July 17, 1934. J. O. HAMREN 1,966,892

TURBINE

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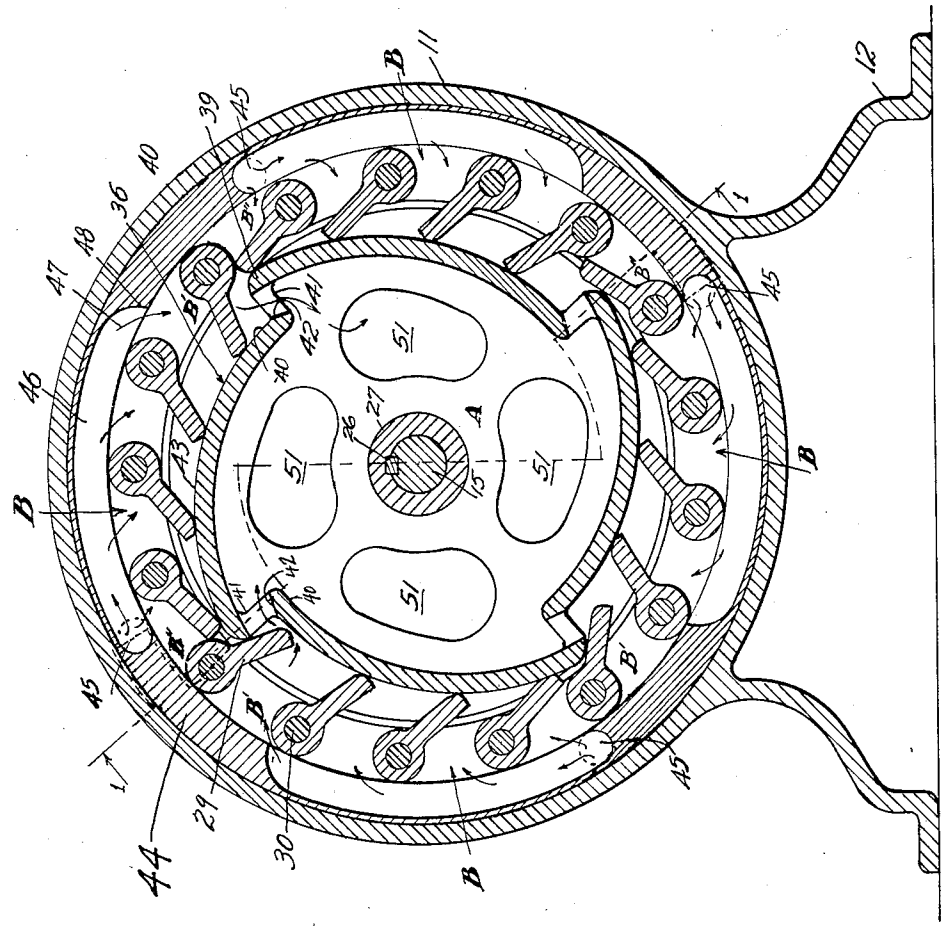

Fig. 3.

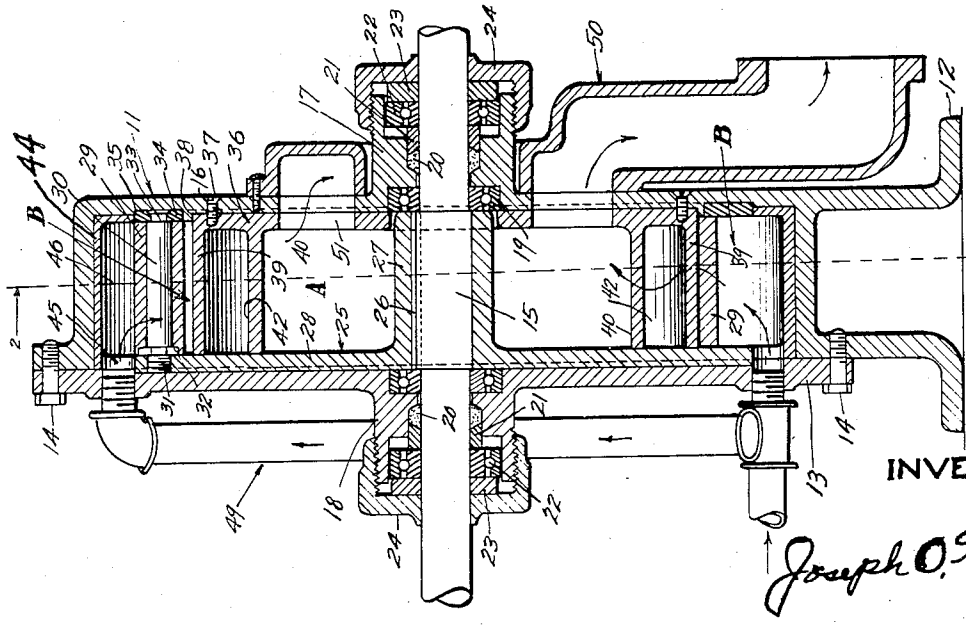

Fig. 4.

