June 7, 1927. 1,631,660

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ELASTIC FLUID TURBINE

Filed Nov. 6, 1925

Fig. 1.

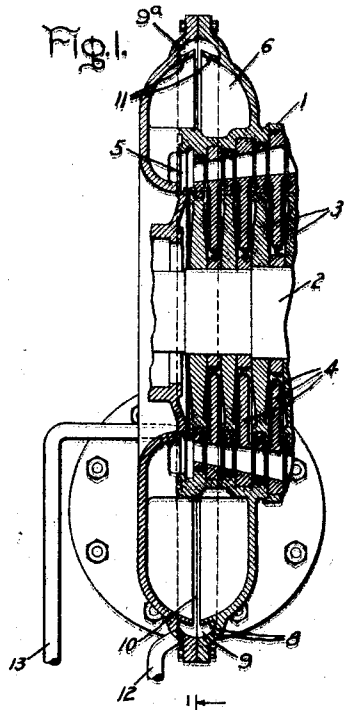
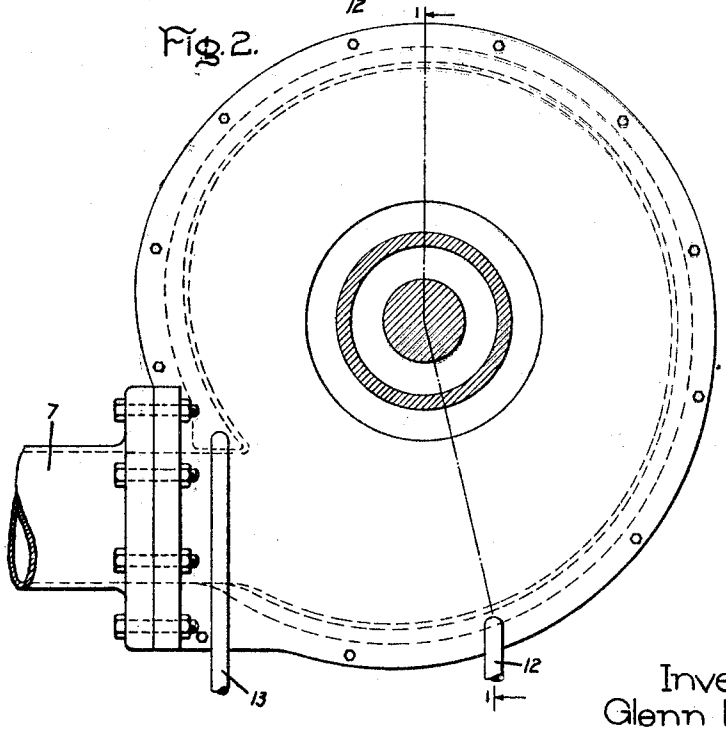


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

Application filed November 5, 1925. Serial No. 67,134.

The present invention relates to elastic fluid turbines and especially to what are termed usually, low pressure turbines, the same being turbines supplied with elastic fluid of relatively low initial pressure. The elastic fluid utilized is usually steam and my invention is particularly well adapted for use in connection with steam turbines. It is not limited necessarily, however, to turbines of this type. For example, it may be used with advantage in connection with mercury turbines.

The steam supplied to low pressure turbines often contains moisture and if moisture is present to any considerable extent, it affects adversely the efficiency of the turbines. Or reversely considered, the efficiency of the turbine is improved if the low pressure steam supplied to it is free from moisture.

The object of my invention is to provide in connection with low pressure elastic fluid turbines, an improved construction and arrangement for separating liquid particles from the elastic fluid supplied to the turbine, and for a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing, Fig. 1 is a sectional view of a low pressure turbine embodying my invention, the section being taken on line 1—1, Fig. 2, and Fig. 2 is a face view of the construction shown in Fig. 1.

Referring to the drawing, 1 indicates the casing of a turbine, 2 the shaft, 3 the bucket wheels mounted on shaft 2, and 4 nozzle diaphragms which are suitably mounted in casing 1. The first ring of nozzles is indicated at 5 and the admission chamber from which elastic fluid is supplied to the first ring of nozzles is indicated at 6. The conduit which supplies elastic fluid to the turbine is indicated at 7. It may lead from any suitable source of supply. For example, the turbine illustrated may be the low pressure turbine of a compound machine in which case conduit 7 conveys the exhaust from a higher pressure turbine to the low pressure turbine. The general turbine construction so far described is illustrated only by way of example and is to be taken as typical of any suitable machine.

