No. 841,255. PATENTED JAN. 15, 1907.

H. KELLER.

WHEEL FOR TURBINES.

APPLICATION FILED JULY 31, 1905.

Fig. 1.

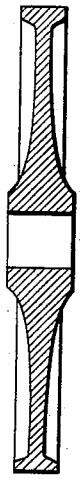


Fig. 2.

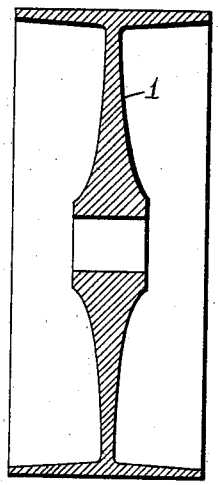


Fig. 3.

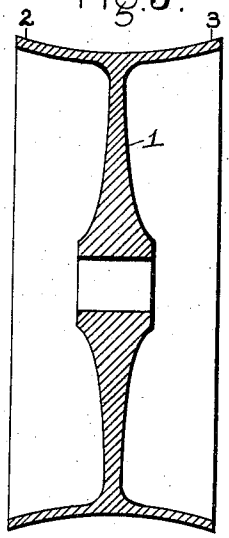
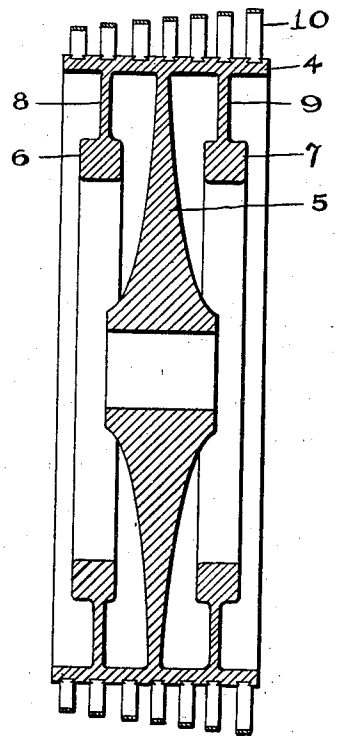


Fig. 4.



Witnesses

A. Gordon Hamilton

Helen Alford

Inventor

Huldreich Keller

By Albert G. Davis

Atty

UNITED STATES PATENT OFFICE.

HULDREICH KELLER, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

WHEEL FOR TURBINES.

No. 841,255. Specification of Letters Patent. Patented Jan. 15, 1907.

Application filed July 31, 1905. Serial No. 272,018.

To all whom it may concern:

Be it known that I, HULDREICH KELLER, a citizen of Switzerland, residing at Berlin, Empire of Germany, have invented certain new and useful Improvements in Wheels for Elastic-Fluid Turbines, of which the following is a specification.

The present invention has for its object to improve the construction of turbine bucket-wheels and other bodies intended to rotate at high speeds.

In the accompanying drawings, Figure 1 is an axial section of a bucket-wheel having a narrow face or rim. Fig. 2 is a similar section of a bucket-wheel having a wide face. Fig. 3 is a sectional view of the same wheel, showing in a somewhat exaggerated manner the distortions which occur due to centrifugal force; and Fig. 4 illustrates one embodiment of my invention as applied to a bucket-wheel or other rotating body.

A free ring rotating at high speed around its own axis is subjected to very heavy centrifugal strains. If, for example, such a ring is made of metal having a specific weight of eight kilograms per cubic decimeter with a peripheral velocity in space of thirty, fifty, seventy, or one hundred meters per second, the strain due to centrifugal force will be seventy, two hundred, four hundred, or eight hundred kilograms per square centimeter. The strain is materially increased when additional weight is added to the ring—such, for example, as the buckets for transforming the energy of a motive fluid into mechanical power.

If the rim of the wheel has a narrow face, as in Fig. 1, it suffices to support it by means of a solid web which gradually increases in thickness from the rim to the hub or to the shaft. Such wheels can be proportioned with a considerable degree of accuracy to withstand the centrifugal strains. If, however, the face of the wheel-rim is very wide, as in Fig. 2, only those parts which are approximately midway between the sides of the rim will exert a noticeable tension on the web 1 when in motion. Those lying on opposite sides of the plane of the web will have an effect approximately the same as that of a free ring of equal diameter. The rim will then assume the general form shown in Fig. 3—that is to say, the parts 2 and 3 will expand, and the rim of the wheel will be subjected to such strains as will cause it to assume a more or less curved form, the diameter gradually increasing in both directions from the plane of the web. This means that the buckets mounted on the wheel will be distorted from their normal positions, thus requiring a clearance greater than normal between the relatively movable buckets. This difficulty could be overcome by dividing the wheel into a number of units, each constructed after the manner shown in Fig. 1; but this is objectionable because it greatly increases the weight and makes the whole construction very expensive on account of the extra devices required to fasten the same to the shaft and also on account of the increased cost of manufacture.

By means of the present invention a relatively light and strong construction is provided requiring only one hub on the shaft. Furthermore, it involves only a minimum amount of machine-work.

The rim 4 is attached to a spider comprising a solid web 5 of suitable construction that gradually increases in thickness toward the hub or shaft. In order to strengthen the edge of the rim and prevent too great tangential strains thereon, rings 6 and 7 are provided which are cast with the wheel and are connected to the rim by webs 8 and 9. The rings 6 and 7 are considerably smaller in diameter than the wheel-rim and are only affected to a relatively small extent by the centrifugal force of their own masses. Such being the case, they are able to take part of the centrifugal strains to which the edges of the wheel-rim are subjected through the medium of the webs 8 and 9. These rings are subjected only to tension strains.

The spider has only one hub and can thus be worked on from both sides, so that it can be easily machined and adjusted on the shaft.

Where it is desired to make a wheel with a materially wider peripheral face, two hubs may be employed and in addition two or more strengthening-rings arranged as described.

Secured to the periphery of the wheel are rows of buckets 10 for transforming the energy of the steam or other elastic fluid into rotary motion. As many of these rows may be provided as are necessary.

The invention is not to be understood as

being limited to the construction of turbine bucket-wheels, since it is capable of a wider application. For example, it can be embodied in pulleys and other bodies intended to rotate at a high rate of speed.

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. An element intended to be rotated at high surface speed, comprising a spider adapted to be mounted on a shaft, a rim secured thereto, and rings which revolve at a materially lower surface speed than the rim, the said rings being connected to the rim and arranged to strengthen and support it.

2. An element intended to be rotated at high surface speed, comprising a spider adapted to be mounted on the shaft, a rim secured thereto, a ring situated at one side of the spider and having a materially less surface speed than the rim, and means connecting the ring with the rim whereby the centrifugal strains on the rim are partially transferred to the ring.

3. An element intended to be rotated at high surface speed comprising a spider adapted to be mounted on a shaft, a rim secured thereto, rings which revolve at a materially lower surface speed than the rim, the said rings being connected to the rim and arranged to strengthen and support it, and buckets carried by the rim for causing rotary motion.

4. A bucket-wheel intended to be rotated at high surface speed, comprising a spider adapted to be mounted on a shaft, a rim secured thereto, rings situated on opposite sides of the spider and having a materially less surface speed than the rim, webs connecting the rings and the rim whereby the strains to which the rim is subjected are partially sustained by the rings, and rows of buckets mounted on the rim for causing rotation.

In witness whereof I have hereunto set my hand this 20th day of July, 1905.

HULDREICH KELLER.

Witnesses:
RICHARD KRAUP,
FR. WAGNER.