Jan. 10, 1928. 1,655,829

W. M. WHITE

DIFFUSER FOR HYDRAULIC MACHINES

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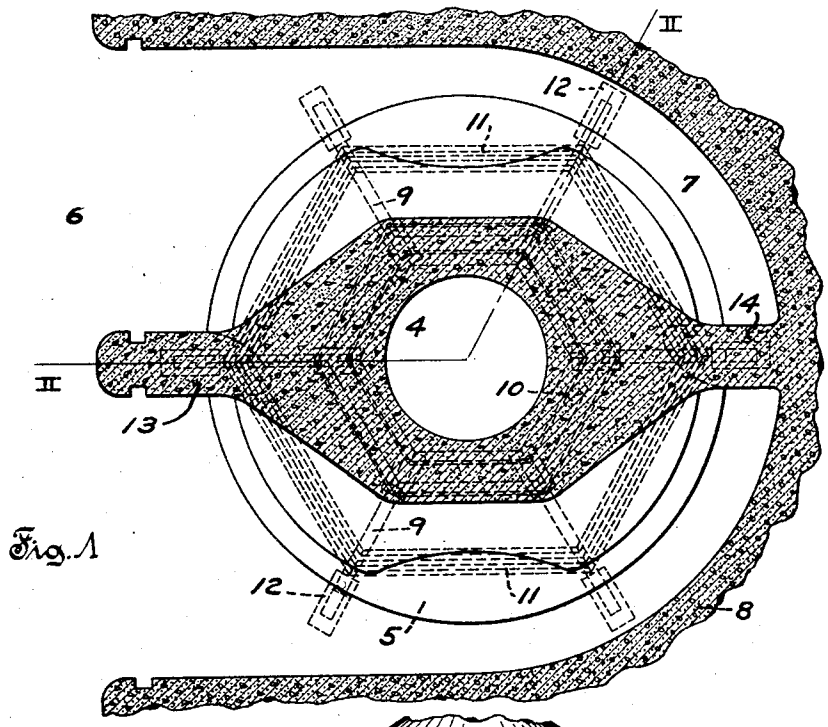

Fig. 1

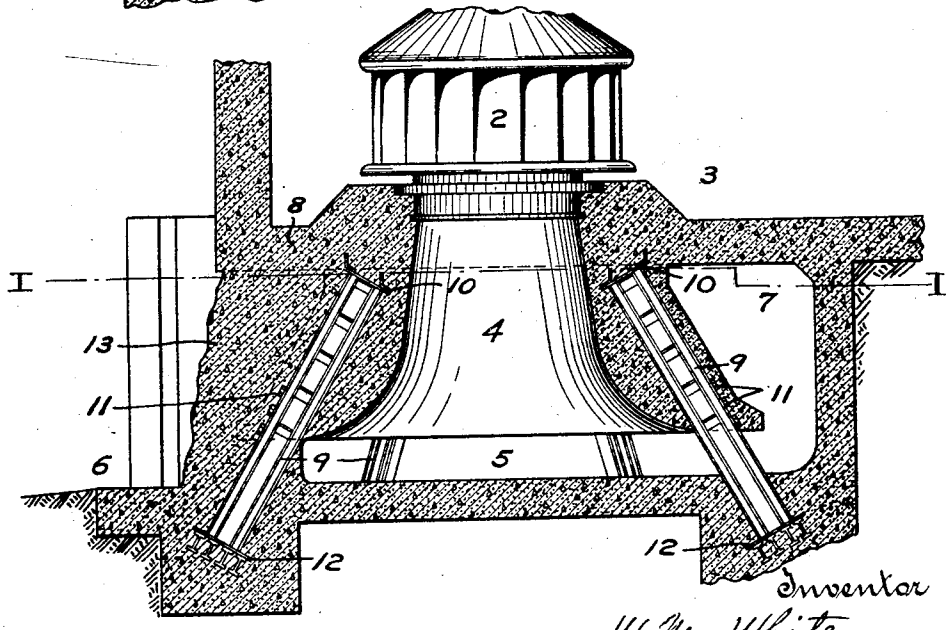

Fig. 2

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DIFFUSER FOR HYDRAULIC MACHINES.

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This invention relates to improvements in energy regaining apparatus, and relates more specifically to improvements in the construction of diffusers or draft tubes for hydraulic machines such as turbines or pumps.

