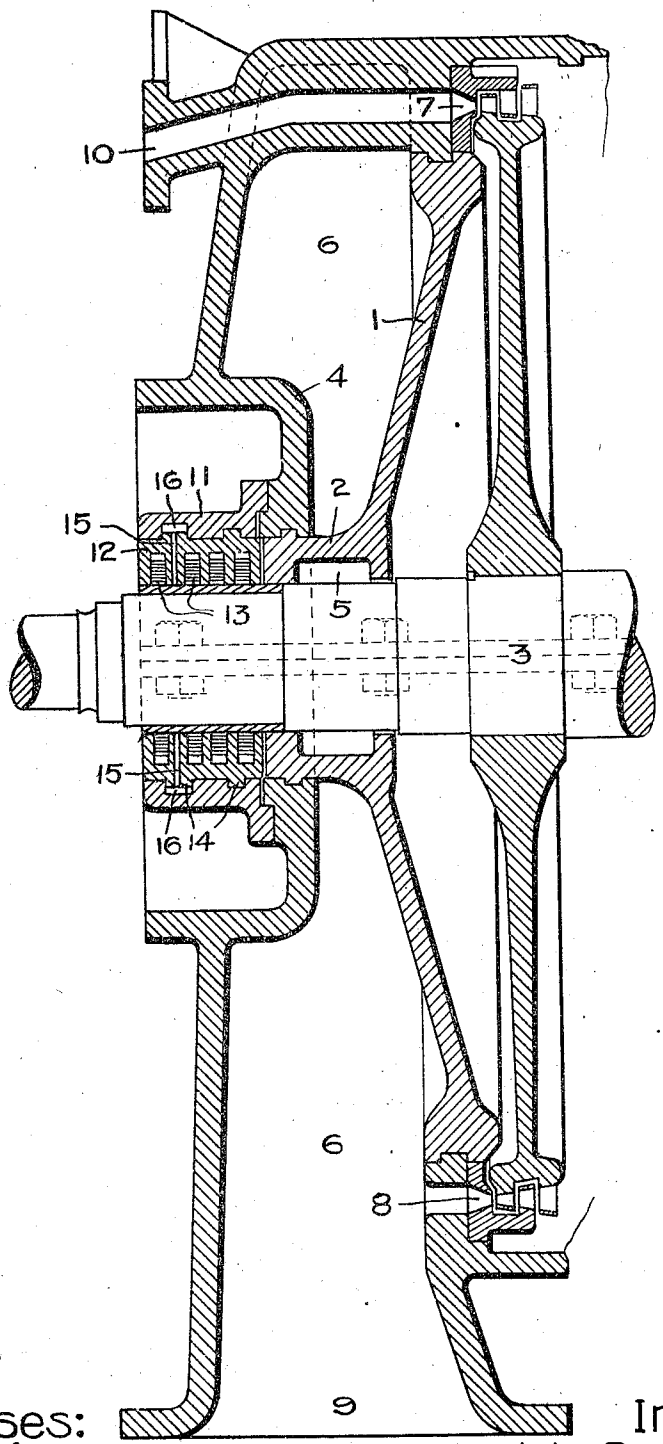
F. SAMUELSON.

ELASTIC FLUID TURBINE.

APPLICATION FILED APR. 1, 1911.

1,013,317. Patented Jan. 2, 1912.



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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

1,013,317. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed April 1, 1911. Serial No. 618,262.

To all whom it may concern:

Be it known that I, FREDERICK SAMUELSON, a subject of the King of Sweden, residing at Rugby, England, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to elastic-fluid turbines generally and more particularly to mixed-pressure turbines which are adapted to be operated with high or low pressure fluid or both. In such turbines it is customary to provide a few nozzles in the first stage which are supplied with high pressure fluid, the remainder being supplied with low pressure fluid. Fluid is admitted to the high pressure nozzles through passages which prevent the high pressure fluid from mixing with the low pressure fluid until after it has passed through the first stage nozzles of the turbine. The low pressure fluid, of which there is usually a large volume as compared with the volume of high pressure fluid, is generally admitted to a space situated between the end of the turbine casing and a diaphragm in front of the first stage wheel. As the turbine shaft usually passes through this space it has been found difficult to satisfactorily prevent the fluid from leaking through the glands surrounding the shaft into the first stage without employing expensive and complicated packing devices, and the object of the present invention is to overcome this difficulty by so constructing and arranging the parts that one gland is omitted and the other is not subjected to the pressure of the fluid in the low pressure steam chest of the turbine.

The accompanying drawing, which is a sectional elevation of a mixed-pressure turbine of the Curtis type, illustrates one form of my invention.

