with a revolving secondary member normally closed-circuited through a resistance moving therewith, of means for varying said resistance, as described.

2. In an electric motor of the inductive type, the combination with a revolving secondary member having a closed-circuited winding, of a resistance in said winding revolving therewith, and means for gradually lowering said resistance by successively short-circuiting portions thereof, as set forth.

3. In an electric motor of the inductive type, the combination with a revolving secondary member having a winding normally closed-circuited through a resistance revolving therewith, of circuit-closing devices such as switch-contacts mounted on said secondary member and revoluble therewith, and means for operating said circuit-closing devices to short-circuit successive portions of said resistance, as set forth.

4. In an electric motor having a closed cir-

cuit armature, the combination of resistances carried upon the armature between the coils and divided into sections with a switching mechanism carried upon the armature shaft and adapted to short-circuit the sections of the resistances successively.

5. In an electric motor, the combination with a revolving secondary member closed-circuited through a resistance movable therewith, of a speed responsive device adapted to gradually remove said resistance from circuit as the speed increases, substantially as set forth.

6. In an electric motor having a closed circuited armature-winding the combination with resistances in circuit with said winding and carried therewith upon the armature shaft, said resistances being divided into sections, of automatic switching mechanism also mounted on said armature shaft and responsive to the speed thereof, whereby successive sections of the resistance are short-circuited as the speed increases, as set forth.

In witness whereof I have hereunto set my hand this 12th day of June, 1893.

LOUIS BELL.

Witnesses:

JOHN W. GIBBONEY,
BENJAMIN B. HULL.