No. 683,235. Patented Sept. 24, 1901.

# R. THURY.

## MOTOR GENERATOR.

(Application filed Jan. 11, 1900.)

(No Model.)

Fig. 1.

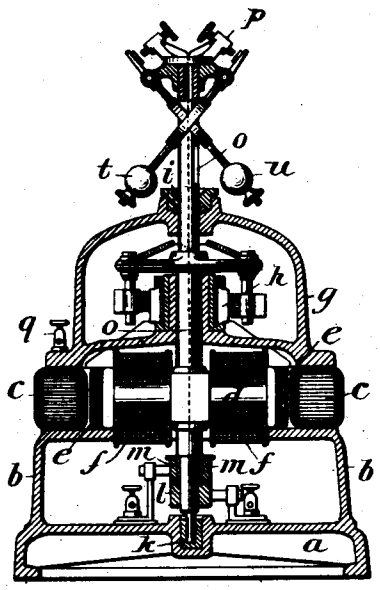



Fig. 3.

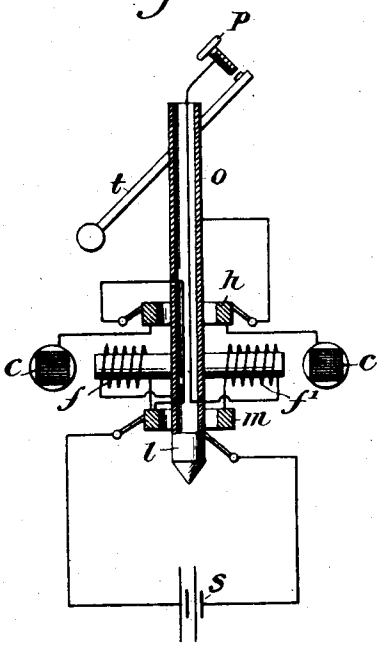
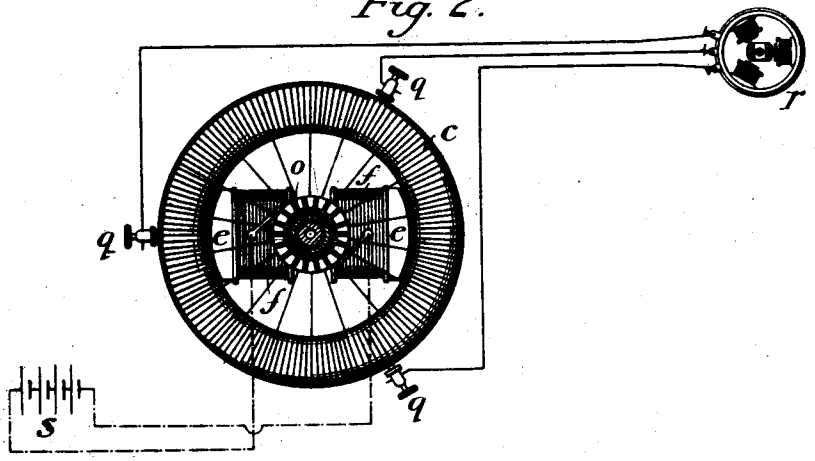



Fig. 2.




Witnesses:

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# UNITED STATES PATENT OFFICE.

RENÉ THURY, OF GENEVA, SWITZERLAND.

## MOTOR-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 683,235, dated September 24, 1901.

Application filed January 11, 1900. Serial No. 1,050. (No model.)

*To all whom it may concern:*

Be it known that I, RENÉ THURY, of Geneva, Switzerland, have invented a new and useful Improvement in Motor-Generators, of which the following is a specification.

The object of the present invention is to provide an alternator generating high-tension currents of practically constant frequency. The power generated by such an alternator is adapted to be supplied to motors or other devices desired to move in synchronism and at a fixed constant speed.

My invention relates more particularly to that type of alternating-current generator known as a "motor-transformer" and to the peculiar construction of the same, together with the means of regulation of the speed, all of which is hereinafter more particularly described.

In the drawings, Figure 1 is a vertical section of the motor-transformer. Fig. 2 is a plan of the same, showing external circuits to and from the motor-transformer. Fig. 3 is a diagrammatical view of the circuits of the motor-transformer.

On a solid metallic block or base *a* are fixed two columns *b*, supporting an armature *c*, preferably wound according to the Gramme-Paccinoti system. Within this armature is a revolving inductor composed of a horizontal core of soft iron *d*, through which is a hollow vertical axis, to which it is fixed. This inducing-core terminates at both of its extremities in a pole-piece *e*, carrying two induction-coils *f* and *f'*. The said coils are differentially wound, the differential winding *f'* being used for controlling purposes. Above the ring there is provided a second support *g*, which is surmounted by the fixed commutator *h* and by the bearing *i*, guiding the axis. The said bearing is preferably supplied with balls or rollers to reduce friction and to do away with the use of lubricants. A second bearing *k* is placed directly on the base to guide and support the axis, together with the other parts fixed thereto. On the said axis are fixed two rings *l* and *m*, one of which is not to be insulated, while the other one must be insulated. These rings are intended to transfer the continuous current first to the exciting-coil and to two movable brushes, which distribute the current to the armature *c* by means of the commutator *h*, having a sufficient number of sections.

