

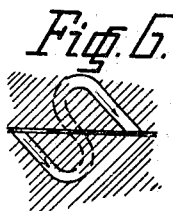
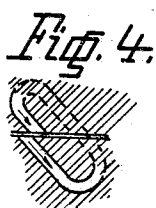
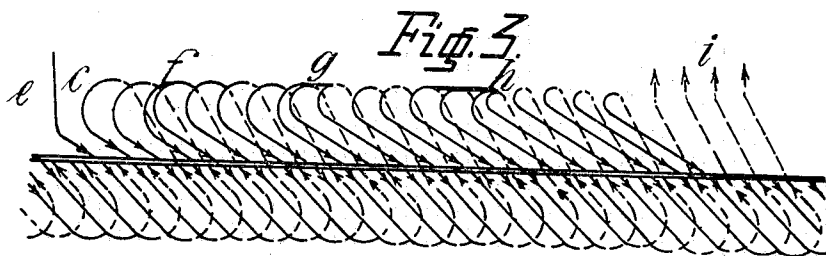
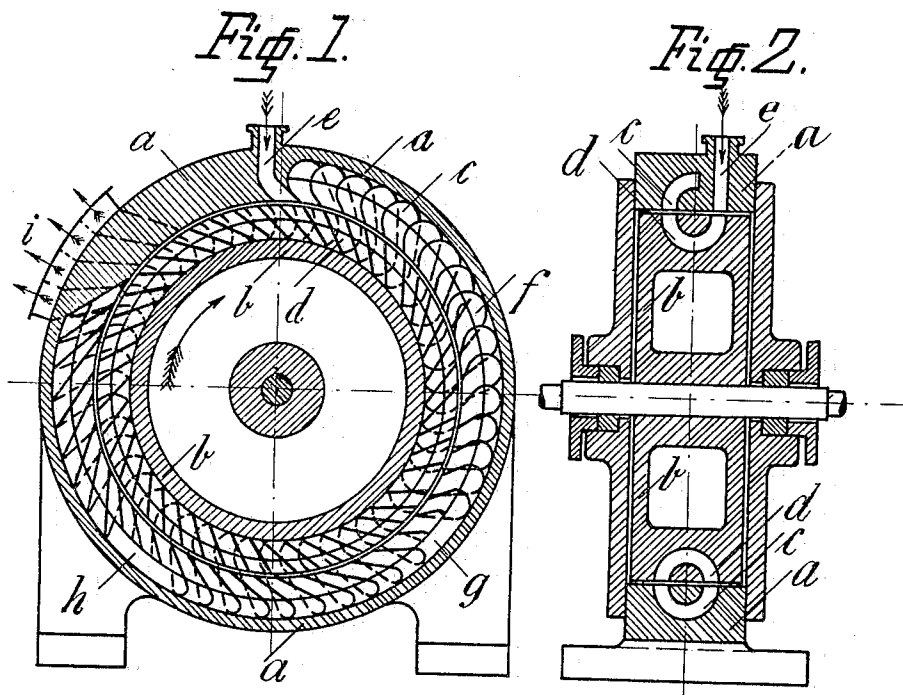
No. 769,425.

PATENTED SEPT. 6, 1904.

G. ZAHIKJANZ.
STEAM TURBINE.

APPLICATION FILED JULY 7, 1903.

NO MODEL.



Witnesses:
Walter Haupt
Henry Harper

Inventor
G. Zahikjanz

UNITED STATES PATENT OFFICE.

GABRIEL ZAHIKJANZ, OF BERLIN, GERMANY, ASSIGNOR TO BERGMANN ELEKTRICITÄTS WERKE AKTIENGESELLSCHAFT, OF BERLIN, GERMANY, A CORPORATION OF GERMANY.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 769,425, dated September 6, 1904.

Application filed July 7, 1903. Serial No. 164,578. (No model.)

To all whom it may concern:

Be it known that I, GABRIEL ZAHIKJANZ, a subject of the Emperor of Russia, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Steam-Turbines, of which the following is a specification.

My invention relates to turbines with U-shaped guide and rotary channels adapted to form spirally-coiled windings whose axis encircles the turbine-axis; and it consists of certain novel features hereinafter described and claimed.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a sectional front view of my steam-turbine. Fig. 2 is a sectional side view of the same. Fig. 3 is a diagram illustrating the course of the driving medium. Figs. 4, 5, and 6 show a winding in three different forms.

In turbines of the nature stated the progressive widening of the steam-path is effected by progressively widening the guide-channels. This has, however, certain practical limits beyond which further widening becomes awkward and difficult to manufacture, as well as disadvantageous for the efficiency of the steam-current.

My invention has for its object to extend this limit in a simple and effectual way.

