No. 876,123.

PATENTED JAN. 7, 1908.

J. WILKINSON.

TURBINE BUCKET WHEEL.

APPLICATION FILED JUNE 4, 1906.

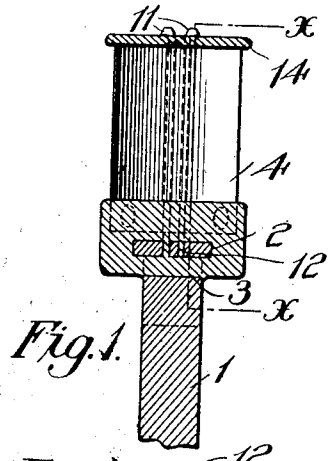


Fig. 1.

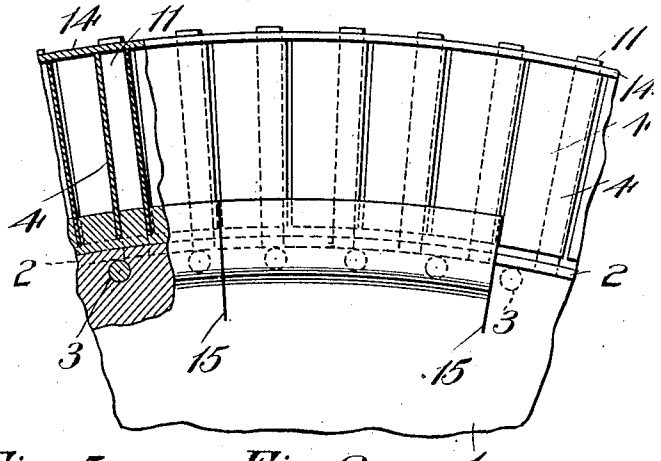


Fig. 2.

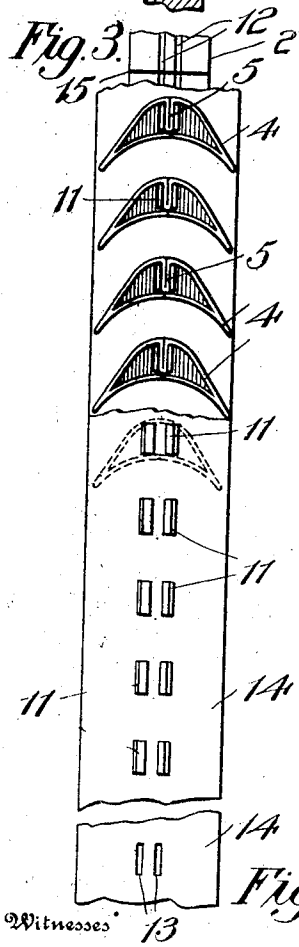


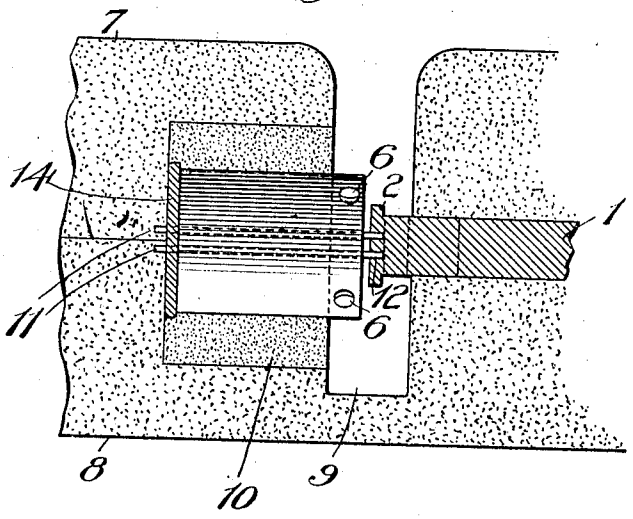
Fig. 3.

Fig. 4.



Fig. 5.

Fig. 6.



Witnesses:

Edwin L. Bradford

P. H. Burch

Inventor

James Wilkinson

By Robt. D. Johnston Co.

Attorney

UNITED STATES PATENT OFFICE.

