No. 839,242. PATENTED DEC. 25, 1906.

J. WILKINSON.

TURBINE BUCKET WHEEL.

APPLICATION FILED APR. 11, 1906.

Fig. 2.

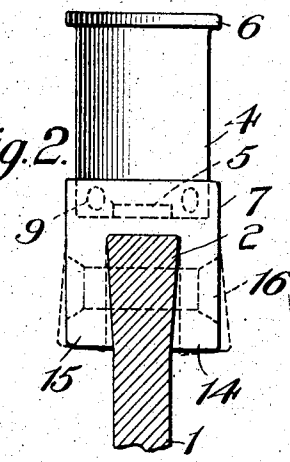


Fig. 1.

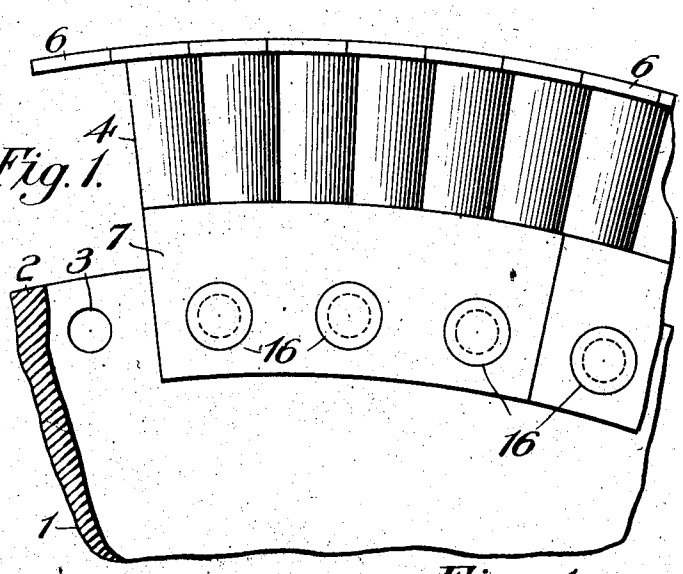


Fig. 3.

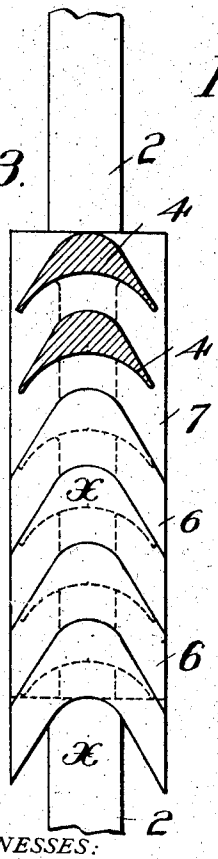


Fig. 5.

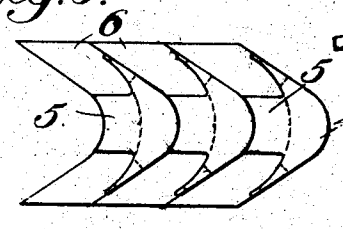


Fig. 4.

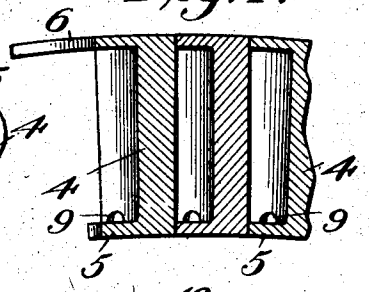
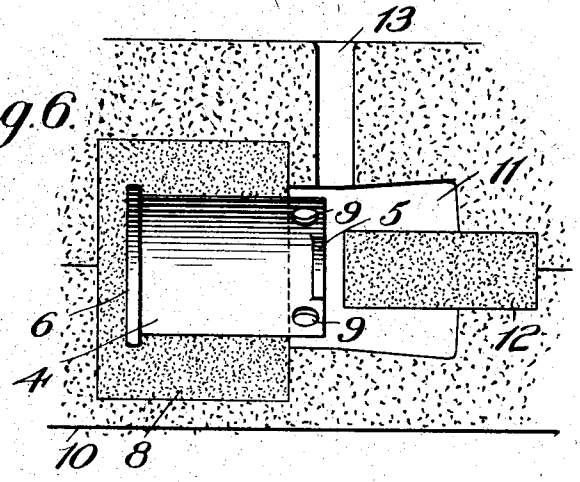


Fig. 6.



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TURBINE BUCKET-WHEEL.

No. 839,242. Specification of Letters Patent. Patented Dec. 25, 1906.

Application filed April 11, 1906. Serial No. 311,140.

To all whom it may concern:

Be it known that I, JAMES WILKINSON, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Turbine Bucket-Wheels, of which the following is a specification.

