

J. STUMPF.
STEAM TURBINE.
APPLICATION FILED SEPT. 8, 1903.

Fig. 1.

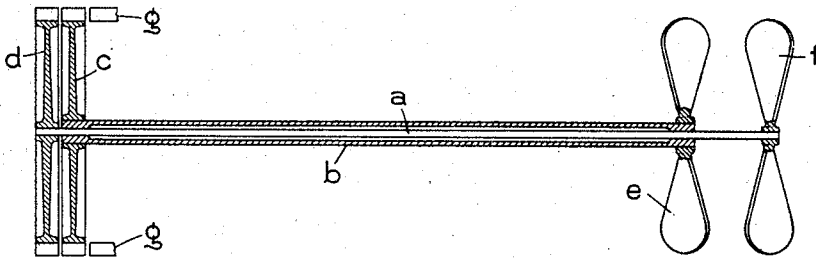


Fig. 2.

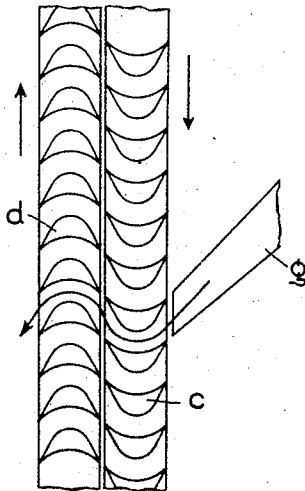
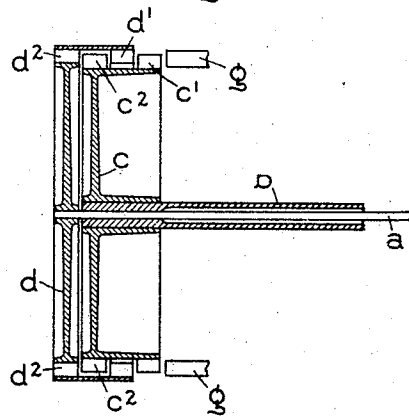


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 790,406, dated May 23, 1905.

Application filed September 8, 1903. Serial No. 172,236.

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 27 Rankestrasse, Charlottenburg, near Berlin, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Steam or Gas Turbines for the Screw-Propellers of Ships, of which the following is an exact specification.

My invention relates to improvements in steam or gas turbines for the screw-propellers of ships. In driving screw-propellers by means of steam or gas turbines it is a great disadvantage that the number of revolutions of the turbines is so great that the velocity of the screw-propellers effects the formation of a vacuum in the water, thereby reducing the effect of the turbines. In order to avoid too great a velocity of the screw-propellers, turbines with two turbine-wheels rotating in opposite directions have been used—that is to say, turbines which have at least two turbine-wheels turnable around the same axis, the steam flowing from one turbine-wheel to the second one. In these turbines the velocity of the turbine-wheels is considerably reduced and it can be attained that by the arrangement of the two turbine-wheels the velocity amounts only to one-half of the velocity of a turbine provided with only one turbine-wheel.

For each turbine-wheel a special screw-propeller or system of screw-propellers is provided. These screw-propellers also rotate around the same axis. I attain this by arranging the turbines as well as the screw-propellers upon two separate shafts, one of which shafts is hollow and the other one of which is situated in this tubular shaft. Advantageously the screw-propeller situated near the ship-hull is fixed to the tubular shaft, while the other screw-propeller is fixed to the solid shaft.

If two screw-propellers are situated one behind the other one, the first screw-propeller gives a certain velocity to the water and the second propeller must give a greater velocity to the water moved by the first screw-propeller. In order to effect this, either the velocity of the second screw-propeller must be

greater than the velocity of the first one or the acting surface of the second screw-propeller must be larger or the angle of inclination of the wings of the second screw-propeller must be greater than the angle of inclination of the wings of the first screw-propeller. It will be understood that all these means, or two of the same, may be used simultaneously.

Now it has proved advantageous to have equal velocities for both screw-propellers in order to avoid the formation of a vacuum by the velocity of the second screw-propeller surpassing the limits allowed, as mentioned above. Therefore screw-propellers of different shape are used, according to the present invention. In practice it has been shown that by enlarging the wings of the second screw-propeller or the angle of inclination of the same the effect of both screw-propellers is not made equal, but the second screw-propeller has only about one-third of the total effect of the propellers, whereas the first screw-propeller has two-thirds of this effect.

In turbines with two turbine-wheels rotating in opposite direction the primary wheel—that is to say, the wheel impinged upon by fresh steam—has about two-thirds of the total energy of the turbine, whereas the second wheel impinged upon by the exhaust-steam of the primary wheel has only one-third of the energy of the turbine. Therefore, according to the present invention, the second screw-propeller is coupled with the secondary turbine-wheel and the first screw-propeller with the primary turbine-wheel.

The screw-propellers naturally move in opposite directions, which has a great advantage. The first propeller gives a certain longitudinal movement to the water, but at the same time gives a rotating movement to this water—that is to say, the water moves on a screw-line. In a certain distance after the first screw-propeller the second screw-propeller rotates in an opposite direction and the wings of the second screw-propeller rotate the water in the opposite direction, hereby augmenting the useful effect of the second screw-propeller.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figure 1 is a scheme showing the arrangement of the turbine-wheels and screw-propellers. Fig. 2 shows part of the circumference of the turbine-wheel rims. Fig. 3 shows the invention applied to a turbine with four bucket or vane rims.

10 In the drawings, *a* is a solid shaft. *b* is a tubular shaft surrounding the same.

c is a primary turbine-wheel fixed to the tubular shaft *b*, and *d* is a secondary turbine-wheel fixed to the solid shaft *a*.

15 *e* is the first screw-propeller fixed to the hollow shaft and primary wheel, and *f* is the second screw-propeller fixed to the solid shaft and secondary wheel. The wings of the propeller *f* are larger than the wings of the propeller *e*. It will be understood, however, 20 that just as well the angle of inclination of the wings of the propeller *f* may be made larger than the angle of inclination of the wings of the propeller *e*.

25 *g* represents the nozzles through which the steam flows upon the primary wheel. As will be seen from Fig. 2, the steam acts at first upon the turbine-wheel *e* and after leaving the vanes of this turbine-wheel acts upon the 30 turbine-wheel *d*.

It will be understood that any kind of turbine-wheels may be used—so, for instance, turbines may be used in which guide-vanes are arranged between the turbine-wheels, 35 which guide the steam from one turbine-wheel to the second one, or turbines with several turbine-wheels may be used—as, for instance,

turbines with four wheels, as shown in Fig. 3. In this construction four turbine-wheels *c' d' e' d''* are provided. The fresh steam acts 40 upon the turbine-wheels *c' d' e' d''*.

It will be clear that the drawings illustrate one example and that the arrangement may be modified in different ways—as, for instance, instead of one screw-propeller several screw- 45 propellers may be arranged upon each shaft and several shafts situated one within the other may be provided, upon each of which shafts a special turbine-wheel is situated.

Having thus fully described the nature of 50 this invention, what I desire to secure by Letters Patent of the United States is—

In an elastic-fluid turbine, the combination of primary and secondary bucket-wheels 55 mounted to revolve in opposite directions, the primary wheel having a greater torque than the secondary wheel, a nozzle for converting the pressure of the fluid into velocity and discharging it against the primary wheel 60 from which it enters the secondary wheel, and load devices connected to the wheels by shafts, the load device adjacent to the turbine being connected to the primary wheel, or one having the greater torque, and the one more 65 remote connected to the secondary wheel, or one having the lesser torque, substantially as and for the purpose set forth.

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

JOHANN STUMPF.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.