

J. TOYOKAWA.
NOZZLE FOR STEAM TURBINES.
APPLICATION FILED OCT. 9, 1917.

1,304,412.

Patented May 20, 1919.

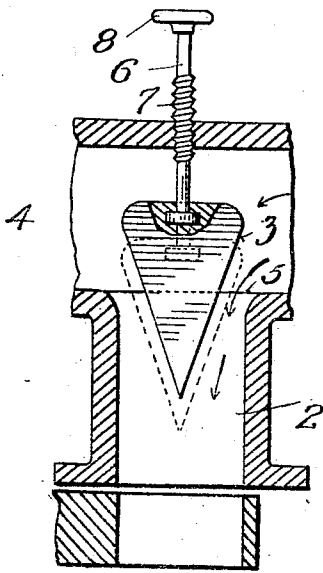


Fig. 2.

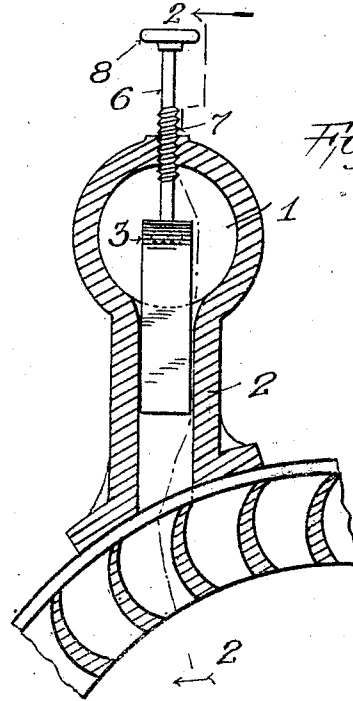


Fig. 1.

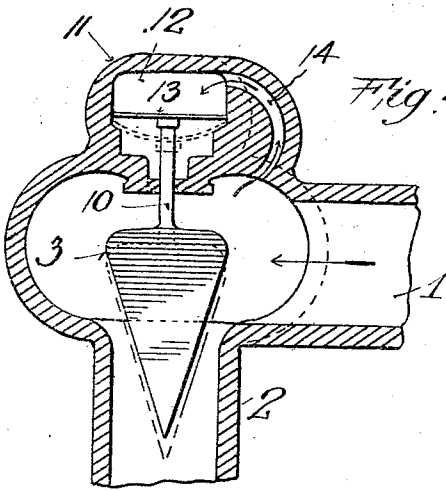


Fig. 4.

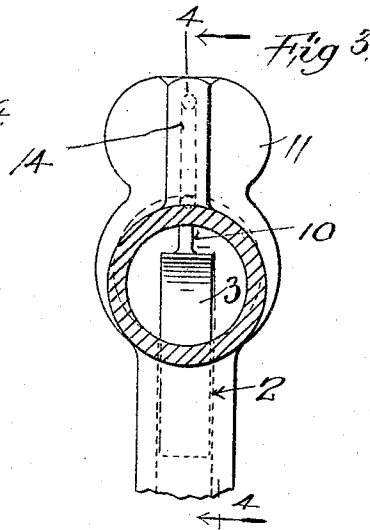


Fig. 3.

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NOZZLE FOR STEAM-TURBINES.

1,304,412.

Specification of Letters Patent.

Patented May 20, 1919.

Application filed October 9, 1917. Serial No. 195,520.

To all whom it may concern:

Be it known that I, JUNYA TOYOKAWA, a subject of the Emperor of Japan, and residing at Koishikawa, Tokyo, Japan, have made a certain new and useful Invention in Nozzles for Steam-Turbines, of which the following is a specification.

This invention relates to steam turbines, and particularly to the nozzle thereof.

The object of the invention is to provide a nozzle which is simple in structure, efficient in operation, and economical of manufacture.

A further object of the invention is to provide a nozzle for steam turbines, which is automatic in action in controlling the proper amount of steam admitted to the turbine.

A further object of the invention is to provide a nozzle which is automatically controlled by the pressure of steam being admitted to the turbine to thereby effect a proportional control of expansion of the steam in the nozzle.

Further objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown by the accompanying drawings, and finally pointed out in the appended claims.

Referring to the drawing:

Figure 1 is a view in section of a nozzle embodying my invention.

