J. WILKINSON.
TURBINE BUCKET WHEEL.
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Inventor
James Wilkinson

By
Charles D. Johnson Co.
Attorney
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 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 band.

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-sectional form. 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 join 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 nicked steel, having a flanged periphery 2 provided with a plurality of transverse openings 3. I prefer to use hollow buckets 4, manufactured from tubular steel 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 wheel 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 identical 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 prop-
osed to cast-join a complete ring of buck-
lets 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 expan-
sion 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 desir-
able 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
used 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 com-
monly 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 practi-
cally 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 inter-
posed 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-join, substantially as and for the
purposes described.
5. As an article of manufacture, a turbine
bucket wheel having a web, a cast rim con-
nected by a cast-join to said web and
formed of a metal having a lower melting
point than that of said web, and a ring of in-
dividual buckets having perforated ends
rooted in said rim by a cast-join, substan-
tially 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-join.
7. As an article of manufacture, a turbine
bucket wheel comprising tubular buckets
which are formed with a longitudinal stiffen-
ing web between their working faces, sepa-
rate band holding pieces disposed on each
side of said webs and cast-joined to the
bucket supporting part and a band connect-
ed to said holding pieces.
8. A turbine bucket wheel comprising a
plurality of tubular buckets having integral
longitudinal stiffening webs, band holding
pieces inserted 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, and
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-
joined 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 sup-
port by a cast-join.
11. In a turbine bucket wheel, the combi-
nation with a group of hollow tubular buck-
ets, of a bucket support cast both inside of
and around the inner ends of the buckets,
and apertures in the bucket end that is em-
bedded in the support.
12. As an article of manufacture, a con-
cavo-convex bucket formed from a tubular
body and provided with an integral stiffen-
ning web which braces its concave and convex
faces against collapse.
13. As an article of manufacture, a con-
cavo-convex bucket formed from tubular
stock and provided with a longitudinally
disposed braking 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 concave-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.