No. 835,473. PATENTED NOV. 6, 1906.

M. ROTTER.

ELASTIC FLUID TURBINE.

APPLICATION FILED JULY 12, 1906.

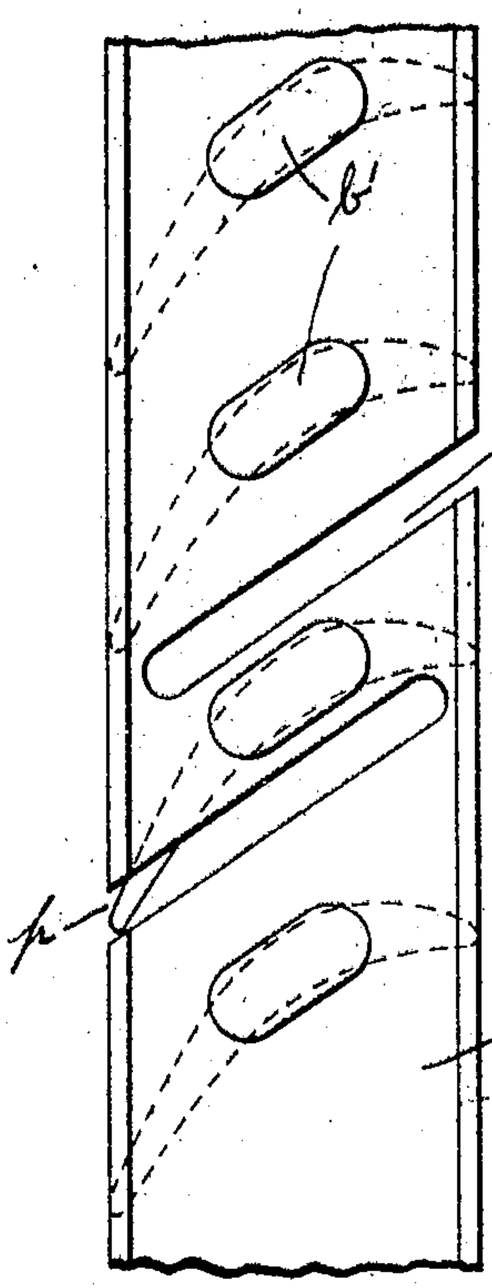

Fig. 4.

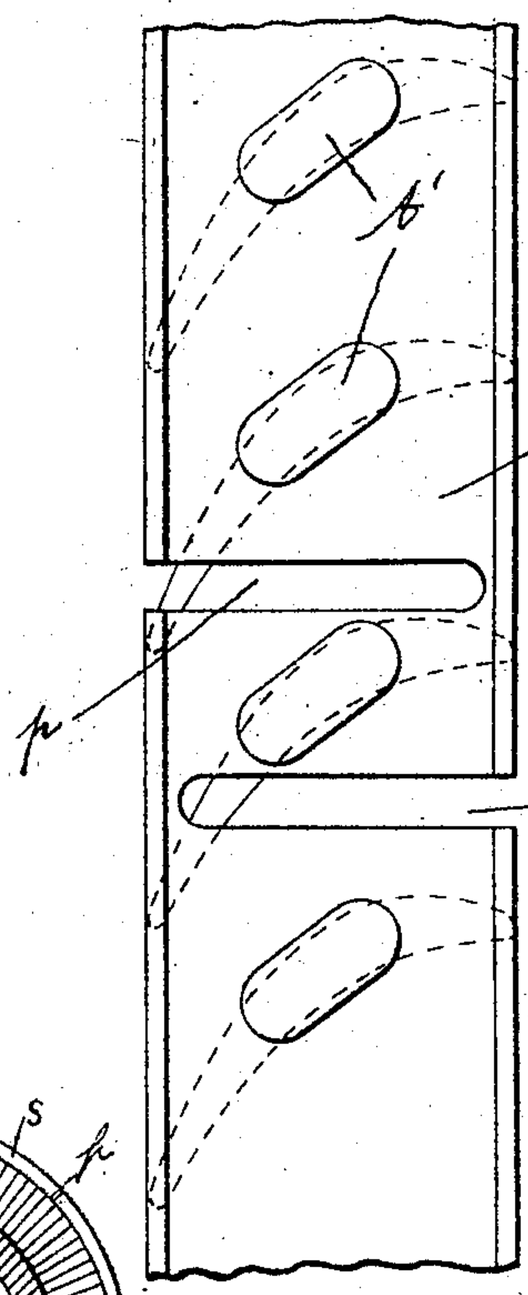

Fig. 2.

