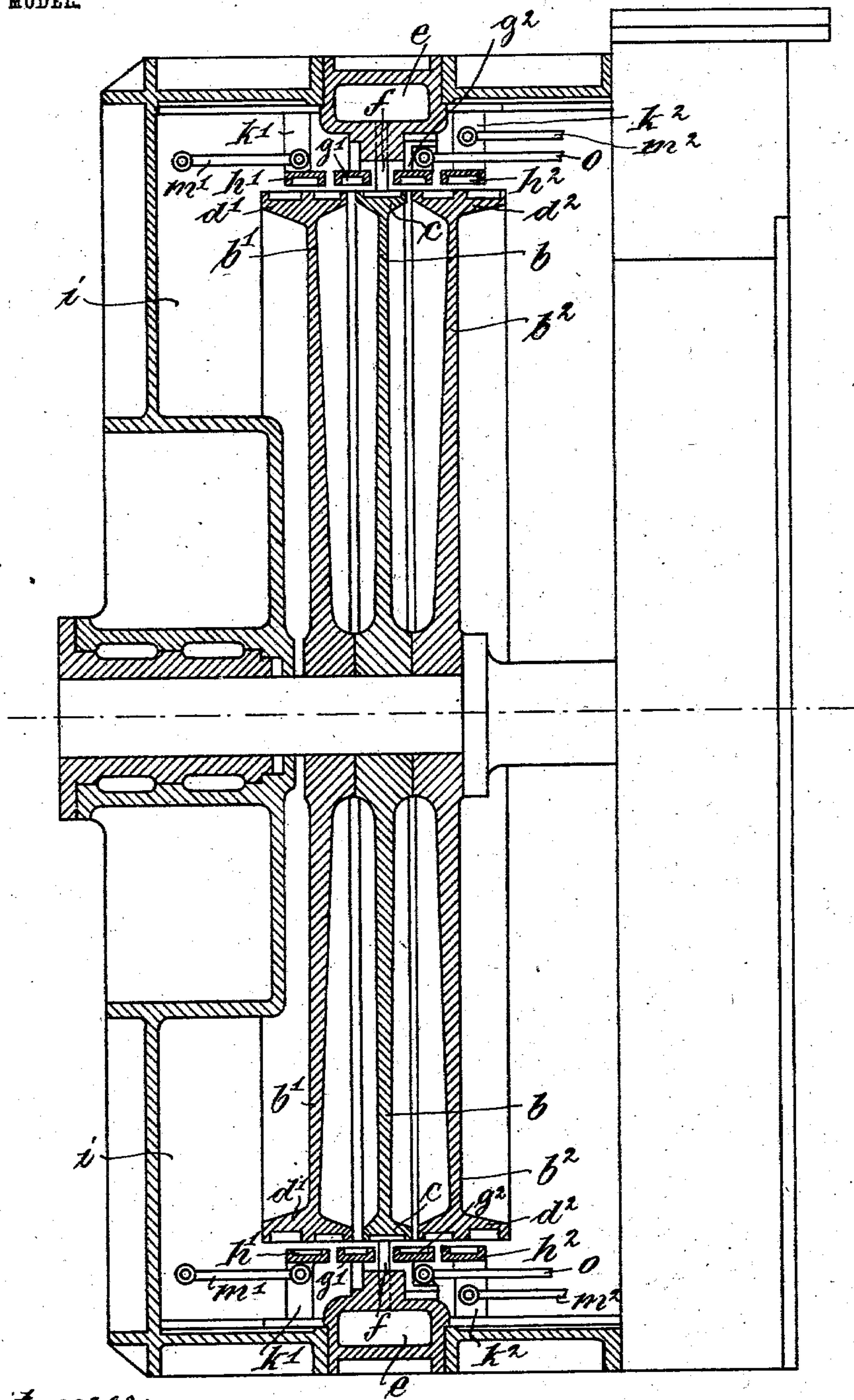


No. 730,416.

PATENTED JUNE 9, 1903.

J. STUMPF.  
STEAM OR GAS TURBINE.  
APPLICATION FILED FEB. 24, 1903..

NO MODEL.



Witnesses:  
Emil Kayser.  
Paul Walleburg.

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by *Wunderlich*  
Attorney.



## UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF CHARLOTTENBURG, GERMANY.

## STEAM OR GAS TURBINE.

SPECIFICATION forming part of Letters Patent No. 730,416, dated June 9, 1903.

