

W. F. RICE.
 BINDER FOR TURBINE BUCKETS.
 APPLICATION FILED AUG. 1, 1910.

1,017,467.

Patented Feb. 13, 1912.

Fig. 1.

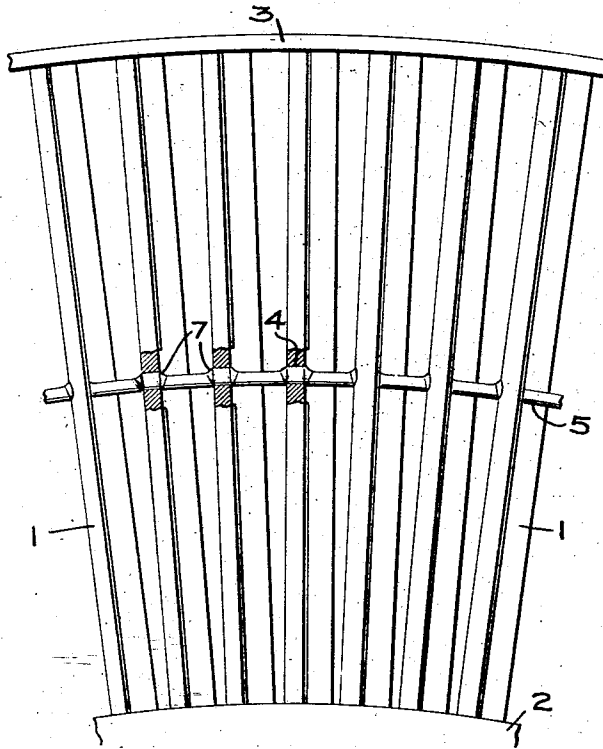


Fig. 2.

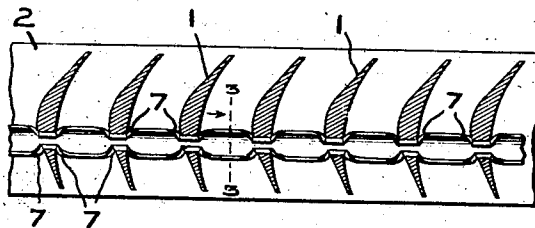


Fig. 3.

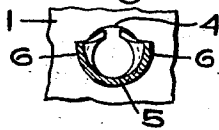


Fig. 5.

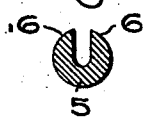


Fig. 4.

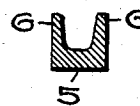


Fig. 6.

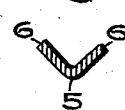
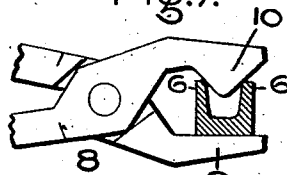


Fig. 7.



Witnesses:

Marcus L. Byng.
J. Ellis Eler

Inventor:
 Walter F. Rice,
 by *Albert B. Davis*
 His Attorney

UNITED STATES PATENT OFFICE.

WALTER F. RICE, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

BINDER FOR TURBINE-BUCKETS.

1,017,467.

Specification of Letters Patent.

Patented Feb. 13, 1912.

Application filed August 1, 1910. Serial No. 574,957.

To all whom it may concern:

Be it known that I, WALTER F. RICE, a citizen of the United States, residing at Quincy, county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Binders for Turbine-Buckets, of which the following is a specification.

This invention relates to means for spacing and tying turbine buckets of unusual length, and its object is to prevent any vibration or distortion of said buckets when running.

Turbine buckets or blades are narrow and rather thin, so that when made of considerable length, as they must be in the low pressure stages, they are liable to warp or vibrate and thus interfere with the efficiency of the machine.

My invention provides a tie, brace or stay about midway between the ends of the buckets, which holds them rigidly in position without materially obstructing the flow of the steam or other motive fluid.

