No. 837,934. PATENTED DEC. 11, 1906.

C. V. KERR.

NOZZLE FOR STEAM TURBINES.

APPLICATION FILED JUNE 22, 1905.

Fig. 2.

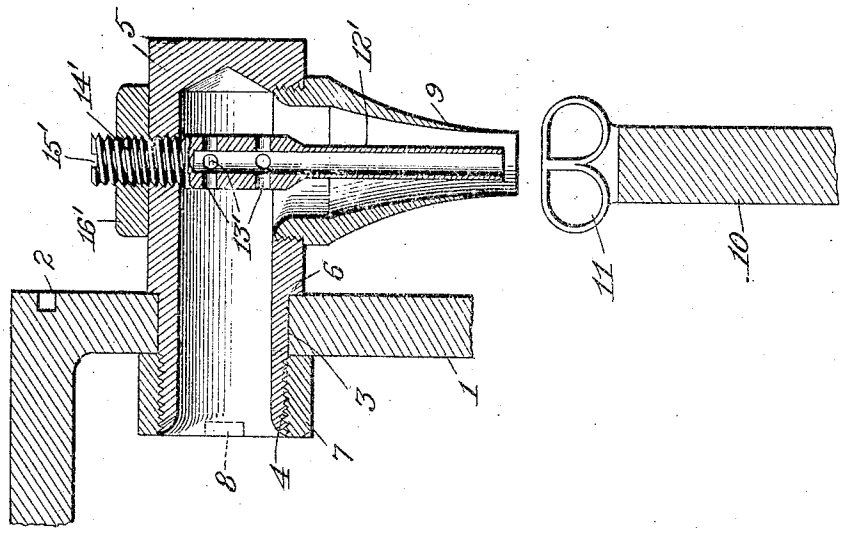
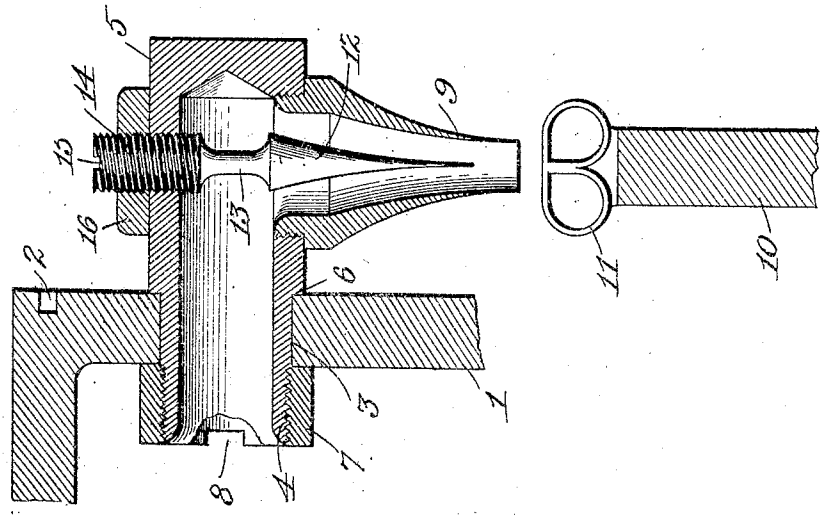


Fig. 1.



Witnesses

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NOZZLE FOR STEAM-TURBINES.

No. 837,934. Specification of Letters Patent. Patented Dec. 11, 1906.

Application filed June 22, 1905. Serial No. 266,423.

To all whom it may concern:

Be it known that I, CHARLES V. KERR, a citizen of the United States, residing at Wellsville, in the county of Allegany and State of New York, have invented certain new and useful Improvements in Nozzles for Steam-Turbines or the Like, of which the following is a specification.

My invention relates to nozzles, and more especially to those used in connection with steam-turbines of the impact type, as shown, for example, in my former patent, No 756,241, dated April 5, 1904, or my allowed application, Serial No. 231,490, filed March 5, 1904.

The objects of my invention are, first, to provide a construction of nozzle which makes it possible to employ a larger orifice and at the same time as efficient nozzle as heretofore used with turbines; second, to provide a nozzle which will enable one to better direct the jet against the buckets of the turbine and at the same time prevent more or less the cross-currents which tend to form within the nozzle and destroy the velocity of the motive fluid or its efficiency of operation; third, to provide a needle within the nozzle-tip and means of adjustment of the same which will enable one to obtain a greater control or refinement of pressures and velocities of the motive fluid in passing through the nozzle; fourth, to provide a construction of the nozzle which may be quickly adjusted in all positions with respect to the buckets and also easily attached or detached from the turbine for repairs and inspection; fifth, other evident advantages of construction and mode of operation which will be fully understood from the following detailed description of the invention.

My invention consists of features of construction and relation of parts which will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying sheet of drawings, in which similar reference characters indicate the same parts in both the figures, Figure 1 is a sectional view through my improved nozzle, showing a portion of the wall separating one stage of expansion or section from another and a bucket with fragment of impact-wheel. Fig. 2 is a similar view as Fig. 1, showing a modified form of the invention.

Referring to the drawings, 1 is a section of the casing or wall which divides one stage of expansion of the motive fluid from another in passing through the different sections of the turbine. 2 indicates a circular groove which receives a corresponding tongue in the wall of the adjacent section in forming the complete casing of the turbine.

