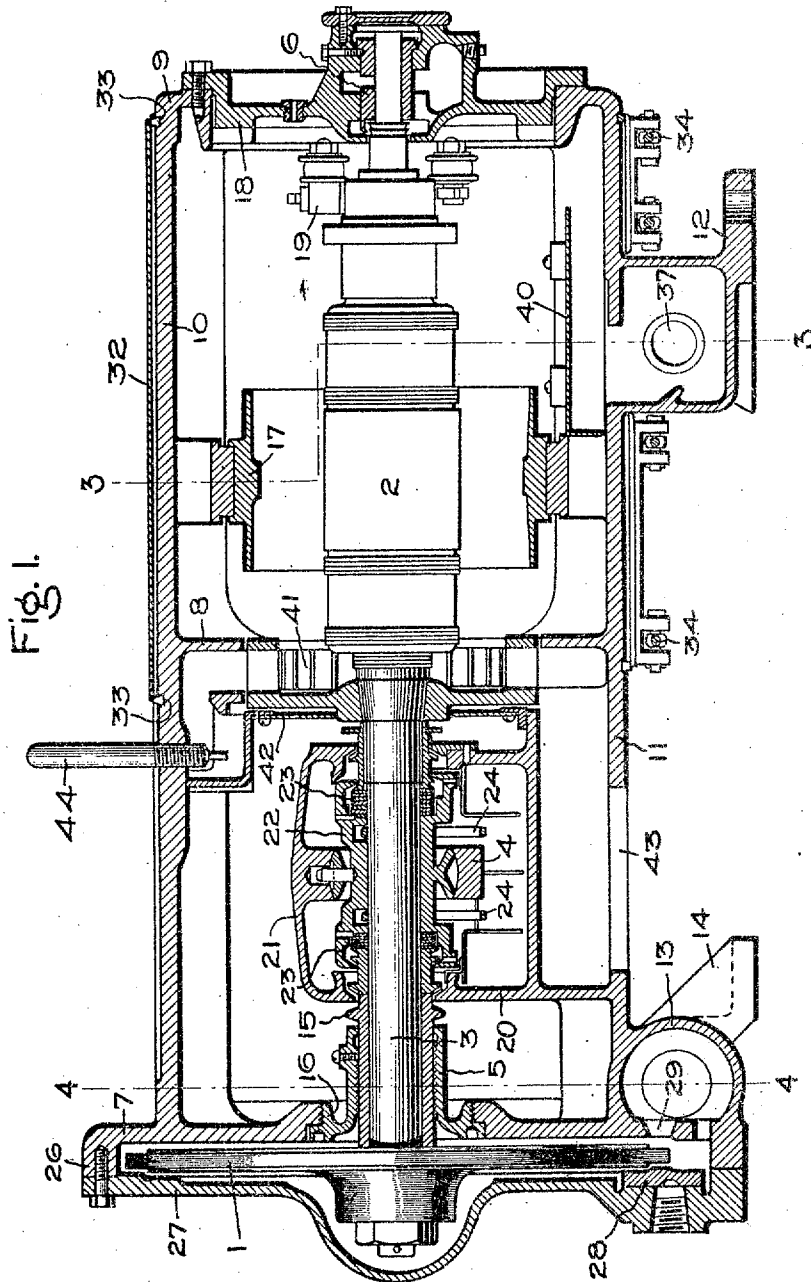


R. H. RICE.
TURBO-GENERATOR.
APPLICATION FILED SEPT. 22, 1909.

1,021,266.

Patented Mar. 26, 1912.

3 SHEETS-SHEET 1.



Witnesses:

Marcus S. Byng.
J. Ellis Ellis

Inventor,
Richard H. Rice,
by *Abner D. Darr*
Att'y.

R. H. RICE.
TURBO-GENERATOR.
APPLICATION FILED SEPT. 22, 1909.

1,021,266.

Patented Mar. 26, 1912.

3 SHEETS-SHEET 2.

Fig. 2.