According to my present invention all of the rotary channels have their outlets arranged in advance of their inlets, while the progressively-widening guide-channels at the beginning of the series have their outlets in the rear of their inlets and at the end of the series have their outlets in advance of the inlets, the change of relative positions of inlet and outlet being preferably gradual throughout the series. Thus the advance of a complete winding (consisting of guide-channel and rotary channel) along the periphery of the turbine is at the end of the series divided between the guide-channel and the rotary channel. To prevent eddies and to guide the steam with precision, I partition the wider guide-channels, in which case at least the par-

titions of each guide-channel increasing its outlet communicate together to equalize the density and velocity of the steam-current. In the disposition described the progressive widening of the guide-channels may be carried out from channel to channel, as well as from group to group of channels. For the sake of simplicity I preferably construct the guide-channels as multiples of the rotary channels by making the peripheral divisions of the partitions of the guide-channels equal to the peripheral divisions of the rotary channels.

Figs. 1 and 2 show a steam-turbine of the character described. *a* is the guide-wheel; *b*, the rotary wheel; *c*, the guide-channels, and *d* the rotary channels. The rotary channels, which are all of the same size, all have their outlets in advance of their inlets, while the guide-channels, which have the same peripheral divisions as the rotary channels, have their outlets in the rear of their inlets at the beginning of the series and in advance of their inlets at the end of the series, the course of steam being as follows: The steam enters at *e* and circulates first through single rotary and guide channels, the latter having their outlets in the rear of their inlets. Having arrived at the guide-channel *f*, the steam doubles its sectional area and flows into two rotary channels and goes on circulating through double rotary and guide channels, the outlets of the latter being still in the rear of their inlets, yet less than before. The steam after arriving at the guide-channel *g* trebles its original sectional area and flows into three rotary channels and goes on circulating through treble rotary and guide channels, the latter having their outlets a little in advance of their inlets. Having arrived at the guide-channel *h*, the steam increases its original sectional area fourfold, flows into four rotary channels, and goes on circulating through quadruple rotary and guide channels, both having their outlets the same distance in advance of their inlets. At the guide-channel *i* the steam leaves the turbine. Fig. 3 shows the flow of steam diagram-

matically, while Figs. 4, 5, and 6 illustrate a winding consisting of a rotary and a guide channel in three different forms. In all of them the rotary channel has its outlet in advance of its inlet, while the guide-channel in Fig. 4 has its outlet in the rear of the inlet, in Fig. 5 a little in advance of its inlet, and in Fig. 6 as far in advance of the inlet as the rotary channel.

The partitioning may be effected in the rotary channels as well, in which case I preferably construct and partition the guide-channels as multiples of the rotary-channel partitions. Thus, for instance, if the rotary channels consist of three partitions each the guide-channels receive first three partitions, then four, then five, and so on. This is of special importance in large steam-turbines to avoid eddies, on the one hand, and, on the other hand, to render the progress of expansion more uniform.

What I claim as new, and desire to secure by Letters Patent, is—

1. A turbine comprising a stationary member provided with progressively - widening guide-channels and a rotary member provided with channels adapted to register with said guide-channels and to form windings therewith, all of the rotary channels having their outlets in advance of their inlets, while the guide-channels at the beginning of the series have their outlets in the rear of their inlets, and at the end of the series have their outlets in advance of their inlets.

2. A turbine comprising a stationary member provided with progressively - widening guide-channels and a rotary member provided with channels adapted to register with said guide-channels and to form windings therewith, all of the rotary channels having their outlets in advance of their inlets, while the guide-channels at the beginning of the series have their outlets in the rear of their inlets, and at the end of the series have their outlets in advance of their inlets, the change of position of the outlets of the guide-channels relatively to their inlets being gradual from the beginning of the series to the end.

3. A turbine comprising a stationary member provided with progressively - widening guide-channels and a rotary member provided with channels adapted to register with said guide-channels and to form windings therewith, all of the rotary channels having their outlets in advance of their inlets, while the guide-channels at the beginning of the series have their outlets in the rear of their inlets, and at the end of the series have their outlets in advance of their inlets, the wider guide-channels being partitioned for the purposes set forth.

4. A turbine comprising a stationary member provided with progressively - widening guide-channels and a rotary member provided with channels adapted to register with said guide-channels and to form windings therewith, all of the rotary channels having their outlets in advance of their inlets, while the guide-channels at the beginning of the series have their outlets in the rear of their inlets, and at the end of the series have their outlets in advance of their inlets, the guide-channels being arranged in successive groups and increasing in area from group to group.

5. A turbine comprising a stationary member provided with progressively - widening guide-channels and a rotary member provided with channels adapted to register with said guide-channels and to form windings therewith, all of the rotary channels having their outlets in advance of their inlets, while the guide-channels at the beginning of the series have their outlets in the rear of their inlets, and at the end of the series have their outlets in advance of their inlets, the guide-channels being arranged in successive groups, which consist of an increasing number of channels, said channels communicating at the points where the area of the passage changes.

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

GABRIEL ZAHIKJANZ.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.