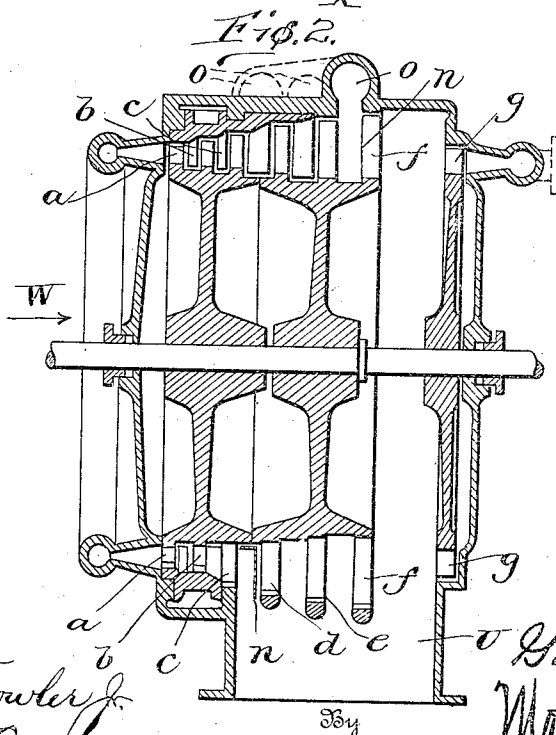
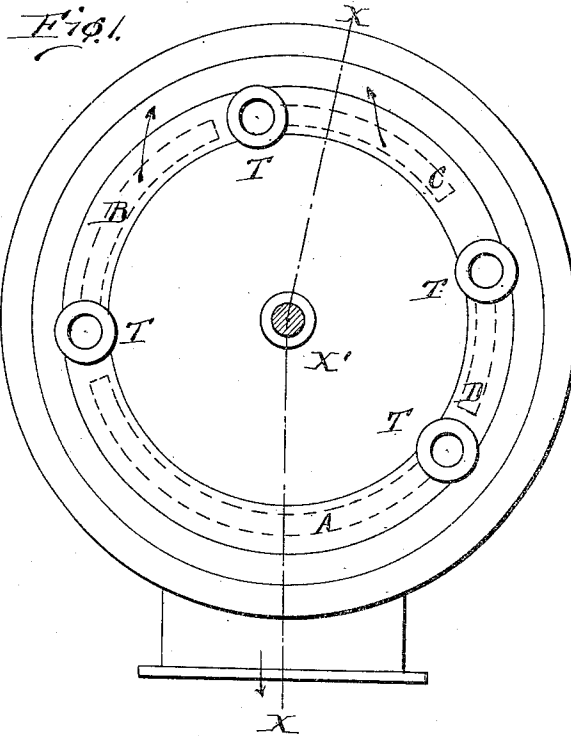


G. BELLUZZO.
 VARIABLE SPEED ELASTIC FLUID TURBINE.
 APPLICATION FILED MAY 8, 1906.

931,985.

Patented Aug. 24. 1909.



Inventor:

Giuseppe Belluzzo
 His Attorney

Witnesses
 J. M. Fowler
 E. O. Schiedbrand

By

UNITED STATES PATENT OFFICE.

GIUSEPPE BELLUZZO, OF MILAN, ITALY.

VARIABLE-SPEED ELASTIC-FLUID TURBINE

931,985.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GIUSEPPE BELLUZZO, engineer, subject of the King of Italy, residing at Milan, Italy, have invented certain new and useful Improvements in Variable-Speed 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 to which it appertains to make and use the same.

The invention refers to a partial reaction turbine which works at different speeds with an almost constant degree of efficiency. The aim is attained by means of various groups of stationary guide wheels distributed over the periphery of the running wheels, each of which is intended for a given speed and by conveniently varying the angles of the vanes and the degree of reaction as well as the number of wheels which are acted upon by the energy stored up in the steam or other elastic fluid. Such an aim is of course only attainable with partial admission turbines wherein the guide wheels only extend to a comparative small part of the whole periphery of the running wheels.

The invention is specially important for its application to ship propulsion.

The drawing shows by way of example a turbine made according to the present invention, which may run at 1900, 1500, 1200 and 900 revolutions with a high degree of efficiency.

Figure 1 is a front view of the turbine as seen in the direction of the arrow W (Fig. 2). Fig. 2 is a section on the line X X' X'' (Fig. 1).

T everywhere indicates the admission to the various groups of distributing or guide vanes, while U is the tube which collects the escape steam from o, o, o and leads to the condenser.

The turbine is supposed to have 6 running wheels *a, b, c, d, e, f* (Fig. 2) mounted on the same shaft the distance between the wheels *c* and *d*, *d* and *e*, *e* and *f* being greater than that between the wheels *a* and *b*, *b* and *c*. The wheel *g*, mounted on the same shaft is intended for reversing the motion.

On the periphery of the wheels is mounted a number of groups of guide vanes or distributing wheels equaling the number of speeds to be attained under good conditions of efficiency. In the case of the figure such groups are four in number A, B, C, D (Fig. 1). The first group namely A consists of the

nozzle preceding the first running wheel *a* and two other sets of guiding vanes namely one between wheel *a* and wheel *b*, and the other between wheel *b* and wheel *c*. The second group namely B includes besides the first nozzle three distributing wheels or sets of guiding vanes namely one between *a* and *b*, one between *b* and *c* and one between *c* and *d*. The third group namely C includes besides the first nozzle four distributing wheels and so on.

