No. 847,111. PATENTED MAR. 12, 1907.

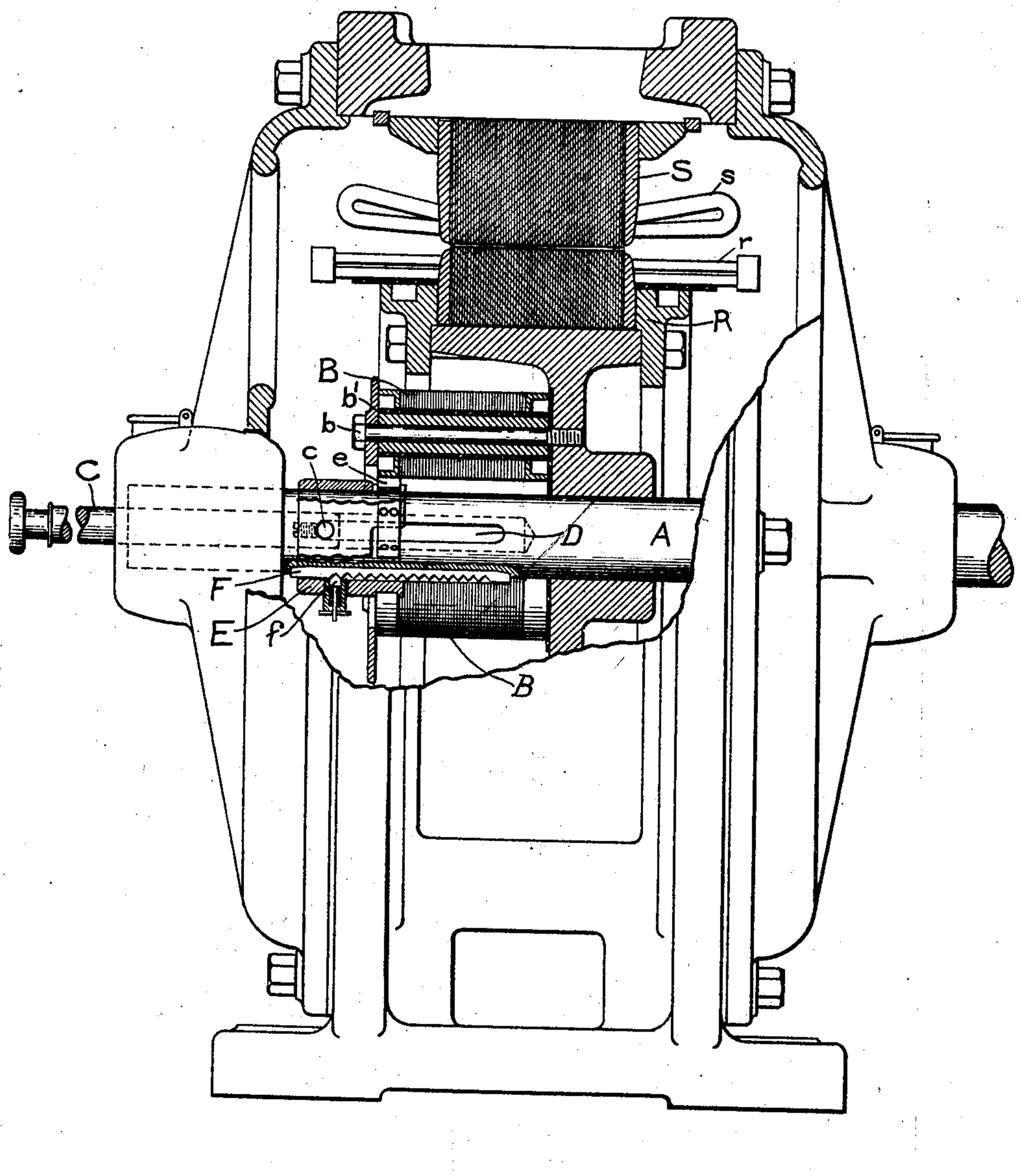
H. G. REIST.

STARTING RESISTANCE FOR MOTORS.