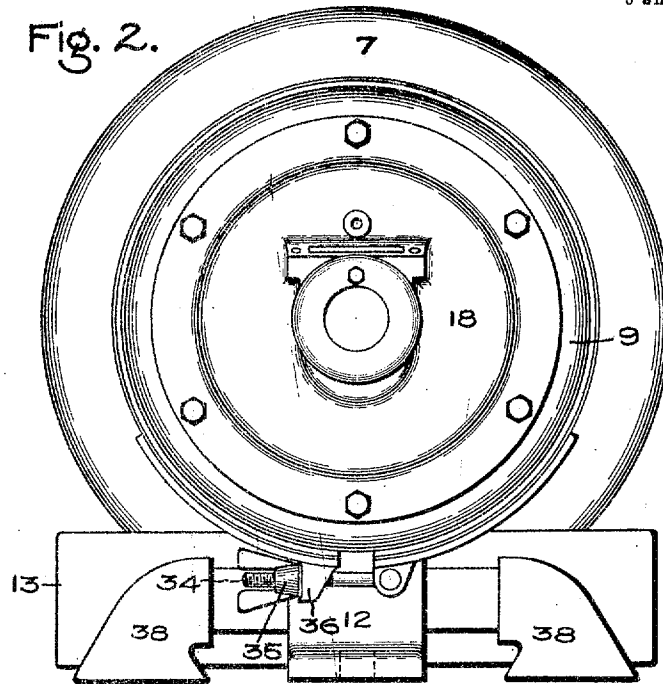
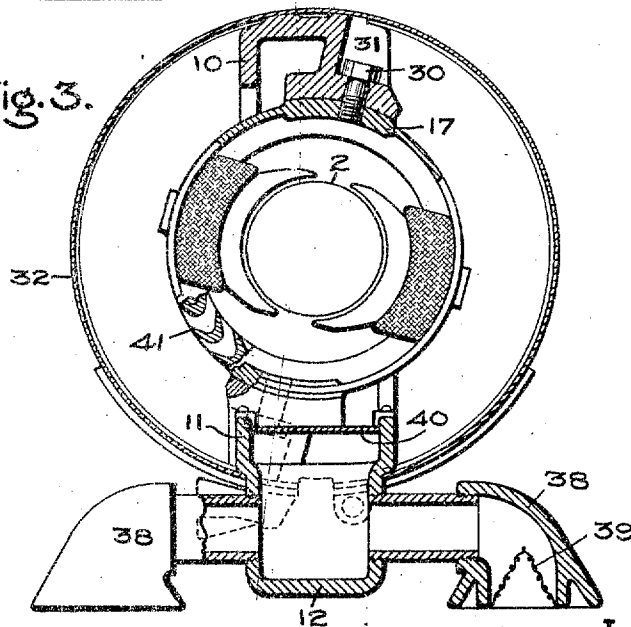


Fig. 3.



Witnesses:

Marcus L. Byng
J. Ellis Allen

Inventor,
Richard H. Rice,
by *Alfred H. Davis*
Att'y.

R. H. RICE.
TURBO-GENERATOR.
APPLICATION FILED SEPT. 22, 1909.

1,021,266.

Patented Mar. 26, 1912

3 SHEETS—SHEET 3.

Fig. 4.

