

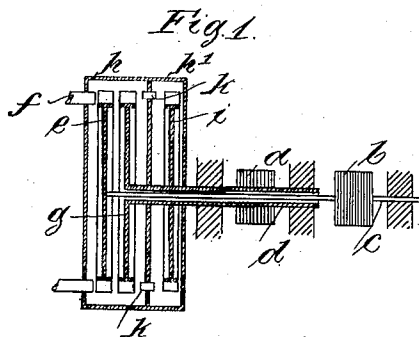
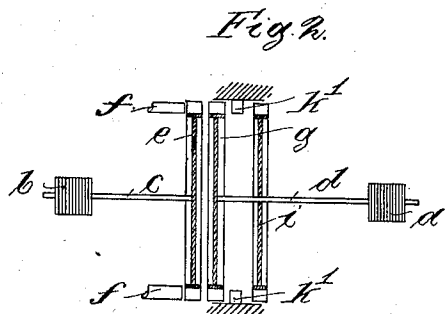
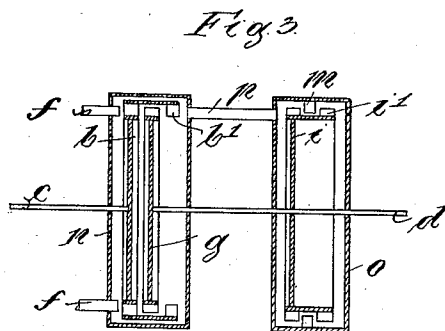
No. 760,035.

PATENTED MAY 17, 1904.

J. STUMPF.
STEAM TURBINE.

APPLICATION FILED SEPT. 8, 1903.

NO MODEL.



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. 760,035, dated May 17, 1904.

Application filed September 8, 1903. Serial No. 172,239. (No model.)

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, of which the following is an exact specification.

My invention relates to improvements in steam or gas turbines, and especially to turbines with several turbine-wheels rotating in opposite directions, the driving medium flowing from one side through all turbine-wheels one after the other. In case, for instance, of a turbine with two turbine-wheels one of which is fed by fresh steam and the other one of which rotates in a direction opposite to the direction in which the first one rotates and is fed by the exhaust-steam of the first one the first or primary wheel will develop about two-thirds of the whole energy of the turbine, while the secondary wheel will develop only one-third of the whole energy of the turbine. The fact that the two turbine-wheels have not the same useful effect is in many cases a great disadvantage. If two similar machines—for instance, two dynamo-machines, centrifugal pumps, or the like—shall be driven by means of a turbine of the type described, the coupling of such machines in series and parallel is very troublesome and even sometimes impossible on account of the different useful effect of the two turbine-wheels. In order to do away with this disadvantage, I provide my new invention, which consists in arranging a third turbine-wheel upon the shaft of the secondary wheel, which third turbine-wheel is impinged upon by the exhaust-steam of the secondary wheel, a guide-shovel rim being provided for guiding this exhaust-steam upon the third wheel. It is hereby attained that two systems rotated in opposite directions exist, the first system consisting only of the primary wheel and the second system consisting of the secondary turbine-wheel and the third additional wheel, which rotates in the same direction as the secondary wheel. By this ar-

range ment it can easily be attained by choosing suitable dimensions that the primary wheel has about fifty per cent. of the total energy, the remaining fifty per cent. being developed by the secondary wheel and the third additional wheel.

It will be clear that the invention may also be used for turbines with more than two wheels rotating in opposite directions and that instead of the third additional wheel several additional wheels may be provided.

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

Figure 1 is a scheme showing the invention applied to a turbine for driving two equal dynamo-machines. Fig. 2 is a modification of the construction shown in Fig. 1. Fig. 3 is a third modification in which several rows of turbine-wheel buckets are provided.

In the construction shown in Fig. 1, *a* and *b* are armatures of dynamo-machines. The armature *b* is fixed to the shaft *c*. The armature *a* is fixed to the hollow shaft *d*, situated around the shaft *c*. *e* is the primary turbine-wheel, situated upon the shaft *c*. *f* represents the nozzles through which the steam flows upon the turbine-wheel *e*. *g* is a turbine-wheel situated at the side of the turbine-wheel *e*, which turbine-wheel is fixed to the hollow shaft *d*. It will be clear that the vanes of this turbine-wheel *g* must be situated in the opposite direction of the vanes of the turbine-wheel *e* and that this turbine-wheel *g* consequently rotates in the opposite direction. The turbine-wheels *e* and *g* are situated in a casing *h*. To this casing *h* a second casing *h'* is fixed, in which a third turbine-wheel *i*, fixed to the hollow shaft *d*, is situated. This turbine-wheel must naturally rotate in the same direction in which the turbine-wheel *g* rotates. *k* represents nozzles connecting the casing *h* with the casing *h'*.

The pressure of the steam in the casing *h* is by means of the nozzles *k* transferred into velocity, which velocity acts upon the turbine-wheel *i*. If the turbine-wheels shall not be rotated in such a way that the pressure of the

steam is transferred step by step into velocity of flow, it is sufficient if a guide-vane rim for reversing the direction of the steam leaving the vanes of the turbine-wheel *g* be provided as shown in Fig. 2. In this drawing, *k'* denotes the guide-vanes which lead the steam leaving the buckets of the turbine-wheel *g* into the buckets of the turbine-wheel *i*. It will be understood that the buckets of the turbine-wheels *g* and *i* must be situated in the same direction.

In the construction shown in Fig. 2 the shafts *c* and *d* are situated in opposite directions. In consequence hereof a solid shaft *d* is provided instead of the hollow shaft shown in Fig. 1.

In the construction shown in Fig. 3, *b* is the primary turbine-wheel. To this turbine-wheel *b* a second bucket or vane rim *b'* is rigidly connected. Between the two bucket-rims the secondary wheel *g* is situated. It will be clear that the turbine-wheel *b* in consequence of this arrangement has a considerably greater useful effect than the turbine-wheel *g*. Now in order to equalize the useful effect of both shafts *c* and *d* a second turbine-wheel *i* is arranged upon the shaft *d*, which turbine-wheel *i* is also provided with a second bucket-rim *i'*. Between both bucket-rims a guide-vane rim *m* is rigidly fixed. Both turbine-wheel systems are situated in casings *n* and *o*, and the steam of the casing *n* flows through a pipe *p* to the casing *o*.

It will be seen from the example shown in the drawings and described that the invention may be used in different ways, the idea of the invention consisting only in the addition of

one or several turbine-wheels to the secondary turbine-wheel.

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 or gas turbine, the combination of a primary and a secondary turbine-wheel rotating in opposite directions, with a third turbine-wheel coupled with the secondary wheel, substantially as described and for the purpose set forth.

2. In a steam or gas turbine, the combination of a primary and a secondary turbine-wheel, rotating in opposite directions, with several additional turbine-wheels coupled with the secondary wheel, substantially as described and for the purpose set forth.

3. In a steam or gas turbine, the combination of a plurality of turbine-wheels, the adjacent wheels rotating in opposite directions with one or more separated turbine-wheels coupled to one set of the alternate wheels, substantially as described.

4. In a steam or gas turbine, the combination of a primary and a secondary turbine-wheel rotating in opposite directions, a casing for said wheels, a third turbine-wheel coupled with the secondary wheel, and a casing for said wheel, substantially as described.

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.