APPLICATION FILED JUNE 23, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

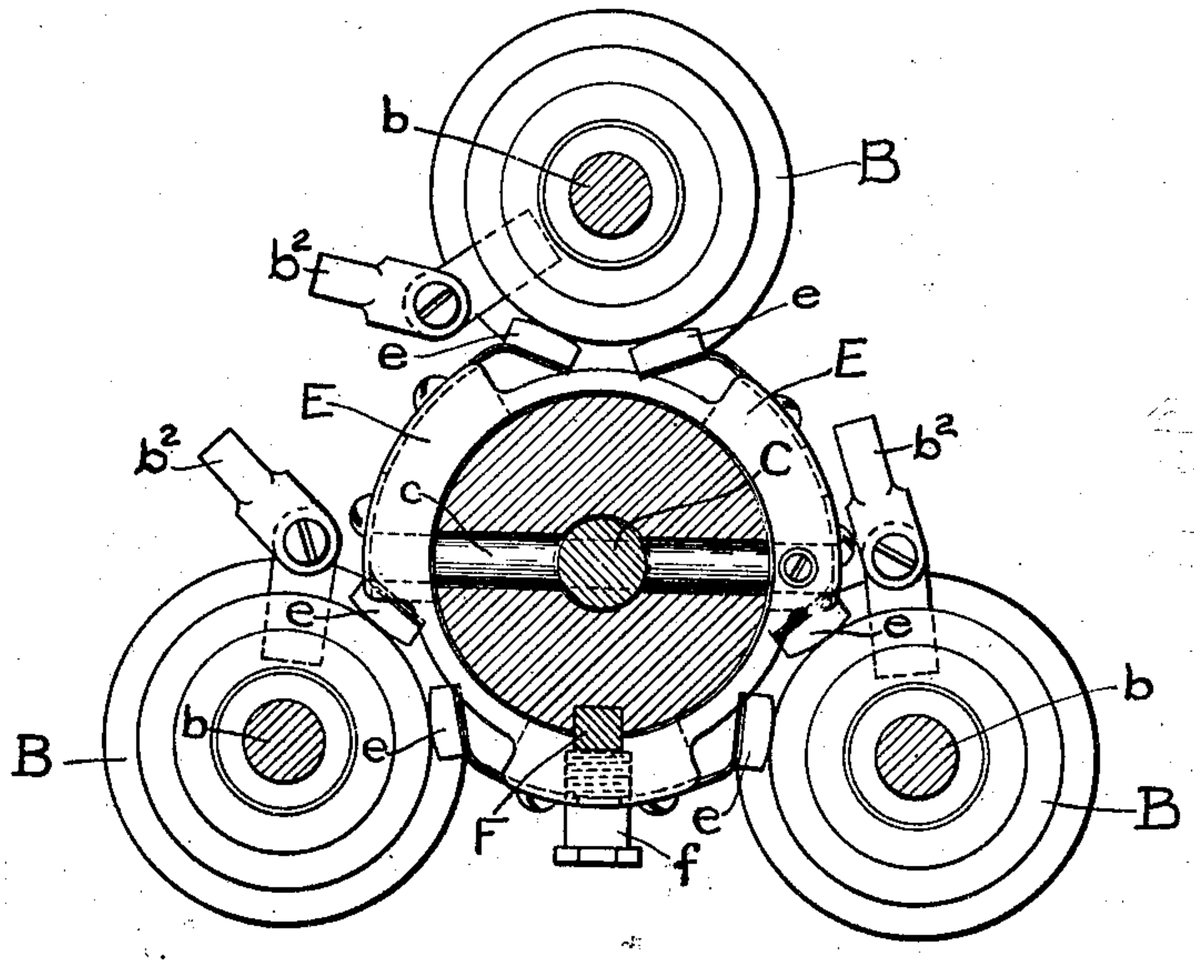
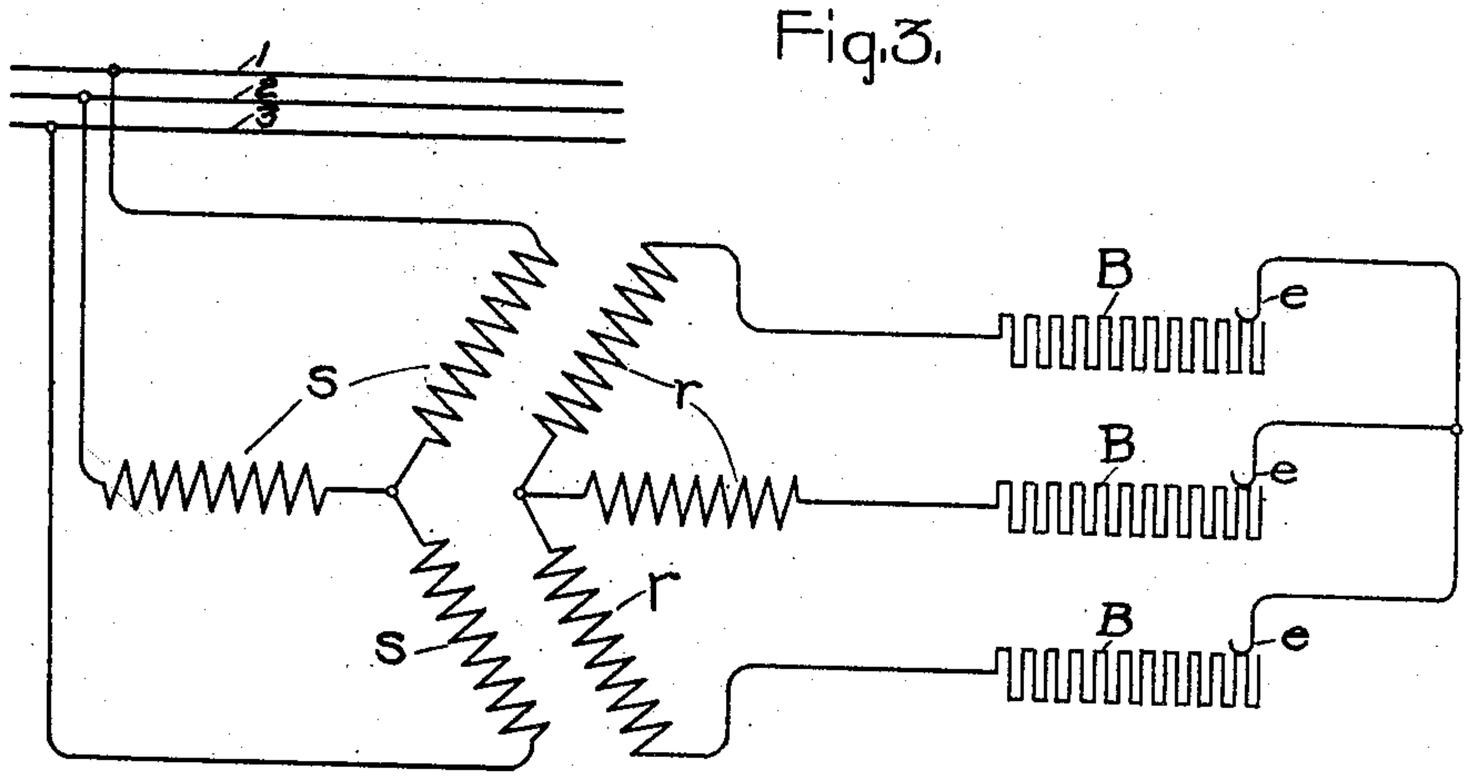


Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY G. REIST, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STARTING RESISTANCE FOR MOTORS.

No. 847,111. Specification of Letters Patent. Patented March 12, 1907.

Application filed June 23, 1904. Serial No. 213,782.

To all whom it may concern:

Be it known that I, HENRY G. REIST, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Starting Resistances for Motors, of which the following is a specification.

My invention relates to alternating-current motors of the induction type; and its object is to provide a novel arrangement of the starting resistance and controlling-switch therefor.

It is well understood that in order to give induction-motors a high starting torque it is necessary to short-circuit the secondary coils at starting through resistances, which are gradually cut out as a motor comes up to speed. In order to avoid sliding contacts, it is necessary to mount the resistances on the rotor. It is also necessary to provide a suitable switch for cutting out the resistance as a motor comes up to speed. Many of the forms of starting resistance that have been proposed heretofore occupy a considerable space and are unsuitable where space is an important item.

By my invention I provide a very compact arrangement of the starting resistance and controlling-switch which reduces to a minimum the space required for mounting the resistances and switch on the rotor.

My invention will best be understood by reference to the accompanying drawing, in which—

Figure 1 shows an induction-motor, partly in cross-section, arranged in accordance with my invention. Fig. 2 shows an end view of the resistances and controlling-switches, and Fig. 3 is a diagram of connections.