JAMES WILKINSON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO WILKINSON TURBINE COMPANY, OF BIRMINGHAM, ALABAMA, A CORPORATION OF ALABAMA.

TURBINE BUCKET-WHEEL.

No. 876,123. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed June 4, 1906. Serial No. 320,113.

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 and a novel method of securing the individual buckets to the wheel by a cast-joint which constitutes a positive lock-joint in its preferred form.

The object of my present invention is to avoid the inconvenience and delay attendant upon the mounting and fastening of the individual buckets on the wheel as now practiced and to enable the entire ring of buckets, or any segment thereof, to be securely connected to the wheel by the casting of what I term the wheel rim around the inner ends of the buckets and the periphery of the wheel web to cast-joint the parts together without amalgamation. I propose to use tubular buckets or such as are formed from tubular stock rolled or shaped to give the desired cross-sectional design for the bucket. In particular I use a novel form of bucket formed with an integral stiffening web which braces its concave and convex faces against collapse. I also intend providing an outer band for the buckets and connecting it to holding pieces which are cast-jointed to the rim and pass through the hollow buckets. To increase the strength of the cast-joint, the portions of the web and buckets, around which the rim is cast, may be shouldered and also notched or perforated so that the rim is positively locked to both by a cast-joint of the required strength. After the buckets have been thus secured by the cast and positive-lock joint to the wheel, the wheel may be turned in a lathe to give it the proper form, and then banded.

My invention, in its preferred form, is illustrated in the accompanying drawings, in which:—

Figure 1, is a sectional view through a portion of a wheel constructed in accordance with my invention. Fig. 2, is a side elevation shown in partial section along the line *x*—*x*, Fig. 1. Fig. 3, is a plan view of part of the wheel with the band broken away. Fig. 4, illustrates the openings in the band which receives the holding pieces. Fig. 5, is an end view of one of the buckets showing band holding pieces of circular cross-section. Fig. 6, is a view of a row of buckets and a portion of the wheel web in position for which the wheel rim or segment is cast to joint them together.

Similar reference numerals refer to similar parts throughout the drawings.

As illustrated, I provide a wheel web 1 of any desired metal, preferably nickeled steel, having a flanged periphery 2 provided with a plurality of transverse openings 3. I prefer to use hollow buckets 4, manufactured from tubular stock which is shaped to the required design and provided with integral stiffening webs 5 formed by bending in a part of one of the curved bucket faces until it engages the inner wall of the opposite face. I prefer to form the web from the convex face. Notches or perforations 6 are provided at one end of the buckets.

To secure the buckets to the web I provide any suitable molding apparatus such as a cope 7 and a drag 8 and form in the sand therein a segmental or annular mold cavity 9 into which the flanged and perforated periphery of the wheel web projects. The buckets are also arranged in a ring or segmental row in any suitable manner, preferably by being baked in a core 10 which fills in and between the buckets, leaving only their inner notched or perforated ends free thereof. In order to provide for banding the buckets, I insert band holding metallic pieces 11 through the buckets before forming the core, two pieces being preferably passed through each bucket and placed against and on each side of the web 5. The inner ends of these pieces project beyond both ends of the buckets. The bucket core 10, as thus formed, is placed in the mold so as to form the outer peripheral wall for the mold cavity 9 into which the inner ends of the buckets and pieces 11 project. To center the buckets with relation to the web 1, I provide two annular grooves 12 in the periphery 2 which are adapted to receive the inner ends of the holding pieces 11, the outer ends of which enter a pair of openings 13 in a band 14 or a segment thereof which is also included in the core. The pieces are thus held at both ends

so as to grip the webs 5 between them and insure the proper positioning of the buckets with relation to the web. Where it is proposed to cast-joint a complete ring of buckets to the web or even a large segment, I provide the web with a plurality of radial slots 15 which will take up the rim expansion without warping the web.

The molten metal by which the buckets and web are to be cast-jointed and which is to form the cast-rim, is poured into the mold cavity 9 in the usual manner. It is desirable that this metal should have a lower melting point than the metal of which the buckets are formed. When this metal is iron it is also desirable to coat the exposed ends of the buckets with a composition, such as tin or copper, which will aid in preventing the carbon in the iron entering the steel buckets during molding. The band 14 is removed to enable the sand to be knocked out of the buckets, after which the pieces are again passed through the openings 13 and turned to lock the band against the outer ends of the buckets without it being directly connected thereto.

