G. E. STEVENS.

NOZZLE FOR ELASTIC FLUID TURBINES.

APPLICATION FILED AUG. 4, 1908.

951,346. Patented Mar. 8, 1910.

Fig. 1.

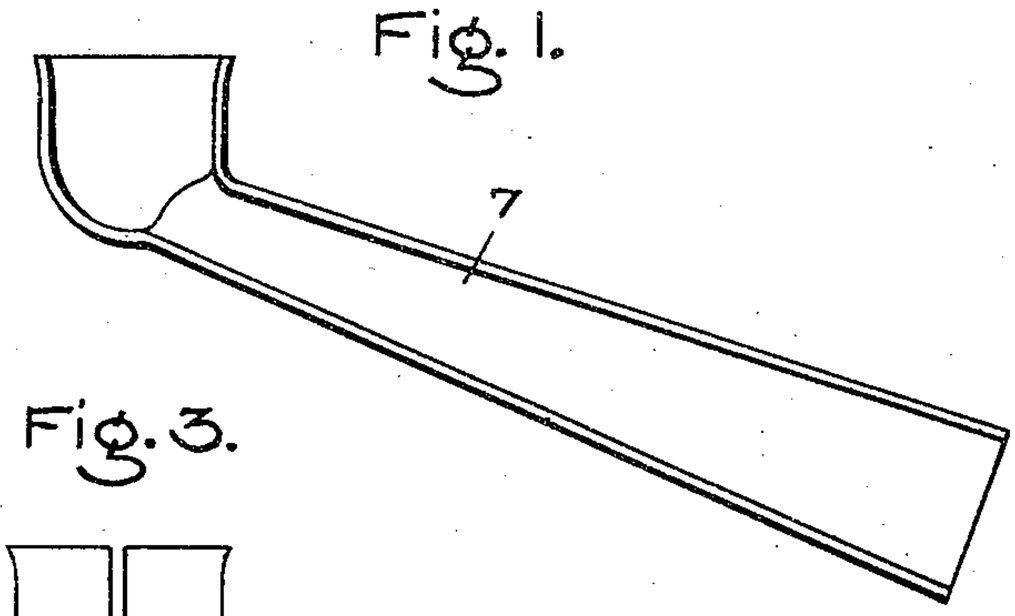


Fig. 3.

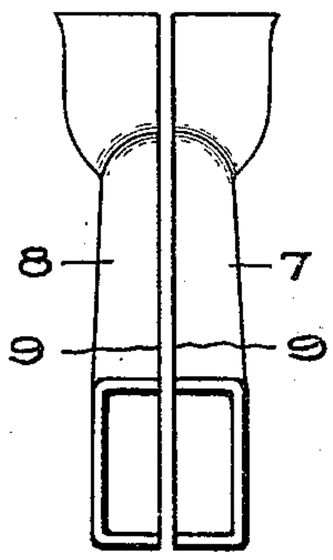


Fig. 2.

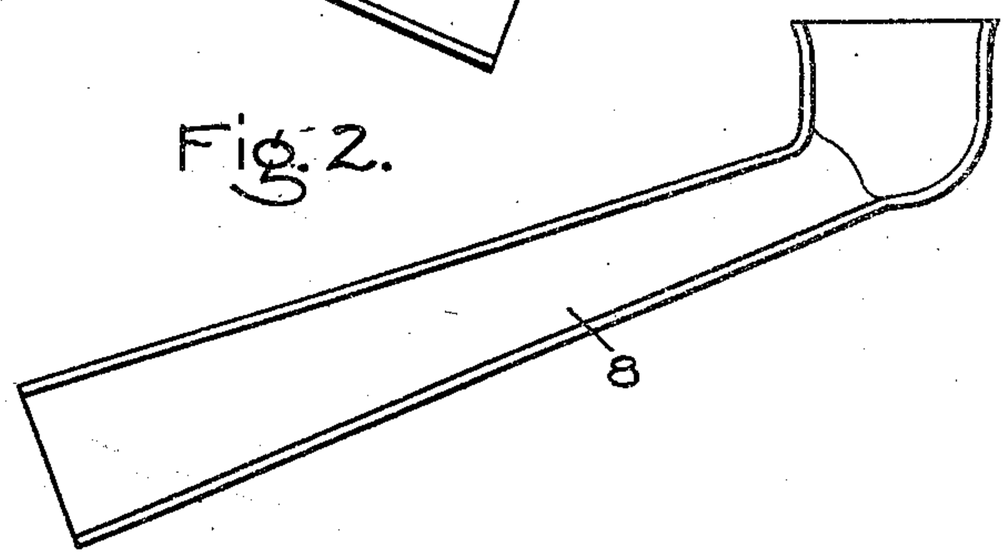


Fig. 4.

