Oct. 13, 1970 T. HAUG 3,533,710

TURBINE VALVE ASSEMBLY ERECTION

Filed May 8, 1968 2 Sheets-Sheet 1

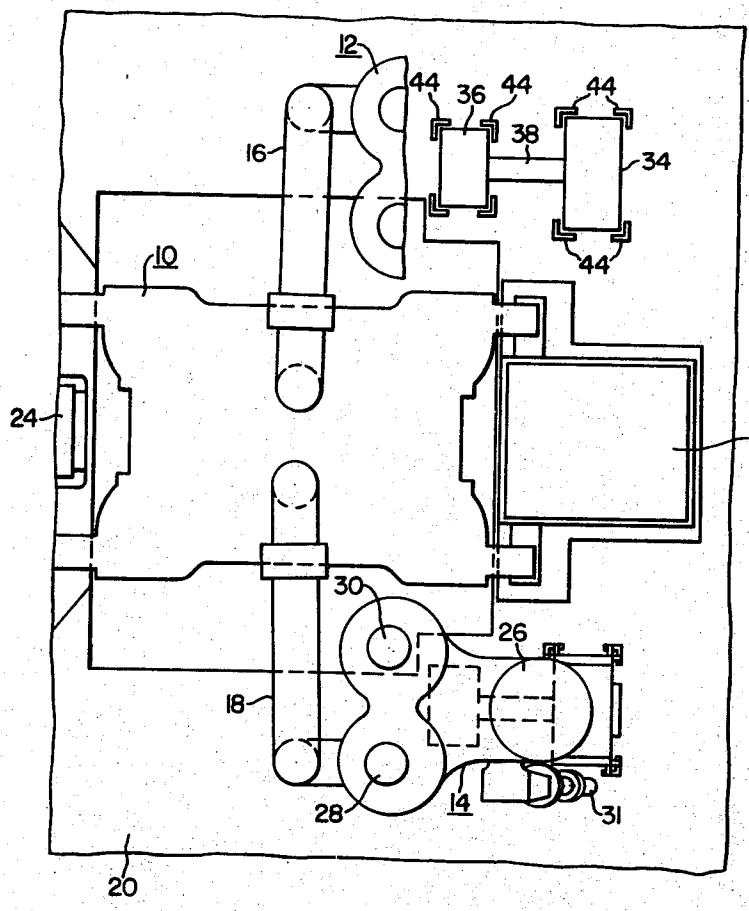


FIG. 1.

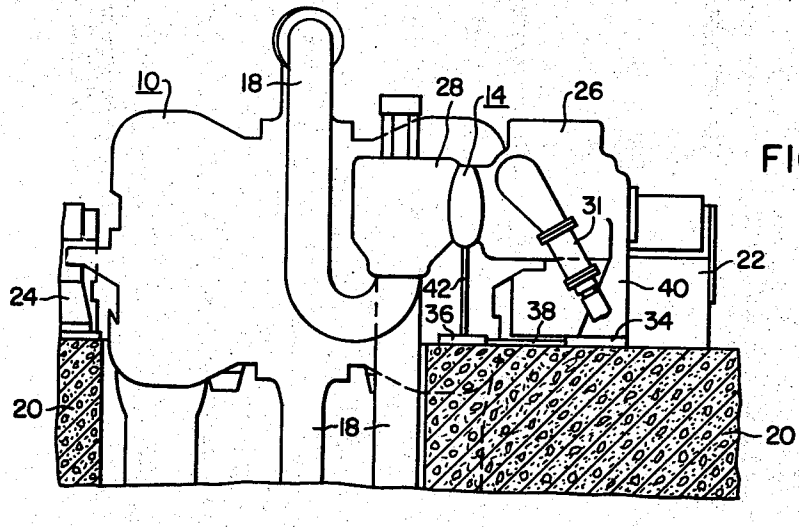


FIG. 2.