An object of the invention is to provide improved means for reenforcing diffuser structures or the like. Another object of the invention is to provide an improved concrete draft tube construction of great strength and extreme rigidity. These and other objects and advantages will be apparent from the following description.

A clear conception of an embodiment of the invention and of the mode of constructing diffusers 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 various views.

Fig. 1 is a transverse horizontal section through an improved hydraulic turbine draft tube embodying the invention, the section being taken along the line I—I of Fig. 2.

Fig. 2 is a vertical section through the draft tube of Fig. 1, the section being taken along the irregular line II—II of Fig. 1.

While the invention has been specifically applied herein to a type of draft tube known as the Hydraucone regainer, it will be apparent that the novel features thereof are more generally applicable to other forms of diffusers. In the specific embodiment illustrated, the diffuser 4 comprises a downwardly enlarging vertical chamber, the upper end of which communicates with the discharge opening of a turbine 2 and the lower end of which flares rapidly into a horizontal diffuser chamber 5 which communicates with a tail-race 6 through a conducting passage 7. The inlet guide vanes of the turbine 2 communicate with a supply flume 3, the flume 3 being separated from the tail-race 6 by means of concrete structure 8. The annular downwardly enlarging concrete bounding wall of the diffuser 4 has its upper portion formed integral with the concrete structure 8 and is also integrally united with the structure 8 at its front and rear portions by means of piers 13, 14.

Located within the concrete wall or bell of the diffuser 4, is a series of inclined metal reenforcing bars 9 which extend longitudinally of the vertical diffuser chamber 4 and span the secondary diffuser chamber 5 located below the diffuser 4. The upper ends of the reenforcing bars 9 are interconnected by a series of metal plates 10 and metal angle bars all of which are embedded in the concrete of the diffuser wall. The medial portions of the bars 9 are likewise interconnected by a series of metal reenforcing plates 11 also embedded in the concrete of the diffuser wall. The lower extremities of the bars 9 are provided with metal anchor plates 12 embedded in the concrete structure 8, and the reenforcing bars 9 and the plates 10, 11 cooperate to provide a metal reenforcing structure which entirely surrounds or encircles the diffuser chamber.

In constructing a diffuser in accordance with the present invention, the reenforcement structure is first assembled and properly positioned within suitable forms. The concrete of the structure 8 and of the annular draft tube wall is then poured around the metal reenforcing structure, thus effectively embedding the upper and lower portions of the bars 9, the reenforcing plates 10, 11, and the anchor plates 12 in a solid bed of concrete. While four sets of the bars 9 have medial portions spanning the diffuser chamber 5, the space occupied by these spanning portions is such a slight percentage of the total area of the discharge passages, that the loss in efficiency due to such obstruction is negligible. The metal reenforcing structure besides providing rigidity in the draft tube and thus eliminating possible vibration, also provides a rigid support for the turbine 2 located thereabove. It will be apparent that the improvement is applicable to other forms of diffusers and turbine draft tubes, than the type specifically shown.

It should be understood that it is not desired to limit the invention to the exact details of construction 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, a reenforcing structure comprising a series of upwardly extending inwardly inclined bars and superposed series of horizontal bars connecting said inclined bars, a base rigidly connecting the lower ends of said inclined bars, and an annular concrete diffuser bounding wall em-

bedding said horizontal bars and the adjacent portions of said inclined bars, said wall being supported above and spaced from said base by said inclined bars.

2. In combination, a reenforcing structure comprising a series of upwardly extending inwardly inclined bars and several superposed series of horizontal bars connecting said inclined bars, a concrete base embedding the lower ends of said inclined bars and having an upper substantially plane surface, and an annular concrete diffuser bounding wall embedding said horizontal bars and the adjacent portions of said inclined bars, said wall being supported above and spaced from said surface by said inclined bars.

3. In combination, a reenforcing structure comprising a series of equally spaced upwardly extending inwardly inclined bars and several superposed series of horizontal bars connecting said inclined bars, a concrete base embedding and rigidly connecting the lower ends of said inclined bars, and an annular concrete bounding wall forming a conical diffuser and embedding said horizontal bars and the adjacent portions of said inclined bars, said wall being supported above and spaced from said base by said inclined bars.

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

WILLIAM M. WHITE.