April 3, 1928.

1,664,895

A. NYDQVIST

BLADE WHEEL

Filed Jan. 13, 1927

Fig. 1.

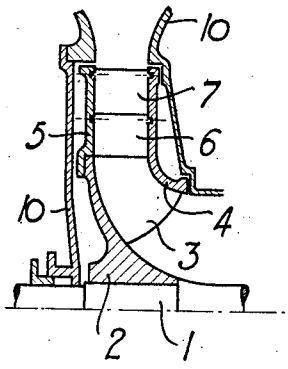


Fig. 2.

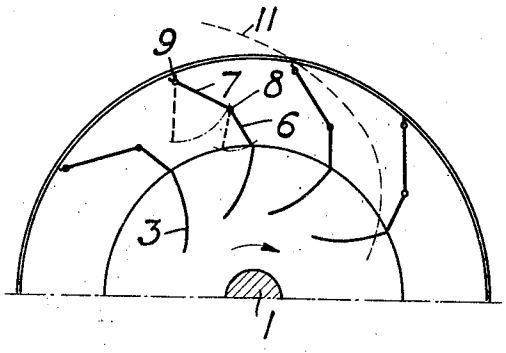


Fig. 5.

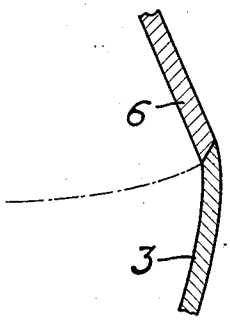


Fig. 4.

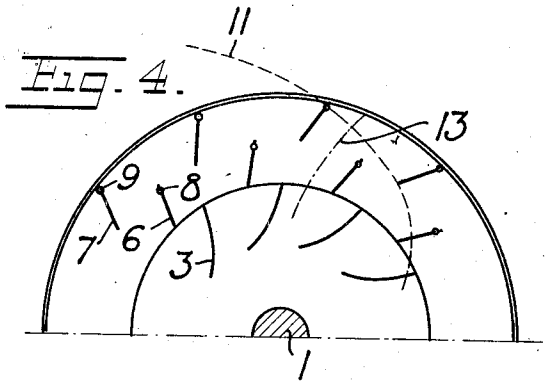
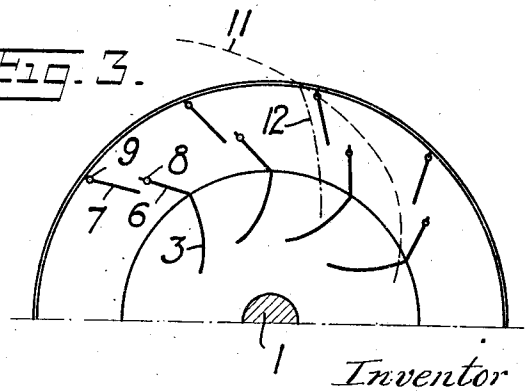


Fig. 3.



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UNITED STATES PATENT OFFICE.

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BLADE WHEEL.

Application filed January 13, 1927, Serial No. 160,940, and in Sweden January 19, 1926.

In certain types of turbine wheels or similar blade wheels it has proved desirable or quite necessary for the practical applicability of the design, as in hydraulic gears, that the torque of the blade wheel can be varied within wide limits as compared with what is possible in connection with blade wheels of the design hitherto in practice. Considering, for instance, a hydraulic gear of a vehicle a relation of the torque in starting to that at normal number of revolutions amounting to about 1. 6:1, as in wheels of the usual design, is far from sufficient. In such case a relation equal to 4:1 at least is necessary in order that the acceleration of the vehicle in starting may satisfy moderate requirements.

The present invention has for its object to provide a blade wheel that will satisfy the above requirement in a simple and reliable way. The invention is characterized, chiefly, by the fact that each blade comprises a plurality of sections one or more of which is or are non-adjustably held in place, while the remaining blade or blades is or are pivotally mounted on journals or shafts so that they may either take a position in which they form a continuous extension of the non-adjustable blade sections or, according as the speed of rotation of the wheel varies, be moved into and out of operation in order to secure a great variation of the torque.