WITNESSES

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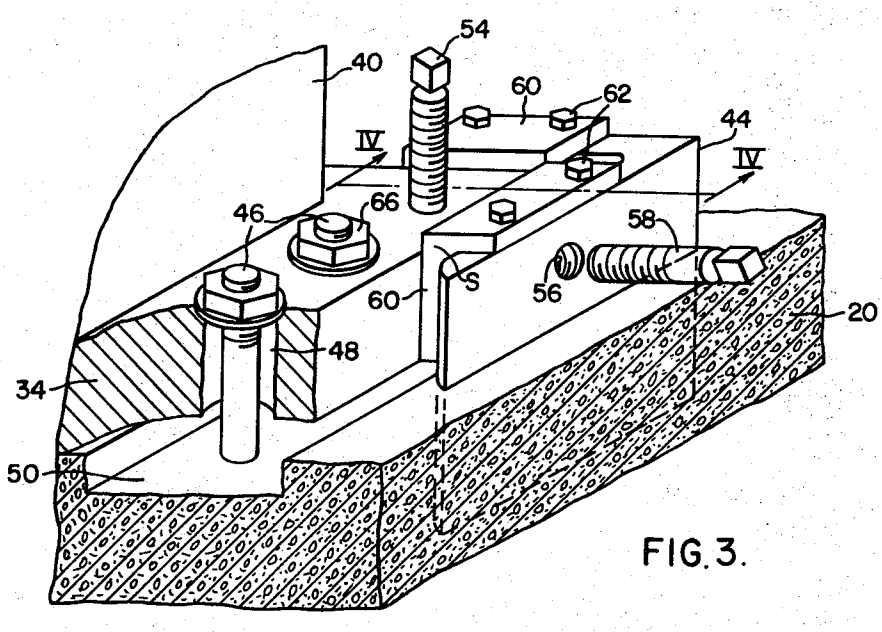


FIG. 3.

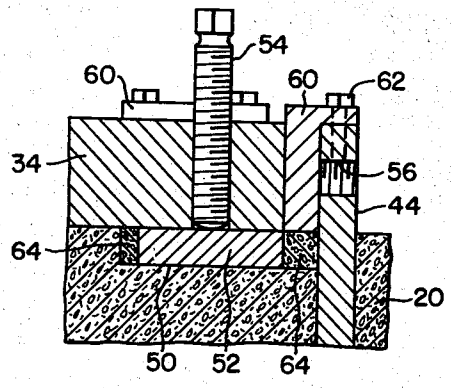


FIG. 4.

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TURBINE VALVE ASSEMBLY ERECTION

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ABSTRACT OF THE DISCLOSURE

The stop and control valve assembly for a steam turbine is mounted on a concrete foundation supplied by the customer. Angle members are imbedded in the foundation at the four corners of generally rectangular base plates for the stop valve and the control valves of the assembly. The valve assembly is aligned horizontally by means of jack screws threaded into the angle members to engage the edges of the base plates, and L-shaped liners are inserted between the angle members and the base plates to lock them in position. Jack screws are threaded into the base plates and engage relatively small jack plates on the fundation to position the base plates at the correct elevation.

BACKGROUND OF THE INVENTION

This invention relates generally, to valve assemblies and, more particularly to the erection in the field of stop and control valve assemblies for elastic fluid turbines.

The stop and control valve assembly for a steam turbine controls the flow of high temperature and pressure steam to the turbine through relatively large and rigid preformed piping. Since the piping cannot be readily bent after it is once formed and installed it is necessary to align the openings in the valve assembly with the piping when the valve assembly is erected on a foundation supplied by the customer.

Heretofore, a customer of a turbine manufacturer has been required to furnish a heavy steel backing plate anchored into the foundation. This plate is positioned to the correct center line and elevation at the time the foundation is constructed. The manufacturer furnishes metal liners machined to the required thickness and correct taper for final positioning of the valve assembly. After final alignment, the assembly is doweled to the customer's backing plate.

The prior method has caused the customer considerable concern because of the difficulty in maintaining the backing plate at the correct elevation and in a level plane during the construction of the foundation. In order to have a level plate, it is quite often necessary to machine the backing plate after it has been anchored in place in the foundation. Also, field doweling is an expensive operation.

An object of this invention is to simplify the aligning of a valve assembly erected on a fixed foundation.

Another object of the invention is to provide for maintaining the assembly in position after it has been aligned.

