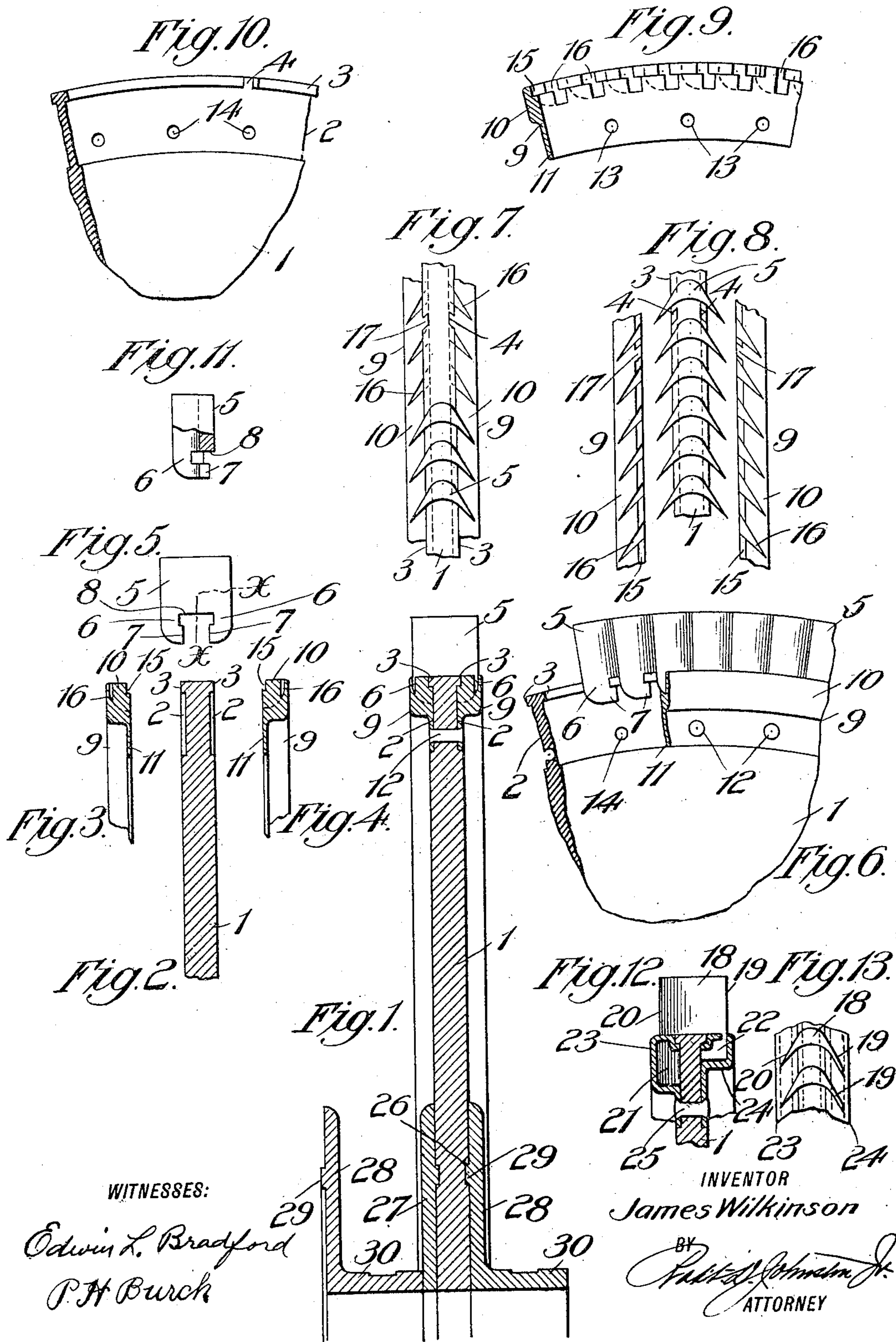


No. 819,105.

