Sept. 25, 1928.

1,685,260

W. M. WHITE

GUIDE VANE

Filed June 17, 1926

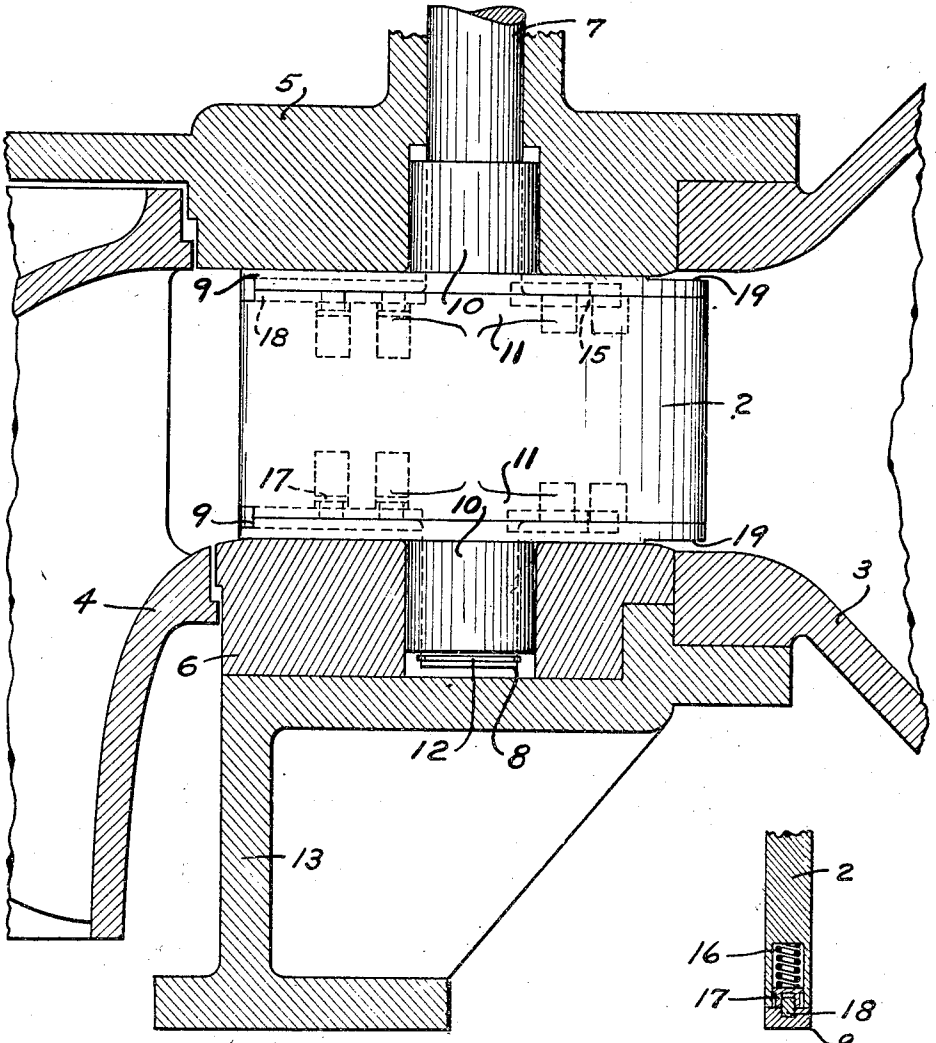


Fig. 1

Fig. 3

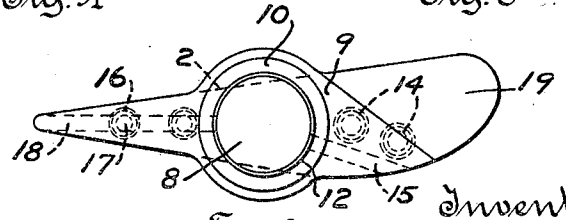


Fig. 2

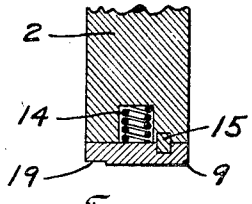


Fig. 4

Inventor

W. M. White

by G. J. Dellwin

Attorney

Patented Sept. 25, 1928. 1,685,260

UNITED STATES PATENT OFFICE.

