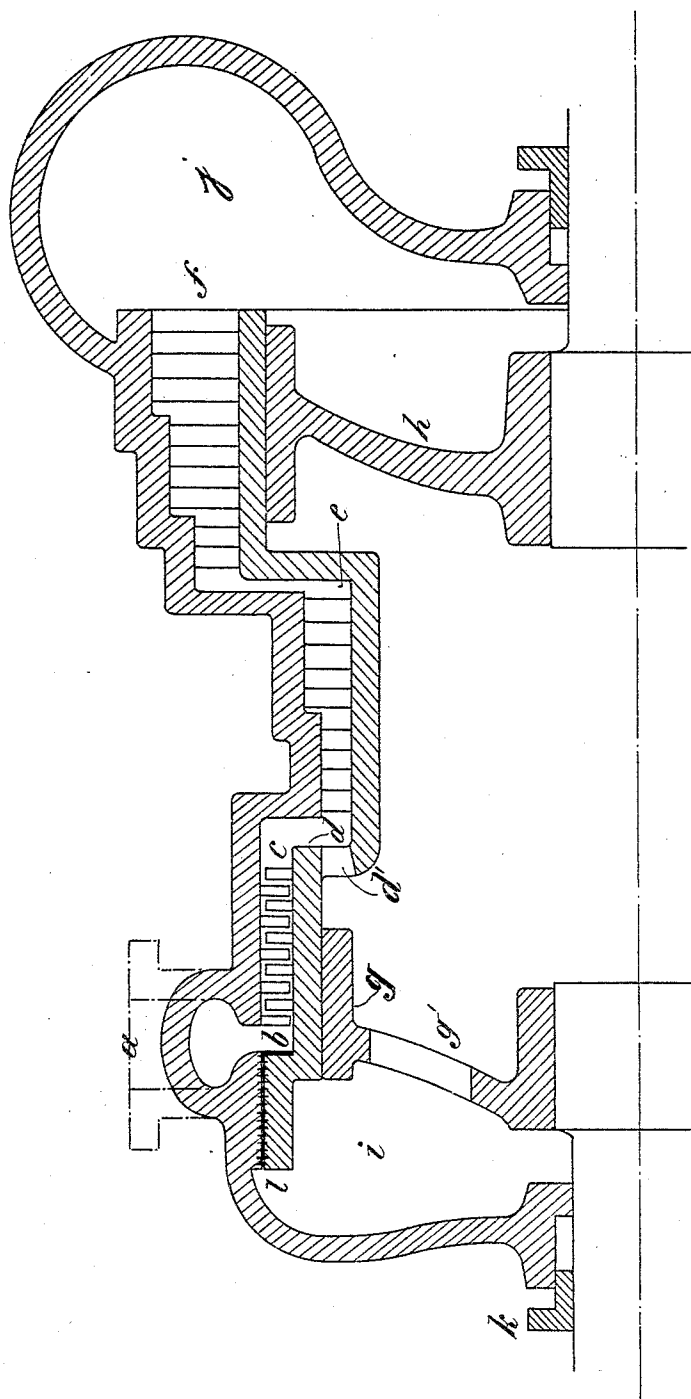


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ELASTIC FLUID TURBINE.
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943,465.

Patented Dec. 14, 1909.



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ELASTIC-FLUID TURBINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CARL ROTH, engineer, a subject of Switzerland, and a resident of Munich, Bavaria, Ismaningerstrasse 94, have
5 invented certain new and useful Improvements in Elastic-Fluid Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art
10 to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

15 My invention relates to elastic fluid turbines, and has for its object to reduce to a minimum the amount of steam pressure sustained by the packing between the casing and the rotor, by reducing the number of
20 the packings to a minimum and by so arranging such as are indispensable that the packing is only required to withstand a part of the drop in pressure occurring in the turbine.

25 The invention is applicable either to steam or to gas turbines.

The drawing is a longitudinal section of a steam turbine embodying the invention.

In the said drawing, *a* indicates as a
30 whole the steam inlet; *b* is an annular surface or shoulder adjacent thereto; *c* represents a set or series of high pressure blades, *d* the drum, *e* a set or series of relatively low pressure blades and *f* a set or series of lower
35 pressure blades successive thereto; *g*, *h* are the bosses carrying the drum; *i* is a chamber for receiving a part of the partially expanded steam, and *j* the exhaust chamber.

