No. 672,838. Patented Apr. 23, 1901.

F. HODGKINSON.

FLUID PRESSURE TURBINE.

(Application filed Mar. 1, 1900.)

(No Model.)

Fig. 1.

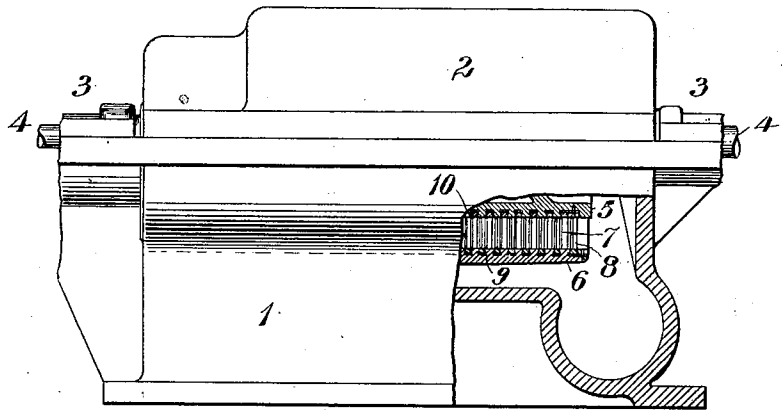


Fig. 2

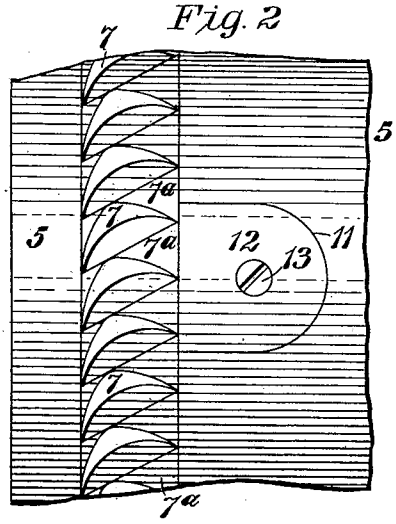


Fig. 3.

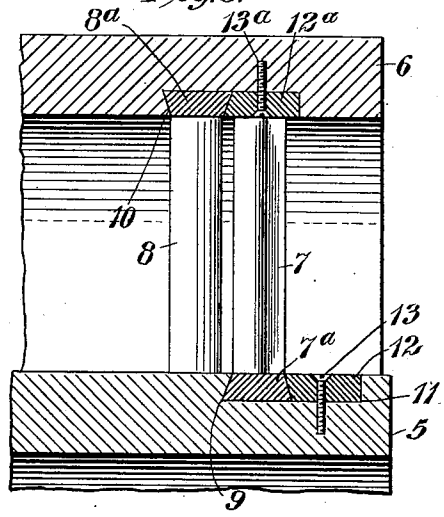


Fig. 4.

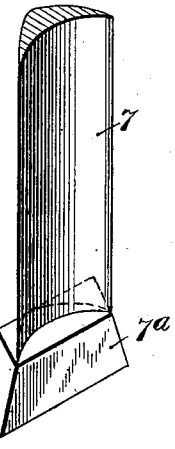
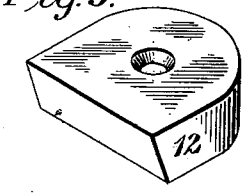


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE TURBINE.

SPECIFICATION forming part of Letters Patent No. 672,838, dated April 23, 1901.

Application filed March 1, 1900. Serial No. 6,986. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS HODGKINSON, a subject of the Queen of Great Britain and Ireland, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fluid-Pressure Turbines, of which the following is a specification.

My invention relates to fluid-pressure turbines, and particularly to means for attaching the blades or vanes to either the cylinders or the drums of such engines or to both of the said parts.

The object of my invention is to provide a means for attaching the blades or vanes to the supporting-drum or the cylinder of a fluid-pressure turbine which shall be of such character as to permit of the ready insertion and removal of the said parts and at the same time insure the locking of the blades or vanes securely in position, so that they are as rigidly supported as if they were cast or otherwise permanently located in the positions which they occupy in use. With these ends in view I have devised the means shown in the accompanying drawings, in which—

Figure 1 is a side elevation, parts being broken away, of a fluid-pressure turbine constructed in accordance with my invention. Fig. 2 is a detail view of a portion of one annular set of blades or vanes and the corresponding supporting and locking parts. Fig. 3 is a detail sectional view showing the means of fastening the blades or vanes in position. Fig. 4 is a perspective of one of the blades or vanes constructed in accordance with my invention, a portion of the free end being broken away. Fig. 5 is a perspective view of a locking-block.

I have illustrated my invention as applied to a rotary steam-turbine of the well-known Parsons type, although it might be employed in connection with turbines of different form and arrangement of parts from those shown.

The frame 1 of the engine embodies an outer casing 2, suitable bearings 3 for the shaft 4 of a drum 5, and a cylinder 6 concentric with the drum 5, all of these parts being of usual construction. The drum 5 is provided with a longitudinally-disposed series of annular sets of blades 7, the bases 7^a of which are firmly set in the periphery of the drum 5 and the free ends of which terminate in close proximity to the inner periphery of the cylinder 6. The cylinder 6 is provided with a series of annular sets of blades or guide-vanes 8, the bases 8^a of which are firmly mounted in the inner wall of the cylinder and the free ends of which terminate in close proximity to the periphery of the drum. The sets of blades carried by the drum alternate in position with the blades or vanes carried by the casing from end to end, as is usual in engines of this general character. It will be understood, however, that the blades or vanes in the several sets pertaining to the cylinder may extend entirely around or only partially around the periphery of the casing, and in case any or all of the sets occupy less than a complete circumference the intervening space will preferably be occupied by a solid ring.