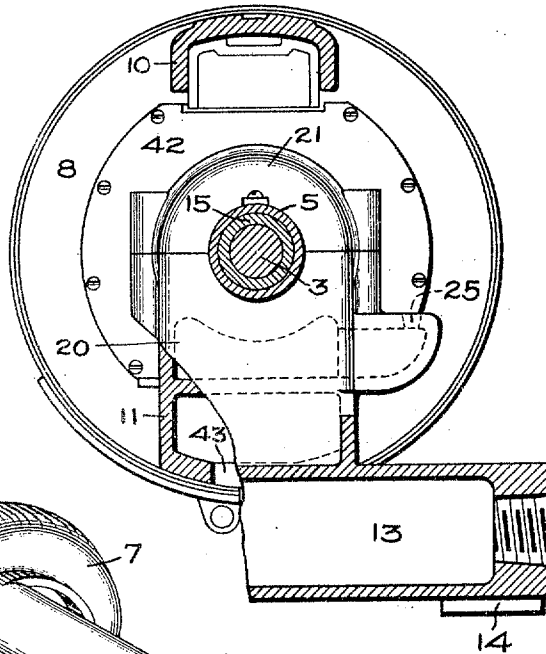
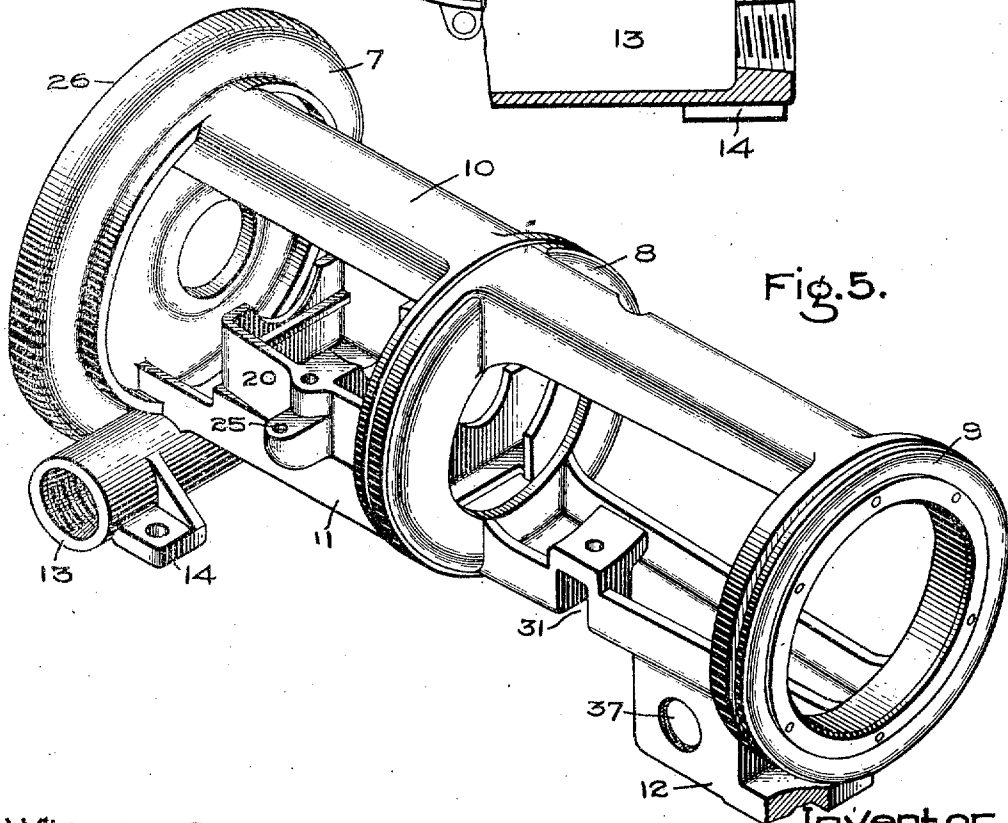


Fig. 5.



Witnesses:

Marcus L. Byng.
J. Ellis Allen.

Inventor,
Richard H. Rice,

by *Wm. S. Davis*
Att'y.

UNITED STATES PATENT OFFICE.

RICHARD H. RICE, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TURBO-GENERATOR.

1,021,266.

Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed September 22, 1908. Serial No. 518,92.

To all whom it may concern:

Be it known that I, RICHARD H. RICE, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Turbo-Generators, of which the following is a specification.

This invention relates to electric generators driven by steam turbines, and especially to those used for supplying current for locomotive headlights and for lighting railway trains. Such turbo-generator sets are usually located on the locomotive and must be compact and of light weight. They must be also self-contained, that is, the turbine and the generator must be mounted in a common frame, which must be rigid enough to maintain its shape under the severe conditions of operation to which it is subject. These machines are frequently mounted on top of the locomotive boiler, where they are exposed to extremes of temperature, and where their supporting medium is liable to distortion or movement, to a slight degree. An efficient turbo-generator set must therefore be so constructed as to be uninfluenced by these extreme conditions. Since the mechanism must be inclosed to protect it from smoke, dust, and the weather, means must be provided for ventilating and cooling the generator. Moreover, the inclosing cover must be easily removable to give access to the mechanism.

