No. 730,363. PATENTED JUNE 9, 1903.

H. GEISENHÖNER.

DETACHABLE TURBINE BUCKET.

APPLICATION FILED AUG. 21, 1902.

NO MODEL.

Fig. 1.

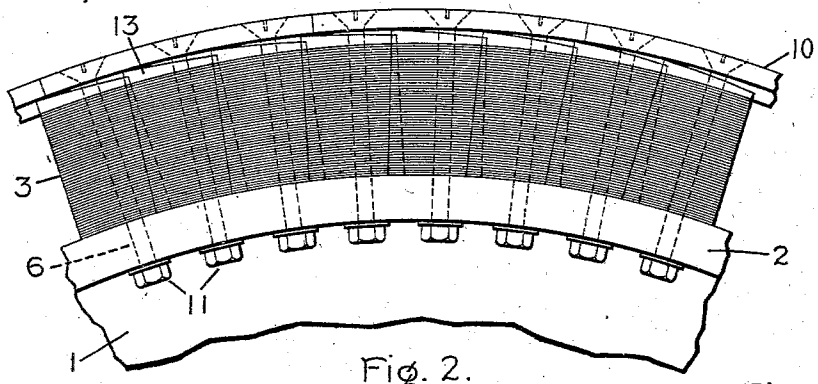


Fig. 2.

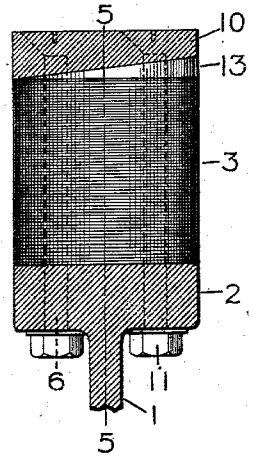


Fig. 6.

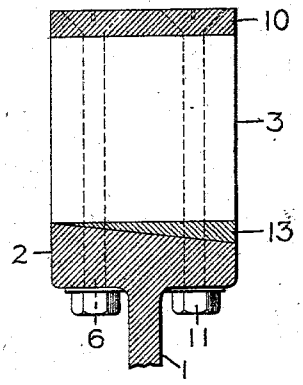


Fig. 5.

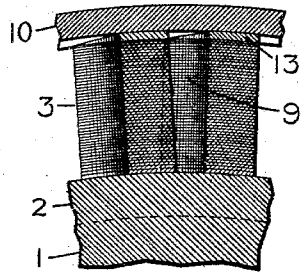


Fig. 3.

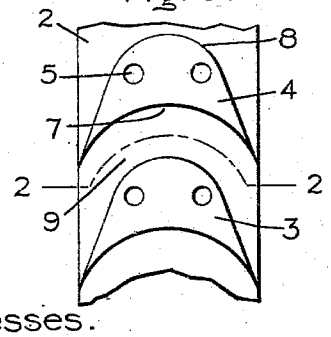
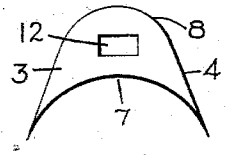


Fig. 4.



Witnesses.

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No. 730,363. Patented June 9, 1903.

UNITED STATES PATENT OFFICE.

HENRY GEISENHÖNER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DETACHABLE TURBINE-BUCKET.

SPECIFICATION forming part of Letters Patent No. 730,363, dated June 9, 1903.

Application filed August 21, 1902. Serial No. 120,561. (No model.)

To all whom it may concern:

Be it known that I, HENRY GEISENHÖNER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Detachable Turbine-Buckets, of which the following is a specification.

The present invention relates to detachable turbine-buckets, and has for its object to provide a simple bucket structure of low first cost and one that can be applied to or detached from the support or wheel with a minimum amount of labor.

To this end one feature of my invention comprises a bucket of suitable shape made of thin pieces of metal, preferably iron or steel, piled flatwise and having suitable clamping or retaining devices for securing it to a support.

In certain types of turbines it is found desirable to increase the cross-sectional area of the fluid-passage between each pair of buckets from the inlet to the outlet end. When my improved buckets are applied to such a turbine, this expansion is provided for by a novel form of bucket-cover, comprising in general a ring made in sections or in a single piece, as desired, which ring is beveled from one side to the other. By reason of this construction the radial depth of the buckets can be increased from one side of the wheel or support to the other. Hence the cross-sectional area of the fluid-passages is also increased. Since the buckets themselves are made of relatively thin pieces of metal of a given cross-section, it follows that some means must be provided to compensate for the beveled face or portion of the cover in order to provide a firm seat therefor. Such a means is found in the beveled or wedge-shaped pieces which are inserted between the end of the buckets and the cover.

The scope and nature of my invention will be more fully set forth in the description and in the claims appended thereto.

In the accompanying drawings, which illustrate one embodiment of my invention, Figure 1 is a partial elevation of a turbine wheel or support fitted with my improved buckets. Fig. 2 is a transverse section of a wheel, taken on the line 2 2 of Fig. 3. Fig. 3 is a partial plan view of a bucket wheel or support, showing the relation of the buckets one to another. Fig. 4 is a plan view of a modified form of one of the bucket laminæ. Fig. 5 is a vertical section of a wheel, taken on a line corresponding to 5 5 of Fig. 2; and Fig. 6 shows the wedge-shaped pieces located between the inner end of the bucket and the support.

