No. 894,015. PATENTED JULY 21, 1908.

K. KISHI & M. NAKAMURA.

GENERATOR.

APPLICATION FILED JAN. 4, 1907.

3 SHEETS—SHEET 1.

Fig. 1

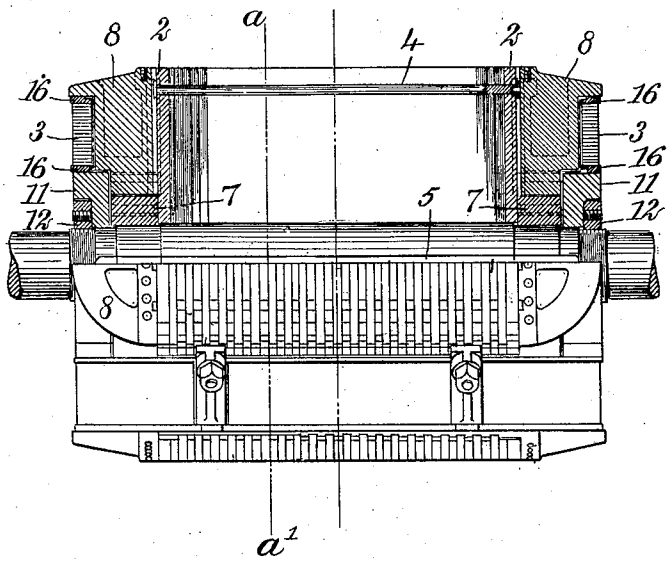


Fig. 2

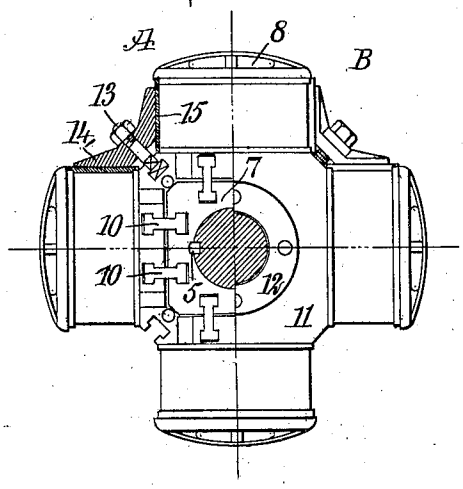
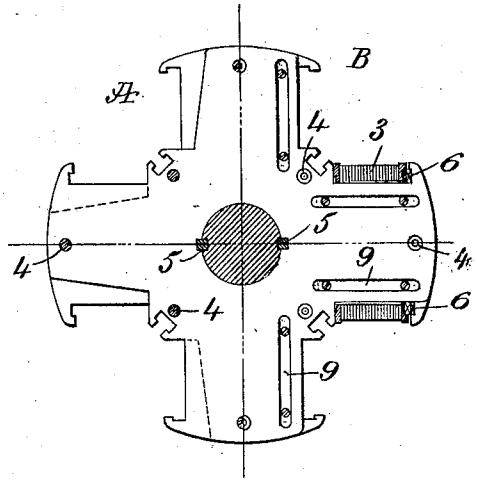