PATENTED MAY 1, 1906.

J. WILKINSON.
BUCKET WHEEL.

APPLICATION FILED MAY 5, 1905.



UNITED STATES PATENT OFFICE.

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WILKINSON TURBINE COMPANY, A CORPORATION OF ALABAMA.

BUCKET-WHEEL.

No. 819,105.

Specification of Letters Patent.

Patented May 1, 1906.

Application filed May 5, 1905. Serial No. 258,970.

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 Bucket - Wheels, of which the following is a specification.

My invention relates to improvements in the construction of bucket-wheels for elastic-fluid turbines.

In constructing a bucket-wheel in accordance with my present invention I provide a wheel-body which may be of any desired construction, having, however, a rim portion which is flanged or shouldered on both sides. I provide the separate buckets with end portions cut away so that the buckets rest on the wheel-rim and have flanges that straddle the rim and engage the under faces of the shoulders thereon, which thus serve to hold the buckets in place. The rim-shoulders are notched at one or more points to enable the flanged ends of the buckets to be mounted on the rim, after which the buckets are slipped around the rim until properly arranged, when spacer-rings, having recessed faces which engage the end of the buckets, are mounted on the wheel and act to hold the buckets in place. The strain of holding the buckets on the wheel is taken up entirely by the shouldered rim and not by bolts or locking-rings, as is the more common practice. By recessing the inner faces of the spacer-rings so that the lower ends of the buckets enter these recesses it will be evident that the buckets will be held firmly against any rattling or shifting and may be easily spaced. I can form the rim-shoulders by casting them integral with the wheel or, as shown, by machining a wheel-blank formed from a steel plate to form two annular grooves on opposite sides near its periphery. The distance of these grooves from the rim determines the thickness and strength of the rim-shoulders.

The gist of my invention consisting in securing the buckets to the wheel without bending or deforming them or the direct use of rivets, bolts, or locking-rings and spacing and holding them against lateral movement by spacer-rings, I desire to protect all such modifications of the illustrative mechanism hereinafter more fully described as come within the scope of my said invention—such, for

instance, as using only one rim-shoulder on the wheel.

Referring now to the accompanying drawings, which form a part of the specification, Figure 1 is a partial vertical sectional view through a bucket-wheel, showing the manner of mounting the buckets and hub-flanges thereon. Figs. 2, 3, 4, and 5 represent similar views of the wheel, spacer-rings, and buckets as shown in Fig. 1 detached and ready to be assembled. Fig. 6 is a side view broken away of Fig. 1. Fig. 7 is a top plan view of the bucket-wheel with several buckets removed. Fig. 8 is a similar view showing the spacer-rings about to be secured to the wheel. Fig. 9 is a partial elevation of the inner face of a spacer-ring. Fig. 10 is a similar view of the wheel-rim. Fig. 11 is a sectional view along the line $x-x$ of Fig. 5. Fig. 12 is a sectional view of a modification of my invention in which the spacer-rings are formed from pressed metal and a different-shaped bucket used. Fig. 13 is a top plan view of Fig. 12.

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

The bucket-wheel illustrating one embodiment of my invention comprises a body portion 1 in the form of a circular plate of sheet metal provided with a central opening by which it is mounted on the turbine-shaft (not shown) and preferably two annular grooves or channels 2 formed on each side near its periphery. These grooves or channels form annular rim-shoulders 3. In cross-sectional contour the rim is T-shaped, the rim-shoulders being cut away to the surface of the channels 2 at suitable points to provide notches 4, by means of which the buckets 5 may be mounted upon the wheel. These buckets 5 are preferably cut from a rolled strip of steel, being cut at one end to leave a T-shaped opening therein between the flanges 6, which have shoulders 7. These flanges are shown curved from their lower ends to the sides of the bucket.

