Aug. 12, 1924. 1,504,738

E. H. BROWN

BEARING

Filed Oct. 4, 1922

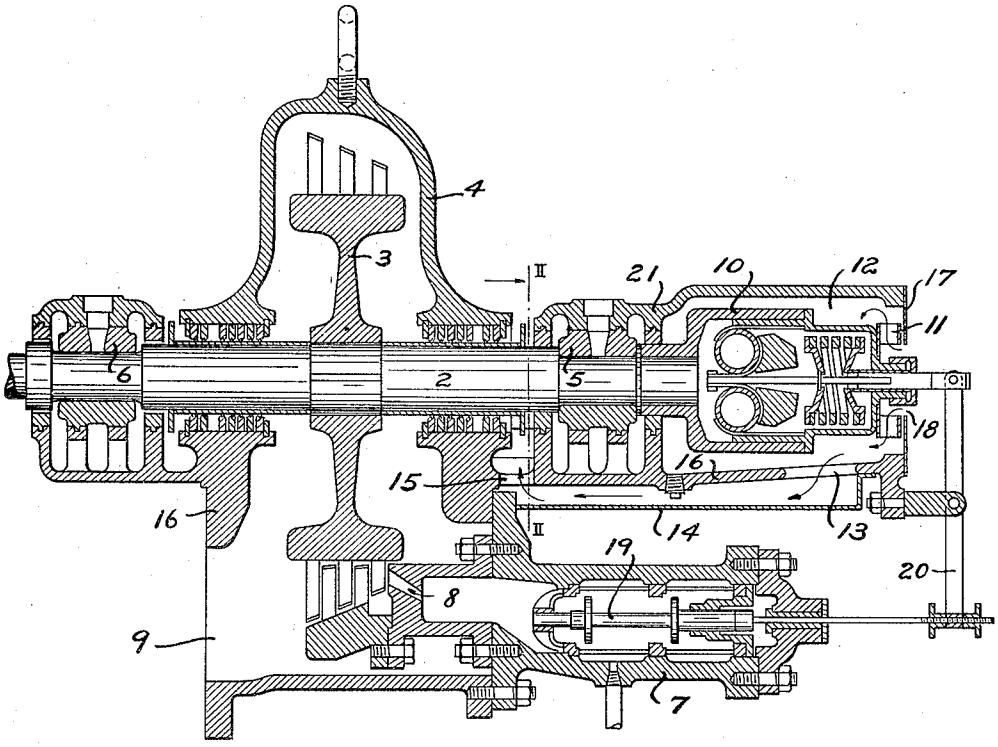


Fig. 1

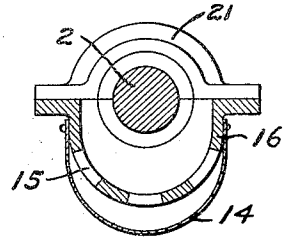


Fig. 2

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UNITED STATES PATENT OFFICE.

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BEARING.

Application filed October 4, 1922. Serial No. 592,207.

To all whom it may concern:

Be it known that EDWIN H. BROWN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Bearing, of which the following is a specification.

This invention relates to improvements in bearing structures, and relates more specifically to means for economically and effectively cooling bearings which are necessarily or preferably exposed to artificial heat.

An object of the invention is to provide simple and efficient means for cooling a bearing structure with the aid of an air current or the like.

It is often desirable in constructing various machines such as steam turbines, to so arrange various elements of the structure that one or more of the bearings are exposed to artificial relatively intense heat such as the heat of radiation from a steam conduit or the heat of conduction from relatively hot turbine structure located directly adjacent to the bearing or bearings. It has heretofore been common practice to cool bearings thus exposed by means of water jackets. While the prior water cooling systems are relatively effective, they are also relatively complicated and expensive because of the multiplicity of conducting pipes, complicated valves, water tight jackets and relatively complicated circulating means required therein for the purpose of producing a continuous circulation of cooling water. The water cooling systems are also objectionable since they require the provision of a fresh supply of cool water in order to maintain efficient operation. The present invention contemplates provision of simple, efficient and compact means for cooling a bearing which is subjected to artificial heat, by circulating a continuous current of cool air about the bearing. The invention also contemplates improvements in bearing structures and cooling systems therefor, which will be apparent in the course of the following description.

A clear conception of an embodiment of the invention and of the operation of a cooling system constructed in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification, in which like reference characters designate the same or similar parts in the several views.

Fig. 1 is a central vertical section through a steam turbine having a bearing associated directly with a relatively hot turbine rotor casing and located directly above and closely adjacent to the steam inlet leading to the turbine, the bearing being provided with an improved cooling system utilizing air as a cooling agency.

Fig. 2 is a transverse vertical section through the unit disclosed in Fig. 1, the section being taken along the line II—II of Fig. 1, looking in the direction of the arrow.

