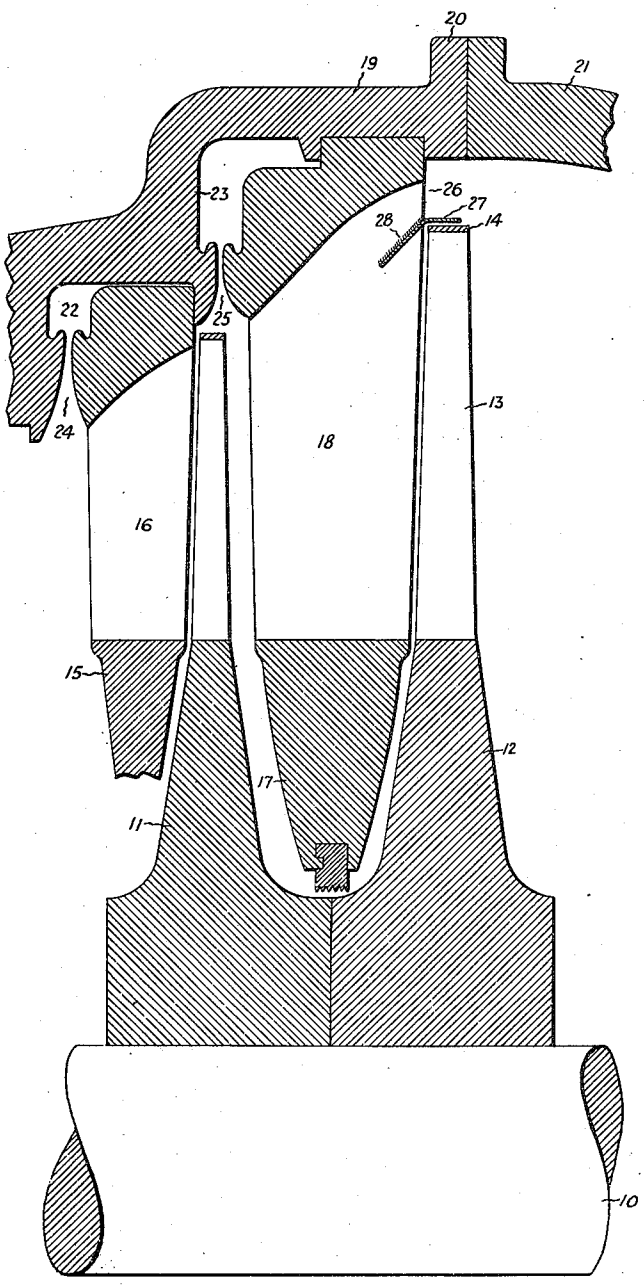
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ELASTIC FLUID TURBINE

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Inventor:
Glenn B. Warren,
by Harry E. Dunham
His Attorney.

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## ELASTIC FLUID TURBINE

Glenn B. Warren, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

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2 Claims. (Cl. 253—69)

The present invention relates to elastic fluid turbines, more specifically to turbine arrangements from which elastic fluid is tapped or extracted from the last stages of the turbine, that is, ahead of the last bucket wheel as regards the direction of flow through the turbine. Aside from arrangements where the extracting is carried out primarily to use the extracted steam for industrial purposes, such extracting may have a two-fold purpose. First, to dewater the elastic fluid flowing through the last stages, that is, reduce its moisture content, and second, to enable the turbine to handle the large amount of elastic fluid flowing through the last stages at high load condition.

The object of my invention is to provide an improved construction and arangement of the type of turbines above specified, whereby fluid flowing through the last stage or stages of the turbine is effectively dewatered or freed from its moisture content and a part of the elastic fluid bypassed with regard to the last stage or stages, to prevent damage to the bucket blades of the last wheel or wheels.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

The single figure of the drawing represents a sectional view of an elastic fluid turbine in accordance with my invention.