The drum *d* is hollow and is provided with
40 orifices *d'* for the purpose of permitting the partially expanded steam to pass there-through into the interior of the drum, and the boss *g* is also perforated as at *g'* to permit said steam to pass into the chamber *i*
45 and thereby equalize the pressures therein and in the interior of the drum. The boss *h* is left solid so as to confine the steam within the drum *d* and chamber *i* by dividing it from the exhaust chamber *j*. In place of
50 this arrangement however the exit end of the blade *c* can be connected directly as by a pipe with the chamber *i*.

l is the packing of the well known labyrinth kind, between the high pressure part *c*

of the rotor and the casing, and *k* is the
55 stuffing box upon the shaft.

The operation of the apparatus is as follows:—The live steam admitted at *a* traverses first the blades *c* and then, successively, the blades *e* and *f*. After traversing the
60 said blades *c* a portion of the partially expanded steam will pass through the orifices *d'* and *g'* and fill the interior of the drum *d* and chamber *i*, and will thus in part counter-act the live steam pressing upon the inlet side
65 of packing *l*. Assuming, for the sake of example, that the live steam has an initial head of, say 12 atmospheres and that between *c* and *e* it is reduced to 2 atmospheres, it will be seen that the packing *l* will only
70 be required to withstand the difference between these two heads, viz. 10 atmospheres, the head being unaffected thereby in the rest of the turbine, where it may fall from say
2 atmospheres to say 0.1 atmosphere. It
75 will thus be obvious that the amount of steam escaping through the packing will be less than where the packing has to withstand the full head of steam. Further
80 when the chamber *i* has its pressure equalized with that at the exit end of the blades *c* it will be seen that the rest of the steam will be utilized in the low pressure turbine
blades *e* *f*.

The packing between the chamber *i* and
85 the external air is effected by the stuffing box *k* which only has to withstand a pressure of say 2 atmospheres. The surface of the chamber *i* and boss *h* will, however, exert or cause a one sided axial thrust on the shaft.
90 In order to compensate this thrust, there is provided adjacent to the steam inlet *a*, an annular surface or shoulder *b* of such dimensions as to compensate both the internal
95 thrust set up by the blades and that exerted upon the boss *h* by the steam between said boss and the surface *i*, as well as any that may result from external causes, such as propeller thrust.

What I claim is:

100 1. In an elastic fluid turbine, the combination of a casing, a hollow rotor, a packing between them at the high pressure end exposed on one side to the head of live motive fluid, and orifices within the walls of
105 the rotor for admitting partially expanded motive fluid to the other side of said packing.

2. In an elastic fluid turbine, the combination of an admission chest, a packing communicating therewith, and a hollow drum rotor comprising high and low pressure parts, said high pressure part connecting at its exit end and within the rotor with the interior of said hollow drum; and means for conveying the partially expanded motive fluid from the interior of the rotor to the other side of said packing.

3. In an elastic fluid turbine the combination of a casing, a chamber at the high pressure end thereof, a drum provided with orifices by means of which it communicates with said chamber and with a low pressure part of the casing, blades on said drum, a packing between said blades and the aforesaid chamber, and an exhaust chamber at the low pressure end shut off from the interior of the drum.

4. In an elastic fluid turbine the combination of a casing, a drum therein open at one end, blades carried by said drum, a packing between said blades and the casing at the open end of the drum, means for enabling the motive fluid from said blades to pass into and through the open end of the drum, means for preventing said fluid from

passing through the other end of the drum, and means for counterbalancing axial thrust.

5. In an elastic fluid turbine the combination of a casing, a drum, blades thereon, packing between said blades and one end of the casing, said drum being adapted to form a channel interiorly between said end of the casing and a low pressure part of the casing, and a shoulder on the drum forming a pressure surface for the motive fluid.

6. In an elastic fluid turbine the combination of a casing, a drum, high pressure blades carried thereby, a packing between said blades and the end of the casing, and low pressure blades on the drum, said drum being provided with orifices in the walls thereof whereby the fluid from between the high and low pressure blades is conveyed to the side of the aforesaid packing remote from the high pressure side thereof.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

CARL ROTH.

Witnesses:

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LOUIS MUELLER.