My invention aims to meet these requirements, and it consists in a turbo-generator embodying certain novel features as hereinafter set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal section of the machine; Fig. 2 is an end elevation; Figs. 3 and 4 are cross sections, respectively taken on the lines 3-3, 4-4, Fig. 1, and Fig. 5 is a perspective view of the frame.

The turbine bucket wheel 1 and the generator armature 2 are both mounted on a common shaft 3 which is arranged horizontally and is journaled in a main bearing 4 and end bearings 5 6. The frame in which these bearings are carried is an integral casting composed of three annular heads 7 8 9 arranged in parallel planes and connected by an upper channel beam 10 and a lower channel beam 11; said beams being located in a longitudinal vertical plane on

the common axis of the three heads. The frame has a foot 12 extending downward from the lower beam 11 near the head 9, while at the other end of the frame a tube 13 extends transversely under said beam 11 and adjacent to the lower portion of the head 7, and a foot 14 projects from each end of said tube. The tube and all the feet are cast integral with the rest of the frame. It will thus be seen that the frame has three points of support which minimize the effects of distortion from any cause. The feet 14 are sufficiently widely spaced to prevent the frame from rocking sidewise while the position of the foot 12 prevents movement in a plane perpendicular to the plane of rotation of the bucket wheel.

A bushing 15 and the bearing 5 are slipped over the shaft before the bucket-wheel is put on, said bearing having a flange 16 which can be secured in the opening in the head 7, preferably by screwing it in. The opening in the head 9 is large enough to allow the field magnet frame 17 of the generator to pass through it, and it is closed by a diaphragm 18 which carries the bearing 6 at its center, and also supports the brushes 19 of the generator.

The main bearing is mounted in a box-pedestal 20 cast with the frame, and having a cap 21. The journal brasses 22 have spherical bearings and at each end of said brasses are thrust bearings 23 to keep the turbine buckets in the proper plane of revolution. Oil rings 24 carry up oil from the cellar formed by the box-pedestal, which can be filled through the oil-hole 25.

The bucket-wheel 1 is housed in the head 7, which has a flange 26 to which is fastened the cover 27 inclosing the wheel, and provided with the nozzles 28. The wheel has preferably but one row of buckets, and the exhaust steam escapes through the tube 13 which communicates with the turbine casing by ports 29.

The field magnet frame 17 is circular and carries preferably two pole pieces. It is attached to the beams 10 and 11 by screws 30 which are received in recesses 31 in said beams. A removable sheet metal cover 32 incloses the generator, fitting at its edges on the peripheries of the heads 8 and 9; preferably between ribs 33 projecting therefrom. The edges of the cover lie under the beam 11, and are provided with fastening

devices, preferably screws 34 hinged to one edge and having wing nuts 35 engaging with slotted lugs 36 on the other edge, so that by loosening the nuts and swinging
5 down the screws the cover can be released.

When the cover is on, the generator is completely inclosed, and in order to ventilate it, the foot 12 is made hollow, opening upward into the generator chamber.
10 One or more air inlets 37 are provided in the walls of said foot, preferably equipped with spouts 38 containing screens 39 for keeping out the larger particles of dust. The air entering the chamber is deflected
15 by a baffle plate 40 to near the end head 9. After flowing lengthwise of the generator it is caught by a centrifugal fan 41 mounted on the shaft in the plane of the annular middle head 8. The fan is shut off from
20 the main bearing 4 by a partition 42 so that it will deliver the heated air to an escape port 43 under the box-pedestal 20. The fan is of such a diameter that it will pass through the opening in the head 9. An eye
25 bolt 44 screwed into the upper beam 10 enables the machine to be readily hoisted.

It will be observed that this design of turbo-generator affords a compact, rigid, self-contained structure, which by reason of
30 its three feet 12 and 14 will always rest firmly upon any surface and will not be racked out of shape by movements thereof. The combination of transverse heads and longitudinal channel beams gives a light
35 but stiff frame, while the removable covers 27 and 32 afford easy access to the moving parts.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention together
40 with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other
45 means.