Application filed February 24, 1903. Serial No. 144,681. (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 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 more especially to such turbines in which the pressure of the steam or compressed gas is transferred into streaming velocity, which is utilized in one or several bucket-rims. In such turbines the number of revolutions depends upon the number of steps in which the transferring of the pressure into streaming velocity takes place. It often occurs that the number of revolutions of the turbine has to be altered or changed, especially in case the turbine is used for driving screw-propellers, pumps, or the like. In the turbines hitherto constructed the consumption of steam was always increased if the numbers of revolutions had to be reduced. In order to do away with this disadvantage, I arrange according to my invention so-called "return-buckets," by means of which the steam leaving the buckets of the turbine-wheel is returned into the same or is led into a second row of buckets or a second turbine-wheel. These return-buckets can be inserted or removed, if desired, in such a way that the streaming energy of the steam can be utilized in one or several steps.

In order to make my invention more clear, I refer to the accompanying drawing, which shows a cross-section of a turbine constructed according to my invention.

In the example shown several turbine-wheels situated upon the same axle are shown and return-buckets are arranged which lead the steam leaving the buckets of one turbine-wheel to the buckets of another one; but it will be understood that just as well return-buckets may be arranged which lead the steam back into the buckets of the same turbine-wheel. In the drawing three turbine-wheels  $b$   $b'$   $b^2$  are shown. The middle turbine-wheel  $b$  is provided with a rim  $c$ , in which are arranged double buckets according to the well-

known Pelton wheel system. In the rims  $d'$   $d^2$  of the turbine-wheels  $b'$   $b^2$  are arranged two rows of single buckets. The steam flows through the annular channel  $e$  and the nozzles  $f$  into the double buckets of the rim  $c$ . In order to lead the steam leaving these buckets to the buckets of the turbine-wheels  $b'$  and  $b^2$ , four leading bucket or vane rims or return vane-rims  $g'$   $g^2$  and  $h'$   $h^2$  are provided. The steam-jets flowing or streaming through the nozzles  $f$  into the buckets of the rim  $c$  are divided in these buckets into two parts which flow through these buckets into the buckets of the leading bucket-rims  $g'$   $g^2$ , in which the movement of the same is reversed, so that the steam can enter into the first row of buckets of the rims  $d'$  and  $d^2$ . After passing these buckets the direction of the steam-jets is reversed again in the vanes or buckets of the leading bucket-rims  $h'$   $h^2$ , so that the steam enters into the last row of buckets or vanes of the wheels  $b'$   $b^2$ . After leaving these buckets the steam enters into the last row of buckets or vanes of the wheels  $b'$   $b^2$ . After leaving these buckets the steam enters into the turbine-wheel casing, whence it passes away by the exhaust or is condensed.

One or all of the return bucket or vane rims  $g'$   $g^2$  and  $h'$   $h^2$  are arranged so as to be capable of being removed. In the drawing guide-pieces  $k'$   $k^2$  for the rims  $h'$   $h^2$  are shown, by means of which guide-pieces these rims can be moved sidewise within the turbine-casing  $i$ . The means for moving the rims may be constructed in any convenient way. In the drawing are shown links  $m'$   $m^2$ , and a number of such links may be divided up over the whole circumference of the rim and may be moved simultaneously by means of a lever arrangement or the like. Guide-pieces and links  $o$  for the rim  $g^2$  are indicated in the drawing in order to show that not only the outer, but also the inner, rims may be arranged so as to be capable of being removed. If, for instance, the number of revolutions of the turbine-wheel amounts to five hundred when all three turbine-wheel rims are at work, as shown in the drawing, this number of revolutions will be augmented to one thousand as soon as the outer leading shovel-rims  $h'$   $h^2$  are removed, while the consumption of the



steam remains the same. If then the following leading bucket or vane rims are removed so that the steam exhausts after leaving the first turbine-wheel, the number of revolutions  
5 will rise to two thousand if the same consumption of steam takes place. Naturally the difference between the numbers of revolutions need not be so considerable as in the example above given.  
10 It will be understood that it is not necessary to use a turbine with double buckets, for the invention may also be used in connection with turbines with single buckets in which the steam-jets are not divided into two parts.  
15 It will also be understood that the return-bucket rims need not be moved sidewise, but that the same may be moved equally well in any other suitable direction. For instance the rim may be divided into several parts,

which may be moved outward, or the whole rim may be turned around its center. 20

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

In a steam or gas turbine, the combination 25 with a turbine-wheel, of return-buckets and means for removing these return-buckets, and bringing the same back in their position, substantially as described and for the purpose set forth. 30

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.