The shouldered flanges 6 are separated a distance substantially equal to the thickness of the channeled portion of the wheel, so that the bifurcated end of the bucket can be slipped over the notched portion of the wheel-rim. After the bucket has been slipped over the wheel-rim its bottom face will rest upon the outer periphery of the rim, and the shoul-

ders of the flanges 6 will bear against the faces of the channels 2 and engage the shoulders 3 of the rim. In other words, the bucket is so shaped that when it straddles the wheel-rim the latter substantially fills out the cut-away portion of its lower end.

The buckets after being mounted on the wheel are slipped around the rim until the number necessary to complete the circular row of buckets is in place, being so arranged that none of their flanges 6 are disposed opposite the notches in the rim. When they have been spaced equidistant around the wheel, I secure them in this position by means of two annular spacer-rings 9. These spacer-rings are provided with an enlarged head portion 10 and a relatively thin body portion 11, which latter corresponds in thickness with the depth of the channels 2, in which the rings are mounted and held in position by rivets 12, inserted through openings 13 in the flanges 11 and corresponding openings 14 in the reduced portion of the rim. The inner faces of these rings are adapted to conform with the contour of the shouldered rim, being grooved at 15, so that their upper portions engage the rim-shoulders 3, while their head portions 10 are disposed flush with the wheel-rim to form extensions on either side thereof, constituting the complete sectional wheel-rim. These rings are provided with a plurality of tapering recesses 16 in the inner faces of their head portions which are adapted to receive the ends of the buckets below a line parallel with the face 8. These openings are preferably milled or cut into the rings by a circular cutter and are of such proportion that when the buckets have been so spaced they will enter the several recesses of the rings and the latter have been secured in place in the wheel the bucket-flanges will fit tightly within these recesses. These rings have tongues 17, which enter the notches 4 in the shoulders 3, so that the rim of the wheel has an unbroken surface. These rings not only serve to space the buckets properly, but, as the tapering bucket-flanges fit tightly in the correspondingly-tapered recesses of the rings they also serve to hold the buckets firmly against lateral displacement. The buckets are held against radial displacement by the engagement of their shouldered flanges 6 with the rim-flanges 3.

In Figs. 11 and 12 I have illustrated a modification of my invention wherein spacer-rings formed of pressed metal are shown in combination with buckets 18, which differ from the buckets 5 in that their wings 19 toward the sides from which the fluid stream delivered to the bucket-wheel is discharged have parallel faces. This provides a discharge passage-way for the motor fluid delivered to the buckets which does not increase in cross-sectional area from the central portion of the passage-way. The wings 20 of

the buckets are tapering, as in the case of buckets 5. This increase of metal in the wings 19 slightly unbalances the wheel, and to compensate this I form the shouldered flange 21 on the opposite side of the base portion of each bucket from the wing 19 larger than the other flange 22. The increased amount of metal in the flange 21 corresponds with the increased amount of metal in the wing 19, and this balances the wheel. The lower portions of the bucket-flanges in this construction are shown squared, and the spacer-rings 23 and 24 are secured by rivets 25 in the grooves 2, continuing upwardly to a point near the base of the flanges 21 and 22, where they are bent outwardly a distance corresponding with the width of the flanges, then upwardly to a point in the plane with the wheel-rim, then inwardly on a line with this rim to abut against the sides of the same, and then downwardly and under the rim-shoulders. It will be noted that the rings 23 are bent to conform with the bucket-flanges 21, while the rings 24 are bent to conform with the bucket-flanges 22, suitable slots being cut in the upper faces of the rings to provide for the reception of the bucket-wings and by means of which the buckets are spaced and held in position in the manner already described.

The bucket-wheel, as shown, is provided with annular channels 26 near its hub portion, which channels are engaged by shouldered rings 27 and 28, the shoulders 29 in the rings entering said channels and the latter of said rings being provided with an enlarged hub-flange 30. In Fig. 1 I show the inner face of these rings in the position in which they rest upon the turbine-shaft, it being noted that these rings abut against each other in such a manner as to prevent the disengagement of their shoulders from the wheel-channels, any suitable means being provided to hold these rings in place.

