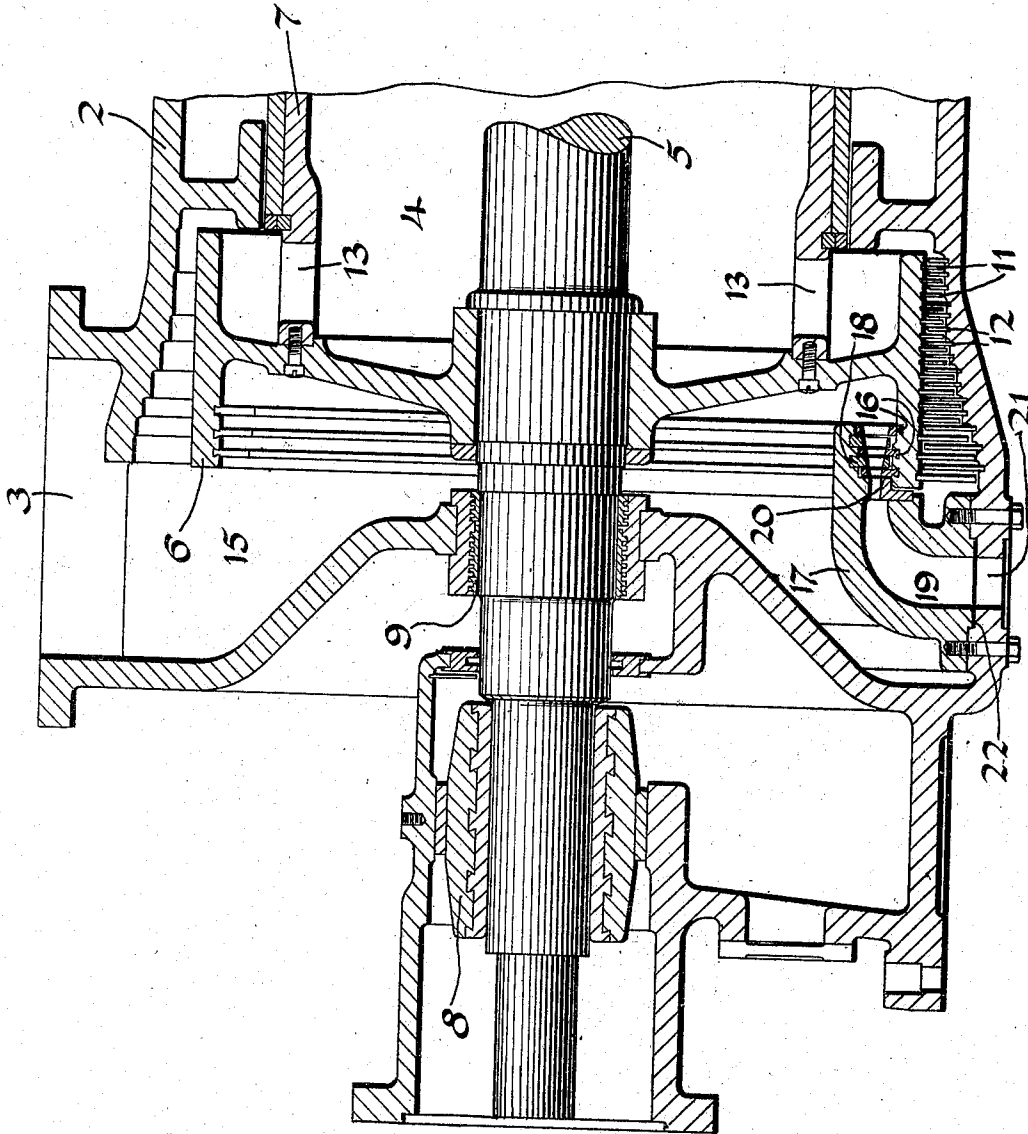


G. WESTINGHOUSE.
MARINE TURBINE.

APPLICATION FILED APR. 13, 1908. RENEWED APR. 20, 1908.

941,396.

Patented Nov. 30, 1909.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

MARINE TURBINE.

941,396.

Specification of Letters Patent.

Patented Nov. 30, 1909.

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To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Marine Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines and more particularly to marine or reversing turbines.

The object of this invention is the production of a simple and efficient reversing or marine turbine.

This and other objects I attain in a turbine embodying the features herein described and illustrated in the single sheet of drawings accompanying this application, in which a partial longitudinal section of a turbine embodying my invention is shown.

The turbine illustrated, as embodying my invention, is of the axial flow, multi-stage type and employs, for the purpose of balancing the longitudinal thrust, a divided low-pressure stage, the separate portions of which are arranged at opposite ends of the turbine and through which the motive fluid discharged from the high-pressure stage or stages flows in opposite directions.

The turbine comprises a stationary casing 2, which is provided with a suitable admission port (not shown) and exhaust ports 3, located at either end of the turbine.

A rotor element 4, which is carried on a shaft 5, comprises two drums 6, located near either end of the casing, and an intermediate drum 7, bolted or otherwise secured to the web portions of the drums 6.

A shaft 5 extends through either end of the casing and is provided with suitable bearings 8 and with suitable packing devices 9, which seal the joints between it and the casing.