Other objects of the invention will be explained fully hereinafter or will be apparent to those skilled in the art.

SUMMARY OF THE INVENTION

In accordance with one embodiment of the invention, the purchaser of a steam turbine builds a concrete foundation for the turbine and its stop and control valve assembly. Angle members are imbedded in the foundation near the location of the four corners of generally rectangular base plates for the stop and the control valves of the assembly. The valve assembly is aligned horizontally by means of jack screws threaded into the angle members to engage the edges of the base plates, and L-shaped liners

are inserted between the angle members and the base plates to retain them in position. Jack screws are threaded into the base plates and engage relatively small jack plates on the foundation to position the base plates at the correct elevation. After final alignment in proper mating relation with the steam piping, grouting material is placed in recesses underneath portions of the base plates.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a view, in plan, of a portion of a steam turbine installation, including valve assemblies erected in accordance with the present invention;

FIG. 2 is a view, partly in side elevation and partly in section, of the installation shown in FIG. 1;

FIG. 3 is an enlarged isometric view, partly in section, of a portion of a valve assembly and supporting foundation, and

FIG. 4 is a detail view, in section, taken through a portion of the structure shown in FIG. 3 along line IV—IV.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, particularly to FIGS. 1 and 2, the apparatus shown therein comprises a high pressure turbine **10** and main stop and control valve assemblies **12** and **14** for controlling the flow of high temperature steam to the turbine **10** through steampipes **16** and **18** interconnected between the turbine **10** and the valve assemblies **12** and **14**, respectively. The turbine **10** and the valve assemblies **12** and **14** are mounted on a concrete foundation **20**, the turbine being disposed between the valve assemblies. The turbine is supported by bearing pedestal assemblies **22** and **24** which are mounted on the concrete foundation **20**.

Each valve assembly includes a main stop valve **26** and two control valves **28** and **30**. The valves may be of a type well known in the art suitable for controlling the flow of steam to the turbine to control its speed. High temperature, high pressure steam from any suitable supply (not shown) is conducted to each stop valve **26** through a steam pipe **31** connected to the housing for the stop valve. As previously explained, steam flows from the control valves to the turbine **10** through the steam pipes **16** and **18**.

The steam piping is relatively large and rigid and is preformed with thermal expansion U-bends to the shape shown before assembly. Hence, it cannot be readily bent once it is formed and installed. Therefore, it is necessary to align the openings in each valve assembly with the steam piping when the valve assembly is erected on the foundation **20**. As explained hereinbefore, prior practice has required the customer to furnish a heavy steel backing plate anchored into the foundation. This plate was positioned to the correct center line and elevation at the time the foundation was constructed. The turbine manufacturer has furnished liners machined to the required thickness and correct taper (often compound) for final positioning of the valve assembly. After final alignment the assembly has been doweled to the customer's backing plate.

This prior method has caused the customer considerable concern because of the difficulty in maintaining the backing plate at the correct elevation and in a level plane during construction of the foundation. In order to have a level plate, quite often it has been necessary to machine the backing plate after it has been anchored into

the foundation. The installation of the dowel pins was also an expensive operation.

As shown more clearly in FIG. 1, in accordance with the invention, each valve assembly is mounted on two generally rectangular base plates **34** and **36** which are connected together by a narrow plate or strap **38**. The housing for each valve assembly is supported by a generally channel-shaped support member **40** and a steel plate **42** as shown more clearly in FIG. 2. The channel-shaped member **40** is rigid and is welded to the base plate **34**. Therefore, it prevents movement of the valve assembly housing in a plane parallel to the axis of the turbine **10**.

The support plate **42** is welded to the base plate **36** and to the housing for the valve assembly **14** and is mounted in a manner to permit the plate **42** to flex or bend in a plane parallel to the axis of the turbine to permit thermal expansion or growth of the valve assembly housing during operation. During the erection of the valve assembly when it is cold, the base plates **34** and **36** are so positioned by means of the connecting strap **38** that the plate **42** is bent slightly in a direction such that when the housing for the valve assembly expands when becoming hot the plate **42** will be substantially vertical during operation of the turbine. Likewise, the steam pipes which are connected to the housing for the valve assembly when cold are sprung slightly to apply a stress on the pipes when cold which is relieved when the valve assembly housing expands upon becoming hot.