The arrangement comprises a turbine rotor having a shaft 10 and a plurality of bucket wheels secured thereto. In the present instance I have indicated a higher or preceding stage bucket wheel 11 and a lower or last stage bucket wheel 12. Each bucket wheel has a row of buckets 13 secured at their inner ends to disk members and held together at their outer ends by a ring or shroud band 14 or the like. Elastic fluid flowing through the turbine is directed to the bucket wheel 11 by a diaphragm 15 having a plurality of nozzle-defining partitions 16, and elastic fluid discharged from the bucket wheel 11 is directed to the bucket wheel 13 by a nozzle diaphragm 17 having nozzle-defining partitions 18. The nozzle diaphragms 15 and 17 form a part of the stator and are secured to and held in position by an outer casing 19. The exhaust end of the casing has a flange 20 secured to a flanged exhaust hood 21 for conducting the exhaust fluid to a condenser or the like. For our present purposes the exhaust hood 21 may be considered a part of the condenser. As the elastic fluid flows through the turbine its pressure decreases and its volume consequently increases. Likewise the moisture content of the elastic fluid is increased. In order to prevent injurious effect of the moisture content and to enable the turbine to handle the large amounts of elastic fluid flowing through the lower stages at high load, means are provided to bypass, bleed, or extract a part of the elastic fluid from the lower stages. These means include channels or chambers 22 and 23 for receiving a part of the stream of elastic fluid before being passed into the last stages. Elastic fluid is conducted to the channels 22 and 23 from the outer region of the stream of fluid, whereby the fluid having the greater moisture content is separated from the main stream of fluid. The fluid is conducted into the channels 22 and 23 through throttling passages 24 and 25 respectively. The passages 24, 25 and the channels or chambers 22, 23 in accordance with my invention are formed by adjacent surfaces of the casing 19 and the nozzle diaphragms 15, 17. The chambers 22, 23 may discharge in known manner to the condenser or other suitable point, not shown.

Another important feature of my invention is the provision of the last stage bucket wheel 12 which has an outer diameter smaller than the outlet diameter of the nozzle diaphragm 17. From another viewpoint, the nozzles of the diaphragm 17 project radially beyond the bucket wheel 12. A passage 26 is thus defined between the outer surface of the shroud band 14 and the inner surface of the casing 19 for receiving fluid from the outer region of the stream flowing through the nozzles of the diaphragm 17. This fluid is bypassed with regard to the bucket wheel 13.

In order to reduce leakage losses around the tip formed by the shroud band 14 of the bucket wheel 12, I may provide a partition 27 having a ring portion surrounding the shroud band 14 and closely spaced therewith and another portion disposed within the nozles defined by the partitions 18 of the diaphragm 17. The partition 27 may be secured to the nozzle partitions or blades 18 of the nozzle diaphragm 17 by means of welds 28 on the outer surface of the partition 27.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A multi-stage axial flow elastic fluid turbine

including the combination of a casing, a rotor having a last stage bucket wheel with a plurality of buckets, a last stage nozzle diaphragm supported on the casing and having a plurality of nozzles for directing elastic fluid to the buckets, and a channel and throttling means defined by adjacent surfaces of the last stage nozzle diaphragm and the casing to receive a part of the elastic fluid flowing through the turbine before it enters the nozzles of the last stage diaphragm, the outlet diameter of the nozzles of the last stage nozzle diaphragm being greater than the outer diameter of the buckets of the last stage bucket wheel to bypass a part of the fluid flowing through the diaphragm with regard to the last stage bucket wheel.

2. A multi-stage axial flow elastic fluid turbine including the combination of a rotor having a last stage bucket wheel with a plurality of buckets, a casing, a last stage diaphragm adjacent the bucket wheel being held on the casing and having a plurality of nozzles for directing elastic fluid to the last stage wheel, the nozzles of the last stage diaphragm projecting radially beyond the buckets of the last stage bucket wheel to cause part of the fluid flowing through the nozzles to bypass the bucket wheel, and a partition having a portion closely spaced with and surrounding the last stage bucket wheel and another portion disposed within the nozzles of the last stage diaphragm and secured to the diaphragm to reduce leakage losses around the tip of the bucket wheel.

GLENN B. WARREN.