Jan. 24, 1928. 1,657,433

K. FREY

TURBOGENERATOR INSTALLATION

Filed April 11, 1927

Fig. 1

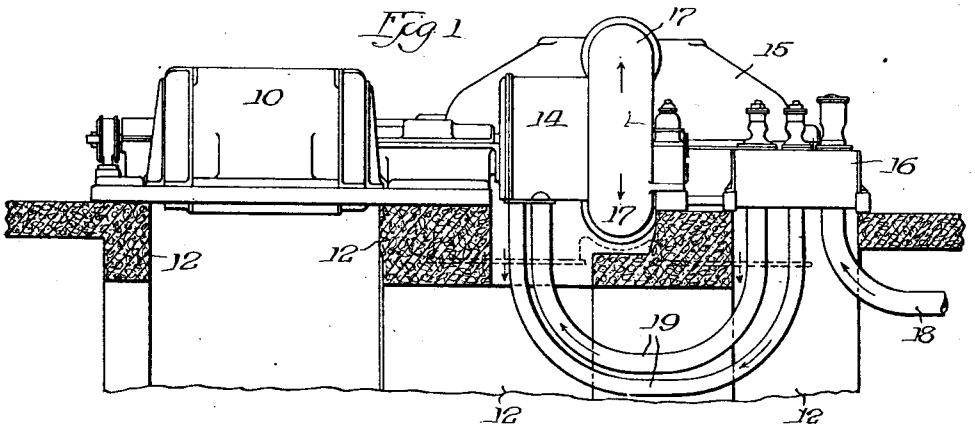


Fig. 2

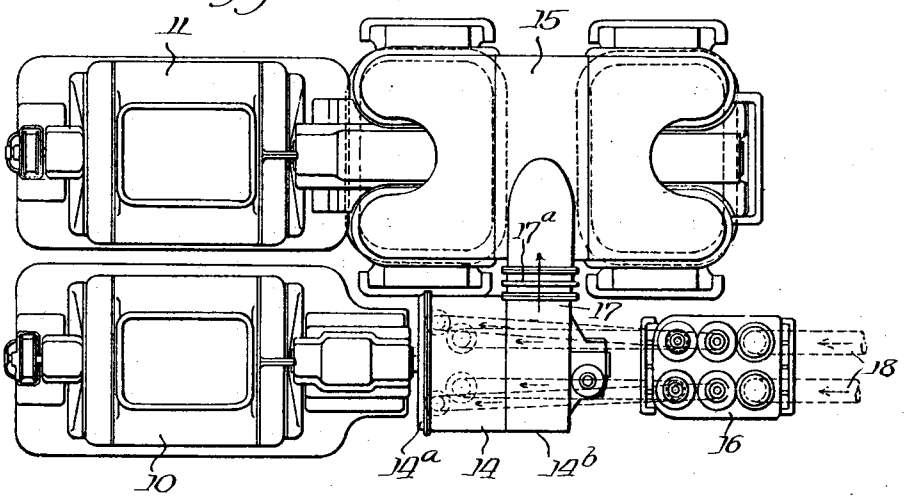
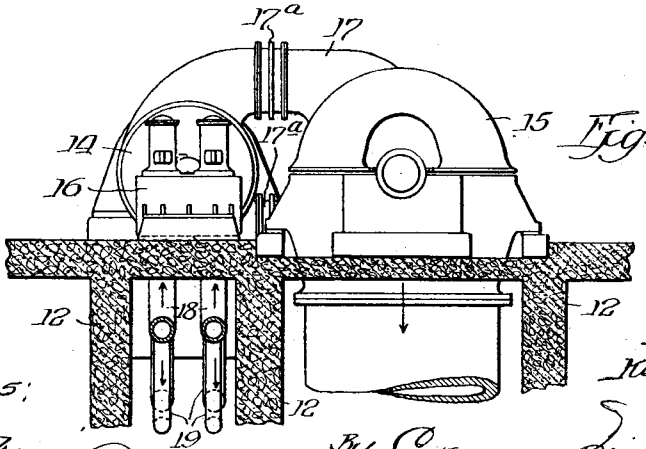


Fig. 3



Witness:

Inventor
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By Cromwell, Dent & Woodward Attys

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UNITED STATES PATENT OFFICE.

KARL FREY, OF ENNETBADEN, SWITZERLAND, ASSIGNOR TO A. G. BROWN BOVERI & CIE., OF BADEN, SWITZERLAND, A JOINT-STOCK COMPANY OF SWITZERLAND.

TURBO-GENERATOR INSTALLATION.

Application filed April 11, 1927, Serial No. 183,017, and in Germany May 5, 1926.

This invention relates to turbo-generator installations of the type in which separate generators are driven respectively by high and low pressure steam turbines through which the steam is passed in series.

The general purpose of the invention is the provision of a construction in which the floor space is used to best advantage, the foundation construction is simplified and arranged in such fashion as to contribute to its stability, and the steam connections to and between the turbines are arranged in such fashion that they eliminate lateral strains and contribute to freedom of flow.

Other and further objects of the invention will be pointed out or indicated hereinafter, or will appear to one skilled in the art upon an understanding of the invention or its employment in practice.

In the accompanying drawing, forming a part of this specification, I illustrate a construction embodying the invention, but it is to be understood that certain variations in the details of the arrangement shown may be made without departing from the scope of the invention as defined in the appended claims.

In the drawing,

Fig. 1 is a side elevational view of a turbo-generator installation looking at the high pressure side, and showing portions of the foundation in sectional elevation;

Fig. 2 is a plan view of the installation; and

Fig. 3 is an end view looking at the turbine end, portions of the foundation being shown in sectional elevation.

