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STEAM TURBINE.

APPLICATION FILED OCT. 18, 1917.

1,410,644. Patented Mar. 28, 1922.

Fig. 1

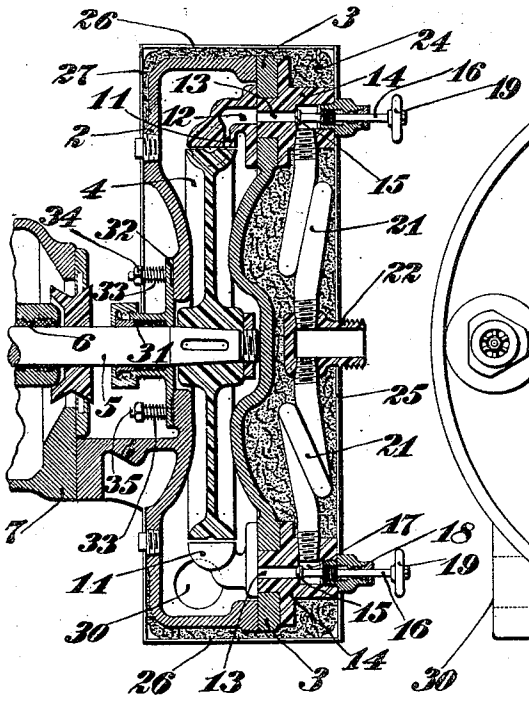
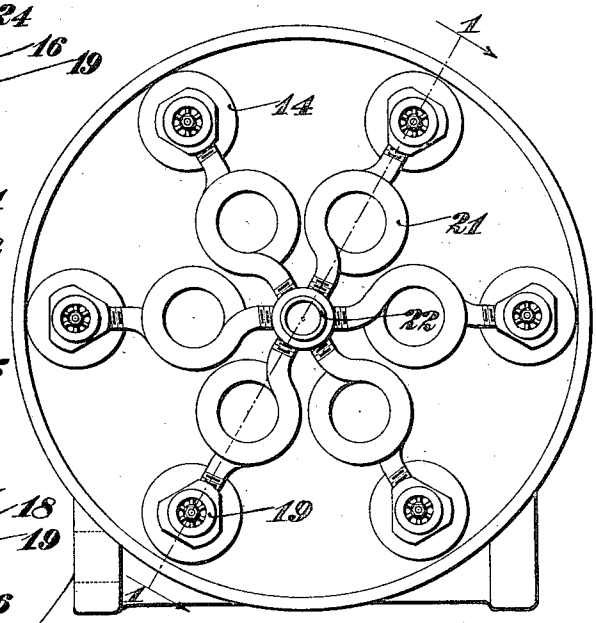


Fig. 2



Witness

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STEAM TURBINE.

1,410,644. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed October 18, 1917. Serial No. 197,364.

To all whom it may concern:

Be it known that I, OLIVER D. H. BENTLEY, a citizen of the United States, residing at Roslindale, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to steam turbines.

Owing to the high temperature of the steam there is a very substantial expansion of the parts and where a steam conduit of any considerable length is employed the expansion and contraction due to the variations of temperature are liable to cause damage to the conduit or to its connections. It is one of the objects of the present invention to provide a steam conduit between the steam supply and the nozzle which shall have rigid connection with these parts and which shall have provision between these connections for yielding to compensate for expansion and contraction due to variations in temperature, thus relieving the connections of undue strain and preventing liability of damage and leakage in the conduit or connections.

Another object of the present invention is to provide a cheap and simple form of steam supply connection by means of which the steam may be distributed from a common supply pipe to a plurality of inlet nozzles.

With these and other objects in view, as will later appear, the present invention consists in the steam turbine hereinafter described, and more particularly defined in the claims.

In the accompanying drawings is illustrated what is now considered to be a preferred form of the present invention as applied to a well-known turbine of the impact type. Figure 1 is an approximately vertical section on lines 1—1 looking in the direction of the arrows with certain parts shown in elevation, and Fig. 2 is a side elevation looking toward the left of Fig. 1 with the cover plate and insulating lagging or packing removed.

In the specific embodiment of the invention illustrated in the drawings, the casing 2 and the head 3 of the turbine are formed of cast iron or other suitable metal. Within the casing is the rotor or bucket wheel 4 fixed upon the shaft 5 which is mounted to turn in bearings 6 on the casing 7 of the speed reducing transmission to which the turbine casing is rigidly secured.