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TURBINE

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3 Claims. (Cl. 253—50)

This invention relates to power devices and deals particularly with a motor of the fluid turbine type. The invention has been designed for use where ever power may be employed and is adapted for use with either liquid or gas under pressure.

I am aware of water turbines and steam turbines but these depend more upon the kinetic energy of the operating medium employed than upon the potential energy and consequently suffer a considerable loss in efficiency. Accordingly it is one of the objects of this invention to provide a turbine which may be operated either by liquid or gas and which will not depend entirely upon kinetic energy but will receive a certain amount of impelling force through the potential energy of the operating medium. This feature will permit the use of low velocity in the operating fluid with a high efficiency in the motor.

Broadly speaking my new turbine consists of a rotor having a plurality of pivotal vanes mounted near the outer periphery of the rotor. The vanes are arranged to move through circumferentially disposed chambers which have a longitudinally increasing cross sectional area. As the vanes pass through the chambers they act as pistons and are impelled by fluid pressure on the back of the vane. By virtue of the vanes being pivoted they are allowed to swing and follow the expansion of the chamber. The result is that there is a differential vane area exposed to fluid pressure between the beginning of the chamber and the end of the chamber which operates to assist in impelling the rotor. The means whereby I form a chamber of an increasing cross sectional area comprises a cam shaped member upon which the free ends of the vanes are arranged to ride. The cam is formed with a plurality of high points and successive low points and as the vanes ride over the high points an outlet in the large end of the chamber is opened, thus permitting a flow of fluid through the chamber. It is therefore another object of this invention to provide a turbine in which pivotally mounted vanes pass through longitudinal chambers of increasing cross sectional area.

As before mentioned, when the vanes ride over the high points of the cam an outlet in the large end of the chamber is opened. I take advantage of this structure to maintain at all times an open outlet from at least one of the chambers. This is accomplished by providing an even number of high points on the cam and an odd number of vanes or vice versa. Such an arrangement is a novel feature of my invention and is peculiarly adapted to the use of vanes and cams and the provision of a structure of this character is to be considered as an object of this invention.

Another feature of my invention resides in the novel means whereby I direct fluid into the chambers. For this purpose I employ a guide member which forms the outer wall of the chambers and is provided with nozzles for directing the fluid against the vanes. With this arrangement I am enabled to supply fluid to a plurality of vanes passing through the chamber at the same time. Also the nozzles are arranged to direct fluid against the vanes in a manner to impart the kinetic energy of the fluid to the vanes. This will be recognized as an impelling force in addition to the potential energy received from the fluid. In this way I increase the efficiency and also supply fluid to the large end of the chamber directly from the inlet. It is accordingly another object of this invention to provide a guide sleeve in a turbine of the character described.

In addition a certain amount of novelty exists in the arrangement of inlet and outlet ports which will become obvious in the description. Other objects and advantages will become apparent as the description proceeds in conjunction with the drawing in which:

Figure 1 is a cross sectional view of the turbine, taken on line 1—1 of Figure 2; and

Figure 2 is cross sectional view taken on line 2—2 of Figure 1. This view is taken at right angles to that of Figure 1.

In the drawing, which is used for illustrative purposes only, I have shown a form of my invention. Referring to Figure 1, it will be observed that the device comprises a casing 11 which may be provided with a suitable base 12. The casing 11 is formed with a cylindrical chamber A which is closed by a cover plate 13 suitably attached thereto in any conventional manner, as by bolts, and is termed hereinafter, the stator. Mounted within the cylindrical chamber are the parts of my turbine which will be more fully described. A shaft 15 passes through both the cover plate 13 and the back wall 16 of the casing and is journalled in both members in the following manner: Since both structures are identical, the description of one will serve for both. It will be noted that, on the back wall 16 of the casing a hub 17 is formed and that a similar hub 18 is formed on the cover plate 13. The hubs are bored to receive a combination bearing and packing gland. On the inner face of the hub 17 an antifriction bearing 19 is installed in a manner to support the shaft 15. In the outer

bore of the hub a packing member 20 is held in position about the shaft by a follower 21. The follower 21 is forced against the packing member by an antifriction bearing 22 which in turn is held in place by a plate 23 that is forced thereagainst by a nut 24 screw threadedly mounted on the exterior of the hub 17. This arrangement will be recognized as providing a combination bearing and packing gland about the shaft 15. The movable parts of the turbine comprise a rotor generally designated 25 which is mounted on the shaft 15 by any suitable means such as a key 26 extending through a hub 27. A plate 28 is formed integral with the hub 27 and carries near the outer periphery a plurality of vanes 29 pivotally mounted on pins 30, said pins being secured in the plate 28 in any suitable manner, such as by threads 31. The pins 30 are formed with shoulders 32 which are adapted to bear against the plate 28 and give added strength. In practice the shoulders 32 are flattened on two sides to form a means of screwing the pins into the plate. The sole support of the pins resides in the connection between the pins and the plate which in effect is a cantilever support. The outer ends of the pins are turned down as shown at 33 and a circular ring 34 is mounted on all the pins and held in place by riveting, or in any other suitable manner.

