No. 874,923. PATENTED DEC. 31, 1907.

H. S. BALDWIN.

NOZZLE FOR ELASTIC FLUID TURBINES.

APPLICATION FILED JUNE 27, 1907.

Fig. 1.

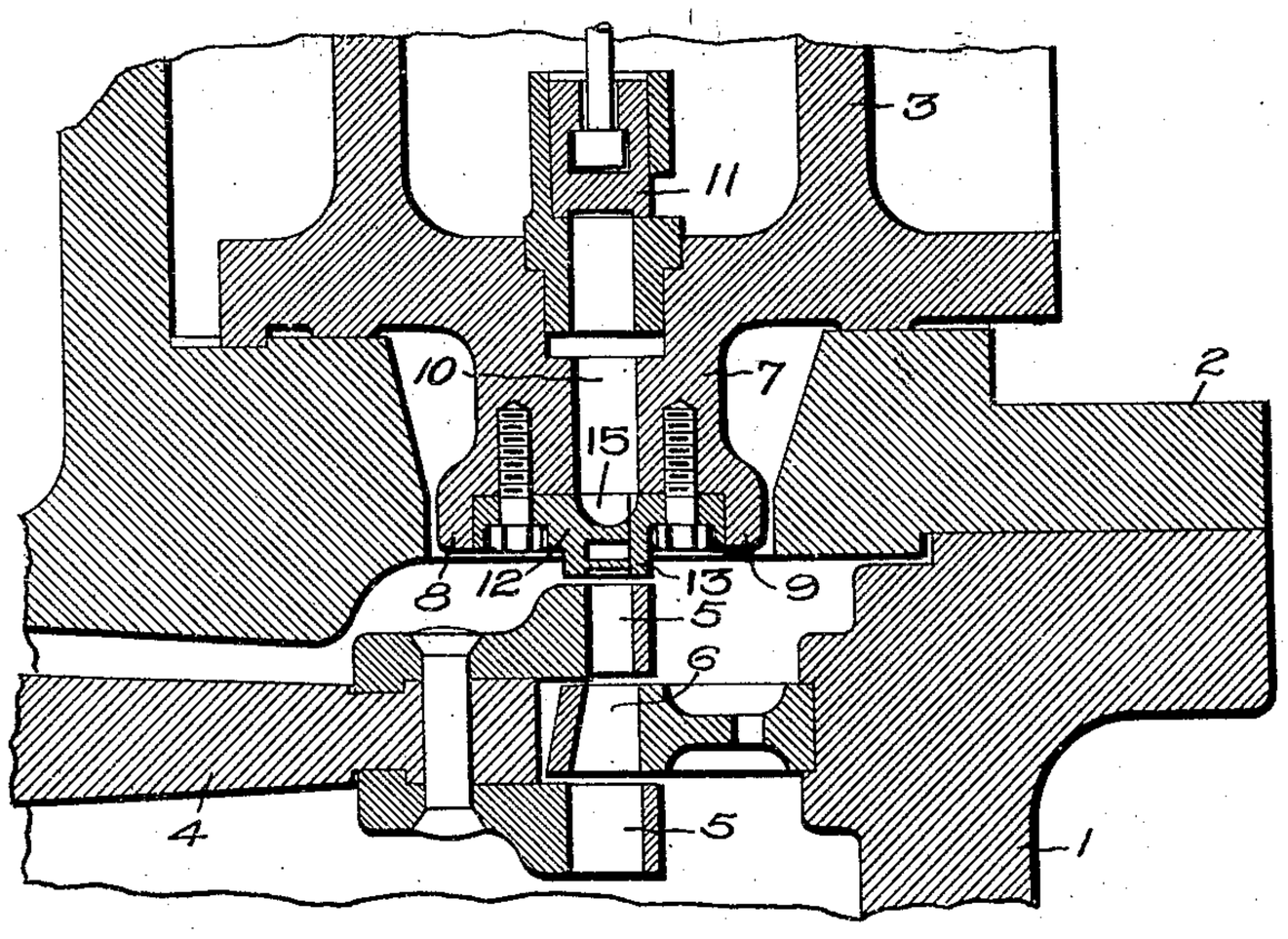
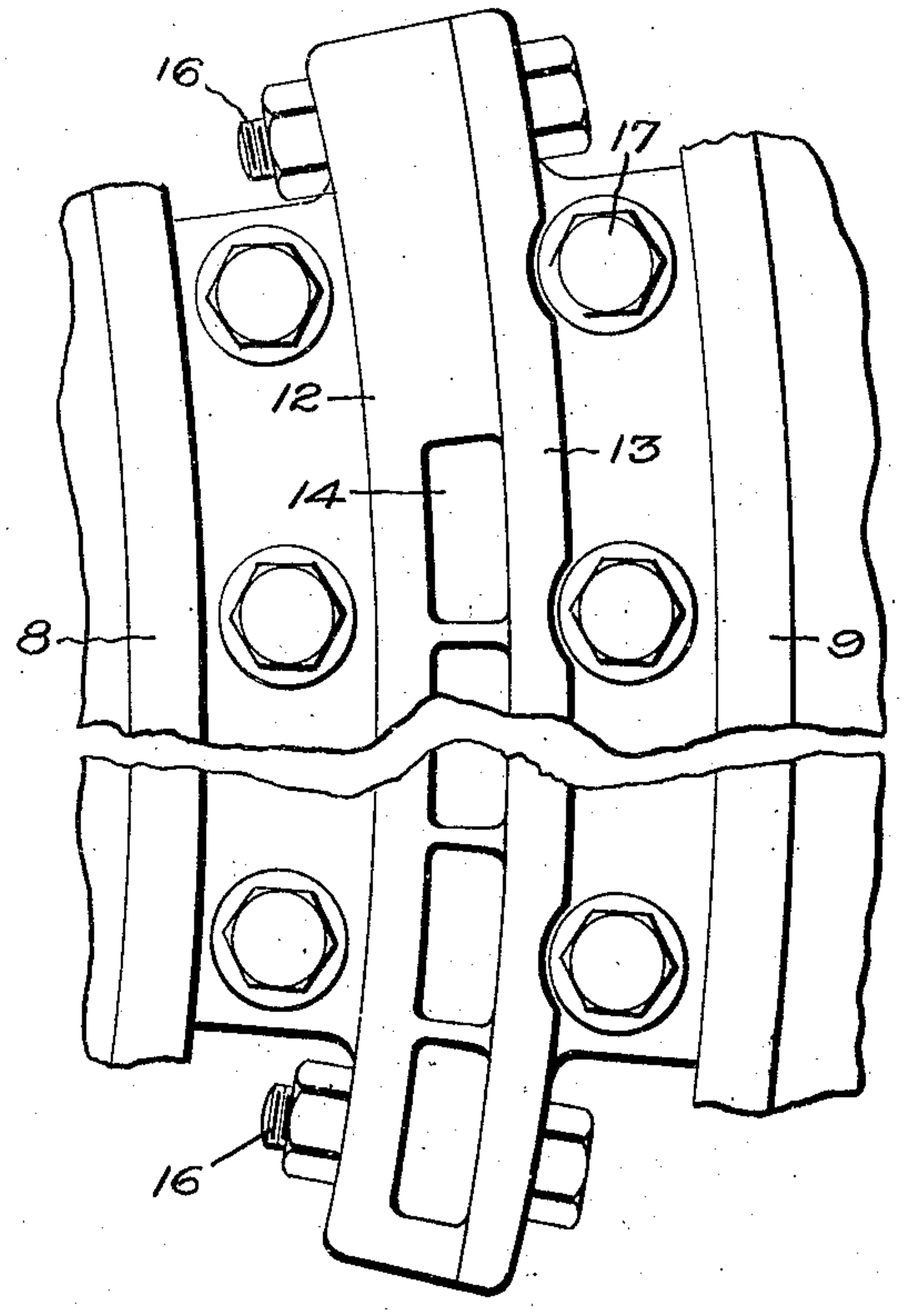


