No. 745,772. PATENTED DEC. 1, 1903.

D. M. BLISS.

INDUCTION MOTOR.

APPLICATION FILED AUG. 17, 1903.

NO MODEL.

Fig. 2.

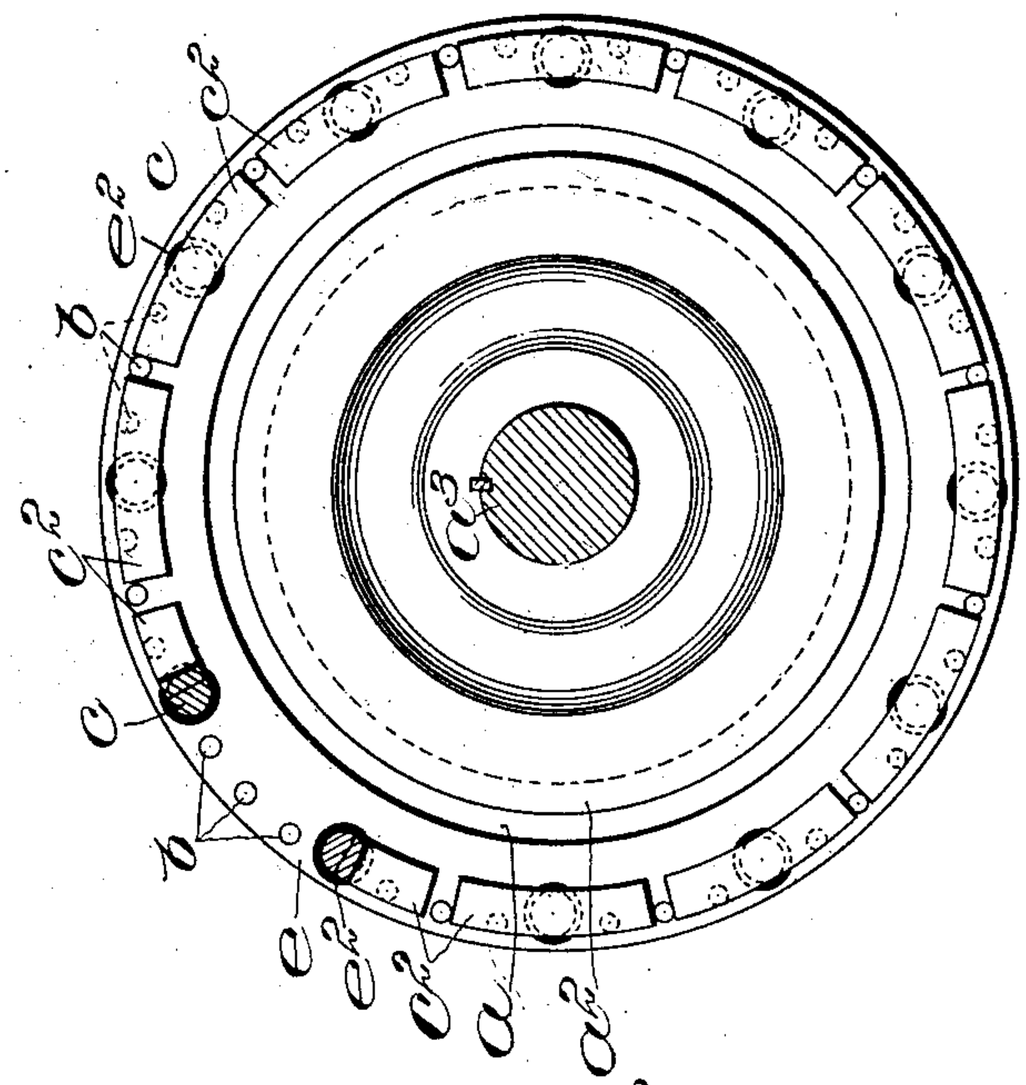
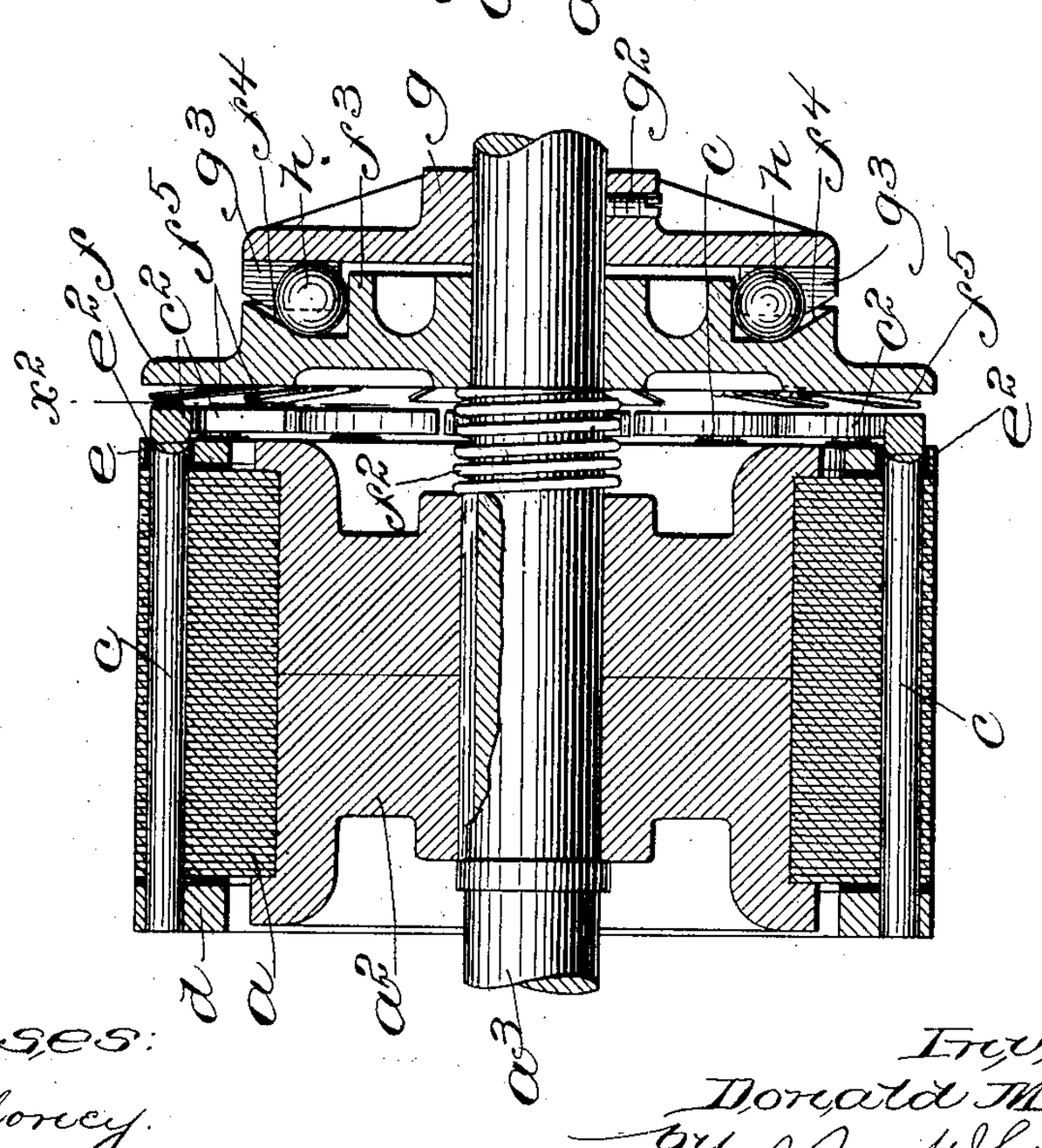


