A. S. ANDERSON.

BUCKET STRUCTURE FOR TURBINES.

APPLICATION FILED DEC. 31, 1908. RENEWED JULY 9, 1910.

980,732. Patented Jan. 3, 1911.

Fig. 1.

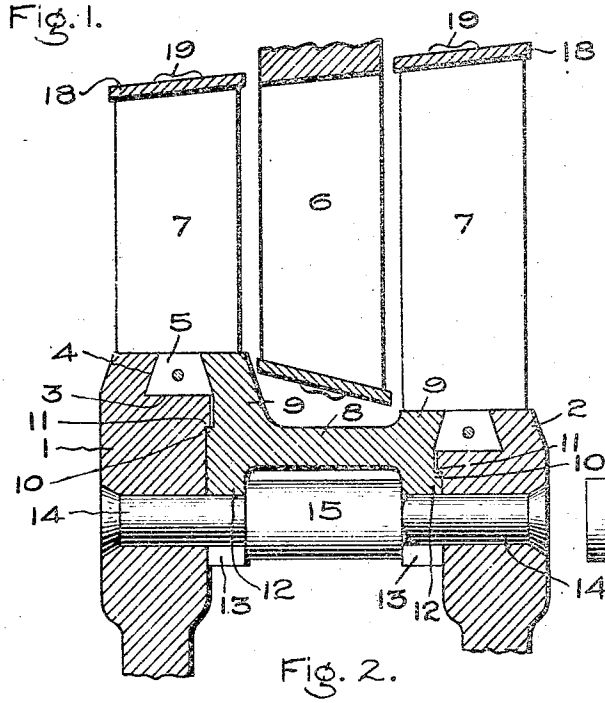


Fig. 6.

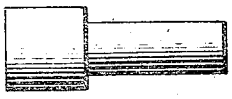


Fig. 2.

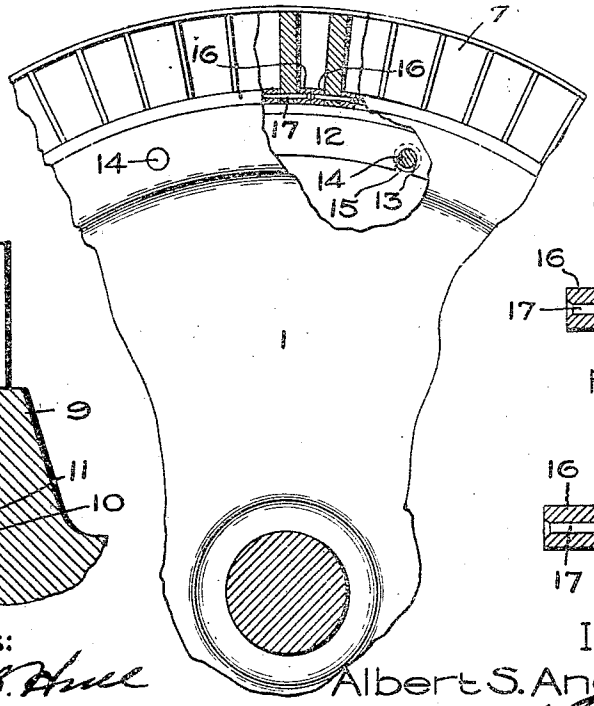


Fig. 3.

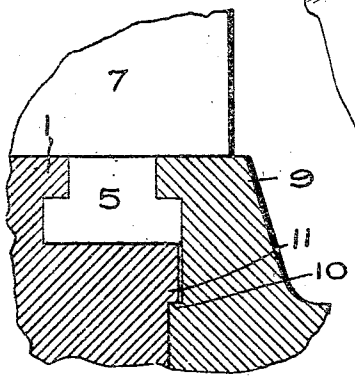


Fig. 4.

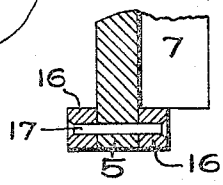
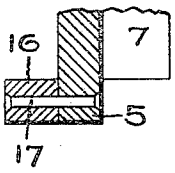


Fig. 5.



Witnesses:

Benjamin B. Hull

Ellen Oxford

Inventor,

Albert S. Anderson,

By Albert S. Davis

Att'y.

UNITED STATES PATENT OFFICE.

ALBERT S. ANDERSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

BUCKET STRUCTURE FOR TURBINES.

980,732. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed December 21, 1908, Serial No. 468,449. Renewed July 9, 1910. Serial No. 571,225.

To all whom it may concern:

Be it known that I, ALBERT S. ANDERSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Bucket Structures for Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines, and its object is to improve the present modes of fastening individual buckets to the bucket wheels, and also to improve the construction of the bucket wheel or support as a whole.

The invention has especial reference to impact turbines having two or more rows of buckets per stage, though it is not limited to that particular type of machine.

By means of my invention, the construction is simplified, the parts are easier to machine, the assembling is facilitated, and the rigidity of the wheel increased.

In carrying out my invention, I place between the peripheral portions of two bucket wheel disks a spacing ring which serves to form one wall of the groove in each disk in which the shanks of the buckets are held. Rivets of peculiar shape secure the rings and disks together, and incidentally secure the buckets. Space-blocks between the buckets are fastened to the shanks of the buckets to distribute the crushing strains on said shanks due to centrifugal force over a relatively large area, and also to obviate the necessity of upsetting them. These points of novelty will be more readily understood from the following detailed description taken in connection with the accompanying drawing, in which—

Figure 1 is a cross section of a portion of a two-disk bucket wheel provided with my spacing and securing ring; Fig. 2 is an end elevation of a portion of a wheel, one disk being partly in section; Fig. 3 shows a slight modification; Fig. 4 shows a portion of a bucket with two space blocks attached to it; Fig. 5 is a similar view showing one such block; and Fig. 6 shows a modified form of rivet for uniting the spacing ring and the wheel disks.