Fig. 2.



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UNITED STATES PATENT OFFICE.

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NOZZLE FOR ELASTIC-FLUID TURBINES.

No. 874,923. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed June 27, 1907. Serial No. 381,007.

To all whom it may concern:

Be it known that I, HENRY S. BALDWIN, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Nozzles for Elastic-Fluid Turbines, of which the following is a specification.

The present invention relates to sectionalized split nozzles for elastic-fluid turbines comprising a divided structure having a plurality of discharge passages which are closely associated so that the steam or other fluid leaves the same as a solid column.

The invention is more particularly applicable to those nozzles having passages with little or no difference in cross-sectional area between the throat and the discharge end of each passage. In other words those nozzles which have little or no expansion. The invention, however, is applicable to nozzles having a considerable expansion ratio between the throat and discharge end.

With split nozzles having little or no expansion difficulty has been experienced in securing them to their support, especially where they cover a considerable wheel arc and yet do not extend entirely around the wheel. One of the constructions for this type of nozzle comprises two principal parts, one part containing the nozzle passages, and the other part acting as a wall for said passages, the plane of division between the parts being concentric with theturbine axis. With such a construction the partitions between the passages are so thin and the conduits leading to the nozzle bowls are so close together that there is not sufficient metal to receive retaining bolts in a plane perpendicular to the direction of steam flow, or at least such bolts cannot be employed unless the shape of the passages leading to the bowls or the shape of the nozzle passages themselves be so designed as to materially interfere with the free passage of steam to the nozzles, and thus decrease the efficiency of the machine as a whole.

