

E. KALLBERG.
TURBINE BUCKET.
APPLICATION FILED JULY 1, 1909.

980,283.

Patented Jan. 3, 1911.

Fig. 1.

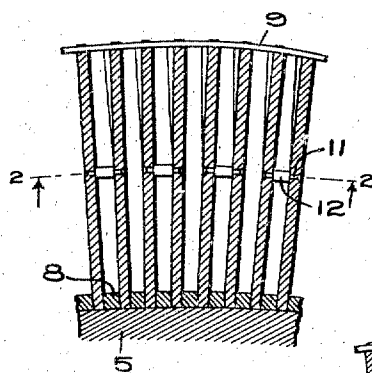


Fig. 3.

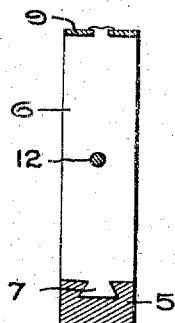


Fig. 4.

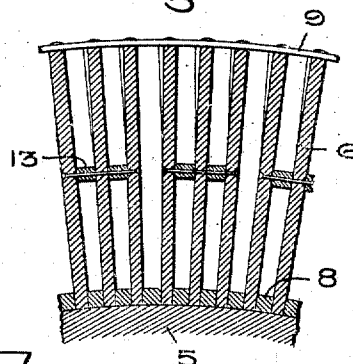
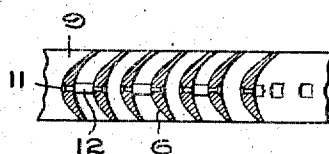


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

ERNST KALLBERG, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TURBINE-BUCKET.

980,283.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed July 1, 1909. Serial No. 505,313.

To all whom it may concern:

Be it known that I, ERNST KALLBERG, a subject of the Emperor of Austria-Hungary, residing at Berlin, Germany, have invented certain new and useful Improvements in Turbine-Buckets, of which the following is a specification.

This invention relates to turbine buckets and more particularly to the relatively long buckets used in certain stages or regions of an elastic fluid turbine.

The object of the invention is to provide a bucket structure which is adapted to withstand the stresses to which said buckets are subjected, is of minimum weight, and is readily and economically manufactured and assembled.

In the accompanying drawing illustrating some of the embodiments of my invention, Figure 1 is a section through a portion of the rim of a turbine rotor and the buckets carried thereby; Fig. 2 is a section on the line 2-2 of Fig. 1; Fig. 3 is a sectional side view of the parts shown in Fig. 1; and Fig. 4 is a view similar to Fig. 1 showing a slight modification.

The invention is shown as applied to the rotor or rotating member of a turbine, but it may be used for strengthening and supporting the buckets carried by the stator or stationary portion of the turbine if desired. The rotor 5 may be a wheel, drum or other structure carrying rings of buckets 6, the inner ends of which are secured to the rotor by any suitable fastening devices. The drawing shows by way of illustration one form of fastening means in which the inner ends of the buckets 6 are provided with dove-tail bases 7 that engage a correspondingly shaped groove in the rim of the rotor. Space blocks 8 are placed in the groove between the ends of the buckets. The outer ends of the buckets carry a cover or shroud-ring 9 of any desired construction. This cover may, however, be omitted under certain conditions if deemed advisable. In the drawing one type of shroud-ring is illustrated. This cover or shroud-ring is formed of a plurality of sections which inclose one side or end of the bucket spaces and assist in confining the motive fluid in said spaces and also aid in supporting and sustaining

the buckets. But in relatively long buckets an additional strengthening means is necessary to enable said buckets to withstand the effects of the centrifugal and other stresses to which they are subjected in the operation of the turbine as its motive fluid drives it at high rotative speeds. For the purpose of strengthening and supporting them, the buckets forming a given ring about the rotor are arranged in groups of two, Fig. 1, and a stay-bolt 11 firmly unites the buckets of each group at a point intermediate their ends, preferably at or about the middle of the buckets. The bolt 11 is provided with an enlarged portion 12 located between the buckets and forming shoulders that engage the adjacent faces of the buckets to space them apart. This enlarged or shouldered portion may be formed as an integral part of the bolt, Fig. 1; or it may take the form of a sleeve 13, Fig. 4. The ends of the bolt pass through the buckets and are secured therein by riveting or otherwise. In the resulting structure the buckets are drawn against the shouldered portion of the stay-bolt and held securely in that relation under the varying conditions of temperature, load, centrifugal stress and the like to which the apparatus is subjected in operation. Groups of three or more buckets may be secured together in a similar manner, as illustrated in Fig. 4, by the use of the sleeves or distance pieces 13 through which the body portion of the stay-bolt passes.