Fig. 3



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 4

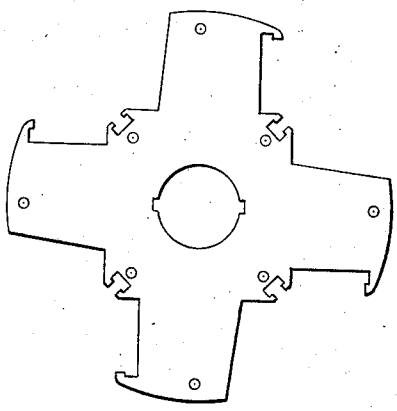


Fig. 5

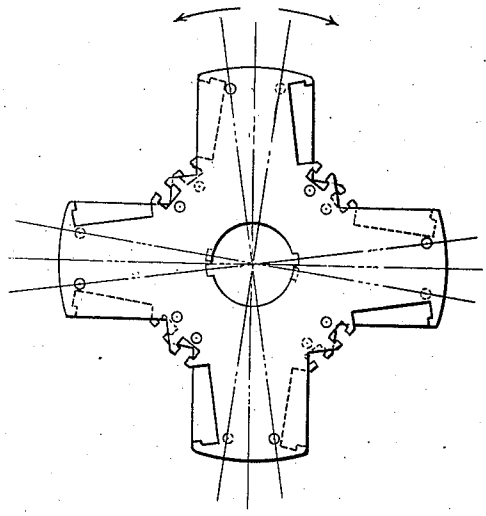


Fig. 6

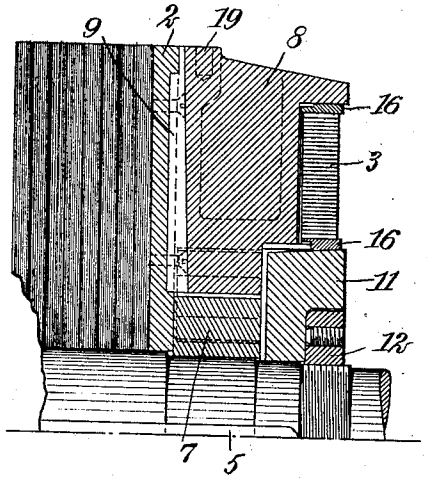


Fig. 7

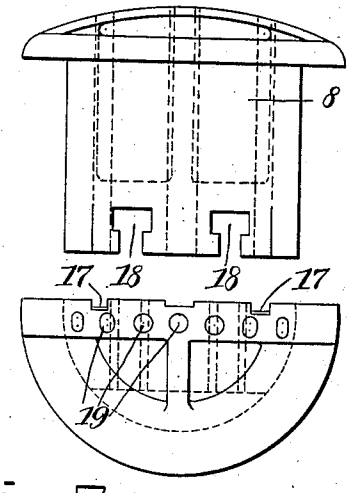


Fig. 7a

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3 SHEETS—SHEET 3.

Fig. 8

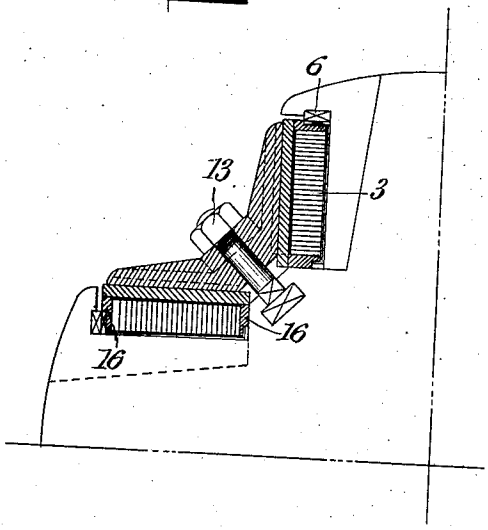


Fig. 9

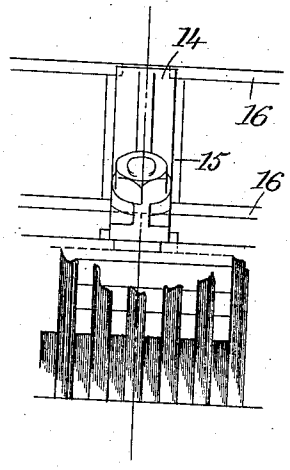


Fig. 10

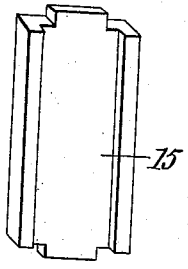
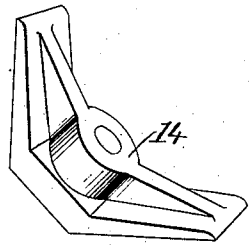


Fig. 11



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UNITED STATES PATENT OFFICE.

