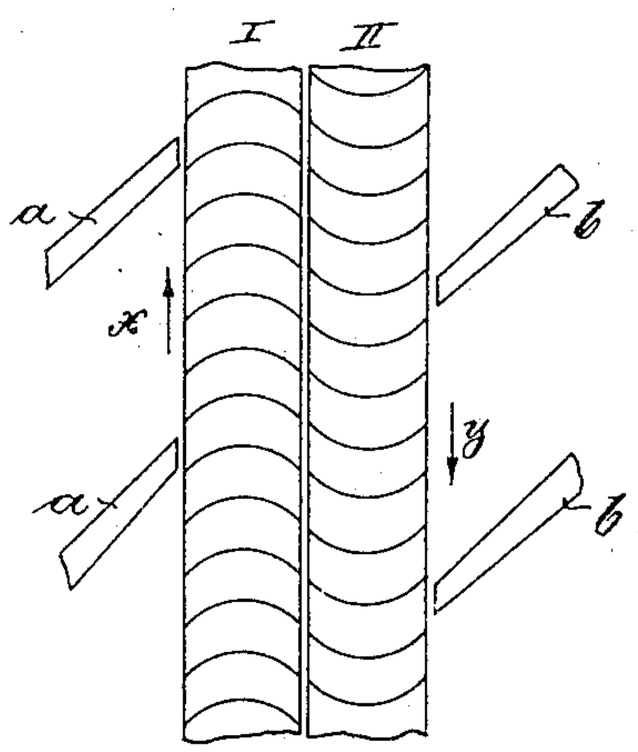
No. 787,231. PATENTED APR. 11, 1905.

J. STUMPF.

STEAM TURBINE.

APPLICATION FILED FEB. 24, 1903. RENEWED SEPT. 9, 1904.



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No. 787,231. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

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STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 787,231, dated April 11, 1905.

Application filed February 24, 1903. Renewed September 9, 1904. Serial No. 223,861.

To all whom it may concern:

Be it known that I, JOHANN STUMPF, a subject of the King of Prussia, German Emperor, and a resident of 28 Rankestrasse, Charlottenburg, near Berlin, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Steam or Gas Turbines, of which the following is an exact specification.

My invention relates to improvements in steam or gas turbines, and has for purpose to avoid the deleterious effect of the reactionary force produced by the steam or compressed gas when leaving the nozzles, which reactionary force tends to move the nozzle-rim or the casing in which the nozzle-rim is fixed in a direction opposite to the direction in which the turbine-wheel revolves.

Steam-turbines have been already constructed in which the steam acts upon two turbine-wheels which rotate in opposite directions. In these constructions the steam leaving the first turbine-wheel enters the second wheel. The first wheel is usually called the "primary" turbine-wheel and the second wheel the "secondary" turbine-wheel. These turbines have the advantage that by the turbine-wheels moving in opposite directions a reduction of the number of revolutions of the turbine can be obtained. They have, however, the disadvantage that the driving power acting upon the single turbine-wheels is a very different one.

In ordinary turbines provided with one turbine-wheel a reactionary force is produced in the nozzles as soon as the steam flows out, which reactionary force must be taken up or absorbed by the turbine-casing. This reactionary force is naturally the same in such turbines, in which several turbine-wheels are arranged which rotate either in the same or in the opposite direction and in which the steam leaving one turbine-wheel flows into those following. This reactionary force tends to rotate the turbine-casing around the shaft of the turbine in the direction opposite that in which the turbine-wheel rotates. This rotary movement of the turbine-casing is avoided according to the present invention by arranging two rows of nozzles, one row acting upon a turbine-wheel rotating in one direction and the other row acting upon a turbine-wheel rotating in the other direction. By this means reactionary forces are produced in both directions which compensate each other. If, for instance, an ordinary steam-turbine into which the steam enters only from one side (in which turbine one or several wheels may be provided) is arranged in a submarine boat of the ordinary cigar shape, the reactionary force will tend to rotate the boat in a direction opposite that in which the turbine-wheel rotates. This will be the case particularly if the axle of the turbine coincides with the longitudinal axis of the boat. Furthermore, it is also for stationary turbines a great disadvantage that in case two turbine-wheels rotating in the opposite direction are provided these turbine-wheels do not develop the same power if the steam acts only in one direction. For instance, for driving a dynamo-machine it is very important that both turbine-wheels develop the same power, as it is hereby possible to use the same model and size of dynamo-machines on both sides, so that both machines can be coupled in parallel. By the present invention the effect of both turbine-wheels is rendered exactly the same, and the reactionary forces have consequently no effect at all. For this purpose the two turbine-wheels are arranged in such a way that the first turbine-wheel forms the primary wheel for the second one and the second turbine-wheel forms the primary wheel for the first one.

In order to make my invention more clear, I refer to the accompanying drawing, which represents a diagram of part of the turbine-wheels.

The turbine-wheel I rotates in the direction of the arrow *x* and the turbine-wheel II rotates in the direction of the arrow *y*. The turbine-wheel I is impinged upon by fluid from a number of nozzles *a*, while for the wheel II a number of nozzles *b* are provided, which are mounted so as to point in the opposite direction. The nozzles are naturally arranged with respect to one another, so that a nozzle on the left-hand side alternates with

a nozzle on the right-hand side. The passage of the steam will be immediately clear, as will be seen from the drawing, and it will be evident that in this construction both turbine-wheels have the same effect. It is especially important that the shafts of both turbine-wheels have the same number of revolutions, so that in case the turbine is used for actuating screw-propellers for ships a lateral pressure is entirely avoided if both propellers are equal in size and form. The effect of the turbine may further be augmented by inserting between the turbine-wheels I and II a leading bucket-rim. It is evident that several turbine-wheels may be arranged between the turbine-wheels I and II, so that the streaming velocity of the steam is step by step transferred into the energy in the several turbine-wheels.

Having thus fully described the nature of this invention, what I desire to secure by Letters Patent of the United States is—

1. In a steam-turbine, the combination of two turbine-wheels, each provided with one row of buckets, the buckets of one turbine-wheel being situated in the opposite direction to the buckets of the other turbine-wheel so that the steam leaving the buckets of one turbine-wheel can enter into the buckets of the second one, nozzles for each wheel, said nozzles being situated so, that a nozzle on the left-hand side alternates with a nozzle on the right-hand side, substantially as described.

2. In an elastic-fluid turbine, the combination of wheels mounted to revolve in opposite directions, each wheel being provided with peripheral buckets, those of one wheel being reversed with respect to those of the next, nozzles disposed on opposite sides of the wheels and located at the same distance from the axis of the wheels so that the passages between the buckets are common to and receive motive fluid from both sets of nozzles.

3. In an elastic-fluid turbine, the combination of wheels mounted to revolve in opposite directions, the buckets on a given wheel being similarly disposed, and nozzles oppositely disposed to balance the reaction, which nozzles discharge motive fluid through the bucket-spaces, the latter being common to all the nozzles.

4. In an elastic-fluid turbine, the combination of bucket-wheels mounted to revolve in opposite directions, the passages between the buckets on one wheel registering with those on another wheel, and oppositely-disposed nozzles located at the ends of the wheels and at the same radial distance from the wheel-axis.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

JOHANN STUMPF.

Witnesses:
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WOLDEMAR HAUPT.