3 is an opening in the wall 1, forming a socket through which is passed the open and threaded end 4 of the hollow nozzle-body 5,

6 is a shoulder on the body 5 for engaging the wall 1, whereby the nozzle is firmly secured thereto by a lock-nut 7, which engages the threaded end 4.

8 represents notches in the lock-nut, by which the same may be quickly and securely tightened up.

9 is the nozzle-tip, which is preferably, as shown in the drawings, detachably secured to the hollow nozzle-body 5, but may, if so desired, be made integral therewith. It is also to be understood that, if desired, the body 5 of the nozzle may be extended and a plurality of tips 9 be used, as shown in my allowed application heretofore referred to.

10 represents a section of the disk of an impact-wheel in a turbine, and 11 is one of the buckets against which impinges the jet of the motive fluid passing out of nozzle-tip 9. It will be readily seen from the construction shown that the angular relation of the axis of the jet of motive fluid with respect to the path described by the buckets can be readily changed by unlocking the nozzle-body 5 and adjusting the same in the opening or socket 3 and afterward locking by tightening up nut 7.

The constructions and relations of the parts so far described are common to both forms of my invention, as illustrated in Figs. 1 and 2. Referring now especially to Fig. 1, 12 represents an adjustable and solid needle having one of its ends conical in shape, which end is inserted within the flaring interior of the nozzle-tip 9. The middle section 13 of the needle is cut away so as to increase, or rather not unnecessarily restrict, the size of the passage-way for the motive fluid and permit the same to easily and uniformly surround the needle in passing through the tips of the nozzle. 14 represents threads at the upper and outer end of the needle which en-

gage corresponding threads in the nozzle-body.

15 is a notch in the upper side of the needle which is adapted to be engaged by a screw-driver or other tool used for adjusting the needle-point with respect to the opening in the nozzle-tip.

16 is a lock-nut for securing the needle in its adjusted position.

In Fig. 2 I have shown a modified form of needle which is especially well adapted for unusually large nozzles, so as to have the jet as it passes out the end of the nozzle-tip uniform and of the same velocity throughout its entire section. In this form the needle 12′ consists of a hollow cylinder having thin walls and whose end terminates near the opening of the nozzle-tip 9. The section of the hollow needle corresponding to the passage within the body 5 of the nozzle is provided with a series of openings 13′, which connect the interior of the hollow needle 12′ with the passage in the body 5. The other end of the needle 12′ is closed and provided with screw-threads 14′, which engage corresponding threads in an opening in body 5 and, as heretofore described with reference to Fig. 1, is provided at its upper side with a similar slot 15′ for adjusting the position of the hollow needle and a locking-nut 16′.

If at any time the removable tip 9 should be found to be worn or inefficient, it can be easily unscrewed and replaced by another without having to replace an entire new body section or nozzle.

The operation of the invention is as follows: The motive fluid flows into the interior passage of the nozzle-body 5 in passing from one stage of expansion to another. In the form shown in Fig. 1 the motive fluid passes out of the nozzle-tip 9 on all sides and uniformly about the needle 12, the conical section of the needle taking up what usually is filled with dead and whirling portions of the fluid. In the form shown in Fig. 2 the motive fluid not only passes around the needle 12′, but by means of the openings 13′ passes into the interior thereof and unites at its ends with the exterior motive fluid, forming one continuous and unbroken jet which is especially applicable to nozzles having large tips. The regulation of the flow and correction of the imperfections in the jet are effected by adjusting the needle end to or from the end of the nozzle-tip in order to properly and efficiently impinge against the rotary brackets.

While I have herein shown and specifically described two means of accomplishing the invention, I wish it to be distinctly understood that I do not care to limit myself to these particular forms, as it will be seen that other and similar forms of construction would readily suggest themselves to those skilled in the art without departing from the spirit of this invention.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a hollow open tip and attached to the hollow body at the other end, a needle within the tip and means separate and independent of the tip and nozzle for securing the hollow body of the nozzle to the turbine-casing.

2. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a hollow open tip at the other end, an adjustable needle within the tip and means for angularly adjusting and securing the nozzle to the turbine-casing.

3. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a removable hollow open tip at the other end, an adjustable needle within the tip, means for locking the adjustable needle, and means for angularly adjusting and securing the nozzle to the turbine-casing.

4. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a hollow open tip at the other end, a hollow needle open at one end and closed at the other end and within the tip and attached to the hollow body, means for permitting the motive fluid to pass from the interior of the hollow body to the interior of the needle and means separate and independent of the tip and nozzle for securing the hollow body of the nozzle to the turbine-casing.

5. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a hollow open tip at the other end, an adjustable hollow needle open at one end and closed at the other and within the tip and attached to the hollow body, means for permitting the motive fluid to pass from the interior of the hollow body to the interior of the needle, means for locking the adjustable needle and means separate and independent of the tip and nozzle for securing the hollow body of the nozzle to the turbine-casing.

6. A nozzle for steam-turbines or the like comprising a hollow body open at one end and having a hollow removable tip at the other end, an adjustable hollow needle open at one end and closed at the other and within the tip, means for permitting the motive fluid to pass from the interior of the hollow body to the interior of the needle, means for locking the adjustable needle and means for adjustably supporting and securing the nozzle to the turbine-casing.

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

CHARLES V. KERR.

Witnesses:

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