Steam is supplied to the rotor through the inlet nozzles formed in the segments 11 secured to the head 3 of the casing, which segments are provided on their inner faces with the reversing buckets commonly employed in the type of turbine illustrated in the drawings. The steam is supplied to the nozzles through the steam passage 12 communicating with the passage 13 formed in the nozzle valve 14 which is also secured to the head 3 of the turbine casing. This valve is of the usual construction, and comprises the valve proper 15 upon the valve stem 16 which passes through the valve chamber 17 and stuffing box 18, and is provided with the handle 19, by means of which the supply of steam can be controlled as desired. The steam is led to the valve chamber 17 through a coiled tube 21, having one end threaded into the valve body 14, and the other threaded into the distributing connection or coupling 22, which may be connected with any suitable steam supply pipe.

To avoid loss of heat by radiation, the asbestos lagging or packing 24 is provided which surrounds the coiled steam tubular connections 21, the regulating valves, and the major portion of the turbine casing, being held in place by the side cover plate 25, the outer band 26, and the side ring 27.

The steam is exhausted from the bucket wheel into the interior of the casing 2 whence it passes out through the exhaust port 30. A stuffing box 31 prevents the escape of steam from the casing around the shaft, the stuffing box being carried by a plate or disk 32 yieldingly clamped on the casing by means of the springs 33 engaging at one end the nut 34 on the threaded stud 35.

The steam passage from the steam supply pipe is formed in the illustrated embodiment of the present invention in a series of connected parts, namely, the coupling 22, coiled steam connection 21, valve 14, and nozzle segment 11, each of which may be separately formed of steel and assembled to provide a continuous all-steel passage for the steam. Preferably the rotor 4 is machined from a solid piece of steel. By the use of steel tubing a very efficient and inexpensive

connection may be provided between the steam supply pipe and the valve casing, a coil or loop in the connection permitting free expansion and contraction under the wide variations in temperature which occur with the use of superheated steam without danger of damage to the steam connections.

Where the turbine shaft is mounted in bearings in a transmission case, as in the illustrated embodiment of the present invention, and the rotor is thus overhung on the shaft, the use of an axially arranged steam supply pipe is permitted, thus affording a symmetrical distribution system or manifold with each nozzle supplied by its own steam connection identical with every other connection. A minimum size of tubing for the connections 21 may thus be employed, as each connection conveys steam for a single nozzle only.

While the present invention has been illustrated and described in what is now considered a preferred embodiment, it is to be understood that it is not limited thereto, but may be embodied in other forms within the scope of the claims. Moreover, where in certain of the claims looped tubes are designated, this is not to be taken as limiting the claims to tubes having one or more complete turns, but to cover tubes with a bend or loop, whether closed or open, of sufficient extent to permit yielding of the tube under the variations of temperature without liability of damage.

Having thus described the present invention what is claimed is:

1. A steam turbine having, in combination, a rotor, a casing, an inlet nozzle within the casing, and a steam conduit from the steam supply to the nozzle and rigidly connected to said supply and nozzle, the conduit intermediate such connections having provision for yielding to permit expansion and contraction of the conduit with variations of temperature, thereby avoiding liability of damage to said conduit and connections.

2. A steam turbine having, in combination, a rotor, a casing, an inlet nozzle within the casing, and a flexible steam conduit between the steam supply and the nozzle adapted to yield laterally to provide for expansion and contraction of the conduit with variations in temperature.

3. A steam turbine, having in combination, a rotor, a casing, a plurality of inlet nozzles within the casing, a coupling adapted to be connected to a source of steam supply, and connections including a looped tube between each of said nozzles and the coupling.

4. A steam turbine, having in combination, a rotor, a casing, inlet nozzles within the casing, and a manifold for distributing steam from the steam supply to the nozzles, the manifold comprising a plurality of looped tubes.

5. A steam turbine, having in combination, a rotor, a casing, inlet nozzles within the casing, valves on the outside of the casing each having a steam passage connected with the steam passage in the nozzle, and looped tubes between the valves and the steam supply.

6. A steam turbine, having in combination, a rotor, a shaft, bearings for the shaft on one side of the rotor, a casing, a steam supply connection axially arranged on the side of the casing opposite the bearings, a plurality of inlet nozzles within the casing, a valve outside the casing for each nozzle, a looped tubular connection between each valve and the steam supply connection, heat insulating material surrounding the looped tubular connections, and means for holding the material in place.

OLIVER D. H. BENTLEY.