F. LJUNGSTRÖM.

TURBINE GENERATOR.

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Fig. 1.

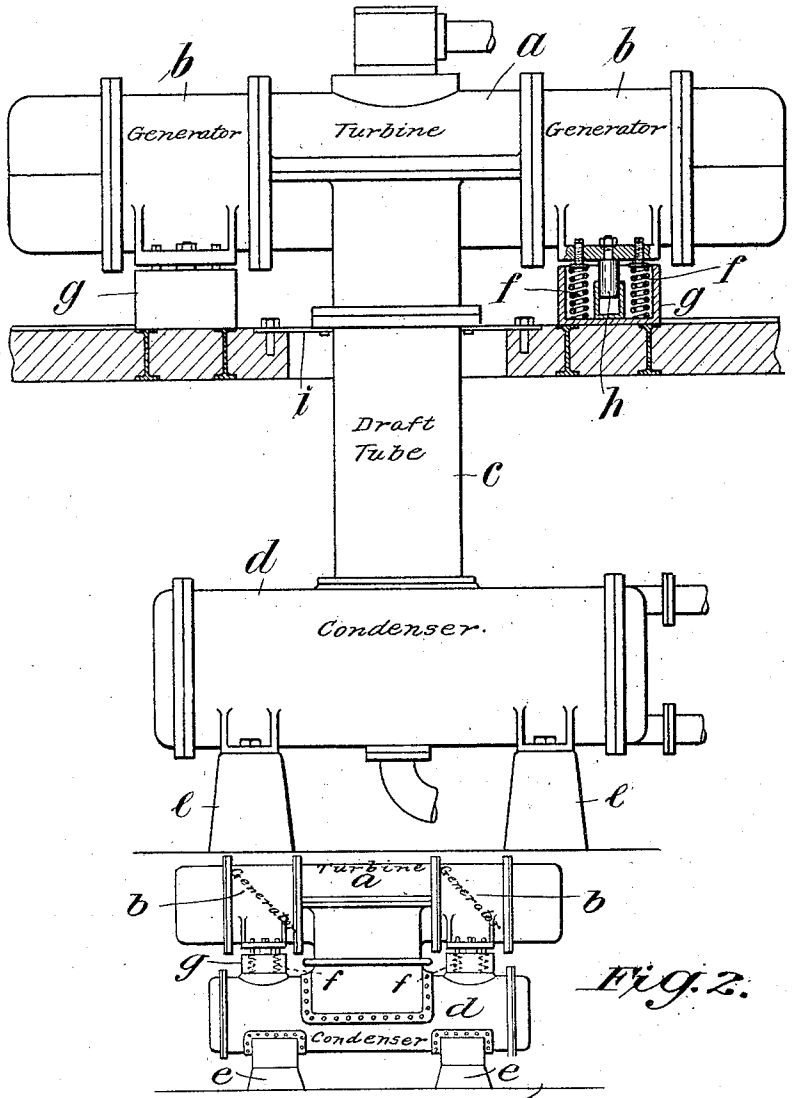


Fig. 2.

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TURBINE-GENERATOR.

1,066,209. Specification of Letters Patent. Patented July 1, 1913.

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To all whom it may concern:

Be it known that I, FREDRIK LJUNGSTRÖM, a subject of the King of Sweden, and a citizen of Sweden, residing at Liljeholmen, in the Kingdom of Sweden, have invented certain new and useful Improvements in Turbine-Generators, of which the following is a specification.

My invention relates to horizontal turbine generators, in which the turbine or turbines are rigidly connected with the electric generator or generators and has for its object a device for supporting the machine.

It is previously known to support machines and also parts of machines, for instance the turbine shaft in turbines so as to make it possible for them to yield. Nor is it new to secure a turbine on the one side in order to allow a free extension of the turbine casing in horizontal direction. In the present case the turbine part is, however, according to the invention rigidly connected with the outlet tube, while the generator parts are supported, in such a way that they can move in all directions. By this there will be attained that the generator parts can swing freely corresponding to the longitudinal and lateral movements of the outlet tube occurring on account of the considerable differences of temperature, without exercising any injurious retroaction upon the turbine parts. By this device another advantage will be attained viz. that the turbine casing is not exposed to a bending action and to injurious tensions, as the whole turbine generator casing can move freely in all directions.

The invention especially proves of use in a turbine generator having a central turbine and two generators arranged laterally in the same casing.

Figure 1 shows in elevation such a device partly in section. Fig. 2 shows a modified form of my invention.

a designates the turbine part and *b* the two generator parts arranged laterally and rigidly connected with each other. *c* is the outlet tube leading to the condenser *d*, rigidly arranged on the foundation *e*. The part *a* is supported by the tube *c*. At the variations of the tube *c* as to form and length on account of the variations of temperature the central part *a* of the machine is moved laterally or up and down. In order to take part in these movements and thereby to prevent the arising of tensile stresses in the casing, the two lateral parts *b* are movably arranged, viz. in the embodiment according to Fig. 1 by means of springs *f* arranged in the boxes *g* rigidly connected to the foundation. In order to limit or to moderate the oscillations, moderating devices for instance dash pots *h* are arranged. In order to limit oscillation of the turbine laterally the tube *c* may be connected with the foundation by means such as an annular corrugated disk *i*.

Fig. 2 shows an embodiment in which the turbine generator is arranged directly on the condenser, the springs *f* being thereby arranged between the ends of the turbine casing and the condenser. The tube *c* as well as the supports of the condenser are connected with the condenser by means of specially strong members, the condenser being thereby reinforced so as to be able to take up the considerable pressure.

It is possible, especially when the tube supports the turbine part of the machine, to mount the whole generator on one and the same bed. Of course the springs *f* may be removed.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In combination with a rigidly mounted condenser, an upwardly extending condensing tube rigidly mounted on said condenser at its lower end, a turbine rigidly supported and mounted on the upper end of said tube, generators rigidly connected with the ends of said turbine, and supporting structures for said generators comprising supporting springs and devices for limiting movement of said generators on said springs, substantially as described.

2. In combination with a rigidly mounted condenser, an upwardly extending condensing tube rigidly mounted on said condenser at its lower end, a turbine rigidly mounted and supported on the upper end of said tube, generators connected with the ends of said turbine, and spring supporting structures for said generators, substantially as described.

3. In combination with a rigidly mounted turbine, of a generator mechanism rigidly connected with said turbine, and a supporting structure for said mechanism comprising supporting springs and a device for

limiting movement of said mechanism on said springs.

4. In combination with a rigidly mounted condenser tube, means connected with said tube to limit movement thereof laterally, a turbine rigidly connected with said tube, a generator rigidly connected with said turbine, and a spring supporting structure for said generator, substantially as described.

5. In combination with a rigidly mounted turbine, of a generator mechanism rigidly connected with said turbine, and a supporting structure for said mechanism comprising supporting springs and dash pot devices limiting movement of said mechanism on said springs, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

FREDRIK LJUNGSTRÖM.

Witnesses:

GRETA PRIM,

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