The steam turbine unit illustrated in the drawing comprises generally a blade carrying rotor 3 secured to a horizontal main shaft 2 which is mounted in bearings 5, 6 supported directly from a stationary lower casing 16. The portion of the casing 16 adjacent to the rotor 3, is provided with an upwardly removable casing cover 4 for permitting free access to the rotor 3 and other internal turbine structure. The bearings 5, 6 are likewise provided with upwardly removable covers for permitting access to the bearings. The end of the main shaft 2 adjacent to the bearing 5 projects beyond the bearing and is provided with a direct connected speed governor 10. The removable bearing cap 21 of the bearing 5 is extended to also provide an upwardly removable cover for the speed governor 10, the cover 21 cooperating with the lower casing 16 to form an annular chamber 12 surrounding the governor 10. Because of the fact that the casing and bearing covers 4, 21 are freely removable to permit inspection of the interior mechanism, the steam inlet 7 for admitting steam to the turbine rotor 3 is preferably located below the bearing 5 and shaft 2. The steam inlet 7 is controlled by means of a valve 19 operable by the governor 10 through connections 20. The valve 19 controls the delivery of steam to the rotor 3 through the nozzles 8, and the stationary casing 16 is provided with a suitable exhaust passage 9 for discharging the spent steam.

In order to prevent the heat of radiation from the steam inlet 7 and the heat of conduction from the rotor chamber of the casing 16 from producing excessive heating of the bearing 5, a suitable cooling system is

provided. This cooling system comprises a fan 11 attached directly to and rotatable with the governor 10. A plate 17 attached to the adjacent ends of the bearing cover 21 and of the stationary casing 16 has a central annular opening 18 forming an inlet passage for the fan 11. The fan 11 is adapted to discharge the air passing therethrough into the annular space 12. The lower portion of the stationary casing adjacent to the bearing 5 and governor 10 is provided with an outer curved sheet metal casing 14 forming an elongated horizontal duct which communicates at one end with the annular chamber 12 through passages 13 in the casing 16. The opposite end of the elongated horizontal duct formed by the casing 14 communicates with the atmosphere through air discharge openings 15 formed in the casing 16, the passages 15 being formed to direct the discharged air upwardly between the covers 4, 21.

During normal operation of the turbine, steam under pressure is being admitted to the rotor 3 through the nozzle 8, valve 19 and inlet 7, thus causing the rotor 3 to drive the horizontal shaft 2 and the governor 10 which is directly connected to the shaft 2. The governor 10 during this rotation, functions to control the speed of the unit by adjusting the inlet valve 19 through the connections 20.

As the governor 10 is rotated, the fan 11 carried by the end of the governor casing, draws cool air through the inlet opening 18 and delivers the air into the annular chamber 12. From the annular chamber 12 the current of air passes downwardly through the openings 13 and into the duct formed by the casing 14. The air after passing along the underside of the bearing 5 through the casing 14 is delivered to the atmosphere through the openings 15 and past the end of the bearing 5 which is closely adjacent to the heated rotor chamber. The continuous current of cool air thus delivered around the governor casing, below the bearing 5 and past the turbine end of the bearing 5, effectively prevents overheating of the bearing 5 by the heat radiating upwardly from the steam inlet 7 and by the heat of conduction and radiation from the rotor chamber. The fan 11 provides exceedingly simple and efficient means for circulating the cooling air, the power required to operate the relatively small fan being insignificant.

It will be noted that with a unit arranged as herein shown and described, the steam inlet may readily be located below the main shaft 2 and associated directly with the stationary lower turbine casing 16 at the most convenient place, without danger of overheating the bearings. The steam inlet is preferably associated with the stationary lower casing 16 in order to permit free removal of the upper caps 4, 21 without necessitating disconnection of the steam piping. The improved cooling system is automatic in operation and extremely simple and compact in construction, eliminating necessity of providing special piping, water tight jackets and complicated valves. While the invention has been illustrated as being embodied in a unit having a horizontal shaft, it will be obvious that features of the invention are also capable of embodiment in units which are otherwise disposed.

It should be understood that it is not desired to limit the invention to the exact details of construction and of operation herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination with a steam turbine having a stationary lower casing, a bearing secured to an end of said casing, and removable caps coacting with said casing and bearing, of a steam supply conduit located beneath said bearing and communicating with said casing, means forming a confined cooling duct extending horizontally between said bearing and said conduit, and a fan operable by said turbine to produce a flow of air through said duct.

2. In combination with a steam turbine having a stationary lower casing, a bearing secured to and spaced from an end of said casing, and removable caps coacting with said casing and bearing, of a steam supply conduit located beneath said bearing and communicating with said casing, means forming a confined cooling duct extending horizontally between said bearing and said conduit and upwardly between said casing and bearing, and a fan operable by said turbine to produce a flow of air through said duct.

3. In combination with a steam turbine having a stationary lower casing, a bearing secured to an end of said casing, a speed regulator adjacent to said bearing, and removable caps coacting with said casing and bearing and enclosing said regulator, of a steam supply conduit located beneath said bearing and communicating with said casing, means forming a confined cooling duct extending horizontally below said regulator and between said bearing and said conduit, and a fan operable by said turbine to produce a flow of air around said regulator and through said duct.

4. In combination with a steam turbine having a stationary lower casing, a bearing secured to and spaced from an end of said casing, a speed regulator adjacent to said bearing on the side thereof remote from said casing, and a removable cap coacting

with said casing and bearing and enclosing said regulator, of a steam supply conduit located beneath said bearing and communicating with said casing, detachable means forming a confined cooling duct extending horizontally below said regulator and between said bearing and said conduit and upwardly between said casing and bearing, and a fan operable by said turbine to produce a flow of air around said regulator and through said duct.

In testimony whereof, the signature of the inventor is affixed hereto.

EDWIN H. BROWN.