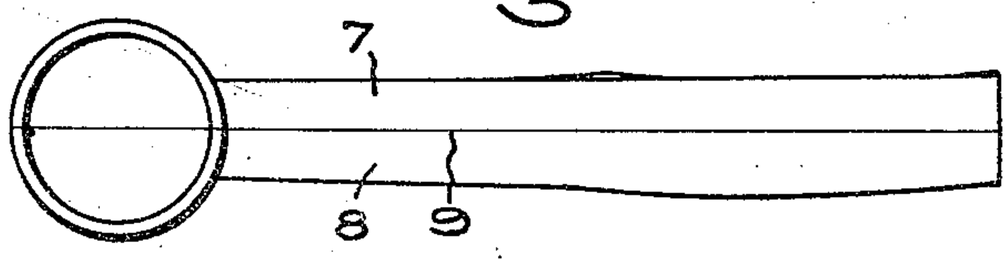


Fig. 5.

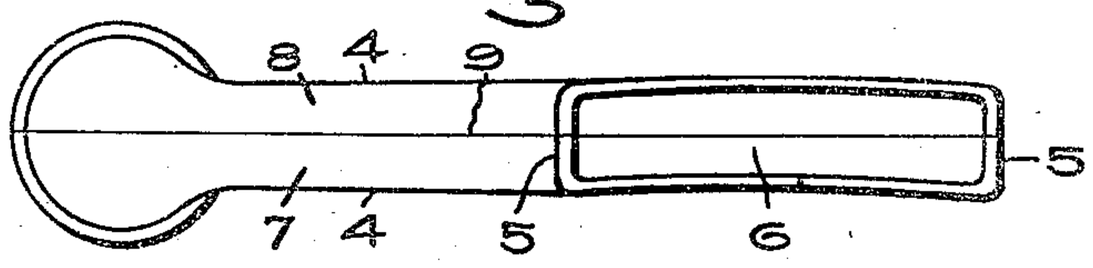
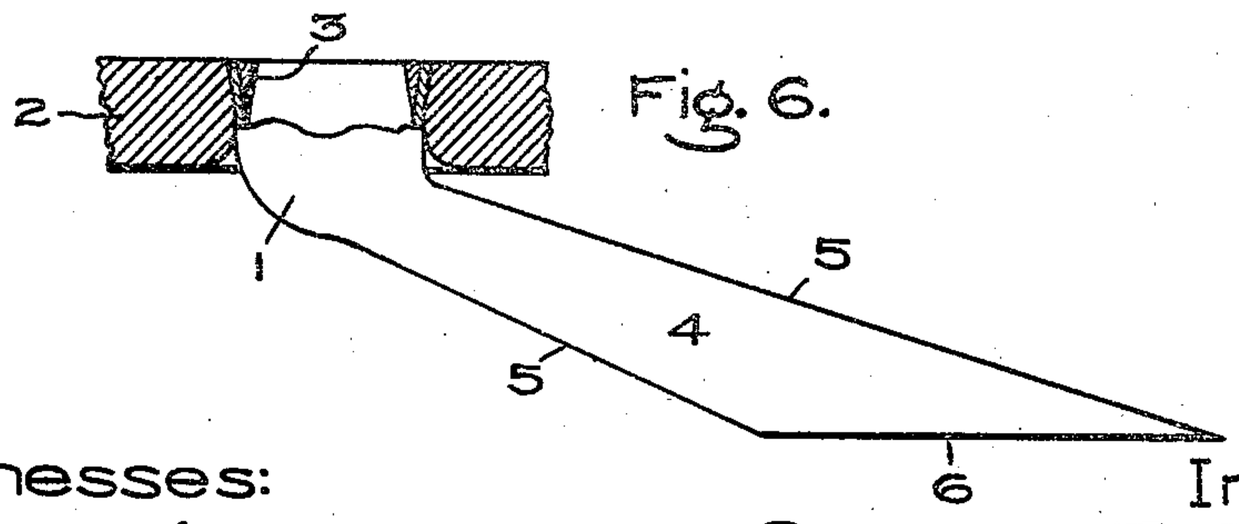


Fig. 6.



Witnesses:
Marcus L. Byng.
J. Ellis Glen.

Inventor,
George E. Stevens,
By Allen & Davis
Att'y.

UNITED STATES PATENT OFFICE.

GEORGE E. STEVENS, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

NOZZLE FOR ELASTIC-FLUID TURBINES.

951,346. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed August 4, 1908. Serial No. 446,841.

To all whom it may concern:

Be it known that I, GEORGE E. STEVENS, 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.