Fig. 1.



Witnesses:

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No. 745,772. Patented December 1, 1903.

UNITED STATES PATENT OFFICE.

DONALD M. BLISS, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO HOLTZER-CABOT ELECTRIC COMPANY, A CORPORATION OF MASSACHUSETTS.

INDUCTION-MOTOR.

SPECIFICATION forming part of Letters Patent No. 745,772, dated December 1, 1903.

Application filed August 17, 1903. Serial No. 169,775. (No model.)

To all whom it may concern:

Be it known that I, DONALD M. BLISS, a citizen of Canada, residing in Brookline, county of Norfolk, and State of Massachusetts, have invented an Improvement in Induction-Motors, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to induction-motors of the so-called "squirrel-cage" type, the object of the invention being to obviate the necessity of using an excessive current for starting the motor, which is due to the comparatively low resistance in the permanently-closed secondary circuit. For this purpose the invention is embodied in a motor having its secondary member provided with two independent systems of inductors, one of the said systems being of comparatively high resistance and permanently closed, while the other is of much lower resistance and provided with a device which operates in response to the speeding up of the motor to close said low-resistance system after a predetermined speed has been reached. By this expedient the motor can be started with a reasonably small current not substantially in excess of that which is capable of operating the motor when under load.

In carrying out the invention the secondary member of the motor is provided with the usual laminated core, having a permanently-closed squirrel-cage winding consisting of small copper rods extending across through the core and permanently connected at their ends with the conducting-rings at opposite sides of the armature. This system of inductors is of comparatively high resistance and will give the desired starting torque with a comparatively small current. In addition to the starting system of inductors the armature is provided with an independent system, comprising a number of inductors extending across through the laminated core, the said inductors being connected together at one end of the armature, but separated from each other at the opposite end of the armature and insulated throughout from the high-resistance system, so that current will not be induced in them until the separated ends are electrically connected together.