In the accompanying drawing, forming part of this specification, one embodiment of the invention is illustrated. Fig. 1 is an axial section of part of a turbine wheel according to the invention. Fig. 2 is a diagrammatic cross section of the one half of such a wheel. Fig. 3 is a similar section of said wheel with the blades shown in another position. Fig. 4 is a similar section of the wheel with the blades shown in a still other position. Fig. 5 is a detailed cross-section of parts of two adjacent blade sections on a larger scale.

In the drawing, each blade is shown as comprising three sections, though it is evident that any desired number of sections other than three may be used. In the drawing, only as large portion of the blade wheel as is necessary for illustrating the invention is shown.

With reference to the drawing, the numeral 1 indicates the shaft of the turbine wheel. 2 is the hub of the turbine wheel keyed to said shaft. The hub 2 is formed integral with the inner, non-adjustable blade sections 3 secured, on the other hand, to the annular side wall 4. Situated opposite the outer portion of the side wall 4 is a removable side wall or ring 5 carrying together with the wall 4 one inner and one outer series of adjustable blade sections 6 and 7, respectively, mounted on journals 8, 9, respectively, parallel to the shaft 1. The surrounding stationary turbine casing is indicated at 10.

The journals 8, 9 of the adjustable blade sections 6, 7 are arranged so that said blade sections may be turned relatively to each other as well as relatively to the non-adjustable sections 3. Thus, they may be adjusted so as to form continuous blade surfaces together with the non-adjustable blade sections 3, as shown in Fig. 2. Said position the blade sections will assume in starting because of the fact that the wheel will be at rest at the first moment. In such case the entire blade surface will consequently be effective giving the wheel its largest diameter and its maximum torque. With increasing number of revolutions of the wheel the circumferential velocity of the outermost adjustable blade sections 7 will finally become so high as to prevent the water entering the wheel, the direction of movement of which is secured by rigid guide blades or helical casing, from exerting any pressure upon the outermost blade sections 7. As a result said blade sections 7 upon further increase of the velocity, will turn on their pivots into an entirely ineffective position relatively to the water flow.

This will appear from Fig. 3 which shows the position of the adjustable blade sections at increased speed. With still more increasing velocity a point will finally be reached at which the intermediate blade sections 6 too are no longer operated by the water pressure in the direction of rotation of the wheel but will turn on their pivots 8 so as to take an indifferent position relatively to the water flow, as shown in Fig. 4. In such position the innermost or stationary blade sections 3 only are in operation and the wheel is thus, running at its highest number of revolutions.

In Figs. 2, 3 and 4 I have also indicated the theoretic path of the water that may be obtained in case the water were allowed to freely continue its way towards the centre

of the wheel without operating any blades. Said water path is represented by the curve 11.

In Fig. 3 the curve 12 is shown to indicate the position that the blades must take in order to prevent the blades from interfering with or being interfered by the water flow at a moderate number of revolutions, and in Fig. 4 the curve 13 is shown to indicate the corresponding position at a higher number of revolutions.

In order that the blade sections may always be in a definite position relatively to each other when in cooperation, they may either be provided with abutments at their sides or, as shown in Fig. 5, they may be obliquely cut at their inlet and outlet edges so as to closely fit together. The lengths of the blades may, of course, be determined in other appropriate ways.

From the above description it will be seen that the invention is very simple in construction and efficient and automatic in its action.

It is to be noted that the invention is not restricted to the embodiment shown in which the blades comprise three sections, and in which the ring 5 is removable. The same comment applies to the appearance and shape of the wheel as a whole. The blades may, of course, comprise any number of sections desired, and the wheel may be an axial flow wheel, a centrifugal wheel or the like instead of a centripetal wheel as shown in the drawing.

What I claim is:

1. A blade wheel, comprising a hub member, blade sections rigidly secured to said hub member, and other blade sections loosely mounted on individual pivots so as to permit said pivoted blade sections to adjust themselves automatically to form continuous blade surfaces together with said rigid blade sections and at increased velocity of the wheel to be automatically brought out of operative position relatively to the direction of flow of the driving medium.

2. A blade wheel, comprising a hub member, blade sections rigidly secured to said hub member, a ring removably connected to said hub member, and other blade sections loosely mounted to said ring at about their outer ends by means of individual pivots.

In testimony whereof I have signed my name.

ANTENOR NYDQVIST.