The formation of the buckets into separate or independent groups secured together by stay-bolts is preferably accomplished before the buckets are assembled on the wheel or rotor 5. This method of procedure facilitates their manufacture and produces better mechanical results. It also facilitates the removal of a bucket damaged during the operation of the turbine and its replacement by a new bucket.

The several independent groups of buckets are mounted in the rotor with the space-blocks between them. Then the sections of the cover or ring can be riveted to the outer ends of the buckets. If the portion of the rotor which receives the buckets is made up of sections or segments, each section or segment may be formed complete with said

groups secured therein and the cover attached before said segment is mounted on the rotor.

By leaving the spaces between the adjacent groups free from the fastening and supporting devices, this method of grouping the buckets and securing them together adds less weight to the rim of the rotor or wheel to increase the centrifugal stresses therein than would otherwise be the case. These free spaces between the groups also permit of convenient access to a sufficient number of the space-blocks at their inner ends to rivet or stake said blocks in with the ordinary tools employed for such purposes in structures utilizing this means of securing the buckets to the rotors. It is unnecessary to stake in all of the blocks to obtain a secure fastening for the buckets.

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,—

1. In combination, a turbine rotor, a ring of buckets carried thereby, the buckets of said ring being arranged in separate groups, each group comprising a plurality of individual buckets, and means intermediate the ends of the buckets forming the group for securing them together in spaced relation, the space between the adjacent ends of the groups being free from securing means.

2. In combination, a turbine rotor, a ring of buckets mounted thereon, the buckets of said ring being arranged in groups, each group comprising a plurality of individual buckets, and a stay-bolt located intermediate the ends of the buckets of a group for securing them together in spaced relation, the spaces between the adjacent groups being free from securing means.

3. In combination, a turbine rotor, a ring of buckets mounted thereon, the buckets of said ring being arranged in separate groups, each group comprising a plurality of individual buckets, and devices for securing the buckets forming the group together in

spaced relation, comprising a bolt passing through the buckets intermediate their ends, and means carried by the bolt which engages the buckets and spaces them apart.

4. In combination, a turbine rotor, a ring of buckets carried thereby, the buckets in said ring being arranged in independent groups, each group including a plurality of individual buckets, a cover attached to their outer ends, means for fastening the inner ends of the buckets to the rotor, a stay-bolt passing through the buckets of a group intermediate their ends, and means carried by said stay-bolt that engages the buckets and spaces them apart.

5. In combination, a turbine rotor, a ring of buckets carried thereby, the buckets in said ring being arranged in independent groups of two, and means for strengthening and supporting the buckets of each group comprising a stay-bolt having a shouldered portion engaging the adjacent faces of the two buckets and end portions which pass through said buckets and are secured thereto.

6. In combination, a turbine member, a row of buckets mounted thereon, and a plurality of means for uniting the buckets, the said means being located between the ends of and acting to divide the buckets into groups, each of said means being independent of the other means and the spaces between the adjacent ends of the groups being free from uniting means.

7. In combination, a turbine member, a row of buckets, means for fastening corresponding ends of the bucket to the member, a cover that is fastened to the other ends of the buckets, and means for uniting the buckets between their ends, the said means being discontinuous so as to divide the buckets into groups, the buckets of one group being independent of those in the adjacent groups except when fastened to the said member and cover and the spaces between the adjacent ends of the groups being free from uniting means.

In witness whereof, I have hereunto set my hand this 10th day of June, 1909.

ERNST KAILBERG.

Witnesses:

OSKAR RIPPING,
ERNST GOTTSCHALK.