This invention relates to nozzles such as are used in elastic fluid turbines to discharge the motive fluid against the wheel buckets.

The object of the invention is to simplify the construction of such nozzles, reduce the cost of manufacture, insure accuracy in shape and smoothness and hardness of the surfaces over which the elastic fluid passes, and secure exact uniformity and interchangeability where the nozzles are made in large quantities.

My improved nozzle is made of sheet metal, and is composed of two complementary parts or sections meeting on longitudinal lines, preferably a median plane. Each part section or half is therefore an open trough which can be easily struck up in dies, thereby insuring accuracy in shape, smoothness of surface, a hard skin on the metal, and exact similarity between large numbers of nozzles. The sections are united by joining their meeting edges in any suitable manner, preferably by fusing or burning them together by an oxygen-acetylene flame.

In the accompanying drawing, Figure 1 is a side elevation of one half of the nozzle, Fig. 2 is a side elevation of the other half, Fig. 3 shows the halves placed close together, Fig. 4 is a top or edge view of the complete nozzle, Fig. 5 is a similar view of the opposite edge and Fig. 6 is a sectional side elevation showing the nozzle inserted in its supporting plate.

The receiving end of the nozzle consists of a bowl 1 preferably circular in cross section and slightly flared at its upper end, so that it may be seated in a hole in the support 2 and expanded therein by an annular wedge 3. The body of the nozzle is straight, with parallel sides 4 and diverging edges 5. The mouth 6 of the nozzle is in a plane oblique to the longitudinal axis of said nozzle, being in a plane of revolution with reference to the axis of the turbine shaft. The sides of said mouth, as shown in Fig. 5, are curved to the same arcs as the tips and bases of the buckets, while the ends of said mouth are preferably radial, so that a number of nozzles may be grouped and fit snugly together, edge to edge. This insures that the fluid issuing from said group forms a practically solid or undivided column, and the curve of the side walls causes the whole of said column to be delivered to the buckets.

This nozzle is composed of two complementary parts or sections 7, 8 united along longitudinal lines, preferably a median plane, so that the sections are similar halves. Each half of the nozzle forms a trough, as shown in Figs. 1, 2 and 3, which can be easily made by striking up or pressing a suitable blank between dies. After the parts of the nozzle are pressed or struck up there will usually be a certain amount of excess metal at or about the edges which are to be united. When such is the case the said edges of the nozzle will first be filed, planed, milled or otherwise machined and then united. As the sections 7, 8 are right-handed and left-handed, two corresponding sets of dies are necessary. The use of dies insures exact similarity in all the sections, so that any pair of sections will fit together, and the nozzle made therefrom will be exactly the same as all others made from sections struck by the same dies. This is of importance in facilitating the assembling of a turbine, and also making repairs, inasmuch as a defective nozzle can be replaced by a new one with entire assurance that no alterations will be required.

The two complementary sections 7, 8 may be united in any suitable manner, but preferably by placing their edges 9 in contact and welding or burning them together by a flame of high temperature, such as an acetylene jet. After being united they are cut off obliquely to form the mouth of the nozzle. The curving of the sides of the mouth may be done either by the dies which form the sections, or by a separate operation after the nozzle has been cut obliquely. The dies give not only accuracy of shape, but a smooth surface affording no obstruction to the flow of the elastic fluid, and a hard skin to the metal which increases the durability of the nozzle.

I have illustrated an expanding nozzle wherein there is an increase in cross-sec-

tional area between the throat and the discharge end, but the invention is not so limited as it applies also to straight-bored and converging nozzles.

One very decided advantage attained by using my invention resides in the fact that there is practically no waste material, the blanks forming the nozzles being roughly cut to size out of large sheets by dies, shears or other means. Each half of a nozzle can be critically examined as to all points before said parts are united and thus any defective ones rejected.

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. As a new article of manufacture, a nozzle for elastic fluid turbines composed of two sheet metal trough-shaped complementary sections meeting along longitudinal lines.

2. As a new article of manufacture, a nozzle for elastic fluid turbines composed of two struck-up sheet metal sections united along a median plane.

3. As a new article of manufacture, a nozzle for elastic fluid turbines composed of similar sheet metal halves united along their meeting edges.

4. As a new article of manufacture, a nozzle for elastic fluid turbines composed of complementary sections each comprising part of the bowl and body portion.

5. As a new article of manufacture, a nozzle for elastic fluid turbines composed of sheet metal sections each comprising a half of the bowl and body portion.

In witness whereof, I have hereunto set my hand this first day of August, 1908.

GEO. E. STEVENS.

Witnesses:
JOHN A. McMANUS, Jr.,
ROBERT SHAND.