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GENERATOR.

No. 894,015. Specification of Letters Patent. Patented July 21, 1908.

Application filed January 4, 1907. Serial No. 350,860.

To all whom it may concern:

Be it known that we, KEIJIRO KISHI and MATSUTARO NAKAMURA, subjects of the Emperor of Japan, residing, respectively, at 1 Shiba-Kanasugi-Shinhamacho, Shiba-Ku, Tokyo, Japan, and at 3 Shiba-Kita-Shimmonzencho, Azabu-Ku, Tokyo, Japan, have invented a new and useful Improvement in Generators, of which the following, taken in connection with the accompanying drawings, is a specification.

The present invention relates to an electric generator, especially to an alternating current generator.

The object of this invention is to make the revolving parts of the machine strong enough as to stand its high speed of revolution.

The accompanying drawings illustrate constructions adapted for carrying out the aforesaid object.

Figure 1 shows the partial sectional elevation of the revolving part of a generator, upper half in section, lower half in finished view and both ends of shaft being cut off. Fig. 2 the partial sectional end elevation of the machine showing in A detail of construction, metal part (11) being taken off, and in B the finished view, the shaft being hatched. Fig. 3 the sectional end elevation, of which, A being the vertical section through (a a') of Fig. 1 shows the arrangement of laminated iron, and part B shows securing end plates (2), keys fitted to said plates and a coil in section, only one coil being shown in the figure. Fig. 4 shows the model of the sheet iron stamping. Fig. 5 method of grouping the laminated iron prior to the insertion of field coil, showing alternately placed sheet iron core. Fig. 6 detailed view of securing method of field coils at both ends of Fig. 1. Fig. 7 the elevation of coil squeezing device (8) made of diamagnetic metal and to be fitted at both ends of the coil. Fig. 7^a is a plan view of the parts shown in Fig. 7; Fig. 8 sectional elevation showing the arrangement of coil supporting metal preventing side motion of the said coil, and Fig. 9 the side view thereof. Fig. 10 the perspective view of grooved metal (15). Fig. 11 the similar view of securing metal block (14).

Similar figures refer to similar parts of the machine throughout the figures and although four polar type machine is selected, for illustration, it will be understood that the present invention may well be equally adapted for two, six or other multi-polar types.

As is illustrated in the accompanying drawings, the construction of field magnet of electric generator being the only purpose of the present invention, it will be unnecessary to give further illustration about the familiar type of coöperating stationary armature.

Since the revolving part of high speed electric generator, such as directly coupled to steam-turbine shaft, revolves with enormous velocity, it is very necessary to pay particular attention to the construction of coil securing device as well as field magnet of such machine, as to make them strong enough to resist the centrifugal force of these revolving parts.

The construction shown in the accompanying figures are obtained as due conception of aforesaid fact.

The core (1) is made from sheet iron shown in Fig. 4. One or more sheet irons are grouped in alternate layers upon the shaft and whole is arranged as shown in Fig. 5, comparatively thick plates (2) being placed on both ends of the core. The field coil consists of a suitable conductor wound on a bobbin and is perfectly insulated. The coil being finished before it is mounted on the magnet core (1), the insulation or any other work may be carried out very easily and effectively.

When the finished coil is mounted on the magnet core (1) of aforesaid construction, sheet iron layers of similar configuration are diverted from those of opposite configuration, that is, layers assuming the position shown in Fig. 4 to the clockwise direction, while those of opposite configuration to the counter-clockwise direction as shown by arrowhead in Fig. 5 and thus the core shown in Fig. 3 will be obtained. The said core is then subjected to suitable pressure and after being clamped by means of end plates (2) and bolts (4), it is secured to the shaft by the keys (5). The field core (1) thus constructed having no junction between its poles and yokes, has great resisting force with respect to centrifugal force and its magnetic reluctance is much less than those which have junctions between poles and yokes. The sheet iron forming field core (1) being alternately arranged one by one or layer by layer, forms ventilating air ducts

on both sides of the field poles, which cool the inside surface of field coils (3) and dissipate the heat generated therein. Keys (6) are used to prevent up and down motion of the coils (3).