WILLIAM M. WHITE, OF MILWAUKEE, WISCONSIN.

GUIDE VANE.

Application filed June 17, 1926. Serial No. 116,551.

This invention relates in general to improvements in hydraulic machines, and relates more specifically to improvements in the construction and operation of adjustable guide vanes for hydraulic turbines or the like.

An object of the invention is to provide a new and useful guide vane structure which is simple in construction and efficient in operation.

It is common commercial practice in the construction of hydraulic turbines, to utilize an annular series of adjustable guide vanes for controlling the flow of fluid to the turbine rotor. These guide vanes are swingable about parallel pivots and have portions projecting forwardly and rearwardly from the pivots and cooperating with adjacent vanes, to control the quantity and the direction of flow of the fluid admitted to the rotor. Considerable difficulty has been had with structures of this type, due to leakage of fluid through the joints between the ends of the vanes and the adjacent casings, when the guide vanes are in closed position, and it is an object of this invention to provide suitable packings for preventing such undesirable leakage. With this object in view, the invention consists in the provision of packing members between the vane ends and the adjacent casing elements, together with means for resiliently urging these members against suitable seating surfaces to thereby eliminate the leakage.

A clear conception of an embodiment of the invention and of the mode of operation of devices 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 various views.

Fig. 1 is a fragmentary sectional view of a hydraulic turbine, the section being taken adjacent to one of the inlet guide vanes of the turbine.

Fig. 2 is an end view of one of the inlet guide vanes showing the improved packing associated therewith.

Fig. 3 is a transverse section through a fragment of the discharge end of one of the inlet guide vanes.

Fig. 4 is a transverse section through a fragment of the admission end of one of the inlet guide vanes.

The hydraulic turbine specifically illustrated in the drawing comprises a stationary turbine casing consisting of a top casing cover or element 5, a bottom casing ring or element 6, and a base plate 13; the top cover 5 and the bottom ring 6 providing an annular inlet conduit directed toward the interior of the casing. A fluid supply casing 3 forms a speed ring communicating with the annular conduit provided by the casing elements 5, 6, and a rotor 4 of suitable construction is disposed within the casing so as to receive fluid from the supply casing 3 through the annular casing conduit. An annular series of adjustable guide vanes 2 is disposed within the annular inlet conduit of the turbine casing, each of these guide vanes being provided with pivots 7, 8 projecting from the opposite ends thereof and into the adjacent casing elements 5, 6 respectively. Suitable guide vane adjusting mechanism of well known construction is associated with the vane pivots 7 for the purpose of simultaneously swinging the vanes 2 about their pivotal axes.

The opposite ends of each of the vanes 2 are provided with packing members or plates 9 having tubular extensions 10 embracing the vane pivots 7, 8 respectively. The packing plates 9 have outer plane surfaces cooperable with the adjacent plane surfaces of the casing elements 5, 6 respectively, the plates being relieved at the cut-away portions 19 so as to produce surface contact of substantially equal areas on opposite sides of the vane pivots. The inlet portion of each vane 2 is provided with grooves adapted to receive guide keys 15, as shown in Fig. 4, the keys 15 snugly fitting adjacent grooves in the packing plates 9. Helical compression springs 14 disposed within pockets in the inlet portion of each vane 2 coact with the plates 9 and constantly urge the adjacent portions of the plates outwardly away from the guide vane. The discharge portion of each guide vane 2 is provided with recesses formed to receive the keys 18, as shown in Fig. 3, the keys 18 likewise coacting with adjacent recesses in the packing shoes 9. The portions of the packing plates 9 adjacent to the keys 18, are urged outwardly against the casing elements 5, 6, by means of helical compression springs 16 disposed within pockets of the guide vane 2 and coacting with plungers 17 which straddle the keys 18 and in turn engage the adjacent packing plates 9. The keys 15, 18 are disposed radially with respect to the guide vane axes and serve to prevent the passage of fluid between the packing plates 9 and the adjacent guide