My invention relates to turbine bucket-wheels of analogous bucket-bearing elements; and consists in certain novel improvements in the construction of the individual buckets and in the manner of mounting them on their support.

One object of my invention is to simplify the manner of securing these individual buckets to the wheel or support. This I do by casting bases, which may be in the form of segments of a ring or rim, around the inner ends of a group of buckets, so as to cast-joint the base and buckets together. The base is provided with side portions adapted to receive the periphery of the bucket support or wheel between them and to be rigidly secured thereto by any suitable positive locking means, such as rivets. As a preferred construction these portions are formed by casting the base with a longitudinal groove in its inner face. Also the bucket-support is tapered inwardly from its outer periphery, which corresponds in width with the groove in the base. When the base has been slipped astride the periphery, the positive locking means may be applied so as to draw together the side portions so that they grip the wedge-shaped rim, and a dovetail joint is produced of great strength and rigidity.

A further object of my invention is to provide a novel form of bucket having a wide backward-projecting cover-plate, which is curved in a manner to overlap the adjacent bucket and serves both to space the buckets and to form a closure to prevent the leakage of steam between the buckets. The buckets are also provided at their inner ends with integral distance-pieces or plates which are narrow in width and embedded in the cast segment to further increase the strength of the joint. These plates enable the buckets to be readily positioned for the cast-jointing to the segments.

My invention further comprises the details of construction and arrangement of parts disclosed in the accompanying drawings, in which—

Figure 1 represents a side elevation of a portion of a wheel-rim having bucket-segments connected thereto. Fig. 2 is a front view of the bucket-segment, a bucket-wheel rim being shown in vertical section. Fig. 3 is a top plan view of the wheel with a segment of buckets mounted thereon, some of the buckets being shown in horizontal section. Fig. 4 is a sectional view along the line $x\,x$ of Fig. 3. Fig. 5 is a bottom view of the buckets shown in Fig. 4. Fig. 6 illustrates the manner of cast-lock jointing the buckets to the base or ring segments.

Similar reference-numerals refer to similar parts throughout the drawings.

I have illustrated my invention as applied to a turbine bucket-wheel, though it is equally applicable to any other form of bucket or vane support. As shown, the wheel-web 1 is provided with a wedge-shaped periphery 2, which is provided with a plurality of transverse bolt or rivet openings 3. The buckets 4 are concavo-convex in shape and are each provided at their inner ends with a narrow backward-projecting distance-piece or spacing-plate 5, having its backward edge curved to conform with the contour of the adjacent bucket which it engages. These distance-pieces are shown integral with the bucket, which is preferable in my present construction. At the outer ends of the buckets I provide arcuate cover-plates 6, which project backward of the buckets. These cover-plates are also formed integral with the buckets and, as shown, extend slightly beyond the side edges of the buckets, so as to provide an outer sectional band of greater width than the buckets. These plates form curved band-sections of equal width from front to rear, their side edges being cut parallel with the plane of revolution of the wheel. The width of the plates being the distance it is desired that the buckets should be placed, these plates furnish a means to both space and brace the outer ends of the buckets. Also the curved or arcuate character of the plates causes them to considerably overlap the sides of the adjacent buckets and plates, so that they brace the buckets together against lateral displacement.

I propose to mount these buckets on the wheel by cast-jointing groups of them to bases, which may be in the form of rim or ring segments 7. This is carried out in the

following manner: A segmental row of buckets is disposed in a sand core 8 in proper relative position for mounting on the wheel. This sand core, which is preferably baked, permits the inner ends of the buckets to project inwardly therefrom, as seen in Fig. 6, and leaves the distance-pieces 5 exposed and also two or more apertures or openings 9 for the purpose hereinafter described. This core is then set in a flask 10 filled with sand, in which a mold-cavity 11 is formed for the casting of a segmental bucket-base. The exposed bucket ends are disposed in this mold-cavity so that the bucket-core forms an outer peripheral wall therefor. A sand core 12 is also inserted in this cavity centrally thereof and opposite to the bucket ends. This core extends to a point adjacent to said bucket ends and is of equal transverse width. It will be noted, however, that the upper and lower side walls of the mold-cavity diverge so that it is of greater width at its inner end than at a point opposite the bucket ends. This is desirable, but not essential. The mold is formed from sand in any ordinary manner, and the two cores 8 and 12 are inserted therein after the usual molding practice. A gate 13 is provided, and through this the molten metal is poured to form the bucket-base. The metal in forming the base flows around the exposed ends of the buckets and the distance-pieces, which become embedded or rooted therein, and it also flows through the openings 9, forming a positive lock cast-joint between the buckets and base. When completed, the base has the form shown in dotted lines, Fig. 2, the channel or groove formed by the core 12 leaving integral parallel side walls 14 and 15, which increase in thickness toward their inner free edges. The normal opening for the groove in the base is just sufficient to permit the latter to be slipped over the wedged periphery 2 of the wheel-disk. After this has been done the bucket-segment is connected to the disk by means of bolts or rivets 16, which pass through openings provided in the attaching portions 14 and 15 and adapted to register with the openings 3 in the periphery 2. During the riveting operation the side portions 14 and 15 are bent or drawn inwardly, so that they clamp against and under the tapering sides of the periphery 2, in which position they are securely locked by the rivets. This furnishes a dovetail joint, as shown in Fig. 2, which possesses considerably greater strength than the shearing strain of the rivets alone. I also contemplate casting or otherwise forming the side portions 14 and 15 so that they have to be sprung apart to slip the base astride the periphery, after which they may be held securely in engagement therewith by some positive locking means.

