

No. 822,317.

PATENTED JUNE 5, 1906.

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

Fig. 1.

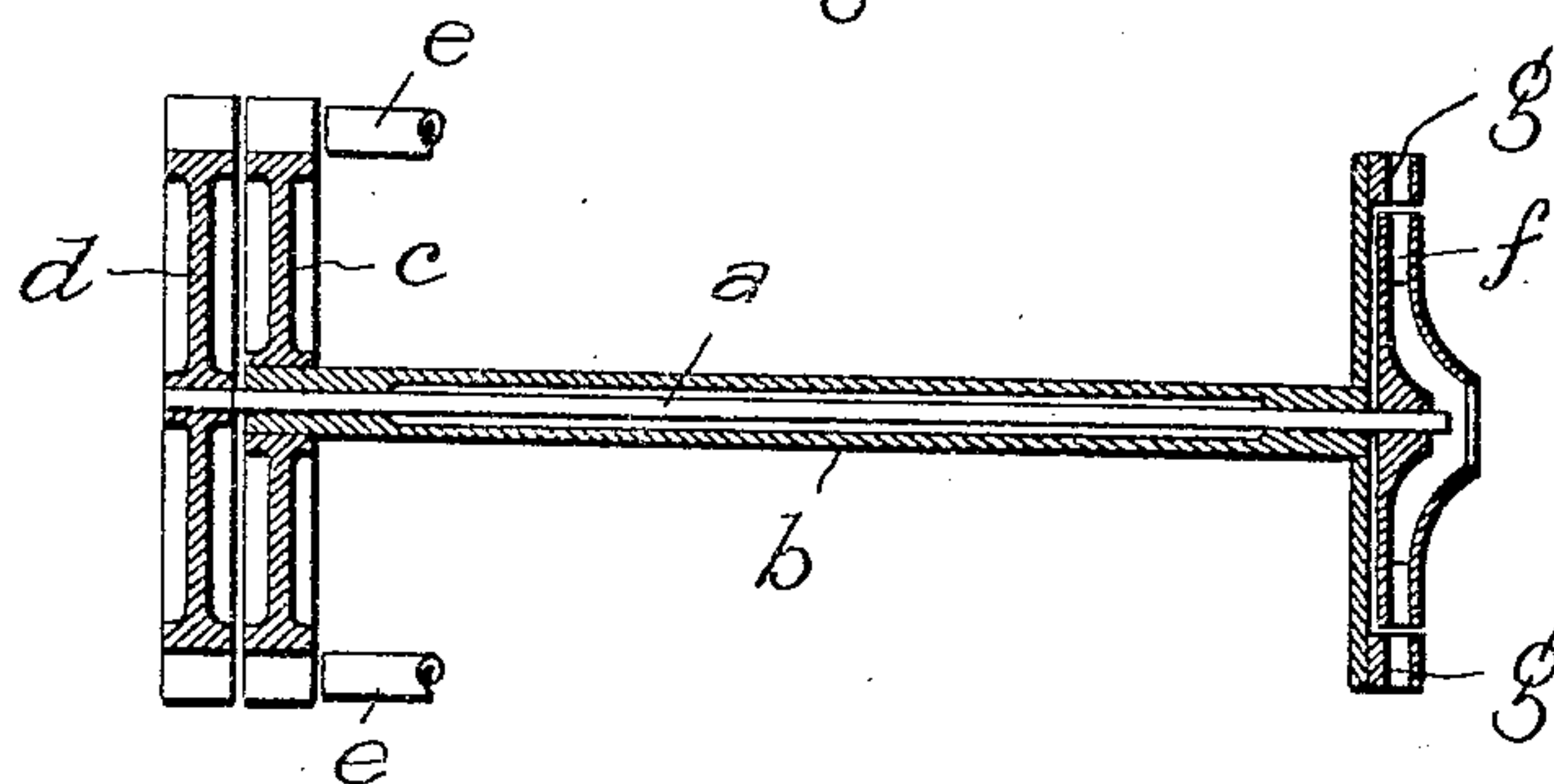
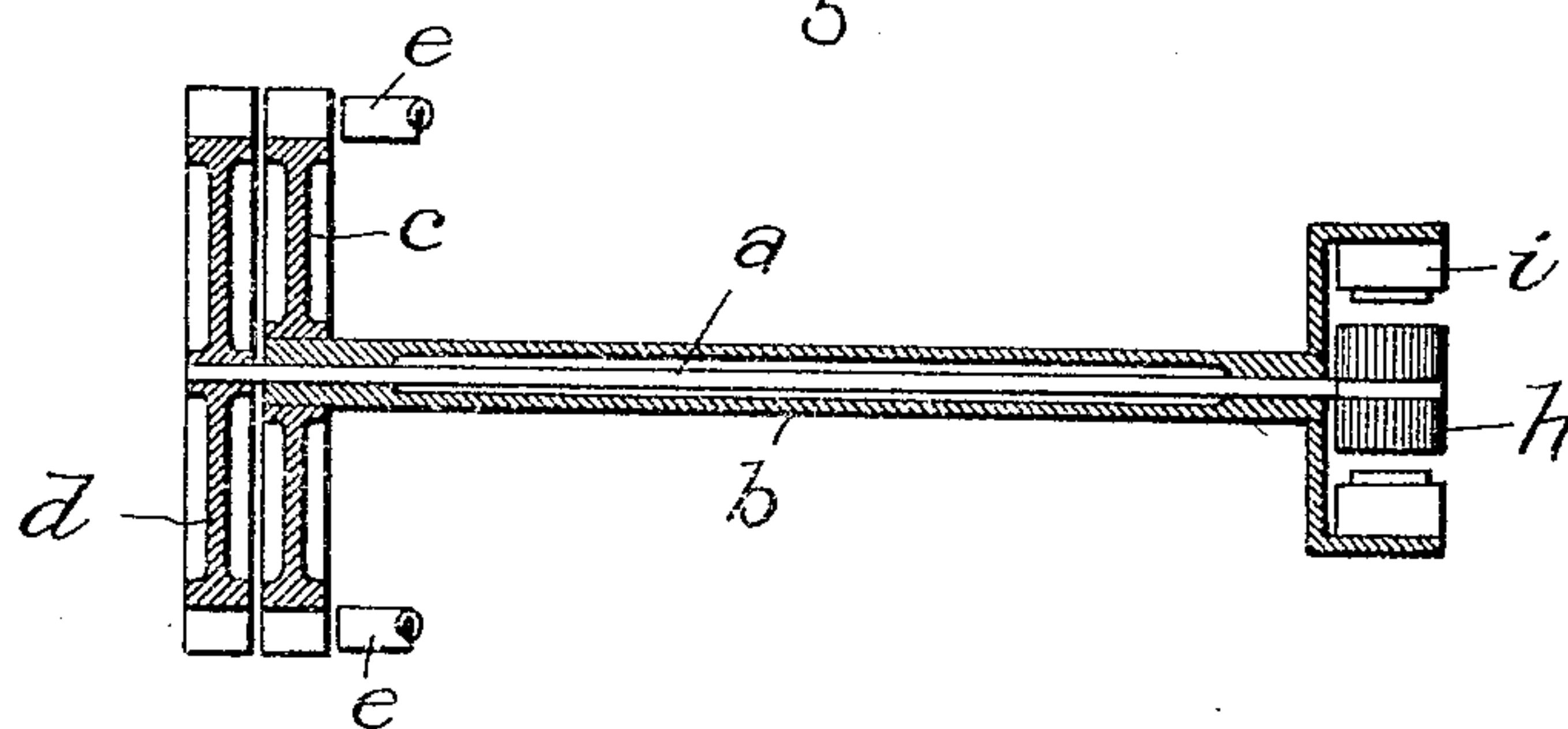


