

L. A. HAINES.
BLADING MEANS FOR TURBINES.
APPLICATION FILED MAY 23, 1910.

991,296.

Patented May 2, 1911.

Fig. 1.

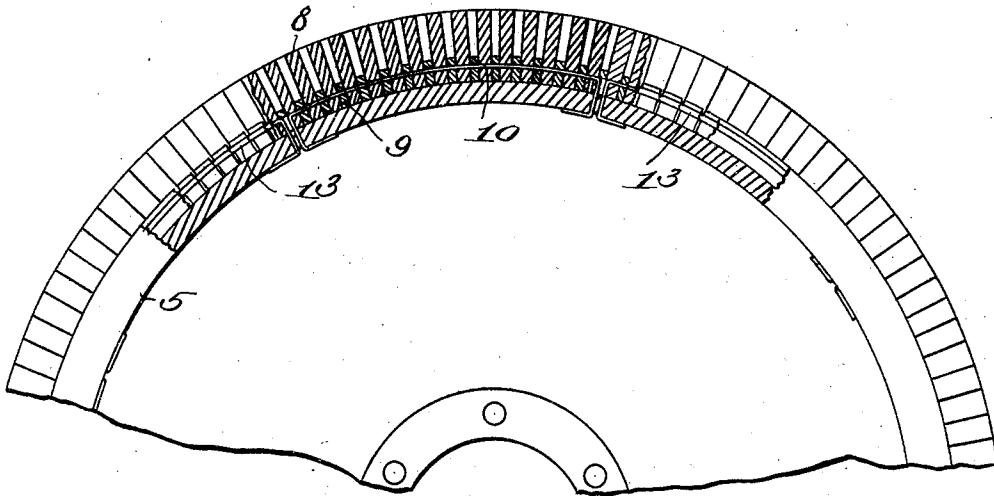


Fig. 2.

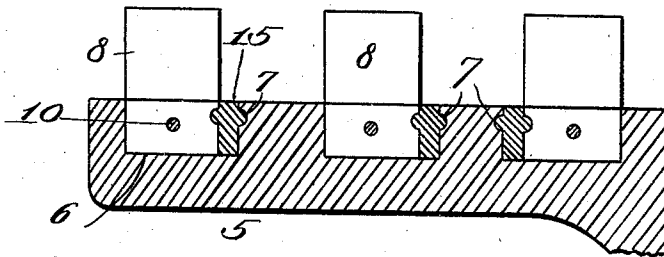
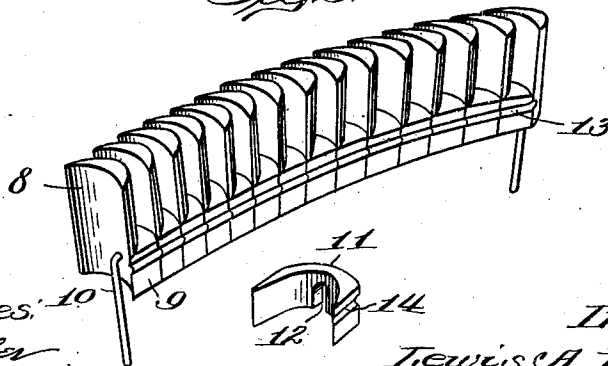


Fig. 3.



Witnesses
Ed. Keller
J. B. Keller

Inventor
Lewis A. Haines
By James L. Norris & Co.

UNITED STATES PATENT OFFICE.

LEWIS A. HAINES, OF COLUMBUS, OHIO.

BLADING MEANS FOR TURBINES.

991,296.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed May 23, 1910. Serial No. 562,974.

To all whom it may concern:

Be it known that I, LEWIS A. HAINES, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented new and useful Improvements in Blading Means for Turbines, of which the following is a specification.

This invention relates to blading means for turbines, and the primary object of the same is to provide a simple and effective arrangement of blade strips or sections readily applicable to and removable from a turbine carrying element, together with means for reliably and positively securing each blade strip or section in the carrying element by a simple operation.

With these and other objects and advantages in view, the invention consists in the construction and arrangement of the several parts which will be more fully hereinafter specified in preferred form.

In the drawing: Figure 1 is an elevation of a portion of a turbine carrying element, partially in section, and showing the blade strips or sections applied thereto and embodying the improved features of the invention. Fig. 2 is a transverse vertical section through a portion of the structure shown by Fig. 1. Fig. 3 is a detail perspective view of one of the sections, strips or groups of blades or motive agent engaging means shown complete and ready for application to the supporting or carrying element and also illustrating one of the key blocks or elements interposed between the terminals of adjacent sections or strips.

In my companion application Serial Number 557,449, filed April 25, 1910, the use of blade strips or sections is disclosed as an essential feature and a particular means for securing the same to the turbine carrying element by means of a calking strip or medium which may be swaged to provide a positive locking means to prevent the blade strips or sections from being thrown out from the carrying element by centrifugal force, and the present invention constitutes an improvement on this prior construction.