Annular rows of working blades are mounted on the intermediate drum 7 and alternate with annular rows of stationary vanes, mounted on the casing. The motive fluid admitted to the turbine traverses the blades on the intermediate drum 7 of the rotor and is discharged into a divided low-pressure stage, the blades 11 of which are mounted on the outer peripheries of the drums 6 and alternate with annular rows of vanes 12, mounted on the stationary casing.

A portion of the motive fluid from the working blades on the drum 7 is discharged

directly into a portion of the low-pressure stage and the remaining portion is caused to traverse a passage through the interior of the drum 7 and is admitted to the other portion of the low-pressure stage through ports 13, formed in the drum 7. The separate portions of the low-pressure stage communicate with exhaust chambers 15, which are located at either end of the turbine.

Annular rows of inwardly-extending blades 16 are mounted on the inner face of the drum 6 in the exhaust chamber 15. The casing 2 is divided on a plane, (usually horizontal) passing through the axis of the shaft and is arranged to receive a substantially L-shaped bracket 17, which is secured to the casing and extends into the exhaust passage 15.

Rows of guide vanes 18, which interleave with the annular rows of blades 16, are mounted on the end of the bracket 17 and a passage 19 is provided in the bracket, one end of which communicates with a fluid-directing device or nozzle 20 and the other with an admission port 21 in the casing 2. The casing 2 is provided with a slot 22, which extends around the lower half of the casing. Bracket 17 is provided centrally with a portion adapted to fit the slot 22. The rotor is put in place in the lower half of the casing, the bracket 17 is inserted at one side between the rotor and the casing and is slid longitudinally of the slot 22 until the passage 19 registers with the port 21.

The nozzle 20 is adapted to convert the pressure energy of the motive fluid into velocity energy which is abstracted by the moving rows of blades 16; and the rows of vanes 18 are adapted to receive the motive fluid discharged from one row of vanes and re-direct and deliver it, in the most effective manner, to the next row of blades. The bracket 17, in conjunction with the fluid-directing device 20, the blades 16 and the directing vanes 18, constitute a reversing or astern turbine; the fluid passages and the blades 16 being arranged to rotate with the rotor element of the turbine in a reversing direction.

One or more of the brackets 17 may be employed, or each bracket may be provided with a number of nozzles and means, automatic or otherwise, may be utilized for varying the number of effective nozzles on the amount of motive fluid supplied to the passage 19.

While the ahead portion of the turbine is operating, the motive fluid supply to the passage 19 is shut off and since the blades 16 communicate with, or, more properly, are 5 located in the exhaust chamber of the turbine, they present little or no resistance to rotation. When the turbine is reversing the motive fluid supply to the ahead portion of the turbine is shut off, the blades 12 rotate 10 in a vacuum and, consequently, add little resistance to the operation of the reversing portion of the turbine. The blades 16 and vanes 18, as illustrated, are so arranged that no axial thrust will be imparted to the rotor element while the turbine is running in the 15 reverse direction and for that reason no auxiliary balancing means is necessary. Blades and vanes, similar to the blades 16 and the vanes 18, with their corresponding supply 20 passages, may be provided at the other end of the turbine.

It is apparent that the construction utilized in connection with the reversing portion of the turbine may be employed with 25 single-flow machines or various types of turbines and I do not, therefore, wish to limit its application to multi-stage, or even axial flow turbines.

What I claim is:

30 1. In an elastic fluid turbine, a stationary casing, a rotor inclosed within said casing, a plurality of rows of radially-extending blades mounted on the outer face of said rotor, annular rows of inwardly-extending 35 radial vanes mounted on the inner face of said casing and cooperating with said blades, a fluid admission port for delivering fluid to said outwardly-extending blades, an exhaust port and an exhaust chamber communicating therewith and receiving fluid from said 40 blades, a plurality of annular rows of inwardly-extending radial blades mounted on

the inner face of said rotor and located within said chamber, a bracket located on said casing within said chamber and provided 45 with a fluid passage, a discharge nozzle communicating with said passage and a plurality of vanes arranged to cooperate with said reversing blades and a fluid admission port provided in said casing and communicating 50 with the fluid passage of said bracket.

2. In combination with the low pressure drum or section of an ahead turbine, an astern turbine of the impulse type, the moving blades of which are mounted within the 55 drum of the ahead turbine and the intermediate guide vanes and nozzles of which are carried by a segmental bracket secured to the casing.

3. In combination with the low pressure 60 drum or section of an ahead turbine, an astern turbine of the impulse type, the moving blades of which are mounted within the drum of the ahead turbine and the intermediate guide vanes and nozzles of which are 65 carried by a bracket movable axially and radially outward into place and secured to the casing.

4. In combination with the low pressure drum or section of an ahead turbine, an 70 astern turbine of the impulse type, the moving blades of which are mounted within the drum of the ahead turbine and the intermediate guide vanes and nozzles of which are 75 carried by a bracket extending partially around the inner circumference of the drum and secured to the casing.

In testimony whereof, I have hereunto subscribed my name this 7th day of April, 1906.

GEO. WESTINGHOUSE.

Witnesses:

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