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

1. A turbo-generator set comprising longitudinally extending channel beams, transverse annular heads formed integral with said beams, a shaft, a bucket wheel and rotor mounted thereon, a cover for the wheel that is supported by one of the heads, a bearing
55 for the shaft carried by another head, a stator located between and carried by the beams, and a second bearing for the shaft carried by one of the beams.

2. A turbo-generator set comprising longitudinally extending channel beams, located one above the other, parallel annular heads that unite the beams, a single foot for supporting the frame at one end, a pair of feet for supporting the frame at the other
60 end, a shaft, a bucket wheel carried by the

shaft, and located in one of the heads, a rotor driven by the shaft, and a removable stator engaging the said beams and supported thereby, said stator being removable through one of said heads.

3. A turbo-generator set having a frame comprising three parallel annular heads united by longitudinal channel beams, a turbine wheel adjacent to the head at one end, a generator between the other end head and the middle head, and a ventilating fan in the plane of said middle head.

4. A turbo-generator set having a frame composed of three annular heads and longitudinal beams, a turbine adjacent to one of the end heads, a generator between the middle head and the other end head, a cover inclosing said generator, a hollow foot having air inlets, and a fan in the middle head for drawing air through said generator.

5. A turbo-generator set comprising relatively narrow and longitudinally extending channel beams located one above the other, heads for uniting the beams, a shaft, a rotor mounted thereon, a stator supported by the inner and opposed faces of the beams, a sheet metal cover which is wrapped around the beams and engages them top and bottom and also engages the heads at its ends, and detachable fastenings for the edges of the cover.

6. A turbo-generator having a frame comprising annular transverse heads and longitudinal beams, a generator located between two of said heads and having a circular field frame adapted to pass through the opening in one of said heads, and a diaphragm attached to said head and filling said opening and carrying a bearing for the generator shaft.

7. A turbo-generator having a frame comprising three annular transverse heads and longitudinal beams, a shaft extending centrally through said heads, a turbine wheel on said shaft and outside one of said end heads, a fan on said shaft in the plane of the middle head, a main bearing between said fan and the turbine, a generator armature on said shaft between said fan and the other end head, a circular field frame concentric with said armature, the opening in the adjacent end head being large enough to admit said fan and field frame, a diaphragm closing said opening, and shaft bearings in said diaphragm and in the end head adjacent to the turbine.

8. A turbo-generator set having a frame composed of longitudinal beams arranged in the same vertical plane, transverse annular heads for uniting the beams, a removable casing for the frame that engages the beams and also said heads, feet for supporting the frame, a conduit in one of said feet that supplies air to the interior of the casing, and a fan for withdrawing air from the casing.

9. A turbo-generator set having a frame composed of longitudinal beams arranged in the same plane, transverse heads for uniting the beams, a casing that rests on the beams and also on the heads at its edges, a partition, a fan between one of the heads and the partition, an air inlet opening into the casing on one side of said head, and a discharge conduit formed in one of said beams on the other side of said head.

10. A frame for a turbo-generator set comprising top and bottom beams, annular heads connecting the beams, a tube forming a part of one head and through which steam is exhausted, a stator for the generator that is supported by and between said beams, a cover attached to one head and forming a chamber, a wheel in the chamber, a rotor for the generator, a shaft for the wheel and rotor, a bearing for the shaft carried by the lower beam, and a second bearing for the shaft carried by one of the heads.

11. A frame for a turbo-generator set comprising top and bottom channel-shaped

beams that are relatively long and narrow, annular heads that are formed integral with the beams, a pair of feet for supporting one end of the frame that are integral with one of the heads and a beam, and a single foot located at the other end of and integral with the lower beam, said feet forming a three-point support.

12. A frame for a turbo-generator set comprising top and bottom beams that are relatively long and narrow, transverse annular heads that are integral with the beams, a tube formed integral with one of said heads, a pair of feet attached to the tube and displaced laterally from the central plane of the frame, and a single supporting foot that is attached to one end of the lower beam.

In witness whereof, I have hereunto set my hand this twentieth day of September, 1909.

RICHARD H. RICE.

Witnesses:

JOHN A. McMANUS, JR.,
CHARLES A. BARNARD.