The construction thus described may be manufactured at comparatively small cost and may be readily repaired or taken apart, no bolts being used in this construction except such as are sufficient to hold the light spacer-rings in position in the grooves 2 of the wheel.

It will be evident that the rim-shoulders serve to relieve these bolts of the centrifugal strain of the spacer-rings, these shoulders being also of sufficient strength to take care of the centrifugal strain of the buckets.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination, a bucket-bearing element having a bucket-supporting portion shouldered on each side and recessed to receive the buckets having bifurcated ends, and buckets adapted to be slipped astride said portion and brought into interlocking

engagement with said shoulders by a movement of the buckets around said element.

2. In combination, a bucket-wheel having a bucket-engaging portion on one or both sides of its rim, integral bucket elements bifurcated and adapted to straddle said rim and bucket-engaging portion or portions and to interlock with the latter, and means to space said buckets.

3. A bucket-wheel having shoulders near its periphery, notches in said shoulders, and buckets having shouldered openings in their ends which are adapted to be passed over said wheel and through said notches and to engage said wheel-shoulders when moved out of register with said notches.

4. A bucket-wheel having a rim substantially T-shaped in cross-section, a bucket having a substantially T-shaped recess in one end, and means to mount said bucket astride said rim portion, substantially as described.

5. A bucket-wheel having a narrow shouldered rim, buckets having recessed portions which straddle said rim and interlock with the shoulders thereof, and elements connected to said wheel, which are recessed to receive the inner end portions of said buckets and hold them in relative position.

6. A bucket-wheel having a sectional rim portion comprising a shouldered peripheral section of the wheel-body, and recessed rings detachably connected thereto, in combination with buckets having portions engaging the shoulders on said wheel-body whereby said buckets are held against radial displacement, said portions being adapted to engage within recesses in said rings, whereby said buckets are held against lateral displacement.

7. In combination, a shouldered bucket-supporting device, a plurality of buckets bifurcated at one end by a slot which corresponds in shape with the cross-sectional contour of said device, the bifurcated ends of the buckets being adapted to interlock with said device in a manner to permit of their adjustment to and from each other, one or more members having a plurality of equidistantly-spaced tapering slots which receive the lower ends of the buckets, and means to secure said member or members to said device.

8. The combination with a bucket-wheel having a body portion of sheet metal provided with a central shaft-opening, of a ring provided with a shoulder which interlocks with a portion of said wheel-body, and an integral flange on said ring adapted to engage the hub portion of an adjacent wheel, substantially as described.

9. In a bucket-wheel, a body portion of sheet metal having a central shaft-opening and recesses in its sides near said opening, rings secured to said body to form the wheel-hub, which have annular shoulders that engage in said recesses and are locked therein by the engagement of said rings with the rings attached to adjacent wheels and one or more rings secured around the periphery of said body and forming the wheel-rim.

10. A bucket-wheel having a sectional rim comprised of a central portion integral with the wheel and a detachable ring on each side thereof, in combination with buckets connected to said central portion and engaged by said rings, substantially as described.

11. A bucket-wheel, a plurality of buckets connected thereto, and spacer means for said buckets comprising an element secured to said wheel and provided with a plurality of equidistant recesses into which portions of the buckets are adapted to enter, and by means of which they are held in relative position.

12. The combination with a bucket-wheel having a body portion of sheet metal provided with a central shaft-opening and an annular groove in each side adjacent to said opening, of a pair of rings adapted to form a detachable hub for said wheel which are provided with annular shoulders that engage in said side recesses, one of said rings being provided with a laterally-projecting annular flange which engages the hub portion of an adjacent wheel, substantially as and for the purposes described.

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

JAMES WILKINSON.

Witnesses:

ALBAN P. REYNOLDS,
JOHN J. DEVENISH.