When the steam or other fluid is let in through the distributing group A, it escapes in the interval between the 3rd running wheel *c* and the 4th running wheel *d* and is directed to the condenser by means of the deviating wall *p* (Fig. 2). In this case the steam does not act on the remainder of the running wheels, which revolve within a space communicating with the condenser and therefore absorb a very slight power. In this case the speed of the turbine corresponding to the highest degree of efficiency will be the greatest. Should on the contrary the steam be caused to enter the group B of distributing wheels the same would escape in the interval between the 4th wheel (*d*) and the 5th one (*e*) and the speed corresponding to the highest degree of efficiency would be somewhat smaller than in the former case, the same decreasing with the increase of the number of wheels which run under steam.

The angle taken up on the periphery of the turbine by the single groups of distributing or guide wheels is of course greater for the guide wheels corresponding to the maximum speed, while it decreases with the decrease of the turbine speed from A toward B, from B toward C and so on.

The angles of inlet and outlet of the steam vary of course for the vanes of the various distributing groups so as to be proportioned to the speed of the running wheels.

The present type of turbine, besides being adapted for the propulsion of ships, affords following advantages:

1. The consumption of steam per unit of power is almost constant for all the speeds taken into consideration. Nor does it materially increase if intermediate speeds are obtained by a slight throttling.

2. The space taken up is a comparatively very small one and the same is the case with the cost of purchase. The same arrangement is also applicable to other elastic fluids besides steam.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an elastic fluid turbine of the reaction type, a plurality of motive fluid passages of different lengths, a plurality of guide-vane groups one located in each passage, a plurality of concentric reaction wheels with their vanes located between the members of the guide-vane groups, means to supply motive fluid to one end of a passage, and a connection between the other end of said passage and the condenser.

2. In an elastic fluid turbine of the reaction type, a plurality of motive fluid passages of different lengths extending therethrough substantially parallel to the axis thereof, a plurality of guide-vane groups one located in each passage, a plurality of reaction wheels arranged in tandem upon a common axle with their vanes located between the members of the guide-vane groups, means to supply an elastic motive fluid to one end of a passage, a connection between the other end of said passage and the condenser, and means to deflect the fluid from the discharge end of said passage to the condenser.

3. In an elastic fluid turbine of the reaction type, a plurality of segmental motive fluid passages of different lengths and of an aggregate width to substantially occupy the periphery of the turbine, a plurality of guide-vane groups one located in each passage, a plurality of concentric reaction wheels arranged in tandem with their vanes located between the members of the guide-vane groups, means to supply elastic motive fluid to one end of the passages, and connections between the other end of the passages and the condenser.

4. In an elastic fluid turbine of the reaction type, a plurality of segmental motive fluid passages of different lengths, the angle subtended by each varying inversely with its length, a plurality of guide-vane groups one located in each passage, a plurality of concentric reaction wheels with their vanes located between the members of the guide-vane groups, means to supply elastic motive fluid to one end of the passages, and connections between the other end of the passages and the condenser.

5. In an elastic fluid turbine of the reaction type, a plurality of segmental motive fluid passages of different lengths corresponding in number to the speeds desired, the angle subtended by the width of each

varying inversely with its length, a plurality of guide-vane groups one located in each passage, a plurality of concentric reaction wheels arranged in tandem upon a common shaft with their vanes revolving between the respective members of the guide-vane groups, means to supply steam to one end of the passages, connections between the other end of the passages and the condenser, and means arranged to deflect the fluid from the discharge end of each passage to the condenser.

6. In an elastic fluid turbine, a plurality of reaction wheels arranged in succession, means to supply the motive fluid to the whole and to a less number of the wheels to vary the efficient speed of the turbine, and an open discharge from between different wheels.

7. In an elastic fluid turbine, a plurality of reaction wheels arranged in succession and provided with a plurality of motive fluid passages extending each through a different number of wheels, and motive fluid supplying and withdrawing means to effect the passage of the fluid through a particular passage to vary the efficient speed of the turbine.

8. In an elastic fluid turbine, means for varying the speed comprising a plurality of running wheels arranged in series, a plurality of motive fluid passages supplying each a different number of running wheels to produce a different speed; the angle subtended by the different fluid inlet passages increasing with the speed they are to produce and the angle at the outlet decreasing with a decrease in the speed.

9. In an elastic fluid turbine, means for varying the speed comprising a plurality of running wheels arranged in series, a plurality of motive fluid passages supplying each a different number of running wheels to produce a different speed, the fluid passages of an aggregate width to occupy substantially the periphery of the turbine, the angle subtended by the different fluid inlet passages increasing with the speed they are to produce and the angle at the outlet decreasing with a decrease in the speed.

In testimony whereof I affix my signature to this specification, in the presence of two witnesses.

GIUSEPPE BELLUZZO.

Witnesses:

B. CARLO SALVOTTI,
ERNEST SANTI.