The ring 34 is arranged to ride in a recess 35 in the back wall 16 of the casing 11. In conjunction with the pivotal vanes I mount a cam shaped member 36 on the back wall 16 of the casing 11 and secure the same by any suitable means such as screws 37. In order to insure proper placing of the cam 36 I form a recess 38 in the wall 16.

By referring to Figure 2 the cam will be observed to consist of high points 39 and low points 40 with a substantially vertical wall 41 therebetween and the vertical wall 41 will be noted to contain an outlet passage 42. It will also be observed that the cam 36 forms the inner walls of a plurality of chambers B which are circumferentially disposed about the shaft 15 and are formed with a longitudinally increasing cross sectional area. As clearly shown in this view the free ends of the vanes 29 ride upon the face 43 of the cam and are adapted to form a sliding water tight fit therewith. As also shown in this view the cam is provided with an even number of high points while the number of the vanes is uneven. This results in always maintaining one of the outlet ports 42 open. It is evident that the number of high points on the cam could be uneven and the number of the vanes even with the same result.

In conjunction with the chambers B and the vanes I provide means for directing the fluid into the chambers and against the vanes in a manner to take full advantage of the kinetic energy and the potential energy of the flowing fluid. For this purpose I provide a member generally designated 44 which is formed with a plurality of inlets 45, the number of inlets corresponding to the number of high points on the cam 36. The inlets 45 lead into passages 46 which are circumferentially disposed about the cam member 36 as best illustrated in Figure 2 and form the outer walls of the chamber B. The purpose of the passages 46 is to conduct fluid from the inlets 45 over the top of the vanes 29 and direct a portion of the fluid downwardly against the vanes directly over the outlets 41 in the cam member 36 in the direction of the arrow 47. Accordingly the ends of the passages 46 are shaped somewhat as shown at 48. Means are provided for conducting fluid to inlets 45 and may take various forms, however, I have shown a system of conduits, generally designated 49, which is best illustrated in Figure 1. No detail will be entered of this system since it is obvious that any system for conducting fluid to the inlets will serve equally as well. On the side opposite the inlets I provide an outlet manifold generally designated 50 which is connected to a plurality of outlets 51 through the cam 36 and the back wall 16 of the casing 11.

In operation the pressure fluid enters the chambers B through the inlets 45 and whatever kinetic energy there is in the fluid due to its velocity is imparted to the vanes, since the fluid is forced to flow through the chamber B from the inlet 45 to the outlet 42 and consequently must encounter the vanes. After the pins 29 of the vanes pass the curved portion 48 the vanes pass into a small chamber designated B'. In this manner the vanes in effect become pistons in the chambers B' and a positive pressure is applied to the vanes which takes full advantage of the potential energy of the operating fluid. It will be noted that the chamber B' is of considerable greater cross sectional area than the chamber B at the opposite end, or at the point B'' and that the hub of the vanes effectively close this end of the chamber and form a partition between the chambers B. It is, therefore, apparent that, due to the expanding chambers, a greater vane area is exposed to the fluid pressure in the chamber B' than is exposed to the fluid pressure at B'' and that as a result there is a differential fluid pressure applied to the vanes at this point which impels the rotor. The vanes accordingly are impelled through the chamber B' by positive pressure of the fluid and as they encounter the high point 39 of the cam, they are rotated on their pins 30 and open the outlet 42 through the cam 36, thus evacuating the cylinder and clearing it for the entrance of the next vane. By arranging the inlets 45, the curved portions 48 and the high points 39 of the cam 36 in the proper relation I am enabled to take full advantage of the potential energy residing in the fluid as well as the kinetic energy, and consequently provide a turbine of increased efficiency as well as of novel construction.

Although I have shown and described one specific embodiment of my invention, nevertheless, I am aware that various modifications and refinements may be made which would in no way alter the principle of my invention. I, therefore, reserve the right to all such modifications and alterations which do not depart from the scope of the specification or the essence of the invention as expressed in the appended claims.

I claim:

1. A turbine comprising: a stator; a cam mounted on said stator, said cam stator being arranged to form circumferentially disposed chambers having a longitudinally increasing cross sectional area with an opening at the smaller end thereof; a rotor mounted in said stator; and a plurality of vanes pivotally mounted on said rotor and having their free ends adapted to engage said cam, said cam and vanes being arranged to continuously close the smaller end of said chambers.

2. The structure as set forth in claim 1 in which there is an even number of high points connected to low points on said cam and an uneven number of vanes on said rotor, and an out-

let fluid passage through said cam between each of said high and low points.

3. A turbine comprising: a stator; a rotor arranged to rotate in said stator; a cam member having a plurality of interconnected high and low points mounted on said stator and a plurality of vanes pivotally mounted on said rotor and having their free ends arranged to engage the face of said cam, said cam and said stator being arranged to form a plurality of circumferentially disposed chambers having a longitudinally increasing cross sectional area with an opening at the smaller end thereof and said vanes being adapted to continuously close the smaller end of said chambers.

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