Nov. 27, 1923 1,475,389

R. S. HYATT

HYDRAULIC TURBINE

Filed May 9, 1923

Fig. 1.

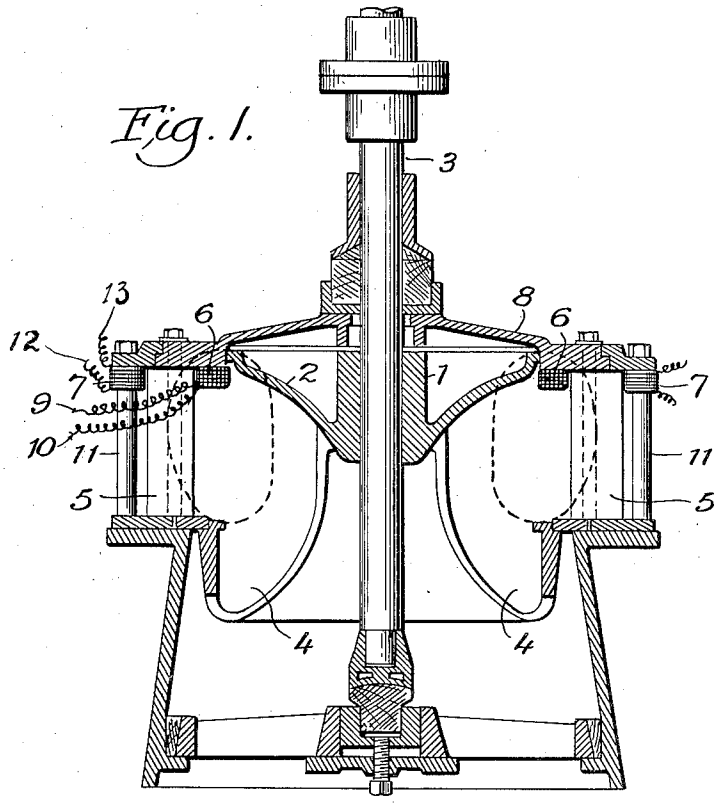
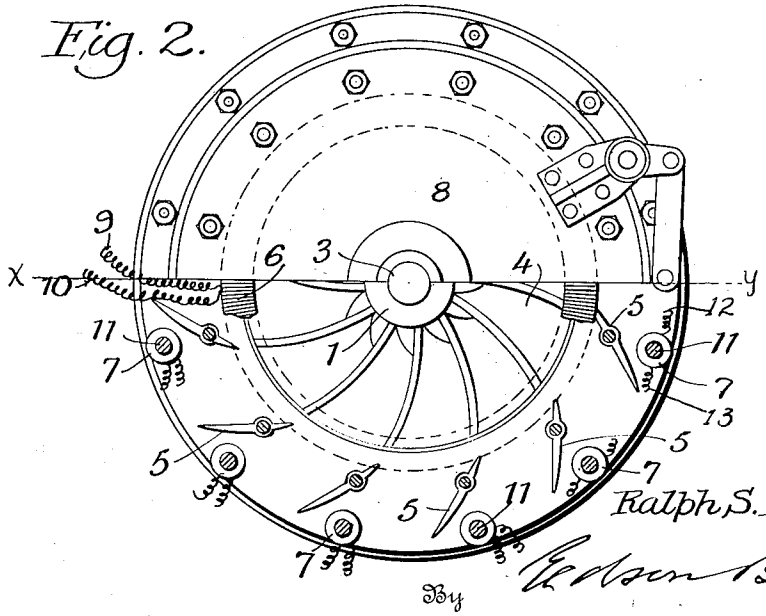


Fig. 2.



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HYDRAULIC TURBINE.

Application filed May 9, 1923. Serial No. 637,769.

To all whom it may concern:

Be it known that I, RALPH S. HYATT, a citizen of the United States, residing at Valentine, in the county of Cherry and State of Nebraska, have invented certain new and useful Improvements in Hydraulic Turbines, of which the following is a specification.

This invention relates to means for preventing the formation and adherence of ice to the metal parts of a device subjected to such formation and adherence and more especially to the metal parts of a device operating under water, such, for example, as a hydraulic turbine.

A common drawback in the operation of water power plants is the existence at occasional intervals of fragile or needle ice in the water passing through the turbines, which adheres to the metal parts, clogs up the turbine runner and water passageways and not infrequently causes a shut-down of the unit until the accumulation is removed.

Accordingly, one object of the present invention is to provide a device in combination with a hydraulic turbine which will prevent the adherence of ice to the metal parts thereof which are submerged in water during the operation of the turbine.

Another object of the present invention is to provide a device which will cause an increase in the temperature of such parts sufficient to prevent clogging thereof due to the adherence of ice to such parts, and which will operate efficiently under water when the turbine is in use.

A further object is to provide such a device that will induce electric currents in the metal parts of a hydraulic turbine, the heating effect of which will prevent the formation of ice on such parts.

Still further objects will appear from the following description, taken in connection with the accompanying drawings, which illustrate a preferred embodiment of the invention, but are not to be construed as a definition of the limits thereof, reference being had to the accompanying claims for that purpose.

In said drawings, in which like reference numerals are used to designate like parts throughout,

Fig. 1 is a sectional elevation of a hydraulic turbine showing a preferred embodiment of the present invention.