According to the embodiment of my invention illustrated in the drawing, I construct the admission chamber 6 in the form of a scroll and arrange admission conduit 7 tangentially to the scroll at its point of largest cross sectional area, so that the elastic fluid is supplied to the scroll at one of its ends and flows around the scroll in a circular path. With this arrangement the particles of liquid in the elastic fluid, being heavier than the elastic fluid itself, will be thrown outward to the periphery of the scroll by centrifugal force. I then provide in connection with the periphery of the scroll, means for catching the liquid particles thrown out and conveying them away. To this end I provide surrounding the scroll, walls 8 which define an annular liquid discharge chamber 9, which chamber communicates with admission chamber 6 through a circular slot 10. The walls of chamber 6 leading up to slot 10 are curved outwardly as is indicated at 11, so that liquid particles which engage the walls 11 tend to flow outward through slot 10 into liquid discharge chamber 9. Walls 11 project inward into chamber 9 whereby there are formed troughs 9^a at each side of the chambers, the slot 10 being between them. With this arrangement, moisture separated out in the upper half of the scroll and passing through slot 10 into chamber 9 will not be able to fall back into chamber 6 after its velocity is destroyed by friction but instead will fall into one of the troughs 9^a and drain into one of the pipes 12 or 13. Connected with liquid discharge chamber 9 at its lower side is a discharge conduit 12 through which liquid which accumulates in the bottom of chamber 9 is carried away. Also connected with it just above conduit 7 is a discharge conduit 13 for conveying away liquid from that portion of chamber 9.

With the foregoing arrangement, the liquid particles carried along with the elastic fluid through conduit 7 will be separated out in the scroll and conveyed away while the elastic fluid itself will be supplied through nozzles 5 to the turbine.

The above-described arrangement, in addition to performing its function in separating the liquid particles from the elastic fluid in an efficient manner, has the advantages also that it is simple in structure and capable of being supplied at low cost. Its provision adds no extra parts to the turbine nor any additional mechanism, and occupies no additional floor space. It requires

only the special shaping of the admission chamber. This has the advantage, also, that the separator is directly adjacent to the first ring of nozzles so that the elastic fluid is supplied to the nozzles directly from it and with little disturbance of the flow.

In accordance with the provisions of the Patent Office, 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 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. The combination with an elastic fluid turbine of an admission chamber from which elastic fluid is supplied to the turbine, said chamber having a curved wall, means for directing elastic fluid along said wall, means providing an annular liquid discharge chamber adjacent the first-named chamber and separated therefrom by said wall, and a slot in said wall connecting said chambers.

2. An elastic fluid turbine having an admission chamber in the form of a scroll for effecting centrifugal separation of liquid particles from the elastic fluid by reason of flow therethrough, and means associated with the scroll for receiving and carrying away the centrifugally separated liquid particles contained in the elastic fluid supplied to the scroll.

3. An elastic fluid turbine having an admission chamber in the form of a scroll, and walls surrounding the scroll which define an annular chamber communicating with the scroll at its periphery.

4. The combination with an elastic fluid turbine having an annular admission chamber, of a conduit for supplying elastic fluid tangentially to said chamber whereby said elastic fluid is subjected to a change in direction therein, and means associated with the outer wall of said chamber for conveying away particles of liquid thrown from the elastic fluid by the change in direction.

5. An elastic fluid turbine having an admission chamber, a conduit for supplying elastic fluid thereto at an angle such that the direction of flow of the elastic fluid is changed therein, and means for receiving and conveying away particles of liquid thrown out from the elastic fluid when it changes its direction of flow, said means comprising a liquid discharge chamber adjacent said admission chamber, a wall between said chambers along which the change in direction of the elastic fluid occurs, and a slot in said wall connecting said chambers.

6. An elastic fluid turbine having an admission chamber provided with a curved wall, a conduit for supplying elastic fluid along said wall at an angle such that the direction of flow of the elastic fluid is changed thereby, means for receiving and conveying away particles of fluid thrown from the elastic fluid to said wall of the admission chamber by the change in direction of flow, and means for preventing such liquid particles from being again mixed with the elastic fluid while it is being conveyed away.

7. The combination with an elastic fluid turbine, of a combined admission chamber and centrifugal separator comprising a scroll casing adjacent the inlet end of the turbine and communicating therewith at its inner end, said scroll casing being adapted to receive elastic fluid at its opposite end and having a peripheral slot, and means providing a discharge chamber in communication with the admission chamber through said slot.

8. The combination with an elastic fluid turbine, of a combined admission chamber and centrifugal separator comprising a scroll casing adjacent the inlet end of the turbine and communicating therewith at its inner end, said scroll casing being adapted to receive elastic fluid at its opposite end and having a peripheral slot and means providing a discharge chamber in communication with the admission chamber through said slot, the walls of said discharge chamber being shaped to prevent the return of separated liquid to the scroll casing.

9. The combination with an elastic fluid turbine having an admission nozzle means, of an admission chamber in the form of a scroll having a peripheral slot and outwardly flaring walls on opposite sides and along said slot, walls surrounding said admission chamber which define a liquid discharge chamber which communicates with the admission chamber through said slot, certain of the walls of the discharge chamber being shaped to form troughs along and adjacent the slot on opposite sides thereof.

In witness whereof I have hereunto set my hand this 4th day of November 1925.

GLENN B. WARREN.