The invention consists in a longitudinally slotted or channeled bar threaded through holes in the buckets in a line substantially parallel with the periphery of the rotor on which said buckets are mounted; the portions of said bar between the buckets being deformed by spreading apart the walls of the slot so as to form abrupt shoulders abutting against the buckets. This tie-rod or binder need not fit the holes accurately, so that it can be quickly thrust through the buckets before deformation. It can be of any desired shape in cross-section; tubular with an open slit along one side, circular with an open radial groove, channel-shaped, V-shaped, or otherwise; the essential feature being two normally parallel, spaced, longitudinal walls or portions connected or united along their adjacent inner edges only, which walls can be separated or expanded by a suitable tool applied between their outer edges after the binder has been threaded through the buckets.

In the accompanying drawing, Figure 1 is a side elevation of a plurality of buckets spaced and braced by my improved tie-rod or binder; Fig. 2 is a section along the line of the binder; Fig. 3 is a cross-section of the binder on a larger scale, taken on the line 3-3 Fig. 2; Figs. 4, 5 and 6 are cross sections of modified shapes of binders, and Fig.

7 shows the jaws of a tool for deforming the binder.

The buckets 1 may be made in any suitable manner from any suitable material and of any desired shape. They are mounted as usual in a rotor 2, and their outer ends are united by a shrouding 3. The buckets are represented as long and rather slender, because it is in such cases that my binder is of advantage; it having been designed in the first instance for buckets seventeen inches in length. About midway of each bucket is a hole 4, which may be circular or of any other preferred shape. Threaded through these holes is the binder 5 which is a bar having a longitudinal slot or groove forming two side walls or portions 6.

In Figs. 1 and 2 the binder consists of a tubular bar slotted longitudinally. In Fig. 4 a channel bar binder is shown. Fig. 5 shows a solid cylindrical bar with a radial groove, and Fig. 6 a V-shaped bar. Other shapes will readily suggest themselves.

After the binder has been threaded through the buckets, those portions which are exposed between them are deformed by spreading apart the walls 6 until an abrupt shoulder 7 is formed adjacent to each side of each bucket, so that the buckets are securely held in place relatively to each other. A tool for effecting this deformation is shown in Fig. 7, consisting of tongs 8, one of whose jaws 9 fits the under side of the binder, while the other jaw 10 is wedge-shaped to enter between the walls 6 and spread them apart when the tongs are closed.

It will be noticed that my improved binder is in one piece and of substantial thickness; that its walls can be easily spread to give a pronounced shoulder; that said walls can be spread almost to a flat condition in the center if desirable so as to offer little resistance to the passage of steam; that there is a close engagement of the shoulders with the buckets; that the binder does not have to be fractured to secure pronounced shoulders, and that the device is easy to make and apply.

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:—

5 1. The combination with a plurality of turbine buckets, of a binder passing through said buckets and having initially an approximately U-shaped cross-section, the portions of the two opposite walls of which between
10 the buckets are afterward expanded outwardly.

2. The combination with a plurality of turbine buckets, of a binder passing through said buckets, comprising a bar having initially an open longitudinal slot or channel
15 in one side thereof forming two walls on the opposite sides of the slot or channel, the portions of the walls between the buckets being afterward spread apart.

20 3. The combination with a plurality of turbine buckets having holes about midway of their length, of a binder consisting of a bar threaded through said holes and provided with an open slot or channel in one
25 side thereof forming two walls, one at each side of said channel or slot, which are spread apart between said buckets to form abrupt shoulders abutting against said buckets.

4. The combination with a plurality of turbine buckets, of a binder threaded 30 through the same, comprising a bar having initially two parallel longitudinal portions connected along one edge only thereof, the sections of said portions between said buckets being afterward bent outwardly so as to be 35 wider there than the sections that pass through said buckets.

5. The combination with a plurality of turbine buckets, of a binder threaded through the same, consisting of a bar having 40 along one side two adjacent separable portions spread apart only between said buckets.

6. The combination with a plurality of turbine buckets, of a binder threaded through the same having two oppositely dis- 45 posed walls united along their adjacent inner edges only with an open space between said walls, the walls being expanded outwardly between adjacent buckets.

In witness whereof, I have hereunto set 50 my hand this 26th day of July, 1910.

WALTER F. RICE. [L.S.]

Witnesses:

S. T. MACQUARRIE,
L. C. HOLLIS.