In carrying my invention into effect as illustrated, I provide the first diaphragm 1 with a hub-like member or part 2 surrounding the shaft 3. This hub is cylindrical and projects into or through an aperture formed in the end of the turbine casing 4, the latter being divided in an axial plane as indicated in dotted lines. As both casing and diaphragm are stationary there is no difficulty in constructing a fluid tight joint between them. The interior of the hub may be bored to fit the shaft closely or may be chambered as shown at 5 and in addition may be provided with projecting rings bored to allow the shaft to pass through so as to form a labyrinth packing. With this construction it will be seen that there is no possibility of fluid leaking from the low pressure steam chest 6 to the shaft aperture until after it has passed through the first stage nozzles 7. The low pressure fluid is admitted to the steam chest from which it has access to the majority of the first stage nozzles 8 through the conduit 9. The high pressure steam which only has access to a few nozzles 7 is admitted through the conduit 10. In mixed-pressure turbines the pressure of the fluid after passing through the first stage is seldom above atmospheric pressure; hence there is practically no tendency for it to leak out so that a simple and inexpensive packing device is sufficient to keep the casing fluid tight.

The casing 4 is suitably shouldered and faced to receive the housing 11, the latter containing a cellular or other packing. In the present illustration of the invention, a sleeve 12 is provided having four cells, each of which contains a packing ring 13 made of carbon or other suitable material. The rings may engage the shaft or a sleeve thereon as best suits the requirements. The packing sleeve 12 is provided with one or more projections 14 that serve to hold the same against axial movement.

15 indicates radial holes connecting with an annular chamber 16. Steam may be admitted to this chamber, when the internal pressure is such as to require it, thereby forming a steam seal. The casing 4 is split axially to permit the mounting or removal of the parts of the turbine.

The periphery of the diaphragm is rabbeted to the casing in such manner as to make a fluid tight joint. The diaphragm may be made in one or two pieces as desired, preferably the former to obviate joints. By utilizing a diaphragm to form a part of the steam chest, I am able to greatly simplify the construction of the casing, thereby reducing the cost of manufacture, and decreasing the losses due to poor castings. I may also use different metals for the casing and diaphragm which in some cases is advantageous. I can also change the size of the steam chest at less cost than if the diaphragm were cast as an integral part of the casing. To state the matter broadly,

the arrangement of parts is advantageous because it simplifies and improves the mechanical construction.

It is to be understood that although I have specifically mentioned mixed-pressure turbines I do not desire to limit myself to this type as it is equally applicable to other types of turbines. Also it will be obvious that other methods of carrying my invention into effect may be devised which come within the scope of my invention.

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

1. In an elastic-fluid turbine, the combination of a casing, a rotor, and a diaphragm located between a wall of the casing and the rotor, said diaphragm making a fluid tight joint with the casing and cooperating therewith to form a steam chest.

2. In an elastic-fluid turbine, the combination of a divided casing, a rotor, a diaphragm located between a wall of the casing and the rotor, a hub-like member carried by the diaphragm that is seated fluid tight between the parts of the casing, the wall of the casing and the diaphragm forming a steam chest.

3. In an elastic-fluid turbine, the combination of a divided casing, a rotor, a diaphragm located between a wall of the casing and the rotor, a hub-like member carried by the diaphragm that is seated fluid tight between the parts of the casing, the wall of the casing and the diaphragm forming a steam chest, and a packing carried by the casing for preventing the admission of air to the chamber in the casing containing the rotor or the escape of steam.

4. In a mixed-pressure turbine, the combination of a casing, one or more high pressure fluid discharging devices, one or more low pressure fluid discharging devices, a rotor arranged to receive fluid from both sources, and a partition located between a wall of the casing and the rotor, said partition and wall coöperating to form a low pressure steam chest with the central portion of the partition being connected fluid tight with the casing.

5. In a mixed-pressure turbine, the combination of a casing, one or more high pressure fluid discharging devices, one or more low pressure fluid discharging devices, a rotor arranged to receive fluid from both sources, a partition located between a wall of the casing and the rotor, said partition and wall coöperating to form a low pressure steam chest with the central portion of the partition being connected fluid tight with the casing, and an external packing carried by the casing which prevents the entrance of air to or the escape of steam from the rotor chamber.

6. In an elastic-fluid turbine, the combination of a casing, a rotor, a shaft therefor, a diaphragm through which the shaft extends with small clearance, a hub on said diaphragm that is seated fluid tight in the casing, the casing and diaphragm forming a steam chest, a housing carried by the outside of the casing, and a shaft packing located in the housing.

7. In an elastic-fluid turbine, the combination of a casing, a rotor, a shaft therefor, a removable diaphragm that is rabbeted to the casing and through which the shaft extends, a hub on the diaphragm that is clamped between the parts of the casing, the diaphragm and casing forming a low pressure steam chest, and nozzles for admitting steam to the rotor.

In witness whereof, I have hereunto set my hand this seventeenth day of March, 1911.

FREDERICK SAMUELSON.

Witnesses:
CHARLES H. FULLER,
J. A. FOSTER.