Fig. 2 is a sectional view taken on the line 2, 2, Fig. 1, and looking in the direction of the arrows.

Fig. 3 is a view similar to Fig. 1 of a modified construction of nozzle embodying my invention.

Fig. 4 is a sectional view taken on the line 4, 4, Fig. 3, and looking in the direction of the arrows.

The same part is designated by the same reference character wherever it occurs throughout the several views.

Referring to the drawing: I show at 1 the piping system which admits the steam to the nozzle 2. If the steam in the piping system is of high pressure the expansion of the steam therein is correspondingly high. It is among the special purposes of my invention to utilize the pressure of the steam in the inlet pipe to control the inlet to the

nozzle in proportion to the pressure in the inlet pipe. Thus it is possible with but a single nozzle form to fit the same to any pressure of steam or gas. I employ for this purpose a wedge 3 adapted to fit into the nozzle 2, and which may be moved into and out of the nozzle 2 in any desired manner. The wedge is of any shape, for example, of such shape as is shown by reference to Figs. 1 and 2 so that it effectively controls the passage of the nozzle 2 in one direction of measurement without affecting same in the other direction of measurement. I do not, however, desire to be limited to any particular shape, size or material of the wedge. For example, the wedge 3 is of unvarying width so that by the movement up and down thereof the only portion of the nozzle that is controlled is the spaces 4 and 5 between the ends of the wedge and the nozzle 2, and thus allowing a regulation for the expansion of the steam in accordance with the pressure under which the steam is transmitted to the nozzle. The regulation may be secured in any desired manner, for example, I show in Fig. 1 a manually controlled means wherein the wedge 3 is carried by the shaft 6 which is provided with threads 7 passing through the wall of the pipe line 1; the end of the shaft 6 is provided with a hand wheel 8 which upon being turned in one direction or the other will raise or lower the wedge out from or into the nozzle as will be readily understood.

It is among the purposes of my invention to provide automatic means for securing the regulation of the expansion of the steam in accordance with the pressure under which same is transmitted to the nozzle, and consequently I show in Fig. 4 one means that may be employed to secure this automatic adjustment wherein the wedge 3 is carried by an arm 10 which projects into an auxiliary casing 11 which forms therein a chamber 12. Located in the casing is a flexible diaphragm 13 which is secured to the end of the rod 10 which carries the wedge 3. The by-pass 14 through casing 11 establishes communication between the pipe line 1 and the chamber 12. Thus it will be seen that if the pressure of the steam in the pipe line 1 becomes excessive steam is forced by the excess through by-pass 14 into chamber 12 behind the diaphragm 13 thus forcing the wedge downwardly into the nozzle 2 in pro-

portion with the amount of pressure which passes behind the diaphragm 12 as will be readily understood. I wish it to be understood that many modifications and arrangements will occur to those skilled in the art without departing from the spirit and scope of my invention as defined in the claims, and while therefore I have shown and described specific embodiments of my invention, I do not wish to be limited thereto. Having now set forth the objects and nature of my invention, and having shown and described specific embodiments thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent, is,—

1. In a steam or gas turbine nozzle, a nozzle, in combination with means for controlling the passage of steam through said nozzle, and automatic means for regulating the controlling means to thus regulate the expansion of the steam in proportion to the pressure thereof.

2. In a steam or gas turbine nozzle, a nozzle, in combination with a wedge adapted to fit in said nozzle, and means for automatically regulating the position of said wedge in said nozzle to thus regulate the expansion

of the steam in proportion to the pressure thereof.

3. The combination with a nozzle, of a wedge of constant width and of decreasing thickness adapted to project therein and automatic means for adjusting the degree of projection of said wedge into said nozzle.

4. The combination with a nozzle, of a wedge of constant width adapted to project therein, and means controlled by pressure for regulating the degree of projection of said wedge into said nozzle.

5. In a steam or gas turbine, a nozzle, in combination with means for controlling the passage of steam through said nozzle, and means controlled by the pressure of the steam for regulating said nozzle controlling means.

6. In a steam or gas turbine, a nozzle, in combination with a wedge adapted to fit in said nozzle, and means controlled by the pressure of the steam for regulating the position of said wedge in said nozzle.

In testimony whereof I have hereunto set my hand on this fifth day of October A. D., 1917.

JUNYA TOYOKAWA.

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