In connection with the low-resistance system the armature is provided with an automatic circuit-closer, which may be operated in any suitable way in response to an increase of speed in the motor, a circuit-closer of novel construction being herein shown the movable member of which is acted upon by centrifugal force, so as finally to come to a position in which the separated ends of the low-resistance inductors are electrically connected together. Thus when the motor is up to speed the combined inductors will afford a path for current having sufficiently low resistance and large capacity to carry the full-load current without abnormal heating.

Figure 1 is a longitudinal section of the secondary member of a motor and circuit-closer therefor, embodying the invention, and Fig. 2 is a section on line x^2 of Fig. 1.

Referring to Fig. 1, the secondary member comprises the laminæ *a*, of the usual type, mounted in the support a^2, which is herein shown as keyed upon the shaft a^3, the secondary member in this case being indicated as the rotating member. The laminæ *a* are punched, as usual, so as to receive the transversely-extending inductors *b* and *c*, the inductors *b* constituting the high-resistance circuit above described and being permanently connected at their opposite ends with the rings *d* and *e* at the opposite ends of the armature.

The inductors *c*, which are herein shown as fewer in number, but of much greater current-carrying capacity, are permanently connected at one end with the ring *d* and extend through the laminæ *a* and through the ring *e*, from which they are shown as separated by insulating material e^2, the opposite ends of the inductors *c*, however, being disconnected from each other, as shown in Fig. 2.

The inductors *c*, since they are separated some distance from each other, are shown as provided at their disconnected ends with laterally-extended portions c^2, which afford a large area of contact with the automatic switch member *f*, which serves to connect them together, so as to form a closed low-re-

sistance circuit after the motor is up to speed. As herein shown, the said member f consists of a collar loosely mounted on the shaft a^3 and normally pressed away from the ends of the inductors c by means of a spring f^2, shown as interposed between said collar and the core-support a^2.

The movement of the member f away from the armature-core is limited by a flange member g, shown as connected by a set-screw g^2 with the shaft a^3, the switch member f not, however, bearing directly against the flange member g, but against centrifugally-acting members h, herein shown as balls resting on a flange f^3, formed around the member f, and being maintained in position by means of wings g^3, formed on the member g. The said balls normally rest in the position shown in Fig. 1; but as the speed of the shaft a^3 increases the said balls will be thrown away from the axis of the shaft by centrifugal force and in so doing will act upon an annular inclined surface formed on one or both of the members between which the balls are interposed, herein shown as the inclined or beveled surface f^4, formed on the member f, thereby tending to press the said member toward the core until the contact-springs f^5, with which the member f is provided, come into contact with the enlarged portions c^2 of the inductors c, thus connecting all of the said inductors together. The inductors c then constitute a closed circuit of comparatively low resistance, and the said circuit carries practically all the working current under full load.

The proportion in number of elements and amount of capacity between the two systems may be varied to suit different conditions, and in practice the low-resistance or working system may be arranged with a comparatively small number of inductors. As herein shown, for example, the starting or high-resistance system is provided with thirty-six inductors of comparatively high resistance, while the working or low-resistance system only includes twelve inductors of comparatively large capacity and low resistance.

While the automatic circuit-closing device herein shown is novel and practicable and forms a part of the present invention, it is obvious that other expedients might be employed for the same purpose, and I do not, therefore, intend to limit the invention so far as relates to the broader features thereof to any specific construction and arrangement of the automatic switch. Furthermore, with regard to the other features of the invention it is obvious that modifications may be made without departing from the invention.

I claim—

1. In an induction-motor, a secondary member of the squirrel-cage type, comprising a system of permanently-closed inductors of comparatively high resistance; an auxiliary system of inductors of comparatively low resistance, the circuit through which is open; and means for closing the circuit through said low-resistance system after the motor has started.

2. In an induction-motor, a secondary member provided with a permanently-closed circuit of comparatively high resistance; a second open circuit of comparatively low resistance; and means for automatically closing said second low-resistance circuit after the motor has reached a predetermined speed, substantially as described.

3. In an induction-motor, a secondary member of the squirrel-cage type, comprising a system of permanently-closed inductors of comparatively high resistance; an auxiliary system of inductors of comparatively low resistance, the circuit through which is open; a circuit-controller comprising a member longitudinally movable on said secondary member; an abutment to limit the movement of said member; means for yieldingly pressing said member toward said abutment; and bodies adapted to be acted upon by centrifugal force, interposed between said member and said abutment, one of said parts being provided with inclined surfaces to be acted upon by said bodies, as set forth.

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

DONALD M. BLISS.

Witnesses:
HENRY J. LIVERMORE,
JAS. J. MALONEY.