When I refer to casting the wheel rim around the buckets and periphery of the web, it will be understood that the rim may be cast as a whole or in segments as may be desired. Any manner of molding now commonly practiced may be used in casting the rim.

What I claim as new and desire to secure by Letters Patent, is:—

1. As an article of manufacture, a turbine bucket wheel comprising a web, a ring of buckets, and a rim cast so as to overlap the periphery of said web and the inner ends of said buckets to unite them and form practically an integral body.

2. As an article of manufacture, a turbine bucket wheel comprising buckets and a wheel web which are independently formed and subsequently connected by a cast metal rim in which both buckets and web are rooted by a cast joint without amalgamation.

3. As an article of manufacture, a turbine bucket wheel comprising a radially slotted wheel web, a ring of buckets, and an interposed rim cast around the buckets and web so as to overlap the periphery of the latter.

4. As an article of manufacture, a turbine bucket wheel comprising a wheel web, a ring of buckets, and a rim portion cast around the periphery of said web and the inner ends of said buckets, and means to positively lock the embedded portions of said buckets and web in said rim to connect them by a positive-lock, cast-joint, substantially as and for the purposes described.

5. As an article of manufacture, a turbine bucket wheel having a web, a cast rim connected by a cast-joint to said web and formed of a metal having a lower melting point than that of said web, and a ring of individual buckets having perforated ends rooted in said rim by a cast-joint, substantially as described.

6. A turbine bucket wheel comprising a wheel web, a plurality of buckets having openings lengthwise therethrough, a band, band holding pieces inserted through said buckets, and a wheel rim portion to which said buckets and pieces are connected by a cast-joint.

7. As an article of manufacture, a turbine bucket wheel comprising tubular buckets which are formed with a longitudinal stiffening web between their working faces, separate band holding pieces disposed on each side of said webs and cast-jointed to the bucket supporting part, and a band connected to said holding pieces.

8. A turbine bucket wheel comprising a plurality of tubular buckets having integral longitudinal stiffening webs, band holding pieces disposed on each side of said webs, an apertured band, and a slotted wheel web, the ends of said pieces entering the apertures in said band and the slots in said webs so as to clamp the bucket webs between them and center the buckets, and a rim portion cast around the web and the inner ends of said buckets and pieces to joint them together, said pieces being bent to lock said band around the buckets.

9. As an article of manufacture, a turbine bucket wheel comprising a ring of hollow buckets, an outer band therefor, and band holding pieces which pass through said buckets, said buckets and pieces being cast-jointed to a rim portion connected to said wheel.

10. A turbine bucket wheel comprising a ring of buckets, a support therefor, a band around said buckets, and band attaching members which are embedded in said support by a cast-joint.

11. In a turbine bucket wheel, the combination with a group of hollow tubular buckets, of a bucket support cast both inside of and around the inner ends of the buckets, and apertures in the bucket end that is embedded in the support.

12. As an article of manufacture, a concavo-convex bucket formed from a tubular body and provided with an integral stiffening web which braces its concave and convex faces against collapse.

13. As an article of manufacture, a concavo-convex bucket formed from tubular stock and provided with a longitudinal stiffening web formed by a bent portion of one of its faces which engages the inner wall of the other face.

14. As an article of manufacture, a concavo-convex bucket formed from tubular stock and provided with a longitudinally disposed bracing web formed by bending in-

wardly a part of the convex rear face of the bucket until it engages the inner wall of the concave face of the bucket.

15. As an article of manufacture, a concavo-convex bucket formed from tubular stock which is doubled or creased inwardly longitudinally of its convex face to form a two-fold stiffening web which engages the inner wall of the concave face of the bucket.

16. The combination with a bucket wheel blank having radial slots in its periphery, of individual buckets cast-jointed to said rim, and means to band the buckets together, substantially as described.

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

JAMES WILKINSON.

Witnesses:
JAMES H. NOLAN,
JOHN F. GRANDFIELD.