The metal collar 7 is secured in fixed relation to the shaft by the keys (5), and diamagnetic metal blocks (8) which secure the coils to the magnet core are inserted from top of the coil down along the keys (9). The keys (9) and the coöperating keyways (17) of securing block (8) being tapered as shown in the figure, the coil (3) will be pushed radially and axially of the shaft in case the securing block (8) is pushed radially. Hence, if steel keys (10) after first being heated are inserted into slots (18) of securing block (8) and into those of metal collar (7), the latter being securely fixed to the shaft, securing block (8) will be pulled down as the keys begin to cool and tends to stretch the coil (3), by the action of the key (9), and prevents any movements of the latter.

The screw holes (19) on the upper part of the securing block (8) serve to receive balance weight for smooth running of revolving part.

The metal collars (11) (see upper part of Fig. 1, part B of Fig. 2 and also Fig. 6) are placed in proper position by aid of key (5) and pressed inward by the nuts (12) screwed on the threaded portion of the shaft. Part of the metal collar (11) and that of the bobbin flange (16) of the field coil, which touch each other, being tapered as shown in Fig. 6, the coil (3) will be pressed upward as the metal collar (11) proceeds inward. The coil (3) thus secured between upper securing block (8) and lower metal collar (11), are restrained from up and down motion.

As shown in Figs. 8, 9, 10 and 11, the bolts (13), securing blocks (14) and insulated intermediate blocks grooved to receive the securing block (14), serve to fix the coils (3) so as to prevent their side motion. The upper and lower flanges (16) of field coil bobbin are cut a little to receive the projected ends of intermediate block (15). The groove of said intermediate block (15) serves to receive securing block (14) and guide the latter when screw nut is applied to the bolt (13). The intermediate block (15) being held between bobbin flanges (16) is kept from throwing off and, further, it being placed between securing block (14) and field coils (3), will prevent the securing block (14) from making direct contact with field coils (3) in case the former is pressed down by the bolt (13) and thus protect the insulation of field coil (3).

The field coils (3) secured as above, being strong, safe and free from slide movement and vibration, will not cause unbalance of rotating parts.

It is evident that the object of this invention may be attained by the above mentioned method of construction.

Some modification may be done without change in spirit of this invention.

What we claim and desire to secure by Letters Patent is:—

1. In combination, a shaft, a series of parallel plates on said shaft, each of said plates forming a part of a plurality of poles and connecting yokes, a plurality of blocks, each having a curved outer surface and disposed adjacent each pole of the end plate of said series, a coil surrounding each of said poles and its terminal blocks, and keys for moving each of said blocks radially and longitudinally of the shaft to lock said coils in place.

2. In combination, a shaft, a plurality of plates mounted thereon, each of said plates having radially-extending portions forming parts of a plurality of poles and having connecting portions, a plurality of radially-disposed blocks adjacent each end plate, each of said blocks having a curved outer surface, a coil surrounding each of said poles, a collar on said shaft, and a plurality of keys, each having dovetailed engagement with said collar and one of said blocks, whereby each of said blocks is held against radial movement.

3. A rotary armature, comprising a central portion, a plurality of radial poles, coils surrounding said poles, radially-disposed plates in engagement with the surfaces of said coils and normally holding said coils in engagement with said poles, each of said plates having the outer surface thereof provided with a groove, L-shaped securing members having radial arms in engagement in the grooves of said plates, and fastening means for securing said members to the central portion of the armature.

In testimony whereof, we have hereto signed our names in the presence of two subscribing witnesses.

KEIJIRO KISHI.
MATSUTARO NAKAMURA.

Witnesses:
GEO. H. SCIDMORE,
I. HONDA.