The bucket wheel disks or members 1, 2 each have an undercut rabbet turned in the periphery, constituting a flat bottom 3 and a wall 4 for the groove in which the buckets are held. The wall 4 may be beveled, as shown in Fig. 1, or it may be itself rabbeted, as shown in Fig. 3. The shank or base 5 of the bucket is shaped to fit this wall and also the flat bottom 3.

The bucket wheel disks are spaced apart the proper distance to admit the stationary intermediate buckets 6 between the wheel buckets 7. The disks are maintained at this distance by a spacing ring 8, which may be either continuous or made in segments, as desired. This ring has along each edge an outwardly-projecting flange 9 whose outer face is machined to fit one side of the base or shank 5 of the bucket; or in other words, the flange forms the other wall of the groove in which said bucket is held. The ring also has on each outer face a shoulder 10 which fits under a ledge or shallow rabbet 11 on the inner side of the bucket wheel disk and resists the tendency of the ring or its segments to move radially outward under the influence of centrifugal force. Along both edges of the ring are inwardly-extending flanges 12 in which are notches 13 spaced at suitable distances apart to receive the rivets 14 which pass through both bucket wheel disks and are headed down into countersinks in the outer faces of said disks. The rivets have centrifugal enlargements 15 which fit between the flanges 12 of the ring to take the thrust when the rivets are headed down. In this case the wheel disks or members are tied together by the rivets.

The buckets are separated circumferentially by spacing blocks 16 which may be applied to both sides of the shank of the bucket, as shown in Fig. 4, or to one side only, as shown in Fig. 5. In either case, the blocks are secured to the shanks by soldering, or brazing, or welding. In addition I may employ a rivet 17 which passes through the block and shank. This construction makes the blocks a part of the bucket as it were, so that the holding effect of the walls of the groove on the buckets is much greater than if the blocks were separate from the buckets.

In Fig. 6 I have shown the rivet 15 made in two parts which facilitates taking down the wheel in event of injury to buckets in one of the rows. In this case a disk may be removed by drilling out the rivets on one side only. With this construction the wheel

disks are tied together through the spacing ring and rivets instead of directly by the rivets as in Fig. 1.

I have described my invention in connection with the rotating element of a turbine, but it can be applied to the stationary element of a turbine where it is desired to have a number of rows of intermediate buckets.

The buckets are provided with covers 18 that are secured to the buckets by any suitable means, such for example as tenons 19 formed integral with the buckets and riveted over at their outer ends.

In assembling the parts I may put the covers on the buckets before or after they are assembled in the wheel. In some cases it will be of advantage to do this before as it will facilitate mounting them in the bucket receiving grooves.

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 an elastic fluid turbine, a bucket support having rows of buckets, a single clamping ring engaging with the opposite faces of the shanks of two rows of buckets, and shoulders between the ring and support which transmit centrifugal strains from the ring to the support.

2. In an elastic fluid turbine, a bucket wheel composed of two disks each having an undercut rabbet in its periphery, a spacing and clamping ring fitting between said disks and having flanges which coöperate with said rabbeted portions to form undercut grooves for the shanks of the buckets, and a shaft carrying the disks.

3. In an elastic fluid turbine, a bucket wheel composed of two disks each having an undercut rabbet in its periphery, a spacing and clamping ring fitting between said disks and coöperating therewith to form grooves for the shanks of the buckets, and provided with flanges extending in between the disks and having notches, rivets passing through said disks and the notches in said ring and provided with enlargements between said flanges, and a shaft carrying the disks.

4. In an elastic fluid turbine, the combination of two members situated side by side, each member having a portion of a bucket receiving groove, a device located between said members and forming the remaining portions of the bucket receiving grooves, the said device also acting as a spacing means and brace for said members, buckets located in the grooves, and means for clamping the members and said device.

5. In an elastic fluid turbine, the combination of two members situated side by side, each member having a portion of a bucket receiving groove, a device located between said members and forming the remaining portions of the bucket receiving grooves, the said device also acting as a spacing means and brace for said members, shoulders between the said device and the members which resist the centrifugal stresses due to rotation, buckets whose shanks are located in the grooves, means for clamping the members and said device, and a shaft upon which the members are mounted.

6. A turbine bucket having a spacing block soldered to its shank.

7. A turbine bucket having a spacing block secured to its shank by riveting and soldering.

8. In an elastic fluid turbine, the combination of disks, a spacing ring between the disks that is anchored in place by both, and rows of buckets that are held in place by the coöperation of the disks and ring.

9. In a wheel for an elastic fluid turbine, the combination of individual disks, a ring between the disks that acts as a spacer and also as means for stiffening the wheel near its periphery, the said ring having undercut grooves on opposite sides that register with grooves in the disks, and buckets arranged in rows whose shanks fit into and are retained by the walls of said grooves.

10. In an elastic fluid turbine, the combination of a pair of supports, a ring located between the supports which serves to space them apart and also to unite them, shoulders between the ring and supports to hold the parts in fixed relation against radial movement, bucket grooves formed partly in the sides of the ring and partly in the opposed faces of the disks, buckets in the grooves, and means for preventing axial movement of the disks with respect to the ring.

11. In an elastic fluid turbine, the combination of a pair of disks, each of which is provided with a part of a bucket receiving groove, a spacing ring situated between the disks and provided with two peripheral flanges that coöperate with the disks to form the remainder of the bucket grooves, inwardly extending flanges on the ring that engage the disks and act as braces, means for clamping the ring to the disks, and buckets whose shanks are seated in the grooves.

In witness whereof, I have hereunto set my hand this 18th day of December, 1908.

ALBERT S. ANDERSON.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.