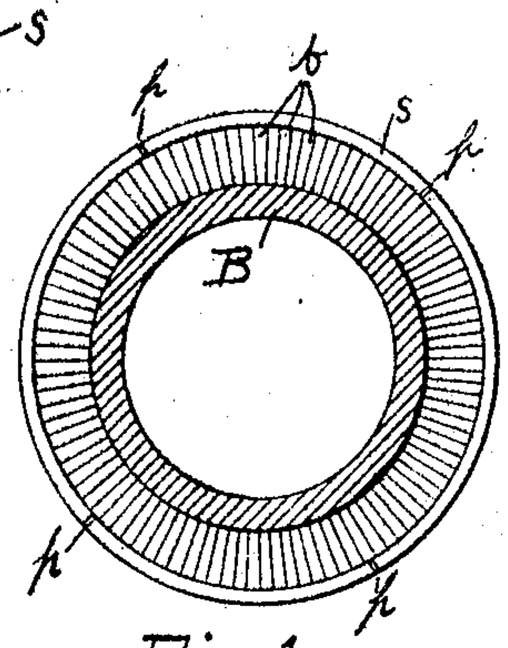

Fig. 1.

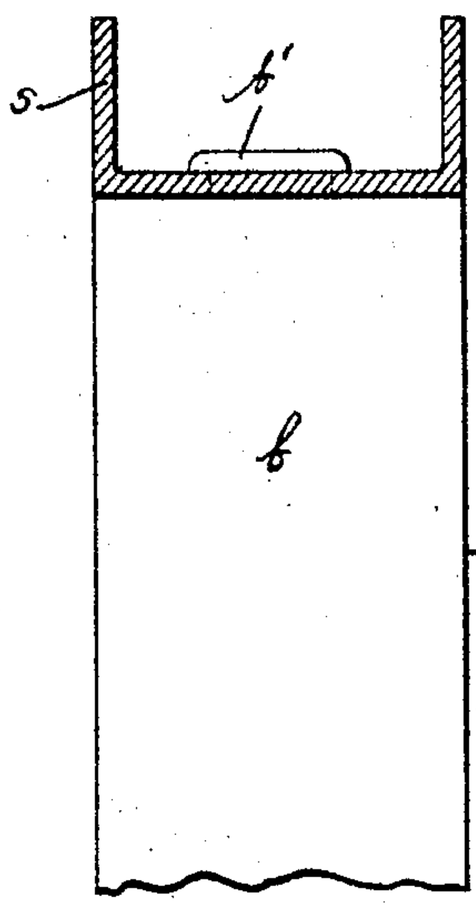

Fig. 5.

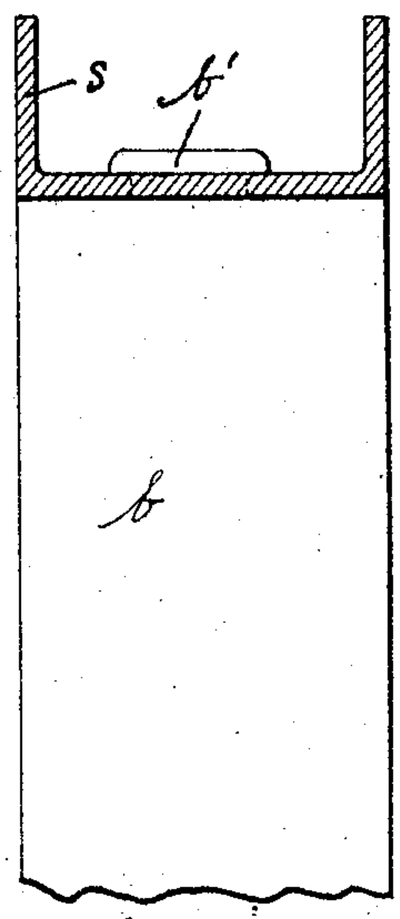

Fig. 3.

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ELASTIC-FLUID TURBINE.

No. 835,473. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed July 12, 1906. Serial No. 325,747.