The exact form of the blades or buckets as shown in the accompanying drawing is not essential to the success of the invention, as it is proposed to use any suitable motive agent engaging means known to the art and to apply thereto the feature of improve-

ment. In the form of the device or turbine shown in the drawing, a plurality of blades or buckets 8 and space blocks or spacers 9 are shown assembled in the form of a flexible bar, strip or section, said blades or buckets and space blocks being alternately arranged and having a stringer threaded therethrough and by means of which the blade strips or sections may be separably attached to the carrying element. The blade or turbine carrying element 5 is formed with channels or grooves 6 which are considerably wider than the blades 8 and space blocks 9 disposed therein, and in one of the side walls of each groove 6 is a counter-groove or key-way 7 located near the upper terminal wall. The stringers 10 of the blade strips or sections are bent inwardly and serve as means for separably securing said strips or sections to the carrying element, as shown by Fig. 1, and between the ends of the blade strips or sections, key-blocks 11 are inserted and approximately of the shape or contour of one of the space blocks. Each key-block 11 is formed with a slot 12 extending vertically through the central portion thereof to a point about midway of the vertical extent and fully through the bottom of the same to receive and compensate for the bent terminals of the stringers of contiguous blade sections or strips. After each blade strip or section has the stringer inserted therein and secured as shown for instance by Fig. 3, the one side of the strip or section as well as one end of each key-block is formed with a key groove 13 extending full length thereof, the groove 14 in the key-block accurately registering with the grooves 13 in the adjacent blade strips or sections. After the blade strips or sections are disposed in the grooves 6 of the turbine carrying element, they are secured by means auxiliary to the stringers, said means consisting of calking strips 15 of copper or other comparatively soft metal introduced in the space formed between the wall having the groove 7 therein and the adjacent alined sides of the blade strips or sections. It will be understood that the grooves 13 in the blade strips or sections will be formed in the sides of the latter adjacent to the wall of each groove 6 having the counter-groove or key-way 7 therein, and the grooves 7 and 13 will be disposed in transverse alinement. After the copper or

other soft metal calking strip is inserted in the space between the blade strips or sections and the adjacent wall of the groove 6, said calking strip may be swaged or otherwise compressed to cause opposite portions thereof to laterally expand or bulge or be driven into the grooves or key-ways 7 and 13 and thereby firmly and positively secure or lock all of the blade strips or sections in the groove of the turbine carrying element. The calking strip may be introduced in the space between the blade strips or sections and the side wall of the groove 6 having the counter-groove or key-way 7 therein in one or more pieces, and instead of swaging the calking strip other means may be employed for causing opposite portions thereof to be projected into the grooves 7 and 13 to form keys. When the calking strip is treated or caused to project at opposite sides to form laterally projecting portions to fit in the grooves 7 and 13, keys will be simultaneously produced from the calking strip to engage the grooves 14 of each key-block 11, thus securely holding all of the key-blocks in place between the blade strips or sections and within the groove 6 of the carrying element 5.

It will be understood that the double key on the calking strip or material serves not only to hold the blade strips or sections in the groove 6 with sufficient resistance to prevent loosening or out-throwing of the blade strips or sections by centrifugal force, but said double locking means serves also to prevent out-throwing of the calking strip in view of the resistance set up by the preliminary fastening of the blade strips or sections to the carrying element by means of the stringers.

At any time found necessary either one or all of the blade strips or sections may be detached or separated from the carrying element by removing the calking strip or material and releasing the proper key-blocks and stringer extremities, and anyone of the blade strips or sections may be replaced by a like organization of parts and again secured in place in a manner similar to the operation heretofore explained.

It will be understood that the features of invention as hereinbefore disclosed may be utilized either with the movable turbine rings or elements or with the fixed turbine rings or elements. In either event a very simple mode and reliable form of fastening is provided and it is obvious that the calking strip between the blade strips or sections and the one wall of the groove in which the said strips or sections are disposed may be equally well used with any form of motive agent engaging means that may have means other than the stringer extremities serving as the primary securing means therefor. It will also be understood that changes

in the proportions and dimensions of the several parts may be modified at will without departing from the spirit of the invention.

What is claimed is:

1. In a turbine, the combination with a supporting element having a circumferential groove with a groove in one side wall thereof, of a motive agent engaging means comprising a plurality of elements having a stringer threaded therethrough and serving to hold the said elements in close associated relation, the motive agent engaging means being assembled in close and tight relation on the stringer prior to disposition in the said circumferential groove, the ends of the stringer being inserted through and secured against the supporting element, the side portion of the elements of the motive agent engaging means having a groove formed therein to cooperate with the groove in the side wall of the said circumferential groove, and a calking strip introduced between the grooved side of the motive agent engaging means and the adjacent side wall of the circumferential groove and having keys laterally projecting therefrom and extending into the grooves of the motive agent engaging means and the adjacent side wall of the circumferential groove.

2. In a turbine, the combination with a supporting element having a circumferential channel or groove with a counter-groove in one of the side walls thereof, of blade strips or sections provided with stringers secured to the supporting element and having key-blocks introduced between the terminals thereof, the blade strips or sections and key-blocks having grooves extending along one side thereof, and calking means introduced between the grooved side portions of the strips or sections and key-blocks and the grooved wall of the circumferential channel or groove, the calking strip having portions thereof at opposite sides projected into the grooves of the strips or sections and key-blocks and of the adjacent side wall of the circumferential channel or groove.

3. In a turbine, the combination with a supporting element having a circumferential groove with a counter-groove in one side wall thereof, of motive agent engaging means composed of a plurality of closely assembled members and a stringer extending therethrough, the members being under pressure on the stringer and held associated independently of the securement thereof in the groove of the supporting element, the ends of the stringer being inserted through and secured against the supporting element, the motive agent engaging means having a side groove formed therein to coincide with the counter-groove of the supporting element, and a calking strip interposed between the motive agent engaging means and

one side wall of the circumferential groove of the supporting element and provided with opposed keys to respectively engage the counter-groove of the circumferential groove
5 and the side groove of the motive agent engaging means.
In testimony whereof I have hereunto set

my hand in presence of two subscribing witnesses.

LEWIS A. HAINES.

Witnesses:

CHAS. S. HYER,
S. E. WHITE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