Fig. 2 is a plan view of the device shown in Fig. 1, with part of the top cover plate removed.

Referring more particularly to said drawings, Fig. 1 shows a common form of hydraulic turbine, consisting essentially of the hub 1 and crown 2 of the turbine wheel, said hub and crown being formed in one piece and being keyed or otherwise suitably secured to the shaft 3.

Secured to said hub and crown, and extending downwardly therefrom are the buckets 4, which receive the water inward and discharge it downward, outward and inward, with the general purpose of distributing it over the cross section of the turbine tube.

The wicket gates 5 control the admission of water to the buckets 4 and are opened and closed by any convenient-operating means, not shown, as it forms no part of the present invention, but which, for example, may be a ring disposed in a horizontal plane above said gates and connected thereto by arms, the opening and closing of said gates being effected by the partial rotation of said ring.

The above described hydraulic turbine is illustrated by way of example, to show the application of the present invention thereto, but it is to be understood that the invention may be as well applied to other forms of hydraulic turbines, and with equally good results.

Referring now to the ice preventing means which forms more particularly the subject of the present invention, the same comprises, in combination with metal parts operating under water, for example the parts of a turbine, an insulated coil 6, and, if desired, the auxiliary coils 7.

The coil 6 is insulated to avoid its being affected by the water passing through the turbine, and is shown conveniently disposed immediately beneath and secured to the stationary top cover plate 8, concentric therewith and having a diameter slightly larger than the crown 2 of the turbine wheel, and said crown may, if desired, fit within

said coil as shown in Fig. 1. Said coil is, of course, arranged so it will not interfere with the maximum opening of the wicket gates 5.

The terminals 9, 10 of said coil 6 lead to any convenient source of electric power, which supplies to said coil an alternating current of electricity.

In order to increase the heating effect, auxiliary insulated coils 7 may be provided, as shown, surrounding the spacing and supporting rods 11 for a part or the whole of their length, but shown as being arranged at the top part of each of said rods, immediately beneath the top plate 8 of the turbine.

Through each of these auxiliary coils 7 passes an alternating current, delivered to said coils through their respective terminals 12 and 13 from any convenient source, not shown, as the source from which the current is derived forms no part of the present invention.

The operation of the device is as follows: The alternating current flowing through the main coil 6 or auxiliary coils 7, or both, induces an electromotive force in the adjacent parts of the turbine, said parts being of metal and acting as a conductor for said induced electromotive force. Owing to the continuous change in the magnetic field produced by said alternating current, the induced current continues to flow in the adjacent metal parts of the turbines. As is well known, such induced or eddy currents are true electric currents, and produce the usual heating and magnetic effects. The heating effect thus produced is sufficient to raise the temperature of the metal parts of the turbine enough to prevent the formation thereon and adherence thereto of any ice particles that may exist or form in the water passing through the turbine, and all necessity of shutting down the unit because of clogging up the metal parts due to ice is thereby eliminated.

In order that the larger parts of the turbine may not be too greatly affected and consume too large a portion of the energy applied, they may be sectionalized and the sections sufficiently insulated to prevent the circulation therein of induced or eddy currents. For example, the top plate 8 may, as shown in Fig. 2, be divided into halves along the line *x—y*.

It will thus be seen that a device has been provided which will supply a sufficient amount of heat to those parts of a hydraulic turbine which operate in water to prevent the formation of ice on such parts and the adherence of ice to said parts; that not only the turbine wheel and the parts adjacent thereto, but also the wicket gates and the parts adjacent said gates, are supplied with heat; that the heat is supplied to all of said parts by insulated coils not affected by the water in which they are submerged; and that by sectionalizing and insulating the parts of the turbine where no heat is required, the loss of energy that would otherwise be used in setting up induced currents in such parts is greatly minimized.

What is claimed is:

1. In a hydraulic turbine, means for preventing the formation and adherence of ice particles to the metal parts of said turbine, comprising a conductor of electricity arranged in proximity to said metal parts, and having an alternating current flowing therethrough, whereby induced currents flow in said metal parts and increase their temperature.

2. In combination, a hydraulic turbine, and means for preventing the formation and adherence of ice to the metal parts thereof operating under water, said means comprising a current conducting coil arranged in proximity to said metal parts and having an alternating current of electricity flowing therethrough, whereby induced currents are set up in said metal parts and increase their temperature.

3. In combination, a hydraulic turbine and means for preventing the formation of ice particles on the parts of said turbine operating under water and the adherence of such ice particles to said parts, said means comprising an insulated current conducting coil arranged in proximity to the metal parts of said turbine operating under water, and submerged with said parts during operation of said turbine, said coil carrying an alternating current of electricity, whereby induced currents are set up in said metal parts and increase their temperature.

4. Means for preventing the formation and adherence of ice to the metal parts of a machine operating under water, comprising a conductor carrying an alternating electric current and setting up induced currents in said metal parts, whereby their temperature is increased.

5. In a hydraulic turbine, a turbine wheel, wicket gates for controlling the admission of water to said turbine wheel, an insulated conductor carrying an alternating electric current and arranged in proximity to said turbine wheel, auxiliary insulated conductors each carrying an alternating electric current and arranged in proximity to said wicket gates, said current carrying conductors setting up induced currents in the parts of said turbine in proximity thereto, whereby said parts are heated.

In testimony whereof I affix my signature.

RALPH S. HYATT.