1 represents the support or wheel, as the case may be. When my improved buckets are applied to the rotary member of a turbine, the support takes the form of a wheel, whereas when they are applied to the stationary part of the turbine the support is rigidly attached to some stationary portion of the casing. The periphery of the wheel is provided with a flange 2, which is turned true and is adapted to receive the detachable buckets 3. The buckets are made of relatively thin pieces of sheet iron or steel 4, which are piled flatwise one upon the other until the desired depth of bucket is attained. The pieces of laminæ of which the buckets are composed can be punched out of sheet stock with an ordinary punch and die. These can be made at a very small cost, as manifestly each piece is like every other piece or plate in the buckets. At the time the punching is made the holes 5 can also be made to receive the retaining-bolts 6. Each of the laminæ is provided with a curved face 7, against which the fluid impinges and causes the rotation of the bucket-wheel. In case of a stationary intermediate the curved face receives the motive fluid and reverses its direction and causes it to strike the buckets on the moving wheel at the proper angle. The rear of each of the laminæ is also curved, as indicated at 8. It will thus be seen that between the adjacent buckets a fluid-passage 9 is formed, which passage has a cross-sectional area that is suited to meet the given conditions. Owing to the curvature of the support 1, the laminæ are also slightly curved. The more nearly straight the support is the more nearly straight will be the laminæ. By properly arranging the punch-press the laminæ can be given this curvature at the time they

are made, thus doing away with a separate operation.

Surrounding the wheel or support in a manner to inclose the buckets is a cover 10, which may be formed in sections or in a single piece, as desired. Extending inwardly from the cover and passing through the laminæ are bolts 6, which are retained in place by nuts 11. By employing two retaining-bolts, one on either side of the central plane of the wheel, the buckets are prevented from twisting out of line.

Referring to Fig. 4, I have shown a slight modification of the form of the bucket wherein the laminæ are provided with curved front and rear faces 7 8, as in the previous figure; but instead of employing two bolts for retaining the buckets in place a single rectangular opening 12 is provided in each bucket, which hole is designed to receive a rectangular bucket-retaining device. In other words, instead of providing two bolts for each bucket having cylindrical bodies I may employ a single bolt having a rectangular body in which the bucket is prevented from turning, due to the angular sides.

In certain types of turbines it is desirable to increase the cross-sectional area of the fluid-passage between the point where the fluid enters the wheel or support on one side and leaves it on the other. In order to provide this increase of sectional area, the cover 10 for the buckets is made somewhat wedge-shaped, as is shown in Fig. 2, it being thicker on the receiving side than on the delivery side of the wheel or support. In order to hold the laminæ firmly in place and afford a seat for the cover and also to complete the walls of the fluid-passage between the buckets, wedge-shaped pieces 13 are employed which have the same contour as the laminæ. These pieces are thinner on the receiving end of the wheel or support and thicker at the delivery end. The increase in thickness toward the discharge end is equal to the decrease in thickness of the cover 10 at this point. I have shown the wedge-shaped piece 13 situated at the outer ends of the buckets; but, if desired, they may be placed at the inner ends of the buckets, in which case the support 2 would have a beveled periphery, the angle of which would depend upon the desired increase in cross-sectional area of the fluid-passages. In this case the thickness of stock on the sides of the cover would be the same. In other words, I desire to be understood as also claiming the reversal of the parts. A construction of the kind referred to is found in Fig. 6, wherein the wheel or support 2 is provided with a beveled surface, and between it and the detachable buckets 3 are the beveled pieces 13. The cover 10 in this case is rectangular in cross-section. In so far as the use of wedge-shaped pieces is concerned I may make the buckets of laminated material, as shown in Figs. 1 to 5, or out of solid stock, as is shown in Fig. 6. I may also use the wedge-shaped pieces in connection with buckets of different form.

In accordance with the provisions of the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a turbine, the combination of a support, buckets therefor, each bucket comprising a plurality of thin metal pieces piled flatwise, the line of division being at right angles to the plane of rotation, and means for securing the pieces to the support which pass radially through the buckets.

2. In a turbine, the combination of a support having a curved surface, with buckets mounted on said support, each bucket comprising a plurality of metal pieces piled flatwise, the said pieces being curved to conform to the curvature of the support.

3. In a turbine, the combination of a curved support, buckets mounted thereon comprising a plurality of metal pieces piled flatwise and curved to conform to the curvature of the support, and retaining-bolts which pass through the said pieces into the support.

4. In a turbine, the combination of a support, detachable buckets mounted thereon, a cover for the buckets, and a detachable piece which is situated at the end of each of the buckets.

5. In a turbine, the combination of a support, laminated buckets mounted thereon, a cover for the buckets, a detachable wedge-shaped piece situated at the end of each bucket, and means for securing the buckets and cover to the support.

6. In a turbine, the combination of a support, buckets mounted thereon, a cover for the buckets having a wedge-shaped cross-section, and wedge-shaped pieces which are placed between the ends of the buckets and the cover to furnish a seat for the cover.

7. In a turbine, the combination of a support, a plurality of peripheral buckets therefor, each bucket comprising a plurality of thin pieces of metal radially disposed and piled flatwise, and a device which passes through the said pieces.

8. In a turbine element, the combination of a support, a plurality of buckets, each composed of laminæ piled flatwise a cover therefor having a wedge-shaped cross-section, and means for securing the parts in place.

In witness whereof I have hereunto set my hand this 19th day of August, 1902.

HENRY GEISENHÖNER.

Witnesses:
ALEX. F. MACDONALD,
BENJAMIN B. HULL.