It will be noted that the bases are squared at their abutting edges and that these edges come opposite the rear wall of the rear bucket and the wing-tips of the back bucket. This construction permits any one of the bucket-segments to be removed and replaced without disturbing the other segments.

By embedding the narrow spacer-plates 5 in the bucket-base the strength of the cast joint is increased. The concave head and base spacer piece enable the holding or gripping of the buckets during process of core-making to be quickly, accurately, and easily done.

An illustrative embodiment of my invention having thus been described, what I claim as new, and desire to secure by Letters Patent, is-

1. In combination, a bucket-support, buckets, bases jointed to groups of said buckets and adapted to straddle said support, and means to lock said bases to said support.

2. In combination, a bucket-support, buckets, bucket-bases cast around the inner ends of groups of buckets and provided with inwardly-projecting portions adapted to receive said support between them, and devices to connect said portions to said support.

3. In combination, a bucket-support, buckets, bucket-bases cast around the inner ends of groups of buckets and provided with inwardly-projecting portions adapted to receive said support between them and to be brought into engagement therewith, and means to lock said portions in engagement with said support.

4. A turbine bucket-wheel comprising a web having an enlarged periphery, a rim-segment adapted to be slipped astride said periphery and by bending to engage therewith, means to connect said segments to the rim and retain them in their bent position, and a group of buckets connected to each segment.

5. A turbine bucket-wheel comprising a web having a periphery wedge-shaped in cross-section, a plurality of bucket-supporting elements adapted to be slipped over said periphery and to make a dovetail joint therewith by bending into engagement with the tapering side thereof, and means to connect said elements to said periphery, substantially as described.

6. A bucket-wheel comprising an annular wheel-web, buckets, and rim-segments cast around the inner ends of groups of said buckets and around a core which provides said segments with attaching side portions, said segments being mounted astride the periphery of said web and connected thereto by bolts or rivets passing through the said web and said attaching portions, substantially as described.

7. A bucket-wheel comprising a plurality of buckets which are cast-jointed in groups to separate supports, said supports having a

groove therein adapted to receive the periphery of the wheel, an engaging portion or portions around said periphery, said supports being adapted to engage said portion or portions, and means to lock said parts in engagement, substantially as described.

8. A turbine bucket-wheel comprising a web having a peripheral gripping portion, a plurality of cast rim-segments astride said web and in engagement with said portion, means to hold said parts in engagement, and a segmental row of buckets having integral spacing-plates at their inner ends which have been embedded in said segments to which said buckets are cast-jointed.

9. In combination, a plurality of buckets having narrow integral spacing-plates at their inner ends, and a bucket-support cast around the inner ends of said buckets so as to inclose said spacing-plates.

10. In combination, a plurality of buckets having a narrow spacing-plate and one or more apertures at their inner ends, and a bucket-support cast around the inner apertured ends of said buckets so as to inclose said spacing-plate.

11. A turbine bucket-wheel comprising a plurality of buckets having concavo-convex bodies and integral spacing projections at each end with curved edges, bases cast-jointed to the inner ends and spacing projections of said buckets, and means to connect said bases to said wheel, substantially as described.

12. A turbine-bucket having an integral arcuate rearwardly-projecting cover-plate with side edges which extend beyond the side edges of the bucket and are parallel to a plane of revolution of the bucket.

13. A turbine-bucket having a concavo-convex body, and integral substantially parallel spacing projections at each end, the inner projection being narrower than the bucket and the outer projection being wider and adapted to overlap the side edges of the corresponding projection on an adjacent bucket.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAMES WILKINSON.

Witnesses:
JAMES H. NOLAN,
THOMAS SHEPARD.