In order to simplify the erection of the valve assembly upon the foundation **20**, right-angle members **44** of L-shape are embedded in the foundation **20** during the construction of the foundation by the customer. As shown more clearly in FIG. 1, an angle member **44** is provided near each corner of the rectangular base plates **34** and **36**. The angle members **44** do not have to be located with close precision but are disposed in closely spaced relation with the four corners of each base plate **34** and **36**.

As shown more clearly in FIG. 3, foundation bolts **46** are also imbedded in the concrete foundation **20**. These bolts must be located in approximately the correct position to permit the base plate **34** to be installed. However, sufficient clearance is provided between the bolts **46** and the holes **48** in the base plate for the bolts to permit the plate to be installed without the bolts being in their exact location and to permit some horizontal movement, as will later be explained. A recess **50** is provided in the foundation **20**. As shown more clearly in FIG. 4, a relatively small jack plate **52** is placed in the recess **50** prior to the installation of the base plate **34**. The jack plate **52** is engaged by a jack screw **54** which is threaded into the base plate **34**. Thus, the jack screw is utilized adjustably to bear against the jack plate **52** and position the base plate **34** at the correct elevation.

As shown in FIG. 3, threaded holes **56** are provided in each angle member **44** receiving back screws **58**,. One hole **56** may be provided in each leg of each angle member **44**. Thus, the jack screws **58** are utilized to engage and bear against the edges of the base plate **34** to adjustably position the base plate horizontally in any direction. Since there is an angle member **44** and a jack screw **54** at each one of the four corners of each base plate **34** and **36**, the base plates may be correctly aligned both horizontally and vertically. After the base plates are properly aligned, the jack screws **58** are removed and L-shaped liners **60**, machined to closely fit, are inserted in the spaces between the edges of the base plate and the angle members **44**. After the liners **60** are installed, they may be attached to the angle members **44** by bolts **62** which are threaded into the angle members **44**. The bolts **62** extend downwardly through the leg of each angle member **60**. After final alignment, grouting material **64** is placed in each recess **50** as shown in FIG. 4. The nuts **66** on the foundation bolts **46** may then be tightened, and the jack screws **54** removed if desired. The base plate **34** is thus retained in the optimum position by the liners **60** and the foundation bolts **46**, thereby facilitating proper connections of the piping thereto. Likewise, the base plate **36** is aligned in the same manner as the plate **34** and is retained in its optimum position by liners **60** and foundation bolts **46** for proper connection to its associated piping.

From the foregoing description it is apparent that the erection of valve assemblies for a steam turbine is simplified as compared with the prior manner of erecting the valve assemblies. Furthermore, the present method of erection will also facilitate service, if and when it is required.

I claim:

1. In an elastic fluid turbine installation, in combination, an elastic fluid turbine,
a valve assembly for the turbine,
elastic fluid piping fixedly carried by said turbine for interconnecting the turbine and the valve assembly,
a concrete foundation for the valve assembly,
a generally rectangular metal base plate supporting the valve assembly on the foundation,
angle members imbedded in the foundation adjacent the corners of the base plate, and
means cooperating with the angle members and the base plate to align the valve assembly with said piping.

2. The combination defined in claim **1**, in which the cooperating means is effective to align the valve assembly in a horizontal plane, and further including
additional means cooperating with the base plate and the foundation adjustably to position the base plate at the correct elevation.

3. The combination defined in claim **1**, wherein
said means is threaded into the angle members to engage edges of the base plate.

4. The combination defined in claim **2**, wherein
the additional means includes a jack plate interposed between the base plate and the foundation, and means threaded into the base plate to engage the jack plate and position the base plate at the correct elevation.

5. The combination defined in claim **1**, including liners disposed between the angle members and the corners of the base plate to retain the base plate in the aligned position.

6. The combination defined in claim **5**, wherein
each liner is L-eshaped with one leg attached to one leg of an angle member.

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HENRY F. RADUAZO, Primary Examiner

U.S. Cl. X.R.

137—15; 248—23; 415—126, 219