I have not deemed it necessary to illustrate an entire set of blades or vanes pertaining to either of the members of the engine, for the reason that my present invention is not in any way concerned with the number of vanes or blades in the several sets or in the relative locations of such sets, except so far as an operative construction and arrangement is necessary.

Referring now particularly to Figs. 2 to 5, inclusive, the outer periphery of the drum 5 is provided with a series of undercut annular recesses or grooves 9, the series extending from end to end of the drum and spaced apart a sufficient distance to provide spaces of the necessary width for the corresponding blades or guide-vanes 8, carried by the surrounding cylinder 6. The inner periphery of the cylinder 6 is similarly provided with a series of undercut annular grooves or recesses 10, which alternate in position with the corresponding grooves in the drum from end to end. Each of the blades 7 is provided with a base-block 7^a, preferably formed integral with the blade and of such form and dimensions as to closely fit the groove 9, in which it is to be placed, and each blade or vane 8 is provided with a like base 8^a, adapted to fit the grooves 10. In the case of the blades 7 it is of course advisable to make the outer faces of the base-blocks 7^a

sufficiently concave to fit the bottom surface of the annular groove or recess 9, and in the case of the cylinder-blades 8 it is desirable to make the outer faces of the base-blocks 8^a sufficiently convex to fit the bottom of the annular groove or recess 10.

The annular grooves or recesses 9 and 10 are shown as of dovetail form in cross-section; but they may be given a different form, if desired, so long as they are undercut sufficiently to hold the vanes or blades securely in position.

In order that the blades 7 may be readily inserted and that after insertion they may be firmly locked in position, I provide a recess 11 adjacent to and communicating with one side of each annular recess 9, its depth being the same as that of the adjacent annular recess and its form and lateral dimensions being such as to permit of the ready insertion therein of the base-block of each blade. The blades are placed in position by inserting their base-blocks one at a time in the annular recess, through the recess 11, and then moving the block along the annular recess to any convenient point or until it abuts against a block previously inserted. The blades and their blocks may be moved both ways from the insertion-recess 11 to proper position, and, in fact, more than one inserting-recess may be provided for each annular recess, if desired, the block in each set that is last inserted being of course adjacent to an inserting-recess in any case. After all the blades of a set are in position a locking-block 12 will be dropped into the recess 11 and a screw 13 or other fastening device inserted to hold the block firmly in position. The edge of the block 12 adjacent to the annular recess 9 will of course be beveled or undercut, as indicated in Fig. 5, so that when in position the cross-section of the annular recess will be uniform throughout.

The casing 2, of which the cylinder 6 constitutes a part, being formed in two sections separable along a horizontal plane through the axis of the cylinder, each half of the cylinder will have a series of grooves, and if these grooves are continued to the edge either at one or at both sides the base-blocks 8^a may be inserted at the open ends of such grooves and the insertion-recesses and locking-blocks omitted. In case the grooves have closed ends, however, recesses 11^a, blocks 12^a, and screws 13, which correspond, respectively, to the parts 11, 12, and 13 of the drum, will be employed.

While I have shown my improvement as applied to both the drum and the cylinder, it will be understood that it may be embodied in only one of these parts, if desired. It will also be understood that the construction and arrangement of parts may be varied within reasonable limits without departing from the spirit and scope of my invention.

I claim as my invention—

1. A fluid-pressure turbine, one of the blade-supporting members of which is provided with undercut grooves and laterally-offset insertion-recesses and with sets of blades or vanes having integral base-blocks that are removably fitted into and completely fill said grooves, and locking-blocks fitting into said recesses.

2. A fluid-pressure turbine, one of the blade-supporting members of which is provided with undercut circumferential grooves and with laterally-offset insertion-recesses, in combination with blades or vanes having integral base-blocks formed to accurately fit said grooves and locking-blocks located in said insertion-recesses.

3. In a fluid-pressure turbine, the combination with a member having a cylindrical periphery provided with a series of annular undercut recesses and with a laterally-projecting recess communicating with each annular recess at one side, of a plurality of sets of blades or vanes having base-blocks adapted to fit said undercut grooves and blocks fitting into said laterally-projecting recesses to lock the blades in position.

4. A fluid-pressure-turbine member provided with an annular recess having undercut sides, in combination with a set of blades or vanes having base pieces or blocks fitting in said annular recess, and a removable block seated in a recess adjacent to and communicating with said annular recess for locking the blades in position.

5. In a fluid-pressure turbine, a drum having a series of annular dovetail grooves and a series of recesses projecting laterally therefrom, in combination with a series of separably-removable blades having dovetail base-blocks seated in said grooves, locking-blocks fitting the laterally-projecting recesses and means for removably fastening said locking-blocks in position.

6. A fluid-pressure turbine, at least one of the blade-supporting members of which is provided with circumferential undercut grooves and with recesses projecting laterally from said grooves, in combination with blades having base-blocks fitting in and filling said grooves and locking-blocks fitting in and filling said recesses.

In testimony whereof I have hereunto subscribed my name this 28th day of February, 1900.

FRANCIS HODGKINSON.

Witnesses:
WESLEY G. CARR,
W. SUMNER SEIBERT.