Fig. 2.



Witnesses:

*Benjamin B. Bruce*  
*Henry Clifford*

Inventor:

*Johann Stumpf,*

by *Albert B. Davis*

*Att'y.*



# UNITED STATES PATENT OFFICE.

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

## STEAM-TURBINE.

No. 822,317.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed September 8, 1903. Serial No. 172,240.

*To all whom it may concern:*

Be it known that I, JOHANN STUMPF, a subject of the King of Prussia, German Emperor, and resident of 27 Rankestrasse, Charlottenburg, near Berlin, in the 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 steam or gas turbines, and more especially to turbines for driving machines consisting of two parts working together in such a way that one of these parts is fixed while the other one rotates, as is the case, for instance, in centrifugal pumps, ventilators, dynamo-machines, and the like. In centrifugal pumps, for instance, a bucket-wheel rotates in a fixed blade-rim or guiding apparatus. In dynamo-machines an armature rotates in a fixed magnet-frame, and so on.

According to the present invention such machines shall be driven by means of steam or gas turbines provided with several turbine-wheels rotating in opposite directions, the driving medium passing through all turbine-wheels one after the other. In order to attain this purpose, the machines to be driven are arranged according to the present invention in such manner that both parts of the same rotate—that is to say, that in centrifugal pumps, for instance, the guide-vane rim rotates in one direction and the bucket-wheel situated within the same rotates in the other direction, and that in dynamo-machines, for instance, not only the armature, but also the magnet-frame rotates, this frame rotating naturally in the direction opposite to the direction in which the armature rotates. By this arrangement great advantages are attained. It is well known that it is very advantageous to reduce the number of revolutions of a steam or gas turbine as much as possible. This can be attained advantageously by using two turbine-wheels rotating in opposite directions, as by this means the number of revolutions of each turbine-wheel amounts only to fifty per cent. of the number of revolutions of a single turbine-wheel having the same effect.

A further great advantage of the turbine-wheels rotating in opposite direction over turbine-wheels rotating in the same direction resides in the fact that the guide-blades which reverse the direction of flow of the steam

leaving one turbine-wheel are unnecessary. As to the machine to be driven, the new arrangement has also great advantages. In centrifugal pumps, for instance, the useful effect is considerably augmented by the guide-vane rim not being fixed, but rotating in a direction opposite to the direction in which the bucket-wheel rotates, as on account of this construction the relative velocity of the fluid to be pumped comes in consideration instead of the absolute velocity of the same. In dynamo-machines it is very important to increase the relative velocity between the armature and the magnets, as the velocity of the armature alone cannot surpass certain limits on account of it being impossible to construct the windings strong enough to offer sufficient resistance to the centrifugal power.

If now, for instance, the armature and the magnet-frame have both one thousand revolutions, the relative velocity of both parts is equal to two thousand revolutions. This is very important for a direct coupling of a dynamo-machine with a turbine, especially in case the whole arrangement shall occupy only a small space.

In order to make my invention more clear, I refer to the accompanying drawings, in which several examples of the arrangement showing the object of the present invention are shown, and in which—

Figure 1 is a diagrammatic view showing the invention applied to a centrifugal pump. Fig. 2 is a diagrammatic view showing the invention as applied to a dynamo-machine.

In the drawings, *a* is a solid shaft which is situated in the hollow shaft *b*. At one end of the shafts *a* and *b* turbine-wheels *c* and *d* of any convenient construction are fixed. If, for instance, turbine-wheels of the Laval type are used, the nozzles *e* for leading the steam to the turbine-wheel *c* can be arranged at the side of this wheel, as shown in the drawings. If the effect of both turbine-wheels shall be equal, both turbine-wheels may be impinged upon by fresh steam, or other convenient means for attaining this purpose may be provided. *f* is a bucket-wheel of a centrifugal pump, which bucket-wheel is fixed to the inner shaft *a*. *g* is the guide-vane rim of the centrifugal pump and is fixed to the hollow shaft *b*. The fluid to be pumped receives a certain acceleration in the bucket-wheel *f*, which acceleration is considerably increased between the



blades of the guide-vane rim *g*, which rotates in the opposite direction. In Fig. 2 *i* is the magnet-frame of a dynamo-machine, which magnet-frame is fixed to the hollow shaft *b*,  
5 and *h* is the armature of this dynamo-machine and is fixed to the solid shaft *a*. Instead of connecting the field and armature as shown they may be reversed—that is to say, the armature may be the outer member and  
10 the field-magnet the inner member.

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 device for driving machine elements in opposite directions, the combination  
15 of two turbine-wheels adapted to rotate in opposite directions, means for rotating said wheels, a hollow shaft fixed to one turbine-wheel and having a flange at its opposite end  
20 to which a machine element may be secured, a shaft between the other turbine-wheel and

another element passing through said hollow shaft and flange and being entirely inclosed by the hollow shaft, substantially as described.

2. In a device for driving machine elements, the combination of bucket-wheels adapted to rotate in opposite directions, devices for discharging motive fluid against the buckets, a hollow shaft attached to one  
25 bucket-wheel, a second shaft attached to another bucket-wheel and located within the hollow shaft, said shafts driving independent loads, and an enlargement on one of the shafts to which a machine element may be attached.  
30 35

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.