*o* is an axis carrying on its upper portion a conical pendulum or governor with at least two arms, the said pendulum or governor being preferably provided with crossed arms, as shown in Fig. 1, so as to be as sensitive as possible, which is a necessary condition to a perfect control. One or more of the arms of this pendulum carry contacts, one surface of which is fixed and insulated on the support *p*, which is composed of an adjustable screw connected to the regulating-coils of the inductor, so that when the arms of the pendulum deviate beyond a certain limit the said contact will be broken. The polyphase current is received directly from the armature-coils *c* by means of three connections made on each third portion of the winding. If instead of three phases another number of phases is required, the coils of the armature *c* must be subdivided accordingly.

*q* represents contact-pieces soldered to the terminals and adapted to receive the wires of the line. Fig. 2 shows plainly the position of the terminals on the armature *c* and the three wires leading to a synchronous motor *r*. It is admissible to replace one of these wires by the earth.

*s* is the source of continuous current. *d* is the revolving inductor in direct connection with the source *s*. The fixed armature-ring *c* is wound in one of the well-known ways used in the construction of dynamos. The fixed commutator *h* surrounds the axis without touching it. The sections of the same, the number of which must be divisible by three, are in regular connection with the ring, according to the usual scheme used in continuous-current machines. If the number of commutator-sections is not divisible by three, the phases of the currents induced in the coils will not be equal to each other.

It is evident that the device, as shown and described, with the arrangement of a revolving field may be made in the inverse way. Instead of rotating the field the armature may be rotated, in which case rings must be provided to collect the polyphase current. The controlling of the apparatus is obtained by means of one portion of the exciting-coil especially designed for this purpose. This

portion of the coil being wound differentially has the effect of weakening the field, which corresponds with the acceleration of the number of revolutions per minute. As soon as the arms of the pendulum *t u* are sufficiently deviated the circuit through the differential coil is opened by the contacts, the field becomes strengthened, and the speed lessened. The object of this device is to reduce to a minimum the current passing through the contacts of the regulator, so as to preserve said contacts from being injured.

Referring to Fig. 3, the circuits in the main distributer are here diagrammatically shown. The battery *s* or other source of electric energy supplies the current to the motor-distributer. The current is led to ring *m*. Here it is shunted into three circuits, one passing through the direct coils *f* on the magnet-cores *d* and the second passing through the differential coils *f'* on the magnet-cores *d*, thence to the contact-post *p*, and back through the shaft to the negative pole of the battery. The third shunted circuit passes through a set of armature-coils *c* by means of the revolving brushes and the fixed commutator *h*. Thus it will be understood how the speed is maintained constant by regulating the magnetic field in the cutting in and out of the differential fields by the pendulum or governor *t*. The speed of this motor-transformer, and consequently that of a motor or motors which may be made to move in synchronism with it, may be made so practically constant that the motor-transformer is adapted to be used to supply power for driving motor-clocks or similar devices.

I claim as my invention—

1. In an apparatus for producing polyphase electric currents of constant frequency and in combination, a continuous-current motor comprising an annular stationary armature, a revolving differentially-wound field, a ball-governor for cutting in and out the differential coils of said field for the purpose of controlling the speed of the apparatus and means for collecting the polyphase current directly from the armature, substantially as set forth.

2. In a motor-generator, the combination with a base, frame and source of electrical energy, of an armature, a hollow vertical shaft mounted in said frame, differentially-wound revolving field-coils, slip-rings on the lower end of said shaft, one of which is insulated from the shaft and the other in direct connection therewith, a centrifugal governor on the upper end of said shaft, electrical connections from said source of energy to the said slip-rings, electrical connections from said slip-rings through the said governor and the differential coils of said revolving fields to cut the same in and out with any variation of the speed and means for collecting a polyphase current directly from the armature, substantially as and for the purposes set forth.

3. In a motor-generator, the combination with a base, frame and source of electrical energy, of an armature, a hollow vertical shaft mounted in said frame, revolving differential field-coils, slip-rings on the lower end of said shaft one of which is insulated therefrom and the other in direct electrical connection therewith, electrical connections from the said source of power to the said slip-rings and therefrom through the direct windings of said differential field-coils and means for collecting a polyphase current directly from the armature, substantially as and for the purposes set forth.

4. In a motor-generator the combination with a base, frame and source of electrical energy, of an armature, a hollow vertical shaft mounted in said frame, differential field-coils, slip-rings on the lower end of said shaft one of which is insulated therefrom and the other in direct electrical connection therewith, a commutator on said frame, revolving brushes bearing on said commutator and fixed in a holder secured to said shaft, electrical connections from the source of said energy to the said slip-rings and therefrom through the said brushes, commutator and armature and means for collecting a polyphase current directly from the armature, substantially as and for the purposes forth.

5. In a motor-transformer the combination with a base, frame, source of electrical energy and means for distributing the alternating current generated, of a stationary armature, a hollow vertical shaft mounted in said frame, differentially-wound revolving fields secured to said shaft, a centrifugal governor secured to the upper end of said shaft, a stationary commutator on said frame, brushes secured to said shaft and bearing on said commutator, slip-rings on the lower end of said shaft one of which is insulated therefrom and the other in direct electrical connection therewith, and electrical connections from said source of energy to the said slip-rings and therefrom, by independent circuits, through the said brushes, commutator and armature, through the direct windings of said revolving fields, and through the said governor and differential windings of said revolving fields, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

RENÉ THURY.

Witnesses:
E. IMER-SCHNEIDER,
L. A. MUUMAY.