The object of my invention is to provide a simple means whereby split nozzles of the general character above referred to can be supported in a turbine and connected with the inlet passages without in any way interfering with the free passage of steam or decreasing the efficiency of the apparatus.

In the accompanying drawing, which illustrates one of the embodiments of my invention, Figure 1 is a partial axial section of a turbine, and Fig. 2 is an inverted plan view of a nozzle.

1 indicates the casing of the turbine having a head 2 that supports the valve chest 3. Located inside of the casing is a wheel 4 having rows of peripheral buckets 5, between which are intermediate buckets 6 extending partially around the wheel and covering about the same arc as the nozzle. Formed on the side of the valve chest adjacent the bucket wheels is a support 7 for the nozzle. This support may be separate from the valve chest and bolted thereto, or it may be carried by any other part of the turbine, without departing from my invention. The arrangement shown is very satisfactory because it reduces the number of parts and the amount of machine work and the alinement is always preserved.

The invention is shown in connection with a vertical-shaft turbine, and will be so described herein, but it is to be understood that it is equally applicable to machines of the horizontal type.

The under side of the nozzle support 7 is provided with two shoulders or abutments 8 and 9 having a recess between to receive the nozzle, the latter discharging steam in an axial direction. The opposed walls of the shoulders or abutments 8 and 9 are concentric with each other and with the axis of the turbine. The upper wall of the recess is perpendicular to the turbine axis. Formed in support 7 are as many conduits 10 as there are admission valves 11. Commonly a valve is provided for each conduit, but one valve may control two or more conduits if desired.

Mounted in the recess formed in the under side of the support 7 is a nozzle comprising parts 12 and 13. The part 12 contains a plurality of closely associated discharge passages or sections 14 and also the major portion of the bowls 15, which communicate with the throats of the nozzle passages and the conduits. The passages or sections are made by a milling operation. The part 13 forms a wall for one side of the nozzle-passages, and also contains a small portion of the nozzle bowls. The plane of division between the parts of the nozzle is, for the purpose of simplicity and ease of manufacture, made cylindrical and parallel to the axis of the wheel, but it can be otherwise shaped if desired.

This is an important matter as will readily be understood. In any event the joint should be steam-tight at every point. At the ends of the nozzle are bolts 16 for clamping the parts together, which bolts extend in a plane perpendicular to the turbine shaft. It is quite evident that if the nozzle is long and covers a substantial arc on the wheel, dependence cannot be placed on end bolts alone to maintain a good joint between the parts 12 and 13 of the nozzle, since the parts would be liable to distortion due to heat and other causes. This tendency to distortion is, however, taken care of by the concentric abutments 8 and 9 which maintain the parts of the nozzle in firm contact at all times. The parts of the nozzle are secured to the support by axially extending bolts 17 of which as many are provided as are necessary. The invention has been shown in connection with admission nozzles but it applies equally well to stage nozzles.

By reason of the construction shown the partitions between nozzle passages may be as thin as desired, thereby avoiding all spill losses at intermediate points in the nozzle, and the parts or members of the nozzle are so confined as to preclude their separating from any cause.

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 a nozzle structure, the combination of a divided nozzle, means uniting the parts of the nozzle at the ends, a support for the nozzle, and abutments which engage the nozzle parts and hold them in contact.

2. In a nozzle structure, the combination of a nozzle divided into two principal parts, the line of division being in the same general direction as the steam flow, devices clamping the members at the ends, a support for the nozzle, abutments engaging the members on opposite sides and holding them in contact, and means which pass through the parts of the nozzle into the support for securing them in place.

3. In a nozzle structure, the combination of a sectionalized nozzle divided in a cylindrical plane into two principal parts, devices at the ends of the parts for uniting them, a support for the nozzle abutments formed on the support which have opposed concentric surfaces that engage the parts of the nozzle and hold them in contact throughout their length, and bolts that pass through the nozzle parts into the support for holding the same in place.

4. In a nozzle structure, the combination of a nozzle divided into two principal parts in a cylindrical plane and provided with a plurality of fluid-discharging passages, means located at each end of the nozzle for holding the parts together, a support having a recess with concentric side walls into which the nozzle may be inserted or withdrawn as a unit, the said walls holding the parts of the nozzle in contact, means for uniting the nozzle and support, and conduits in the support for supplying fluid to the nozzle passages.

In witness whereof I have hereunto set my hand this twenty second day of June, 1907.

HENRY S. BALDWIN.

Witnesses:
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