In Fig. 1, S represents the stator of an induction-motor carrying the stator-coils *s*. R represents the rotor carrying the rotor-coils *r*. B B represent resistances which are formed as bobbins, each comprising a thin strip of resistance material wound on edge. The strip is preferably wound non-inductively in the well-known manner by winding alternate sections in opposite directions. The resistance material is provided with an insulating-coating which insulates adjacent turns from each other. This form of resistance unit is described in Patent No. 803,795, issued to G. E. Stevens November 7, 1905. Each bobbin B is secured to the rotor by a bolt *b*, this bolt being insulated from the resistance material. The rotor is formed with an offset flange which is secured to the shaft and supports the portion which carries the winding. By bolting the bobbins to this flange, as shown in the drawing, they are supported beneath the rotor-winding and do not increase the width of the rotor. A ring *b'* is clamped against the outer ends of the bobbins and takes up the centrifugal strain. The rotor-shaft A is hollowed out for a portion of its length to receive a rod C, which is shown in Fig. 1 entering the left-hand end of shaft A. The rod C carries a pin *c*, which extends outward through a slot D in shaft A and carries a collar E. This construction is clearly shown in detail in Fig. 2. The collar E carries a plurality of brushes *e*, which are all grounded on the collar or otherwise electrically connected to each other. These brushes bear on the outer surfaces of the bobbins B. The outer surfaces of the bobbins are uninsulated, so that as rod C is pushed inward, moving the collar E toward the rotor-spider, the brushes *e e*, traversing the outer surface of the bobbins B, vary the amount of resistance in the rotor-circuit.

The connections are shown diagrammatically in Fig. 3, in which *s* represents the stator-coils connected to the line-wires 1 2 3. The motor in this particular diagram is shown as three-phase. The rotor-coils *r* are also shown as three-phase, each phase being connected in series with a bobbin B by means of the terminals b^2. (Shown in Fig. 2.) The three brushes *e* are shown electrically connected in Fig. 3, and it is seen that as these brushes are moved toward the rotor the amount of resistance in the rotor-circuit is gradually reduced.

In order to hold the brushes in any given position and to prevent too rapid a movement of the brushes when manually controlled, I provide the notched key or rack F, secured to or let into the shaft D and adapted to be engaged by a spring-pressed pawl *f*, carried by the collar E. The spring which controls pawl *f* is given sufficient strength to hold the collar E in any desired position and to produce a step-by-step movement of the collar when pushed inward or retracted by rod C.

The construction and arrangement of parts may be varied without departing from my in-

vention, and I aim in the appended claims to cover all such modifications.

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

1. In a motor, a member supporting the rotor-winding and having a supporting offset flange secured to the shaft, a plurality of bolts secured to said flange and distributed around the shaft and extending parallel thereto, resistance-bobbins mounted on said bolts and insulated therefrom, a ring engaging the outer ends of said bolts and holding them against centrifugal strain, and axially-movable contacts engaging the peripheries of said bobbins.

2. In a motor, a member supporting the rotor-winding and having a supporting offset flange secured to the shaft, a plurality of bolts secured to said flange and distributed around the shaft and extending parallel thereto, resistance-bobbins mounted on said bolts and insulated therefrom, a ring engaging the outer ends of said bolts and holding them against centrifugal strain, an axially-movable collar surrounding the shaft, and contacts carried by said collar and engaging the outer peripheries of said bobbins.

3. In a motor, resistances mounted on the rotor, axially-movable contacts adapted to engage said resistances, a notched rack on the shaft, and a spring-pressed pawl carried by the movable contacts and engaging said rack.

4. In a motor, a collar surrounding the shaft and axially movable thereon, contacts carried by said collar, resistances mounted on the rotor and adapted to be engaged by said contacts, a notched rack on the shaft, and a spring-pressed pawl carried by said collar and engaging said rack.

5. In a motor, resistance-bobbins mounted on the rotor with their axes parallel with the shaft, a collar axially movable on the shaft, contacts carried by said collar and adapted to engage the peripheries of said bobbins, a notched rack on the shaft, and a spring-pressed pawl carried by said collar and engaging said rack.

In witness whereof I have hereunto set my hand this 22d day of June, 1904.

HENRY G. REIST.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.