In large steam turbine units, in which the steam is expanded from stop valve to condenser pressure in separate turbines, which drive respective generators, it may be desirable to arrange the units in collateral association. With this collateral disposal, if both the turbines are connected to their generators in normal relationship, one of the units is likely to be substantially longer than the other, thus increasing the length of the floor area requisite for the set, and requiring also that the cross connecting pipes between the two turbines be run diagonally with respect to the longitudinal axis of the set. By virtue of the present invention these disadvantages are eliminated and the entire set may be arranged within more closely circumscribed area with the foundation portions on which the respective units are supported affording one another mutual lateral support. This is accomplished by assembling the set after the manner of the arrangement shown in the drawing, wherein the reference numerals 10 and 11 designate respective generators arranged in collateral association and carried on foundation portions 12. The generator 10 is driven by a high pressure steam turbine 14, and the generator 11 by a low pressure steam turbine 15 of the double flow type. Steam supply to the set is controlled by a valve gear housed in the valve casing 16. Instead of being disposed in normal relationship with respect to the valve casing and the generator which it drives, viz, with the generator at the low pressure end of the turbine, and the valve casing at the high pressure end, the high pressure turbine is arranged with its inlet or high pressure end 14^a toward the generator, and its low pressure end 14^b, approximately on the central transverse axis of the low pressure turbine. As a result, the cross connection pipe 17, for leading steam from the high pressure turbine to the low pressure turbine, may be arranged at right angles to the longitudinal axes of both turbines without requiring an undue lengthening of the shaft connecting the high pressure turbine to its generator, while permitting the generators to occupy the collateral relationship with their commutator ends in alignment transversely of the set. By virtue of this arrangement, also, the generators may be disposed more closely together, thus keeping the overall width of the set within closer limits. This disposal of the high pressure turbine and its generator affords space at the low pressure end of said turbine for disposal of the valve casing approximately within the terminal limit of the low pressure turbine. The steam supply lines to the valve casing are designated 18 and the connecting steam pipes between the valve casing and high pressure turbine are designated 19. The latter are arranged in symmetrical relationship with respect to the axis of the high pressure unit and extend substantially parallel thereto and, by virtue of the relationship of the valve casing and high pressure turbine, may be made of suitable length to give the desired flexibility in the connection without involving an undesirable extension of the overall length of the set. The

close collateral assembly of the generators and of the turbines simplifies the foundation construction and makes possible a foundation design in which the portions under the respective units afford each other a desirable lateral reinforcement or support, thus contributing to stability and requiring a minimum area and amount of material for the foundation. The cross connecting pipes 17 between the high and low pressure turbines are provided with a customary expansion joint 17*, and the disposal of these pipes at right angles to the longitudinal axis of the set permits their being of minimum length, minimizes the number of turns in the steam path, and eliminates diagonal stresses between the turbine casings. The invention, therefore, in addition to conserving floor space, contributes to stability in the installation and application of expansion and contraction stresses as between the component units in a manner in which they are best sustained by the structures, both of which considerations are of particular importance in large installations.

What I claim is:

1. A turbo-generator installation comprising, in combination, collaterally disposed high and low pressure turbines, collaterally disposed generators having driving connections with the turbines respectively, the inlet end of the high pressure turbine being toward its generator, a steam pipe connecting the exhaust end of the high pressure turbine and the inlet of the low pressure turbine, said steam pipe extending at right angles to the longitudinal axes of both turbines, a valve casing disposed at the exhaust end of the high pressure turbine in collateral relationship to the low pressure turbine, and steam connections between said valve casing and the inlet end of the high pressure turbine.

2. A turbo-generator installation comprising, in combination, a foundation, generators supported thereon in collateral association, high and low pressure turbines supported on the foundation in collateral association in alignment with the turbines respectively and having driving connection therewith, the high pressure turbine having its high pressure end toward the connected generator, a pipe for passing exhaust steam from the high pressure turbine to the low pressure turbine, said pipe extending at right angles to the longitudinal axes of the turbines, a valve casing supported on the foundation at the low pressure end of the high pressure turbine, and a steam inlet pipe extending longitudinally about the high pressure turbine and connecting the valve casing to the high pressure end thereof.

3. A turbo-generator installation comprising, in combination, collaterally disposed high and low pressure turbines, the latter of the double flow type, a steam pipe connecting the exhaust end of the high pressure turbine to the inlet of the low pressure turbine, said pipe extending at right angles to the longitudinal axes of the turbines, collaterally disposed generators arranged respectively at the high pressure end of the high pressure turbine and a low pressure end of the low pressure turbine and in alignment with the respective turbines, the turbines having driving connection with respective generators, a valve casing disposed at the low pressure end of the high pressure turbine in collateral relationship to a low pressure end of the low pressure turbine, and steam inlet connections between the valve casing and high pressure end of the high pressure turbine.

4. A turbo-generator installation comprising, in combination, collaterally disposed generators, a low pressure turbine in alignment with one thereof and having driving connection therewith, a high pressure turbine and valve casing in collateral association with the low pressure turbine, said high pressure turbine being in alignment with the other generator and having driving connection therewith, steam pipe connections extending longitudinally of the high pressure turbine and connecting the high pressure end thereof to the valve casing and steam pipe connections extending at right angles to the axes of both turbines and connecting the exhaust end of the high pressure turbine to the inlet of the low pressure turbine.

In testimony whereof I have hereunto subscribed my name this 30 day of March A. D. 1927 at Zurich, Switzerland.

KARL FREY.