To all whom it may concern:

Be it known that I, MAX ROTTER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Elastic-Fluid Turbine, of which the following is a specification.

This invention realtes to elastic-fluid turbines, and specifically to a shroud member uniting the blades and adapted to expand and contract under the influence of variations of temperature without disturbing the alinement of the blades.

In the accompanying drawings, which form a part of this specification and which illustrate an embodiment of the invention, and in which the same reference characters are used to indicate the same elements in each of the several views, Figure 1 is a vertical transverse section of the rotor of a steam-turbine, showing a ring of blades and a shroud member embodying my invention attached thereto. Fig. 2 is a plan view of a shroud member, showing the blades attached thereto. Fig. 3 is an elevation of a blade with the shroud member shown in Fig. 2 attached thereto, the shroud member being shown in section. Fig. 4 is a plan view of a shroud member, showing a modification in the manner of forming said member; and Fig. 5 is an elevation of a blade and shroud member attached thereto, the shroud member being shown in section.

In elastic-fluid turbines, especially those using a highly-heated gas, such as superheated steam, for the motive fluid, a considerable amount of expansion of certain parts of the turbine should be provided for.

As shown in Fig. 1, which illustrates a modern construction of turbine, the blades *b* are mounted upon a blade-carrying drum B, and the outer ends of the blades are united by a shroud member *s*.

The blade-carrying drum B is usually composed of iron or steel, while the blades *b* and the shroud member *s* are made of brass or some such material which has a rather high coefficient of expansion.

It is obvious from an inspection of the turbine as shown by Fig. 1 that the length of the shroud member *s* is relatively very great as compared with the total length of two diametrically located blades, so that the total expansion or contraction of the shroud member *s* is not provided for by an equal expansion or contraction of the blades *b*, this difference between the total amount of expansion of the shroud member *s* and the blades *b* being liable to alter the position of the blades.

In Figs. 2 and 4 is shown a way to permit the shroud member *s* to expand and contract without disturbing the blades or changing their relative positions.

The shroud member *s* is provided with slits or slots *p*, which are either disposed at right angles to its length, as shown in Fig. 2, or at some angle other than a right angle to its length, as shown in Fig. 4.

In Figs. 2 to 5, inclusive, the reference character *b'* shows the projection upon the end of each blade securing the shroud member to the blades. It will be understood that this shroud member, arranged to permit of excessive expansion and contraction, is equally applicable to the blades secured to the stator member as it is to the blades secured to the rotor member, such as shown in Fig. 1; but to avoid unnecessary illustration it is deemed sufficient to show the shroud member only in its relation to the blades carried by the rotor member, as shown in Fig. 1.

It will be noticed by reference to Figs. 2 and 4 that the slots *p* extend from either side of the shroud member into said member a sufficient distance to allow for relative movement between the different parts of the shroud member.

The shroud member *s* is shown as made from a channel-bar, and the slots *p* are shown as extending practically through the bar to the farthermost web.

The action of the shroud member under the influence of a rise of temperature is to diminish the width of the slots in case the blades do not expand sufficiently in a direction radial to the axis of the turbine to compensate for the expansion of the shroud member. If, on the contrary, the blades are so long as to more than compensate for the expansion of the shroud member, then the width of the slots would be increased.

The slits or slots need not be arranged, as

shown in Figs. 2 and 4, between every two blades, but may be placed at intervals and separated by a plurality of blades.

What I claim is—

1. The combination with a blade-holding member of blades secured thereto and a unitary member connecting said blades, said unitary member being so constructed and arranged as to permit of relative movement between different parts thereof when subjected to variations of temperature.

2. The combination with a blade-holding member of blades secured thereto and a member connecting the blades, said latter member being slotted to diminish the effects of variations of temperature thereon.

3. The combination with a blade-holding member of blades secured thereto and a member connecting the blades, said member being provided with transverse slots to diminish the effects of variations of temperature thereon.

4. The combination with a blade-holding member of blades secured thereto and a member connecting the blades, said member being provided with slots in the opposite edges thereof.

5. The combination with a blade-holding member of blades secured thereto and a channel-bar-shaped member connecting the blades, said member being provided with a transversely-disposed slot.

In testimony whereof I affix my signature in the presence of two witnesses.

MAX ROTTER.

Witnesses:

FRANK E. DENNETT,

G. F. DE WEIN.