vanes 2. The tubular extensions 10 which snugly fit the guide vane pivots 7, 8 are journalled in the casing elements 5, 6, and a snap ring 12 serves to maintain the lower packing plate 9 in assembled position with respect to the guide vane 2 while inserting and removing the latter. The medial end portions of the packing plates 9 are somewhat wider than the adjacent vanes 2, and the vanes are provided with end enlargements 11 cooperating with the widened plate portions.

During normal operation of the turbine, the actuating fluid is admitted from the supply casing 3 past the guide vanes 2 to the turbine rotor 4 in a well known manner. The guide vanes 2 are adjustable about their pivots 7, 8 to vary the direction and quantity of flow of the entering fluid and also to completely shut off the flow. When the guide vanes 2 are closed, the packing plates 7 and the keys 15, 18, provide a continuous annular packing for effectively preventing the flow of fluid past the ends of the annular series of guide vanes. The helical springs 14, 16 coacting with the inlet and discharge portions of the packing plates 9 constantly urge these plates against the adjacent casing elements, and the keys 14, 16 provide effective baffling elements for preventing the flow of fluid through the space between the plates 9 and the vane ends. The guide vanes may be removed in assembled condition upon removal of the top cover 5 and the tubular extensions 10 provide renewable wearing sleeves cooperating with the pivots 7, 8 and with the adjacent casing elements.

It should be understood that it is not desired to limit the invention to the exact details of construction and 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, a casing element, a vane element formed to direct fluid into said casing element and pivotally associated therewith, and a packing member supported by one of said elements and resiliently urged against the other on opposite sides of the vane element pivot.

2. In combination, a casing element, a vane element formed to direct fluid into said casing element and pivotally associated therewith, and a packing member supported by said vane element and resiliently urged against said casing element on opposite sides of the vane element pivot.

3. In combination, a plurality of casing elements, a vane element pivotally associated with and disposed between said casing elements, and packing members supported by opposite ends of said vane element and resiliently urged against said casing elements.

4. In combination, a plurality of casing elements, providing a fluid conduit, a vane element pivotally associated with said casing elements within said conduit, a packing plate associated with each end of said vane element adjacent to one of said casing elements, and spring means for urging said plates against the adjacent casing elements.

5. In combination, a casing element, a vane element pivotally associated with said element, a key coacting with a groove in said vane element, a packing plate having a recess for receiving said key, and means for urging said packing plate against said casing element.

6. In combination, a casing element, a vane element having a recess at an end thereof, a key disposed with said recess, a packing shoe engaging said key, and spring means for urging said packing plate against said casing element.

7. In combination, a casing element having a recess, a vane element having a pivot extending through said recess, a key disposed within a recess of said vane element and projecting therefrom, a packing plate having a recess cooperating with said key and provided with a tubular extension extending into said casing recess, and means for urging said plate against said casing.

8. In combination, a casing forming a fluid conduit and having alined recesses on opposite sides of said conduit, a vane located within said conduit and having pivots extending into said recesses, guide keys projecting from the opposite ends of said vane, packing plates cooperating with said keys and with the adjacent condit walls, and spring means for resiliently urging said plates against said walls.

9. In combination, a casing element, a vane element formed to direct fluid into said casing element and pivotally associated therewith, and a packing supported by one of said elements and coacting with the other on opposite sides of the vane element pivot to reduce leakage between the end surface of said vane element and the adjacent surface of said casing element.

10. In combination, a casing element, a vane element formed to direct fluid into said casing element and adjustably associated therewith, and a packing supported by one of said elements and coacting with the other to reduce leakage between the relatively movable end surface of said vane element and the adjacent surface of said casing element.

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

WILLIAM M. WHITE.